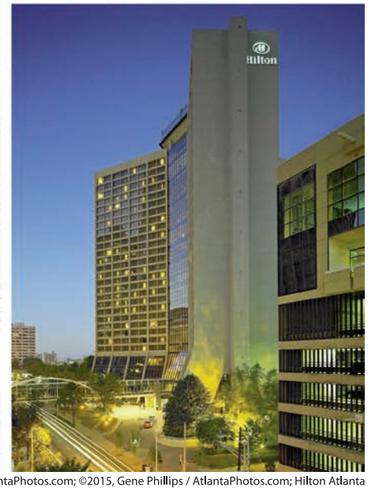
# See you next year in Atlanta for ACPA's 73RD Annual Meeting!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## Mark Your Calendar: April 4-9, 2016 Hilton Atlanta, GA

American Cleft Palate–Craniofacial Association's

# 72ND Annual Meeting

April 20-25, 2015 - Palm Springs, CA

*"Journey to the Oasis - Explore the World of Cleft and Craniofacial Care"*

American Society of Craniofacial Surgery
22nd Annual Meeting

## Pre-Conference Symposium

What İs The 'İdeal' Treatment Outcome For A Child With A Cleft?

# Week at a Glance

## SUNDAY

**April 19**
**4:00PM-7:00PM**
**ACPA 72nd Annual Meeting & Pre-Conference Symposium Registration Opens**

## MONDAY

**April 20**
**7:30AM-5:30PM**
**Registration**

**9:00AM-5:30PM**
**Pre-Conference Symposium:**
***What is the "Ideal" Treatment Outcome for the Child with a Cleft?***
*(separate registration required)*

## TUESDAY

**April 21**
**7:30AM-7:30PM**
**Registration**

**8:00AM-11:30AM**
**Pre-Conference Symposium:**
***What is the "Ideal" Treatment Outcome for the Child with a Cleft?***
*(separate registration required)*

**8:00AM-12:00PM**
**ACPA Primer for Cleft Care Providers***

**12:00PM-1:00PM**
*Optional Primer Lunch

**12:00PM-1:30PM**
**ACPA/CPF Committee Chair Luncheons**

**1:30PM-6:30PM**
**ACPA/CPF Committee Mtgs**

**5:00PM-6:00PM**
**New Member Orientation**

**6:30PM-8:30PM**
**ACPA/CPF Presidents' Welcoming Reception**

## WEDNESDAY

**April 22**
**6:30AM-6:30PM**
**Registration**

**7:00AM-8:00AM**
**Eye Openers – Group 1 (1-4)**
*(separate ticket required)*

**7:00AM-1:00PM**
**Poster Session A**

**7:00AM-5:00PM**
**Exhibits Open**

**7:30AM-8:20AM**
**Past Presidents' Breakfast***
**open only to past presidents of ACPA and CPF*

**8:30AM-9:00AM**
**Opening Ceremony**

**9:00AM-10:00AM**
**Keynote Address:**
Harold Slavkin, DDS

**10:30AM-12:30PM**
**General Session I**

**12:30PM-2:00PM**
- **Lunch Break** (on your own)
- **2016 Program Committee Meeting/Luncheon**
- **Ethics Roundtable***
  *(registration required)*
- **Optional Lunch Available**

**1:30PM-6:30PM**
**Poster Session B**

**2:00PM-3:00PM**
**General II: Team Care Panel**

**3:00PM-6:30PM**
**CPCJ Editorial Board Mtg/Dinner**
*(editor & section editors only)*

**3:15PM-4:45PM**
**Discipline Forums**

**5:00PM-6:45PM**
**Ideas & Innovations***
*(*upgraded Show & Tell)*

## THURSDAY

**April 23**
**6:30AM-6:00PM**
**Registration**

**7:00AM-8:00AM**
**Eye Openers – Group 2 (6-11)**
*(separate ticket required)*

**7:00AM-6:00PM**
**Poster Session C**

**7:00AM-5:00PM**
**Exhibits Open**

**8:00AM-10:00AM**
**Junior Investigator**

**10:30AM-11:45AM**
**General Session III**

**12:00PM-2:00PM**
**Annual Awards Luncheon**

**2:30PM-4:00PM**
**Study Sessions – Group 1 (A-J)**
*(separate ticket required)*

**4:30PM-6:00PM**
**Study Sessions – Group 2 (K-T)**
*(separate ticket required)*

**6:00PM-7:30PM**
**CPF Donor Reception**
*(by invitation only)*

## FRIDAY

**April 24**
**7:00AM-5:30PM**
**Registration**

**7:00AM-8:00AM**
- **ASCFS Breakfast**

**7:00AM-3:30PM**
**Exhibits Open**

**8:00AM-12:30PM**
**Poster Session D**

**8:00AM-9:00AM**
**Concurrent Panels**
***A: Quality of Life and Health Services***
***B: Speech-Language Pathology***
***C. ASCFS Linton A. Whitaker Lecture: Craniosynostosis***

**9:00AM-10:00AM**
**ACPA Annual Business Meeting**
*(open only to members of ACPA)*

## FRIDAY (cont.)

**April 24**
**10:30AM-12:00PM**
**Concurrent Session 1**
*1- ASCFS 1*
*2- Cleft Lip/Palate Surgery*
*3- Speech*
*4- Ortho/Dental*
*5- Basic Research*

**12:00PM-1:30pm**
- **Lunch Break** (on your own)
- **ASCFS Business Mtg/Luncheon***

**open only to the members of ASCFS*

**12:00PM-3:00PM**
**ACPA Council Meeting/Luncheon**

**1:00PM-5:00PM**
**Poster Session E**

**1:30PM-3:00PM**
**Concurrent Sessions 2**
*6- ASCFS 2*
*7- Cleft Lip Palate Surgery 2*
*8- Advances in BioImaging*
*9- Psychosocial*
*10- Genetics*

**3:30PM-5:00PM**
**Concurrent Session 3**
*11- Mandible Microsomia*
*12- Cleft Lip Palate Surgery 3*
*12- Speech Surgery*
*14- Hospital Management*
*15- Outcomes & International Issues*

**6:30PM-10:30PM**
**ACPA's 72nd Annual Gala "Night at the Oasis"**

## SATURDAY

**April 25**
**7:30AM-10:00AM**
**Registration**

**7:30AM-9:30AM**
**Concurrent Sessions**
*D: First Year Care (7:30 - 8:30)*
*E: Cleft Care in the Developing World (8:30 - 9:30)*
*F: ASCFS Panel: Timing of the Surgical Management of Non-Syndromic Craniosynostosis (7:30 - 9:30)*

## MEETING AJOURNED!

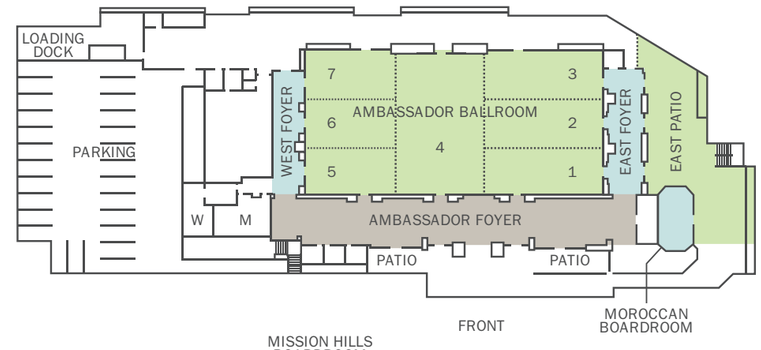
This Program Belongs to:

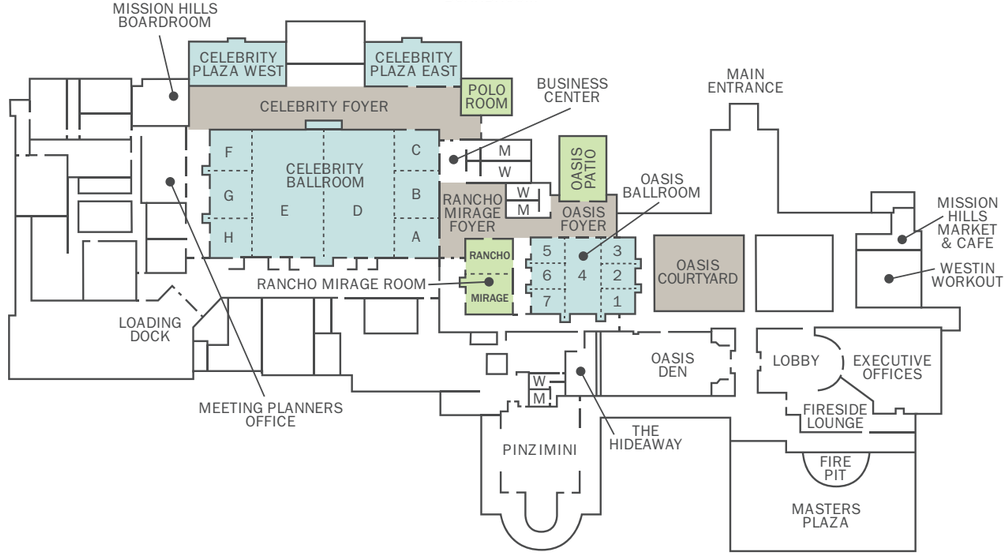
_____

If found, please return to the ACPA registration desk. Thank you.

***Cover artwork designed by Amatullah King, Molly Brewer, and Hillary Jones.***

# Hotel Floor Plan




THE WESTIN
MISSION HILLS
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Patricia H. Glick, DMD, MS
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John N. Jensen, MD
Joseph E. Losee, MD, ASCFS Liaison
Judy A. Marciel, MSN, CPNP
Michael S. Nelson, MD
Jamie L. Perry, PhD, CCC-SLP
Patricia A. Severns, MA
Harold C. Slavkin, DDS
Margot B. Stein, PhD
Michael J. VanLue, PhD, CCC-SLP
Amatullah King, Staff Liaison

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Katrina Dipple, MD, PhD
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Yvonne R. Gutierrez, MD,
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Jessica Kokos, Staff Liaison

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ACPA Executive Director
Hillary Jones,
Team Services Manager
Amatullah King,
Meetings Manager
Jessica Kokos,
Meetings Assistant
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CPF Director of Family Services

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Allison Smith, CMP,
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Kim Howard, CMP,
Global Events Managers

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**Marilyn A. Cohen, LSLP**
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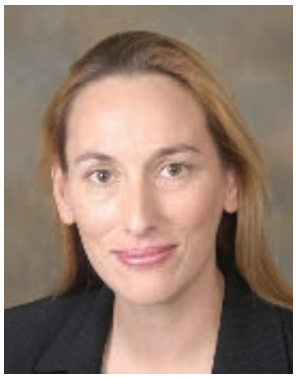

**Andrea O. Ray, MD**
Local Arrangements Chair

**Robert J. Havlik, MD**
ACPA Vice President and 2015 Program Chair

**ACPA/CPF National Office Staff and Support Team**
(l to r) – Wendy, Stephanie, Tina, Hillary, Sharon, Chinyere, Jessica, Amatullah

**Debbie**

**Teri**

**Allison**

**Kim**

# Table of Contents

# General Information



## Registration and Information

Your ACPA registration and information desk is located in the Celebrity Ballroom foyer on the ground floor of the Westin Mission Hills Hotel. Days and hours of operation are listed below. A message board has been provided for your convenience. Please check the board periodically for messages from other attendees or important telephone calls. Please have callers leave messages at your room if the messages are not urgent.

## Registration Desk Hours

| Date | Hours of Registration |
|---|---|
| Sunday, April 19 | 4:00PM - 7:00PM |
| Monday, April 20 | 7:30AM - 5:30PM |
| Tuesday, April 21 | 7:30AM - 7:30PM |
| Wednesday, April 22 | 6:30AM - 6:30PM |
| Thursday, April 23 | 6:30AM - 6:00PM |
| Friday, April 24 | 7:00AM - 5:30PM |
| Saturday, April 25 | 7:30AM - 10:00AM |

## Program, Badge, and Ticket Policy

When you register, you will receive your badge as well as appropriate tickets for social events, eye openers, and study sessions. If you are not attending the social event, please donate your tickets to students and residents. You may leave tickets with ACPA staff at the registration desk.

***It is essential that you keep your tickets with you for entrance into each of the above short courses and social events.*** Volunteers will take your tickets at the doors. The tickets have cash value and can be purchased but not replaced at the registration desk. We suggest you put your tickets behind your badge in the badge holder.

***You must wear your badge at all times during the meeting.*** Your badge gains you entrance to the general, concurrent, keynote, and poster sessions of the annual meeting. Special badge markings are needed for the Pre-Conference Symposia. The **"BADGE POLICE"** will be watching!

One program is provided for each registered attendee. If your program is lost or if additional copies are desired, they may be purchased at the registration desk for $15 each.

## Social Packages for Guests

Additional tickets to social events are available at the registration desk. The $135 Social Package includes the Welcoming Reception, the Annual Luncheon, and Friday's Gala – ***A Night At The Oasis*** – held outdoors at the Masters Plaza of the Westin Mission Hills Hotel. Tickets may be purchased separately at $25 for the Welcoming Reception, $35 for the Luncheon, and $75 for the Friday night Gala.

## AV Instructions and Speaker Ready Room

***(Audiovisual Preview)***

Speakers may preview their presentations in the Celebrity Planners Room located near the Celebrity Ballroom. Look for directional signs in the Celebrity Ballroom Foyer.

*General and Concurrent Session* speakers should pre-load their PowerPoint presentations at the podium prior to the beginning of their session, e.g., first thing in the morning or during coffee or lunch breaks.

*Eye Opener and Study Session* speakers are responsible for operating their own AV equipment.

*Laser Pointers* should be picked up by Session Co-Chairs just prior to their session and returned immediately afterwards to the ACPA Registration Desk.

*All speakers* must pick up their materials immediately following their presentation. Do not leave them with the technicians. ACPA and the AV staff will not accept responsibility for lost or damaged materials.

## Journal Manuscripts

Manuscripts to be submitted to the ***Cleft Palate-Craniofacial Journal*** should be left at the registration desk with an ACPA staff member to be given to Dr. Jack C. Yu, Editor.

## Poster Sessions, Exhibits and Coffee Breaks

Exhibits and posters will be displayed during the times specified in the Summary of Events. There will be five poster sessions: Poster Sessions A and B will be on Wednesday, Session C on Thursday, and Sessions D and E on Friday. Poster sessions will be held in the Celebrity Patio. All exhibits and coffee breaks will be held in the Celebrity Ballroom Foyer.

## Welcome to New Members

Look for the **LIGHT BLUE RIBBON** affixed to the badge of individuals who have joined ACPA in the past year. Please take a moment to welcome them to ACPA and to introduce them to colleagues. Also, as you meet non-members (blue badges), you might take a moment to discuss the goals and activities of the organization and the benefits of ACPA membership. Membership applications are available at the ACPA/CPF information desk in the Celebrity Ballroom Foyer.

## ACPA/CPF Authorized Photographs

Candid photos will be taken throughout the week in which you may be included. It is understood and agreed that these photos may be reprinted in our newsletter, on our website or in other publications. If you do not want your picture used, please inform the ACPA staff at the registration desk.

## Unauthorized Recording:

***Please Do Not Take Photographs or Otherwise Record Any Meeting Proceedings***

Taking photographs, audiotaping, or videotaping any annual meeting proceedings, oral presentations, or on screen images is STRICTLY PROHIBITED. Audience members who attempt to do so will be asked to leave the meeting rooms.

## Please be Courteous to Other Attendees

**Mobile devices:** Turn off – or put in silent mode – your cell phones and/or pagers while sessions are in progress.

**Children:** Children under 13 years of age are not permitted in lecture areas.

## 2016 Annual Meeting

April 4-9 2016 — ACPA's 73rd Annual Meeting and Pre-Conference Symposium
Hilton Atlanta Hotel
Atlanta, Georgia
Program Chair: Amelia F. Drake, MD

# General Information (cont)

## Educational Objectives

The overall educational objectives of the Annual Meeting are (1) to make concerned professionals aware of new clinical and research information through the organized presentation of original papers and poster sessions, and (2) to provide an opportunity for the involved professionals to update their knowledge and skills of their own and related disciplines through exhibits, video presentations, and focused short courses. Specific educational objectives for each component of the meeting are presented throughout the agenda.

## Continuing Education Credits

| | ASHA | ACCME | Nursing* | Instructional Level |
|---|---|---|---|---|
| Convention | 1.6 CEUs | 16.25 hours | TBD | Variable |
| Study Sessions (2 sessions) | 0.15 CEU ea (.3 for 2) | 1.5 hours ea | TBD | Variable |
| Eye Openers (2 sessions) | 0.10 CEU ea | 1.0 hour ea | TBD | Variable |
| Pre-Conference Symposium | 0.95 CEUs | 9.75 hours | TBD | Intermediate |

**Maximum Available: 3.05 CEUs / 31.00 hours**

* This activity has been submitted to North Carolina Nurses Association for approval to award contact hours. North Carolina Nurses Association is accredited as an approver of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.

## American Speech-Language-Hearing Association

ASHA Special Interest Division 5 (Speech Science) is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. See course information for number of ASHA CEUs, instructional level and content area. ASHA CE Provider approval does not imply endorsement of course content, specific products or clinical procedures.

This program is offered for 3.05 CEUs (Various Levels, Professional Area).

**Instructions for ASHA:** When you check in to the meeting, you will be given an ASHA participant form and the date and time of your arrival will be noted. Complete the form and return it to an ACPA staff member at the registration desk after you attend your last session. You are also required to complete **online evaluation forms** (see section to the right) for each component of the meeting for which you are seeking credit (i.e., annual meeting, symposia, study sessions, and eye openers).

## Continuing Medical Education:

**Accreditation Statement:** The American Cleft Palate-Craniofacial Association (ACPA) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

**Designation Statement:** ACPA designates this educational activity for a maximum of **31.00** ***AMA PRA Category 1 Credits™.*** Physicians should only claim credits commensurate with the extent of their participation in the activity.

**Instructions for ACCME:** When you register, the date and time of your arrival will be noted. At the end of the meeting or time of your departure, you must return the completed continuing education form to an ACPA staff member at the registration desk. You will also need to complete **online evaluation forms** (see section to the right) for each component of the meeting for which you are seeking credit (i.e., annual meeting, symposia, study sessions, and eye openers). Approximately 4 weeks after the meeting, a continuing education certificate will be mailed to you. If the continuing education form and evaluation forms are not completed, we will not be permitted to award credits.

## Online Evaluation Forms:

Help us improve future programs while fulfilling requirements to obtain your continuing education credits. Complete the online evaluation form for each component for which you are seeking credit. Links can be found here: http://www.acpa-cpf.org/am-feedback. You will need the registration ID number found on your meeting badge.

## Full Disclosure Policy

The American Cleft Palate-Craniofacial Association, in compliance with the Accreditation Council for Continuing Medical Education (ACCME) Standards for Commercial Support, has adopted the following Full Disclosure Policy:

*Presentations made at continuing medical educational activities sponsored or jointly sponsored by the American Cleft Palate-Craniofacial Association must include information regarding all commercial or industrial funding, consulting, or equity holdings by the presentations' author(s) and/or anyone related to the author(s) which could be affected by or could have an effect on the content of the presentation. This information is requested during the abstract submission process and will be disclosed to participants through statements in printed meeting materials and declared by the faculty member at the beginning of his/her presentation.*

**Faculty Disclosure Statements:** It is the policy of ACPA to ensure its programs are fair, balanced, independent, objective, and scientifically rigorous. In support of this policy, ACPA requires that: 1. Trade names are to be avoided during presentations. 2. Presentations made at continuing medical educational activities sponsored or jointly sponsored by ACPA, in compliance with standards for accreditation by ACCME, must include: a. information regarding off-label use(s); b. all commercial or industrial funding, consulting, or equity holdings by the authors of this presentation and/or anyone related to the authors which could be affected by or could have an effect on the content of the presentation. 3. This information will be disclosed to meeting participants through printed materials and must be declared verbally by the presenter at the beginning of the presentation. See Abstracts, page 56, for indication of disclosures, and online at http://meeting.acpa-cpf.org/abstracts-disclosures.html

## Disclaimer

The scientific material presented at this meeting has been made available by the American Cleft Palate-Craniofacial Association for educational purposes only. The material is not intended to represent the only, nor necessarily the best, methods or procedures appropriate for the health care situation discussed, but rather is intended to present an approach, view, statement, or opinion of the presenter which may be helpful to others who face similar situations.

The American Cleft Palate-Craniofacial Association disclaims any and all liability and injury or other damage resulting to any individual attending a course and for all claims which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by members of the health care professions or any other person.

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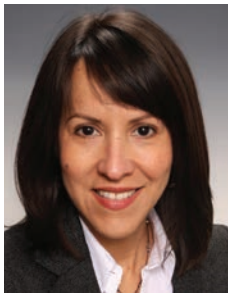
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Marilyn A. Cohen


Wendy-Jo Toyama

AMERICAN CLEFT PALATE-CRANIOFACIAL ASSOCIATION

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*Elizabeth Clifton*
– Tonya Mayer

*Ellis Tate Earls*
– Erin Paine

*Emily Rose Weiss*
– The Norman Shulevitz Foundation

*Emma Rose LeClair*
– Karen LeClair

*Eryn Foust*
– Erica Cooper

*Evelyn Luchansky*
– Cheryl Noe

*Flynn Johnson*
– Katie Johnson

*Great Nephew*
– Cynthia Stanton

*Hadley Evelyn*
– Aakre Kari Aakre

*Hugh Xiong*
– Lucy Yang

*Jacob Andrew*
– Joseph Lewis, Cornerstone Baptist Church

*Jameson Scott*
– Joanne Denison

*Jessica, Bruno and Daniel*
– Linda G. Poirier

*Kai Charlie Curtis*
– Jane E Ryan

*Kyle Ivankovich*
– Gabrielle Barrick
– Richard Knight

*Layla Ross*
– Joanne Altizer
– Steven and Miriam Brandon
– Brian and Beth Ross
– Ginger Thomann

*Liana Bassett*
– Ruth Baker
– Robert and Melinda Bassett
– Tabitha Clinton
– Senta Cunningham
– Stacey Harris
– Irene Renteria
– Amanda Ruiz

*Liana Bassett and Mickey Corral*
– Irene Renteria

*Lily Barefoot*
– EM and Ted Glick
– Jane Hutchinson-Barefoot
– Tonya Kirk
– Eric and Jennifer Olson

*Lindsay Michele Holcomb*
– Becky Holcomb Smith

*Marilyn Cohen*
– Jonathan and Lori Cilley

*Miracle Marie Thompson*
– Harpers Ferry Baptist Church

*Morgan Annalise Brachman*
– Daniel J. Brachman

*My Son*
– Todd Hughes

*Nancy and Brandy*
– Cheryl Jeanneret

*Nicholas Rodriguez*
– Cynthia Rodriguez

*Patrick Coble*
– April Coble

*Richard Strong Ortiz*
– Joseph Hinojosa
– Robin McGrew
– David Pfau

*Ryder Jeremiah*
– Lupe and Rodrigo Aguilera
– Julie Alexander
– Christopher and Ashleigh Alvarez
– Edward and Maria Alvarez
– Christine Amira
– William and Nancy Barbour
– Ann K. Briant
– Michael and Melissa Bullock
– Andrea K. Cox
– Kristy De Leon
– Scott and Irene Dunbar
– Linda Engstrom
– Delores and Brett Gourley
– Alma and Mark Gutierrez
– Dominic and Hollie Hajdukovic
– Rodrigo and Kelly Jimenez
– Jared Kluth
– Susan Kluth
– Brandy Lemon
– Courtney and Denise Mark
– John and Juleene McGowan
– Jimmy and Cindy Misiuk
– Elizabeth Perez
– Aurora, Ricky, and Graciela Perez-Jenkins
– Elizabeth and Janina Quintana
– Michael and Patty Roberts
– Monica R. Montoya and Alphonse Robles
– A. Bruce and M. Dianne Sanborn
– Carolyn Segiun
– Sean and Michelle Stegmaier
– Ariana and Nicholas Stein
– Angela Stewart
– Jennifer Stocking
– JL Stocking
– Mary and Roy Stocking
– Rick and Pamela Stocking
– Franz Summers
– Arthur and Geraldine Vasquez

*Sam Sheffield*
– Margaret Sheffield

*Saul Santana*
– Perez Sharon Marquez

*Sawyer Dumm*
– Phil and Nancy Andrews
– Christina Boehmer
– Susan Dattilio
– Bill and Bev DeLong
– Laura Dumm
– Amie Fox
– Olivia Frye
– Amanda Heidinger
– John Heidinger
– John and Kay Helm McCorkles
– Sandy Petzel
– Megan and Lee Radcliff
– Lorraine Rhymer
– Timothy and Deborah VanSickle
– Rusty and Tricia Wiget

*Seth Miu*
– Hope Kingma

*Smiles for Miles*
– David Garcia
– Jose Henriquez

*Vickie Petersen*
– Michael Petersen

**IN MEMORY OF:**

*Anna DeRuyter*
– Peggy Aldridge

*Ava Hicks*
– Glen Marshall

*Cory Boland*
– David and Janet Anthony

*Dr. Daniel Subtelny*
– James and Ann Anderson
– Jim and Linda Baroody
– Ronald J. Billings
– Marie-Elena Deeney
– Gerald and Nancy Graser
– Mark and Susan McDonough
– Maureen Wood

*Dr. Don LaRossa*
– Jewish Community Foundation of Greater Kansas City
– The Children's Hospital of Philadelphia
– Thanksgiving in the Country
– Children's Surgical Associates, Ltd.
– Stephanie Abvonizio
– Jeremy Baggish
– Nadia Blanchet
– Cynthia and Bruce Bower
– Christopher Ciatto
– Lisa Connelly
– Richard and Marcia Connelly
– Roger Crockett
– Bill and Jackie Fegley
– Nancy Folsom
– John Gatti
– Jill Ginieczki
– Hans and Anita Gottschalk
– Anthony Hallock
– John and Keera Holloran
– Emily Kiser
– Carol and John Kornitzer
– Rivka Levy
– Linda Lux
– Barry and Florence MacGibeny
– Will and Amy Mackin
– Maryanne D. Malin
– Katherine H. McNabb
– Emmanuel G. Melissinos
– Edward Meltzer
– Andrew Newman
– Pamela Onyx
– Bill Postic, MD, MMM
– Angela M.L. Randall
– Claire and Lawrence Raymond
– Charles and Dolores Sabino
– Nancy and Patrick Smythe
– John and Debra Spaldo
– Lawrence Tom
– Chris Tzarnas
– Robert Willson
– Robert and Kristine Yaworski
– Jerrold Zeitels
– Sheldon Bernick

*Dr. Peter Randall*
– Patricia Landis
– Pamela Onyx
– Ralph Shelton
– Mehdi Mazaheri

*Gerald M Sloan, MD*
– Timothy Bukowski
– Jan Diamond
– Nancy Fong
– Beth Holmgren
– Lois Jean Houpe
– David Neil Kirkman
– Tom Linden
– Michael Zenn

*His Mother*
– Ed Munson

*Janet Salomonson*
– Jeremy Baggish

*Joseph De La Rosa*
– RoseMarie Kiick

*Julian Alejandro Ojeda-Bustillos*
– Poleth Bustillos

*Lively Hembree*
– Wendy Schroeder

*Lora Ann Hensley*
– Buckingham Coal Co.
– Freedie Freewill Baptist Church
– Patricia Hensley
– The Mine Safety and Health Administration
– Laura Beckelhimer
– Jamie Guida Tate
– William and Myra Hagedorn
– Ronald J. Racicot

*Marvin Leaphart*
– Patsy Amick
– Virginia Benson
– Mary Bickley
– Joyce Cook
– Paul and Hazel Duell
– Emma Lou and Charles Easley
– Sheryll and Raymond Gill
– Azilee Lindler
– Dale Lindler
– Brenda Manus
– Barbara Prosser
– Jane and Charles Risinger
– Margaret Shealy
– Melanie and Gregory Webb
– Louise Winesett

*Mrs. Mickey Wise*
– Keith and Mary Ann Bacon

*Thelma Cohen*
– McGann, Trindade, Simons, and Yandoli
– Gregory McGann

***The Cleft Palate Foundation sincerely appreciates your generous support. Due to recent system changes, this listing may not contain complete data. Please notify us of any changes to be reflected in our online donor acknowledgements.***

FY 2014 FINANCIAL REPORTS TO THE MEMBERSHIP

# American Cleft-Palate Craniofacial Association

**Following are the audited financial reports prepared by the firm of Maher Duessel.**
**Additional information will be provided at the Annual Business Meeting in Palm Springs on Friday, April 24, 2015.**

**Copies of the audits are available through the National Office.**

## Statement of Financial Position
## June 30, 2014

| | |
|---|---|
| **ASSETS** | |
| CURRENT ASSETS: | |
| Cash and cash equivalents | 939,963 |
| Accounts receivable | 5,295 |
| Due from The Cleft Palate Foundation | 135,819 |
| Deposits | 65,690 |
| **Total Current Assets** | **$1,146,767** |
| Investments | 805,158 |
| FIXED ASSETS: | |
| Building | 451,586 |
| Office furniture and equipment | 127,505 |
| Assets not yet in service – software | 43,545 |
| Less accumulated depreciation – bldg | (157,212) |
| Less accumulated depreciation – office furniture and equipment | (114,423) |
| **Total Fixed Assets** | **$351,001** |
| **TOTAL ASSETS** | **$2,302,926** |
| **LIABILITIES AND NET ASSETS** | |
| CURRENT LIABILITIES: | |
| Accounts payable | 114,017 |
| Accrued liabilities | 69,181 |
| Due to The Cleft Palate Foundation | 84,739 |
| Deferred revenue | 167,330 |
| **Total Liabilities** | **$435,267** |
| **NET ASSETS** | |
| Unrestricted | 1,867,659 |
| **Total Liabilities and Net Assets** | **$2,302,926** |

## Statement of Activities
## For the year ended June 30, 2014

| | |
|---|---|
| **OPERATING REVENUES AND OTHER SUPPORT:** | |
| Member dues and fees | 359,750 |
| International airmail receipts | 8,820 |
| Annual meeting | |
| - Exhibits | 40,750 |
| - Commercial support | 55,500 |
| - Registration | 259,573 |
| Program registration | 6,895 |
| Cleft Palate-Craniofacial Journal | 45,100 |
| CAT application fees | 25,450 |
| Grant revenue | 18,248 |
| Miscellaneous receipts | 10,857 |
| **Total Operating Revenues and Other Support** | **$830,943** |
| **EXPENSES** | |
| Programs: | |
| - Membership and team services | 198,903 |
| - Annual meeting | 385,050 |
| - Educational and research initiatives | 35,993 |
| - Cleft Palate-Craniofacial Journal | 75,475 |
| - Outreach and alliances | 58,290 |
| - Team standards | 39,866 |
| Total program expenses | $793,577 |
| Management and general | $105,043 |
| **Total operation expenses** | **$898,620** |
| Excess (deficiency) of operating revenues and other support over operating expenses | (67,677) |
| **NONOPERATING SUPPORT AND REVENUES** | |
| Investment income | 67,957 |
| **CHANGES IN NET ASSETS** | 280 |
| **NET ASSETS** | |
| Beginning of year | 1,867,379 |
| End of year | 1,867,659 |

# Cleft Palate Foundation


**Following are the audited financial reports prepared by the firm of Maher Duessel.**

**Copies of the audits are available through the National Office.**

## Statement of Financial Position
## June 30, 2014

| | |
|---|---|
| **ASSETS** | |
| CURRENT ASSETS: | |
| Cash and cash equivalent | 495,539 |
| Accounts receivable | 2,921 |
| Due from ACPA | 84,739 |
| **Total Current Assets** | **$583,199** |
| Investments | 944,622 |
| FIXED ASSETS: | |
| Building | 149,435 |
| Less accumulated depreciation | (54,439) |
| **Total Fixed Assets** | **94,996** |
| **TOTAL ASSETS** | **$1,622,817** |
| **LIABILITIES AND NET ASSETS** | |
| CURRENT LIABILITIES: | |
| Accounts payable | 2,166 |
| Accrued liabilities | 4,124 |
| Due to ACPA | 135,819 |
| **Total Liabilities** | **$142,109** |
| **NET ASSETS** | |
| Unrestricted | |
| - Unrestricted, board designated for endowment | 23,353 |
| - Unrestricted, undesignated | 685,441 |
| **Total unrestricted** | **$708,794** |
| Temporarily restricted | |
| - Temporarily restricted – program purposes | 181,011 |
| - Temporarily restricted – accumulated endowment earnings | 249,109 |
| **Total temporarily restricted** | **$430,120** |
| Permanently restricted | 341,794 |
| Total Net Assets | $1,480,708 |
| **Total Liabilities and Net Assets** | **$1,622,817** |

## Statement of Activities
## For the year ended June 30, 2014

| | Unrestricted | Temporarily Restricted Funds | Permanently Restricted Funds | Total |
|---|---|---|---|---|
| **OPERATING REVENUES AND OTHER SUPPORT** | | | | |
| Contributions | 274,762 | 17,343 | 0 | 292,105 |
| Member fundraising | 9,450 | 0 | 0 | 9,450 |
| Pamphlet and bear sales | 27,502 | 0 | 0 | 27,502 |
| Research and foundation grants | 7,615 | 0 | 0 | 7,615 |
| Miscellaneous income | 6,603 | 0 | 0 | 6,603 |
| Net assets released from restriction | 130,411 | (130,411) | 0 | 0 |
| **Total Operating Revenues and Other Support** | **$456,343** | **(113,068)** | **0** | **$343,275** |
| **OPERATING EXPENSES** | | | | |
| Programs: | | | | |
| - Family services | 172,451 | 0 | 0 | 172,451 |
| - Outreach and alliances | 10,303 | 0 | 0 | 10,303 |
| - Educational research initiatives | 79,340 | 0 | 0 | 79,340 |
| Total program expenses | $262,094 | 0 | 0 | $262,094 |
| Management and general | 44,205 | 0 | 0 | 44,205 |
| Fundraising | 8,715 | 0 | 0 | 8,715 |
| **Total operating expenses** | **$315,014** | **0** | **0** | **$315,014** |
| Excess (deficiency) of operating revenues and other support over operating expenses | 141,329 | (113,068) | 0 | 28,261 |
| **NONOPERATING SUPPORT AND REVENUES** | | | | |
| Investment income | 14,782 | 84,747 | 0 | 99,529 |
| **CHANGE IN NET ASSETS** | 156,111 | (28,321) | 0 | 127,790 |
| **NET ASSETS:** | | | | |
| Beginning of year | $552,683 | $458,441 | $341,794 | $1,352,918 |
| End of year | $708,794 | $430,120 | $341,794 | $1,480,708 |

## What Is The "Ideal" Treatment Outcome For A Child with a Cleft?

**Educational Objectives:** The treatment of the child with a cleft begins at birth and does not have a defined end point. A multitude of practitioners are called upon to provide superb care for the child through the years. The ultimate treatment outcome for this child is dependent on every practitioner and each step or intervention the child receives.

No practitioner caring for a child with a cleft strives for anything less than the optimal outcome. But what defines that outcome in each respective field? From the surgeon to the orthodontist, to the speech pathologist to the behavioral psychologist; each practitioners' treatment builds on the others and plays into the total outcome. Further complicating the picture is the reality that medical reimbursement is being tied to outcomes. Therefore, "who is defining my ideal outcome?"

This pre-conference symposium will focus on defining what the "ideal" outcome is as it pertains to each of the fields participating in the care of a cleft patient. Within each field we will review the evidence that supports the ideal outcome or discuss its glaring absence. Strategies to achieve the ideal outcome will also be highlighted. Finally, an assessment of how outcomes will continue to be tied to professional reimbursement will be had.

At the conclusion of the symposium, the attendee will be able to:

1) identify the key participants in a cleft team and recognize the successful outcome methodologies used by each specialty within the team.
2) reflect on their cleft team and identify the specific strengths of his/her team as well as any deficiencies in assessment of outcomes QI process?
3) define a quality improvement measure that can be implemented within the team and a strategy to accomplish it.
4) recognize a void in the cleft outcome literature that might be addressed through a collaborative team effort and/or with collaboration with other teams.

**Symposium Co-Chairs:**

*Thomas D. Samson, MD*
Penn State Hershey Medical Center, Hershey, PA

*Mary Michaeleen Cradock, PhD*
St. Louis Children's Hospital, St. Louis, MO

**Symposium Faculty:**

*Amy L. Conrad, PhD*
The University of Iowa Hospitals and Clinics
Iowa City, Iowa

*Todd C. Edwards, PhD*
University of Washington School of Public Health
Seattle, Washington

*Kelly Evans, MD*
Seattle Children's Craniofacial Center
Seattle, Washington

*David Fitzsimons, BS**
The Children's Hospital at Westmead –
Cleft Palate Clinic
Westmead NSW, Australia

*Lynn Marty Grames, MS, CCC-SLP **
St. Louis Children's Hospital –
Cleft Palate and Craniofacial Institute
St. Louis, MO

*Carrie Heike, MD, MS*
Seattle Children's Craniofacial Center
Seattle,Washington

*Kathleen A. Kapp-Simon, MA, PhD Psychology*
Shriners Hospital for Children
Chicago, Illinois

*Ross Long, Jr, DMD, MS, PhD*
Lancaster Cleft Palate Clinic
Lancaster, PA

*Joseph E. Losee, MD*
Children's Hospital of Pittsburgh of UPMC
Pittsburgh, PA

*Mohammad Mazaheri, MDD, DDS, MSc*
Lancaster Cleft Palate Clinic
Lancaster, PA

*Thomas Sitzman, MD*
Cincinnati Children's Hospital Medical Center
Cincinnati, OH

*Judith Trost-Cardamone, PhD*
California State University, Northridge
Northridge, CA

*Karen Wong, MD, MSc*
Hospital for Sick Children
Toronto, Ontario, CAN

*An asterisk indicates the presenter made a disclosure. Please see symposium faculty listings on pages 22-23 for disclosure.

**Symposium Support**
**With grateful appreciation to:**
**KLS-Martin Group and**
**Dr. Mohammed Mazaheri, MDD, DDS, MSc**
**for support through educational grants.**

## MONDAY, April 20, 2015

9:00 AM-5:30 PM
**Room: Celebrity E-H**

9:00 AM **INTRODUCTION & WELCOME**

9:15 AM **54 YEARS OF CAREER IN THE MANAGEMENT OF PATIENTS WITH CLEFT LIP AND PALATE, DEFINING THE IDEAL OF TEAM CARE**
*Mohammad Mazaheri, MDD, DDS, MSc*

I have had the pleasure of working at the Lancaster Cleft Palate Clinic for 54 years. I have seen thousands of patients treated via surgery or various dental modalities. Today's management of these patients has significantly changed from the previous years. In the 1950s, 1960s, and 1970s many of the patients received prosthetic management for their cleft palate condition. In my presentation I will present my findings of the longitudinal data from birth to 16 years. The surgical and the dental outcome will be presented. As a co investigator of the NIH supported study at the Lancaster Cleft Palate Clinic, I was responsible to collect longitudinal data from birth to 16 years. The data consisted of oral, dental, and facial casts and cephalometric radiographs. The uniqueness of this longitudinal investigation was that all cleft lip/palate surgical procedures were performed by one surgeon. Data was collected on patients birth-date. I will present the finding of the effective surgery and the growth of the mid-face and oral facial region. Conclusion is that traumatic surgical procedures has a significant effect in the final outcome of oral-facial growth and speech and hearing performance.

9:45 AM **EUROCLEFT**
*Ross Long, Jr, DMD, MS, PhD*

In this lecture, other initiatives from around the world, that have been started based on the model established by Eurocleft and with a focus on internal audits, standardization of records, and intercenter comparisons of outcomes, will be presented.

10:15 AM **AFTER EUROCLEFT...AMERICLEFT AND BEYOND**
*Ross Long, Jr, DMD, MS, PhD*

Following the success of Eurocleft, in 2000, the WHO launched a 5-year project to advance international research on craniofacial anomalies. Included in the recommendations from that project was emphasis on intercenter collaboration for comparisons of treatment outcomes. In 2006 the Americleft Project was initiated with the support of ACPA and CPF. Since then, Americleft has carried out comparisons of outcomes from over 20 centers representing a wide range of treatment protocols. As interest in collaborative studies grows and additional centers with different protocols participate, our understanding of best practices in cleft care increases. Just as Americleft used Eurocleft as its model, other similar efforts worldwide have been planned or initiated: Japancleft, ANZcleft, Indiacleft, Africleft, Turkeycleft, Mexicleft. With worldwide agreement on standardization of records and methods for blinded comparisons, and eventual clinical trials based on the findings of inter-center studies, our treatment choices for cleft care become increasingly based on sound evidence rather than anecdote and opinion.

10:45 AM **BREAK**

11:00 AM **THE PROCESS OF DELIVERING HIGH QUALITY CLEFT AND CRANIOFACIAL TEAM CARE: A FORGOTTEN OUTCOME?**
*David Fitzsimons, BS**

Numerous multicenter initiatives including the Americleft Project have empowered healthcare teams to collect and study patient-based outcome data for cleft/craniofacial care. These data provide an accurate picture of patient outcomes from a given team and are useful for comparing patient outcomes between teams. However, patient-based data does not provide information about the specific journey undertaken by patients through their respective cleft/craniofacial team nor information on how well a team actually works. By monitoring our provision of care, we can detect non-compliance or deviations from care more easily. When we pair our patient-based data and the data on our clinical processes, we are in a better position to understand and thus improve patient outcomes. The purpose of this presentation is to highlight the importance of measuring and monitoring the processes and steps within our patients' journeys through our teams as an adjunct to the collection of traditional patient-base outcome measures.

11:30 AM **PANEL: HOW CAN OUR TEAM GET INVOLVED? — REAL LIFE EXAMPLES**
*Ross Long, Jr. DMD, MS, PhD, David Fitzsimons, BS*

Each learner will be able to determine how their respective team can participate in outcomes studies without compromising excellence in patient care. They will also better appreciate the importance and feasibility of team participation in outcomes studies.

12:30 PM **LUNCH BREAK** (on your own)

1:00 PM **CLEFT Q — WHO'S 'IDEAL' IS IT ANYWAY?**
***Karen Wong, MD, MSc**, Elena Tsangaris, BHSc, MSc, PhD Candidate, Tim Goodacre, BSc, MB BS, Christopher Forrest, MD,MSc, Andrea Pusic, MD, MHS, Stefan Cano, BSc, PhD CPsy AFBPsS Anne Klassen, BA, DPhil*

Patient-reported outcomes (PROs) measure concepts of interest to patients, as reported by patients. As patient-centered care becomes increasingly important, quality improvement and clinical audits are driven by outcomes data that include PROs in addition to observer-reported, clinician-reported, and performance outcomes. The measurement of outcomes from the patient perspective must be clinically meaningful and scientifically sound. The CLEFT-Q is a cross-cultural PRO measure for patients with cleft lip and/or palate (CLP) designed through a rigorous mixed-methods process. We developed fourteen independently-functioning scales following extensive qualitative interviews that were then

revised through an iterative series of cognitive debriefing interviews and expert input. In a pilot field-test, we determined the optimal response options and compared paper versus electronic administration. A large-scale multi-national field-test is now underway. Once finalized, the CLEFT-Q will facilitate the inclusion of the patient perspective in the overall evaluation of treatment outcomes.

1:30 PM **DEFINING THE SPEECH IDEAL**
*Judith Trost-Cardamone, PhD*

It is implicitly agreed, at least among speech-language pathologists in developed countries who are specialized in craniofacial disorders, that an ideal early outcome for children born with cleft palate (+ cleft lip) is "normal speech by age 5," to coincide with entry into school and all that that experience brings with it. At the same time, available research evidence and informal dialogue among SLP cleft specialists both suggest that somewhere between 50%-70% of children with cleft palate actually achieve normal speech by age 5. There clearly appears to be a mismatch between what is ideal or expected and what is real at this age and point in treatment. The speech outcome literature also informs us that outcome figures tend to improve as the population gets older and that by young adulthood, "good speech" can be expected in 90-100% individuals with repaired cleft palate. This presentation will consider various factors that underlie how we define the ideal speech outcome.

2:00 PM **BREAK**

2:15 PM **PATIENT AND FAMILY-CENTERED IDEAL OUTCOMES**
*Kathleen A. Kapp-Simon, PhD Psychology, Todd Edwards, PhD*

The definitions of 'ideal outcomes' for children with cleft lip, cleft palate or both and their families vary based on the perceptions of the person completing the evaluation. Parents, patients and treating medical specialists do not always value the same outcomes. For example, hypernasal speech may prompt a recommendation for further intervention from a speech pathologist, but be of little concern to either parent or patient. Lip or nasal asymmetry may be of prime concern to a young patient but viewed as minor by a parent or surgeon. Adding further complexity, individual families differ where they place their priorities for treatment: for some families speech intelligibility or academic achievement is a high priority, while for others facial appearance takes primacy. During this presentation we will discuss methods for determining patient and family centered ideal outcomes as these methods apply to research and clinical settings.

2:45 PM **PATIENT OUTCOMES: LEARNING AND PSYCHOSOCIAL**
*Amy L. Conrad, PhD*

As children with oral clefts grow, focus of their care often extends beyond that of the cleft to how they are functioning in life (i.e., academically, personally, and socially). The nature of having a cleft puts children at risk for various psychosocial and learning concerns. Because of this risk, it is important to ensure proper screening methods to identify those with clinical concerns as early as possible, provide appropriate assessment of concerns to ensure appropriate intervention/ remediation is given, and follow-up through development as psychosocial and learning demands change. This presentation will discuss common psychosocial/emotional and learning diagnoses children with cleft are at an increased risk for; review methods for clinical screening, assessment, and referral; and list different concerns during developmental stages. Attendees will be able to describe different diagnoses children with cleft are at risk for and list appropriate methods of screening and identification for referral and treatment.

3:15 PM **BREAK**

3:30 PM **THE SURGICAL "IDEAL"**
*Joseph E. Losee, MD*

What is the IDEAL surgical outcome for children born with clefts? This controversial discussion will call upon the psychology of appearance, beauty, and facial deformity. Likely all surgeons would agree that the ideal surgical outcome would include "normal human appearance", intelligible speech, as well as a functional and aesthetic occlusion. Many suffer from facial differences that result from trauma and injury, such as dog bites, and congenital anomalies. The ideal surgical outcome results when the patient, at the conclusion of reconstruction, is psychosocially stable and are at peace with themselves – accepting differences that fall within the "normal range" of human appearance.

4:00 PM **SPEECH OUTCOMES: TECHNIQUES FOR THE REAL WORLD**
*Lynn M. Grames, MS, CCC-SLP**

Standard 6 of the Standards for Cleft Palate and Craniofacial Teams mandates that "The Team documents its treatment outcomes, including base-line performance and changes over time. Teams must conduct periodic retrospective or prospective studies to evaluate treatment outcomes."
For busy clinicians, evaluating treatment outcomes may seem both time-consuming and expensive. Yet, unless we evaluate our outcomes in a meaningful way, we cannot know that changes we make in methods or techniques actually result in positive change. Organizing clinical data on the front end can make for easier retrospective outcomes analysis. Some methods for organizing and evaluating treatment outcomes will be discussed.




4:30 PM **PANEL: TAKING OUR PULSE — EVALUATING OUR TEAMS' INDIVIDUAL AND TEAM OUTCOME GOALS**
*Kathleen A. Kapp-Simon, PhD Psychology*

Each learner will be able to identify strategies to help navigate team dynamics in order to achieve "ideal" patient outcomes, as well as strategies to handle patient outcomes are less than ideal.

5:30 PM **ADJOURN**

## TUESDAY, April 21, 2015

8:00 AM-11:30 AM
**Room: Celebrity E-H**

8:00 AM **INTRODUCTION**

8:15 AM **BRINGING THE TEAM TOGETHER TO REACH THE "IDEAL": A PEDIATRIC PERSPECTIVE**
*Carrie Heike, MD, MS, Kelly Evans, MD*

Children with orofacial clefts require multidisciplinary, longitudinal, and coordinated care. The goal for this presentation is to provide an overview of the medical considerations for children with clefting. We will discuss considerations for evaluation of overall health, growth, feeding, sleep-disordered breathing, preventative dental and medical care, associated anomalies, eustachian tube dysfunction, surgical readiness, school performance, and other appearance-related concerns (e.g. acne). We will provide a pediatric perspective regarding holistic team care for children with multiple providers and different treatment options. We will also briefly discuss our experience using a clinical pathway designed to track specific aspects of surgical readiness for infants undergoing primary lip repair in order to facilitate discussion on optimal ways to monitor overall health.

9:15 AM **PARTICIPATING IN MULTI INSTITUTION STUDIES — HOW CAN MY TEAM GET INVOLVED**
*Thomas Sitzman, MD*

This presentation will discuss opportunities for cleft teams to participate in multi-institutional studies evaluating cleft outcomes. Results of previous multi-institutional studies will be highlighted. Ongoing studies will then be reviewed and details provided on how to join these studies.
The opportunities to improve patient outcomes through multi-institutional studies will be highlighted using examples from multiple domains. The challenges of teams to participating in these studies will also be addressed with potential approaches to overcome these hurdles.

9:45 AM **PANEL: LET'S GET REAL — BALANCING CLINICAL WORK, OUTCOMES ASSESSMENT AND PROFESSIONAL REIMBURSEMENT**
*Carrie Heike, MD, MS*

Each learner will be able to identify strategies to successfully begin or continue outcome based studies within their team.

10:15 AM **BREAK**

10:30 AM **PANEL: PULLING IT TOGETHER — DEVELOPING A ROAD MAP/PLAYBOOK TO BRING THIS BACK TO OUR TEAM**
*Thomas Samson, MD*

Each learner will be able to identify a strategy to get themselves and their team involved in outcomes research.

11:30 AM **ADJOURN**

# Symposium Faculty

**Amy L. Conrad, PhD** is a psychologist at the University of Iowa, who has worked in the research of learning and psychosocial outcomes among children with oral clefts since 2005. As an Assistant Professor in the Stead Family Department of Pediatrics, she conducts clinical assessment of learning and attention disorders. Her research uses standardized assessment and both structural and functional MRI to better understand the development of language and reading disorders in children with oral clefts. She is a member and past co-chair of the Society of Pediatric Psychology Craniofacial Special Interest Group and is a member of the AmeriCleft psychosocial team.

**Mary Michaeleen Cradock, PhD** is a pediatric psychologist at the St. Louis Children's Hospital. She specializes in the assessment and treatment of young children with medical or developmental concerns including those with high risk neonatal history, craniofacial conditions, and other chronic medical conditions. Her clinical interests include the assessment and treatment of children with medical or developmental concerns, early childhood mental health issues, and parent-child relationship improvement.

**Todd C. Edwards, PhD** is a Research Assistant Professor in Health Services at the University of Washington School of Public Health. He is a founding member of the Seattle Quality of Life Group. His interests include development, validation and application of patient and observer-reported measures of signs/symptoms, function, and quality of life across a variety of populations and health conditions, including pediatric craniofacial conditions. Dr. Edwards is also involved in work developing and applying patient-centered clinical tools for screening and support of treatment decisions. He teaches the course "Assessing Outcomes in Health and Medicine" at the University of Washington.

**Kelly Evans, MD** is a pediatrician and clinician-scientist in the Seattle Children's Craniofacial Center and faculty member of the University of Washington. She provides medical management and care coordination for children with craniofacial conditions in the outpatient clinic and hospital setting. Her clinical research focuses on optimizing outcomes for infants with Robin sequence. She participates in clinical protocol development and improvement projects, along with multidisciplinary outcomes research.

*** David Fitzsimons, BS** is a Clinical Specialist Speech Pathologist from The Children's Hospital at Westmead in Sydney, Australia. David is the lead clinician on the hospital's Cleft Palate Team and is highly experienced in the perceptual assessment of cleft palate speech as well as the objective assessment of velopharyngeal insufficiency (VPI). David is also experienced in relational database development and has designed and constructed a number of Hospital-based clinical databases including three systems specifically designed for the management of children with cleft lip and palate. David is currently co-project managing a clinical redesign project in cleft and craniofacial care within The Sydney Children's Hospital's Network and is also completing his PhD through the University of Sydney. **The presenter has disclosed that he is the developer of the "Crux Cleft Palate Database" software. Any description of the functionality of the database that may appear as part of this presentation are for educational and illustrative purposes only. The Crux Cleft Palate Database is not for sale, and David is not receiving or soliciting any financial benefits related to this presentation.**

*** Lynn Marty Grames, MA, CCC-SLP** has served as a speech-language pathologist with the Cleft Palate and Craniofacial Institute at St. Louis Children's Hospital for thirty years. Her focus includes articulation therapy for children with cleft palate; velopharyngeal imaging and management, and clinical research. She is an instructor at Saint Louis University in the Department of Communication Sciences and Disorders and at the Center for Advanced Dental Education. **The presenter has disclosed that she receives salary in part for collection and analysis of clinical outcome data.**

**Carrie Heike, MD, MS** is a pediatrician and clinician-scientist in the Seattle Children's Craniofacial Center. She has participated on the multidisciplinary team by diagnosing and managing patients with complex craniofacial conditions in both the outpatient and inpatient settings for over 10 years. She spends half of her time caring for children with craniofacial conditions, and the other half conducting clinical research.

**Kathleen A. Kapp-Simon, MA, PhD** is a Pediatric Psychologist at Shriners Hospital for Children and Clinical Associate Professor in the Craniofacial Center, University of Illinois at Chicago. She has been an active member of a Cleft-Craniofacial Team for more than 30 years. She served as principal investigator on Maternal and Child Health and multi-site NIDCR funded studies focused on social skills development, quality of life, stigma and neurodevelopment of children with CFCs. She has been active with ACPA and CPF, serving on multiple committees, task forces, and both Councils; and she is a past president of ACPA.

**Ross Long, Jr, DMD, MS, PhD** is Executive Director of the Lancaster Cleft Palate Clinic, being involved in cleft care for 38 years. He is Past-President of the American Cleft Palate-Craniofacial Association, and heads the Americleft Task Force.

**Joseph E. Losee, MD** is the Ross H. Musgrave Endowed Professor of Pediatric Plastic Surgery and Executive Vice Chair of the Department of Plastic Surgery at the University of Pittsburgh Medical Center. He is the Plastic Surgery Program Director and Chief of the Division of Pediatric Plastic Surgery at Children's Hospital of Pittsburgh of UPMC. Dr. Losee serves as a Director of the American Board of Plastic Surgery, President of the American Society of Craniofacial Surgeons, and past-president of the American Council of Academic Plastic Surgeons. He is an editor of "Comprehensive Cleft Care" and "Pediatric Plastic Surgery".



**Mohammad Mazaheri, MDD, DDS, MSc** started his medical and dental education in September of 1950 at the University of Pennsylvania School of Medicine. He received his MD degree in 1954. In 1956, following two years of studies, he received his DDS degree from the same school, shortly after he started his residency at the Lancaster Cleft Palate Clinic. He is the recipient of three NIH grants. His research in the effect of surgery on oral facial growth lasted for twenty years with a very successful outcome and numerous publications. Dr. Mazaheri has received numerous awards for his research and clinical endeavors. He is the recipient of the American Cleft Palate-Craniofacial Association's (ACPA) Honors and Awards, ACPA President and Distinguished Award, the Lancaster Cleft Palate Clinic and LGH Highest Physician Award, the Lancaster Health Center Humanitarian Award for being the founder of and president of this center. Dr. Mazaheri is past president of both the American Cleft Palate-Craniofacial Association and the Cleft Palate Foundation, as well as state and local medical and dental societies. He is the President and founder of the Happy Face Foundation. He is professor of surgery at Penn State Hershey Medical Center, Director Emeritus Lancaster Cleft Palate Clinic.

**Thomas D. Samson, MD, FAAP, FACS** has been a pediatric plastic surgeon at Penn State Hershey Medical Center and a member of the Lancaster Cleft Palate Clinic team since 2010. He completed a general surgery residency at the Mayo Clinic Arizona followed by a plastic surgery residency at Penn State Hershey and a craniomaxillofacial fellowship at Sick Childrens Hospital, University of Toronto. Upon completion of his fellowship, he returned to Penn State and became a Co-Director of the Penn State Hershey Craniofacial Clinic as well as the Penn State Hershey Vascular Anomalies Clinic. Tom also serves as the associate program director for the Penn State Hershey Integrated Plastic Surgery Residency Program.

**Thomas Sitzman, MD** graduated summa cum laude from the University of Virginia in 2001. He obtained his medical degree from Duke University, where he conducted research on the genetics of craniofacial anomalies. Dr. Sitzman completed an integrated residency in Plastic and Reconstructive Surgery at the University of Wisconsin. While in residency he received a grant from the Plastic Surgery Education Foundation to support his work in detection of tissue ischemia. Dr. Sitzman completed a fellowship in pediatric plastic surgery at the prestigious Hospital for Sick Children in Toronto, Ontario. During his fellowship he obtained advanced training in management of cleft lip and palate, facial reanimation, traumatic and congenital deformities of the upper and lower extremity, sarcoma reconstruction, and brachial plexus reconstruction. Joining Cincinnati Children's Hospital Medical Center in 2012, Dr. Sitzman is a key member of the quality improvement efforts within the Department of Surgery. He has an active practice in plastic surgery at Cincinnati Children's.

**Judith Trost-Cardamone, PhD** is Professor Emeritus, California State University, Northridge and Speech Pathologist at Ventura Cleft Lip and Palate Clinic. Publications and professional development presentations have focused on description, assessment and treatment of cleft palate speech disorders. She is nationally/internationally recognized for her educational contributions, co-author of The Clinician's Guide to Treating Cleft Palate Speech (2006), Fellow of ASHA, recipient of the 2012 ACPA Distinguished Service Award and actively involved in the Americleft Speech Outcomes Project. She has travelled as a volunteer Visiting Educator to provide and develop speech services for children with clefts in underserved regions of the world.

**Karen Wong, MD MSc FRCSC** is a surgeon-scientist and Assistant Professor in the Division of Plastic and Reconstructive Surgery at the Hospital for Sick Children and the University of Toronto. She is completing a PhD in Health Research Methodology at McMaster University. Her clinical focus is in cleft lip and/or palate and microsurgery. Her research focus is in health services research and patient-reported outcomes, including the development of the CLEFT-Q with Dr. Anne Klassen. The CLEFT-Q project now includes a multi-national team and is supported by grant funding from the Canadian Institutes of Health Research.

## TUESDAY, April 21, 2015

8:00 AM-12:00 PM
**Room: Celebrity D**

The 2015 Program Committee is pleased to announce the return of the pre-conference symposium, The 2015 Team Care Primer. This program is designed for newer members of ACPA and for those who are simply interested in learning more about optimizing team care.

*Continuing Education credit is not available for this program*

8:00 AM **INTRODUCTION & WELCOME**
*Wendy-Jo Toyama, MBA, CAE*
*ACPA Executive Director*

8:05 AM **THE 5 FUNDAMENTAL LAWS OF TEAM CARE**
*Richard E. Kirschner, MD**
*Nationwide Children's Hospital*

We all know that teamwork is essential to providing optimal care to cleft-affected children. But how does a successful team really work? What makes some teams excel while others fail to thrive? What separates great teams from groups of individuals that struggle to reach their full potential? The 5 Fundamental Laws of Team Care will discuss the basic principles and strategies that are essential to building a winning cleft-craniofacial team. Understanding and applying these ideas, including The Law of Significance (Yes, It Takes a Team), The Law of Purpose (It Really is the Vision Thing), and the Law of the Helm (The Team Sinks or Sails on Leadership), will not only help your team fulfill its mission but also empower your team to achieve greatness. This session is designed for all team members and team leaders (which, on successful teams are truly one and the same). Learning and practicing these laws will enhance your capacity to unlock your potential and to function effectively as a team builder, allowing you to provide your patients with the best in comprehensive cleft and craniofacial care. ***The author has disclosed that he receives salary as Editor, Comprehensive Cleft Care, CRC Press.**

8:35 AM **ORIGINS OF TEAM CARE: THE LANCASTER CLEFT PALATE CLINIC**
*Ross E. Long, Jr., DMD, MS, PhD*
*Lancaster Cleft Palate Clinic*

ACPA's mission is based on the concept of multi/ interdisciplanry team care. The original application of team care as applied to management of patients with clefts and craniofacial anomalies, was first developed by a Lancaster, PA orthodontist in 1938, Dr. HK Cooper. Seventy-five years later, while technology and procedures have continued to improve our treatment capabilities, the underlying principle of team care remains the same. This presentation will summarize the history and concepts of team care.

8:45 AM **INTRODUCTION TO THE AMERICAN CLEFT PALATE-CRANIOFACIAL ASSOCIATION (ACPA)**
*Ronald Reed Hathaway, DDS, MS, MS*
*Cincinnati, OH*

Welcome to ACPA, the home of professionals like yourself! Find out more about this organization, its new horizons and how you can become more involved.

8:55 AM **UNDERSTANDING THE CLEFT PALATE FOUNDATION (CPF)**
*Marilyn A. Cohen, BA, LSLP*
*Cooper University Hospital*

The Cleft Palate Foundation was originally established in 1973 as The American Cleft Palate Educational Foundation. Its goal at that time was to provide special educational symposia, both as a part of the annual ACPA meeting and as separate freestanding educational programs. That goal has evolved over the years and is now focused on patient and public education about clefts and craniofacial conditions. This presentation will highlight the major services, projects and products of the Cleft Palate Foundation and its current mission. Particular emphasis will be placed on how it supports team care, and a description of the foundation's educational materials and programs including student scholarships for both undergraduate and graduate specialty education. In addition, the types of research funding will be described. The goal of this presentation will be to familiarize the attendees with the scope and programs available through CPF.

9:05 AM **THE REVITALIZATION TASK FORCE AND THE ACPA STRATEGIC PLAN**
*Jerry Moon, PhD, University of Iowa*
*Helen Sharp, PhD ,Western Michigan University*

The Task Force on ACPA Revitalization (hereafter referred to as the RTF) was constituted following the 2012 annual meeting of the American Cleft Palate-Craniofacial Association (ACPA) to "develop ACPA's web presence to increase relevance". RTF members were asked to envision what a new organization would look like, given the mission and vision, without constraint with respect to available resources (financial or otherwise). They were asked to not consider what the ACPA currently is or does, but rather what the organization should be in order to provide the greatest benefit to its members and to be uniformly recognized as the global vanguard for promoting team care for individuals affected with cleft lip/palate and other craniofacial anomalies. Ove a two year period, 79 ACPA members brainstormed and developed a series of "solutions", or initiatives, for moving the ACPA forward in four emphasis areas …. Learning and Discovery, Networking and Connectivity, Leadership, and Advocacy. It was recommended that these emphasis areas be incorporated into the ACPA Strategic Plan. A new Strategic Plan for the future of the ACPA was developed during the Fall 2014 Interim Meeting of the Council. This presentation will highlight the

outcome of the Revitalization Task Force and the potential impact of its findings on the future direction of the ACPA, along with a review of the newly developed Strategic Plan for the ACPA.

9:25 AM **Q&A**

9:40 AM **BREAK**

9:55 AM **ABC'S OF TEAM CARE**
*Lynn M. Fox, MA, MEd, CCC-SLP*
*UNC Craniofacial Center*

This presentation will deconstruct, describe, and discuss craniofacial team formation, mission, composition, leadership, decision-making, roles, collaboration skills, communication, goals, conflict, ethics, and the team process.

10:20 AM **FUNDAMENTALS OF CLINICAL RESEARCH**
*Carrie L. Heike, MD, MS*
*University of Washington,*
*Seattle Children's Hospital*

We have the opportunity to improve cleft and craniofacial care by contributing to high quality research. This presentation will provide a review of clinical study designs, highlight considerations for participation in research, and offer tips to get started.

10:45 AM **PARAMETERS OF CARE AND THE COMMISSION ON APPROVAL OF TEAMS (CAT)**
*David Kuehn, Professor Emeritus*
*University of Illinois at Urbana-Champaign*

The Commission on Approval of Teams (CAT) oversees team approval in relation to the six standards that were derived from the ACPA Parameters of Care.

11:10 AM **GLOBAL ASPECTS OF TEAM CARE**
*John van Aalst, MD*
*Cincinnati Children's Hospital*

This is part of a team primer that will be presented prior to the Annual Meeting.

11:35 AM **THE 5TH LAW**
*Richard Kirschner, MD**
*Nationwide Children's Hospital*

The 5th Law will conclude the points discussed in The 5 Fundamental Laws. ***The author has disclosed that he receives salary as Editor, Comprehensive Cleft Care, CRC Press.**

11:45 AM **Q & A**

12:00 PM **ADJOURN**

1:00 PM **2015 Team Care Primer Luncheon** *(Optional)*
**Room: Celebrity D**

## TUESDAY, April 21, 2015

7:30 AM-7:30 PM
**REGISTRATION**
**Room: Celebrity Ballroom Foyer**

**SPEAKER READY ROOM**
**Room: Celebrity Planners Office**

8:00 AM-11:30 AM
**PRE-CONFERENCE SYMPOSIUM (CONTINUED):**
***WHAT IS THE "IDEAL" TREATMENT OUTCOME FOR A CHILD WITH A CLEFT?***
**Room: Celebrity E-H**

8:00 AM-1:00 PM
**ACPA PRIMER FOR CLEFT CARE PROVIDERS (Lunch Optional)**
**Room: Celebrity D**

12:00 PM-1:30 PM
**ACPA/CPF COMMITTEE CHAIR LUNCHEON**
**Room: Rancho-Mirage**

1:30 PM-6:30 PM
**ACPA/CPF COMMITTEE MEETINGS**

3:00 PM-5:00 PM
**EXHIBIT SET-UP**

5:00 PM-6:00 PM
**NEW MEMBER ORIENTATION**
**Room: Rancho-Mirage**

6:30 PM-8:30 PM
**PRESIDENT'S WELCOMING RECEPTION**
Join ACPA President Ronald R. Hathaway, DDS, MS, MS and CPF President Marilyn Cohen, LSLP for cash bar and light hors d'oeuvres.
Supported in part by KLS Martin Group and 3D Systems – Medical Modeling.
**Room: Masters Plaza (outdoor)**

## WEDNESDAY, April 22, 2015

6:30 AM-6:30 PM
**REGISTRATION/SPEAKER READY ROOM OPEN**

7:00 AM-1:00 PM
**POSTER SESSION A**
**Room: Celebrity Patio**

7:00 AM-5:00 PM
**EXHIBITS**
**Room: Celebrity Foyer**

7:30 AM-8:20 AM
**PAST PRESIDENTS' BREAKFAST**
*Open only to past presidents of ACPA & CPF*

1:30 PM-6:30 PM
**POSTER SESSION B**
**Room: Celebrity Patio**

### EYE OPENERS — GROUP 1
7:00 AM-8:00 AM

**Separate registration fee required.*

| Codes: | Instruction Level | Format |
|---|---|---|
| | B=Beginner | L=Lecture |
| | I=Intermediate | H=Hands-on |
| | A=Advanced | P=Panel |
| | V=Varied | R=Roundtable |

1
*1 **CLEFT PALATE CRANIOFACIAL JOURNAL (CPCJ)**
**Educational Objective:** Each learner will be able to prepare a manuscript suitable to submission to the CPCJ.

This Eye Opener will be given by members of the "Cleft Palate-Craniofacial Journal" Editorial Board. Section Editors from a variety of disciplines will discuss what constitutes a good scientific manuscript, what kinds of manuscripts are accepted, and what is required by the "Cleft Palate-Craniofacial Journal." Common problems in manuscript preparation and ways of avoiding them will be addressed. (V , L)
***Jack Yu, MD, DMD***
**Room: Mirage**

2
*2 **COMMISSION ON APPROVAL OF TEAMS (CAT)**
**Educational Objective:** Each learner will be able to identify and use key requirements for team approval.

Compliance in relation to the six standards required for team approval will be discussed. Questions related to team approval will be addressed. (I, L)
***David Kuehn, Professor Emeritus***
**Room: Oasis 4**

3
3 **CHALLENGING CASES OF VELOPHARYNGEAL DYSFUNCTION: SPEECH ASSESSMENT AND MANAGEMENT**
**Educational Objective:** Each learner will be able to list several factors which may influence treatment decision-making in patients who present with challenging cases of velopharyngeal dysfuction.

Speech outcomes are of paramount importance to members of craniofacial teams, however, the decision-making process to achieve the end goal is just as important as the final result. This session explores the decision-making process involved with the management of several challenging cases of velopharyngeal dysfunction. ASHA Division 5, Speech Science and Orofacial Disorders, offers this eye opener session of case presentations to ACPA attendees. (V, P)
***Kristen DeLuca, MS, CCC-SLP,*** *Sara Kinter, MA, CCC-SLP, Jamie Perry, PhD, Angela Dixon, MA, CCC-SLP*
**Room: Oasis 1-3**

4

4 **THE AMERICLEFT PROJECT: PROGRESS AND GUIDELINES FOR PARTICIPATION IN COLLABORATIVE INTERCENTER OUTCOMES STUDIES**

**Educational Objective:** Each learner will be able to list the requirements for participating in intercenter comparisons of outcomes, the value of that, and the progress made to date in the Americleft Project.

The Americleft Project is now in its 10th year and has carried out comparisons of over 20 protocol outcomes in 4 disciplines. Outcome measures are being developed and refined for future use and record-taking and record-keeping protocols have been established. This course will summarize this progress and future plans. (I, P)

***Ross Long, Jr. DMD, MS, PhD***

**Room: Oasis 5-7**

## OPENING GENERAL SESSION

8:30 AM

**Room: Celebrity**

**Welcome and Opening Remarks**

*Ronald R. Hathaway, DDS, MS, MS, ACPA President*
*Robert J. Havlik, MD, ACPA Vice-President and 2015 Program Committee Chair*
*Andrea Ray, MD, Local Arrangements Committee Chair*
*Marilyn Cohen, LSLP, CPF President*

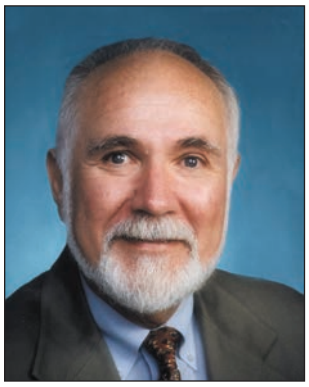
## GENERAL SESSION 1 — KEYNOTE ADDRESS — Harold C. Slavkin, DDS

9:00 AM

**Room: Celebrity**

**Session Chair:** Ronald R. Hathaway, DDS, MS, MS
**Session Co-Chair:** Robert J. Havlik, MD

310 **THE BIRTH, DEVELOPMENT AND FUTURE PROSPECTS FOR CRANIOFACIAL BIOLOGY**



Harold (Hal) Slavkin

Throughout the genesis of the human face, facial expressions and the various sensory functions performed within the craniofacial-oral-dental complex – vision, hearing, speech, taste, chewing and touch – have created awe and wonder, pain and suffering, and the advent of remarkable health care for craniofacial birth defects as well as acquired craniofacial malformations resulting from trauma, burns, infections and head and neck cancers. Recent investments in fundamental biomedical research – human genetics and developmental and molecular craniofacial biology – have changed the landscape and now suggest therapeutic strategies for a number of craniofacial skeletal and soft tissue malformations. Enter regenerative medicine and dentistry, personalized medicine and dentistry, and precision health care. This presentation will provide an assessment and celebration of our past, present and future prospects for craniofacial biology and the human condition. *Where did we come from? Who are we? Where are we going?* This keynote address will conclude with basic, translational and clinical biological and behavioral research priorities related to craniofacial birth defects and craniofacial acquired malformations. The genesis of craniofacial and the story of the human face have important implications for both research, health professional education, and trans-professional, patient-centered, outcomes-based, comprehensive, quality and cost-effective health care for all people.

**Harold (Hal) Slavkin, DDS** is Professor and Dean Emeritus of the University of Southern California (USC). For nearly five decades he has engaged in biomedical research focusing on craniofacial developmental and molecular biology. He was the founding Director of the Center for Craniofacial Molecular Biology at USC. In 1995 he took a leave of absence to serve as the sixth Director of the National Institute of Dental Research (NIDR), one of the National Institutes of Health (NIH) (1995-2000). He was instrumental in the name change for the Institute to become the National Institute of Dental and Craniofacial Research (NIDCR) in 1998. He presently serves on the Board of Directors for
The Los Angeles Trust for Children's Health and focuses on the integration of primary health care with mental, vision and oral health through Wellness Centers that serve the 650,000 students and families within the Los Angeles Unified School District (LAUSD is the second largest in the nation).

10:00 AM **POSTER SESSION A, EXHIBITS, COFFEE BREAK**

## GENERAL SESSION I (cont.) — THE BEST OF THE OASIS – THE LEADING EDGE OF CLEFT AND CRANIOFACIAL CARE

10:30 AM-12:30 PM

**Room: Celebrity**

**Goal:** To expose attendees to leading edge research related to the etiology of cleft and craniofacial conditions, and practice patterns and outcomes of treatment of individuals with these conditions.
**Objective:** Learners will be able to discuss three leading edge research findings in the etiology of cleft and craniofacial conditions, and/or practice patterns and outcomes of treatment of individuals with these conditions.

**Session Chair:** Helen Sharp, PhD
**Session Co-Chair:** Richard Kirschner, MD

WEDNESDAY, April 22, 2015

# General Session

10:30 AM
5 **HOW QUALITATIVE METHODS CAN BE USED TO ENSURE CONTENT VALIDITY IN A PATIENT REPORTED OUTCOME (PRO) INSTRUMENT FOR PATIENTS WITH CLEFT LIP AND/OR PALATE WHO VARY BY AGE AND CULTURE: DEVELOPMENT OF THE CLEFT-Q**
*Elena Tsangaris, Stefan Cano, Christopher Forrest, Tim Goodacre, Anne Klassen, Andrea Pusic,* ***Karen Wong***

10:40 AM
6 **PRACTICE PATTERNS FOR MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION IN PATIENTS WITH 22Q11.2 DELETION SYNDROME**
***Kaitlyn Paine****, Cynthia Solot, Ariel Pollak, Ava Skolnik, Donna McDonald-McGinn, Leanne Magee, Meg Maguire, Elaine Zackai, Oksana Jackson*

10:50 AM
7 **THE RELATIONSHIP BETWEEN CEACAM1, CK13, AND TGFB IN PALATAL FUSION**
***Takayoshi Sakai****, Aya Obana-Koshino, Hitomi Ono, Kanji Nohara, Kyoko Oka*

11:00 AM **DISCUSSION**

11:10 AM
8 **COMPARISON OF CUCLP DENTAL ARCH RELATIONSHIPS BETWEEN 5 CENTERS WITH VARIED INFANT MANAGEMENT PROTOCOLS (NAM, GPP, PRIMARY GRAFTING, INFANT ORTHOPEDICS)**
***Stephen Beals****, Patricia Glick, Ross Long, Jr, John Daskalogiannakis, Ronald Reed Hathaway, Kathleen Russell, Thomas Sitzman, Andrea Smith, Gunvor Semb, William Shaw*

11:20 AM
9 **A NEW CONCEPT FOR CRANIOFACIAL REPAIR USING A CHEMOTACTIC SCAFFOLD**
***Reza Jarrahy****, Akishige Hokugo, Andres Segovia, Anisa Buck, Andrew Li, Kameron Rezzadeh*

11:30 AM
10 **EFFECTIVENESS OF A PHONOLOGICAL INTERVENTION FOR PRESCHOOL CHILDREN WITH NONSYNDROMIC CLEFT PALATE**
***Heather Thompson****, Sean Redmond, Bruce Smith*

11:40 AM **DISCUSSION**

11:50 AM
11 **DYNAMIC FACIAL ASYMMETRY IN PATIENTS WITH CLEFT LIP AND PALATE – WHAT 4D VIDEO STEREOPHOTOGRAMMETRY CAN TELL US ABOUT MOTION OF THE REPAIRED LIP**
***James Seaward****, Rami Hallac, Alex Kane*

12:00 PM
12 **IS CRANIOSYNOSTOSIS REPAIR KEEPING UP WITH THE TIMES? RESULTS FROM THE LARGEST NATIONAL SURVEY ON CRANIOSYNOSTOSIS**
***Michael Alperovich****, Raj Vyas, David Staffenberg*

12:10 PM
13 **A SYSTEMATIC REVIEW OF THE EVIDENCE FOR NEUROTOXICITY ASSOCIATED WITH EARLY CHILDHOOD EXPOSURE TO ANESTHESIA**
***Donald Laub****, Molly Rideout, Robert Williams*

12:20 PM **DISCUSSION**

12:30 PM-2:00 PM
**LUNCH BREAK** (on your own)
**POSTER SESSION B, EXHIBITS**

**2016 PROGRAM COMMITTEE MEETING/LUNCHEON**
**Room: Oasis 3**

**ETHICS ROUNDTABLE — REGISTRATION REQUIRED** (optional lunch available)
**Room: Rancho-Mirage**

3:00 PM-6:30 PM
**CPCJ EDITORIAL BOARD LUNCHEON –**
(open only to Editor and Section Editors)
**Room: Polo**

## GENERAL SESSION 2 — TEAM CARE PANEL

2:00 PM-3:00 PM
**Room: Celebrity**

**Goal:** To assist the current and the upcoming generations of Cleft and Craniofacial (CC) team care providers in forward planning for the optimization of resource utilization and patient/family outcomes.
**Objective:** Each learner will be able to understand the original intention of interdisciplinary Cleft/CF team care; assess the congruence or lack thereof between that intention and the current state of team care; and employ the information gained from this presentation to his/her local team.

**Session Chair:** Jeffrey Marsh, MD

14 **INTERDISICPLINARY CLEFT/CRANIOFACIAL TEAM CARE: AN OASIS OR A MIRAGE?**
The goal of this presentation is to explore whether the concept of interdisciplinary team care for cleft and other craniofacial deformities has been fully realized from its inception in the 1920s to current

practice. The objective of this presentation is to assist the current and the upcoming generation of team care providers in forward planning for the optimization of resource utilization and patient/family outcome.
***Jeffrey Marsh, MD**, Marilyn C. Jones, MD, Kathleen A. Kapp-Simon, PhD, Ross Long, Jr, DMD, MS, PhD, Jerald Moon, PhD, John E. Riski, PhD, CCC-SLP*

## IDEAS & INNOVATIONS —
5:00 PM-6:45 PM
**Room: Celebrity**

**Goal:** To share new ideas, techniques, case presentations, and research findings related to the management of people with cleft and craniofacial conditions.
**Objective:** Learners will be able to identify four innovations or new techniques that may be applied to their treatment or research of patients with cleft and craniofacial conditions.

**Session Chair:** Bernard Costello, MD, DMD
**Session Co-Chair:** Bruce Horswell, MD, DDS, MS

5:00 PM **INTRODUCTION**

5:05 PM
15 **IMPLEMENTING A DYNAMIC CLINIC MANAGEMENT SYSTEM AND ITS EFFECT ON CRANIOFACIAL TEAM CLINIC EFFICIENCY AND PATIENT EXPERIENCE**
***James Seaward**, Rami Hallac, Alex Kane*

5:10 AM
16 **Z-SCORES AND MIXED EFFECT MODELING: A PRACTICAL METHOD FOR ANALYZING GROWTH PATTERNS IN CHILDREN WITH CRANIOFACIAL DISORDERS**
***Sandra Tomlinson-Hansen**, Patrick Gerety, Brianne Mitchell, Jordan Swanson, Jesse Taylor*

5:15 PM
17 **THE USE OF A NOVEL MOBILE TECHNOLOGY PLATFORM TO FACILITATE INSTANTANEOUS HIPAA-SENSITIVE PERIOPERATIVE MESSAGING IMPROVES PATIENT CARE AND PHYSICIAN-PATIENT COMMUNICATION**
***Kameron Rezzadeh,** Akishige Hokugo, Andres Segovia, Reza Jarrahy*

5:20 PM
*18 **INCREASING LIKELIHOOD OF PARENTS PROVIDING ACCURATE FEEDING HISTORY FOR INFANTS WITH A CLEFT BY LEVERAGING THE PREVALENCE OF SMARTPHONE APPS**
***Judy Marciel**, Michael Marciel*

5:25 PM
19 **"FACE IT WITH FRIENDS": AN EVENT FOR TEENS WITH A HISTORY OF CLEFT LIP AND PALATE**
***Margaret Wilson**, Shyla Miller, Sarah Woodhouse*

5:30 PM
20 **PATIENT- AND PARENT-REPORTED OUTCOMES ONE YEAR FOLLOWING AN INTERNATIONAL CLEFT MISSION**
***Ari Wes**, Nadine Paul, Patrick Gerety, Jordan Swanson, Nancy Folsom, Jesse Taylor, Mark Weinstein*

5:35 PM
21 **IDENTIFYING GENETIC REFERRALS THROUGH DEVELOPMENTAL SCREENING IN SAGITTAL CRANIOSYNOSTOSIS: CASE EXAMPLES**
***Alexis Johns**, Pedro Sanchez-Lara*

5:40 PM
22 **TWO-STAGED TOTAL EAR RECONSTRUCTION WITH CONCOMITANT ATRESIAPLASTY FOR PATIENTS WITH MICROTIA**
***Christopher Runyan**, Angela Black, Daniel Choo, Ann Schwentker*

5:45 PM
23 **OPTIMAL LANDMARKS FOR THE DIAGNOSIS OF METOPIC CRANIOSYNOSTOSIS: A COMPUTATIONAL APPROACH**
***Benjamin Wood**, Carlos Mendoza, Nabile Safdar, Marius Linguraru, Gary Rogers*

5:50 PM
24 **ANATOMICAL STUDY OF THE EFFECTS OF FIVE SURGICAL MANEUVERS ON NASAL MUCOSA MOVEMENT**
***Dennis Nguyen**, Kamlesh Patel, Gary Skolnick, Albert Woo*

5:55 PM
25 **EFFICACY OF THE VOMER FLAP DURING CLEFT LIP REPAIR FOR CLOSURE OF ANTERIOR PALATE**
*Gaurav Deshpande, Lisa Wendby, Björn Schönmeyr, **Carolina Restrepo***

6:00 PM
26 **THE ELECTRONIC TABLET AS A TEACHING TOOL FOR MARKING CLEFT LIP**
*Björn Schönmeyr, Gaurav Deshpande, **Carolina Restrepo***

6:05 PM
27 **PRIMARY ABBE FLAP FOR MIDLINE AND SEVERE BILATERAL CLEFT LIP DEFORMITY: NEW TRENDS ON AN OLD CONCEPT**
***Jordan Steinberg**, Colin Brady, Fernando Burstein*

6:10 PM
28 **COMPUTER SIMULATED NEONATAL DISTRACTION OSTEOGENESIS**
*Sidney Eisig, Caitlyn Magraw, **Michael Perrino**, Austin Daly*

# Discipline Forums/Meet & Greet/Eye Openers

6:15 PM
29 **PANCRANIOSYNOSTOSIS FOLLOWING ENDOSCOPIC-ASSOCIATED STRIP CRANIECTOMY FOR SAGITTAL CRANIOSYNOSTOSIS IN THE SETTING OF POOR COMPLIANCE WITH FOLLOW-UP: A CASE REPORT**
*Isak Goodwin, **Dana Johns**, Barbu Gociman, Faizi Siddiqi*

6:20 PM
30 **DOES A REPORTED CONFLICT OF INTEREST AFFECT STUDY OUTCOMES IN HELMET THERAPY FOR POSITIONAL PLAGIOCEPHALY?**
***Vincent Noori**, John van Aalst*

6:25 PM
31 **STICKLER SYNDROME: IMPORTANCE OF MULTIDISCIPLINARY ASSESSMENT OF ENTIRE FAMILY!**
***Elena Hopkins**, Deborah Alcorn*

6:30 PM
32 **TREATING SPANISH SPEAKERS WITH CLEFT PALATE AND CRANIOFACIAL CONDITIONS: CLINICAL CONSIDERATIONS, ADAPTATIONS, AND RESOURCES**
***Diana Acevedo***

6:35 PM
*33 **SPECIALTY COURSE AND CLINIC IN CLEFT AND CRANIOFACIAL DISORDERS: A UNIQUE TRAINING EXPERIENCE FOR GRADUATE SPEECH – LANGUAGE PATHOLOGY STUDENTS**
***Kerry Mandulak**, Caitlin McDonnell, Janet Brockman, Kameron Beaulieu*

6:45 PM **ADJOURN**

## DISCIPLINE FORUMS

Back by popular demand, these informal professional networking opportunities will be held Wednesday afternoon from 3:15-4:45 pm. First organized at the 2013 International Congress, reports from forum leaders indicated a wide range of topics and information was exchanged, but even more importantly, connections were made. This is your opportunity to 'meet and greet' colleagues in your discipline from around the world. Forum specialties and room assignments are:

**Genetics/Pediatrics** .....Oasis 1
**Mental Health**.....Oasis 7
**Nurse/Coordinators & Speech-Language Pathology/ Audiology**.....Rancho-Mirage
**Oral-Maxillofacial Surgery**.....Oasis 2
**Orthodontics/Prosthodontics** .....Oasis 4
**Otolaryngology** .....Oasis 3
**Pediatric Dentistry**.....Oasis 5
**Plastic Surgery** .....Ambassador Foyer
**Research**.....Oasis 6

## AMERICLEFT SPEECH MEET & GREET

6:45 PM-8:15 PM
**Room: Rancho-Mirage**

## THURSDAY, April 23, 2015

6:30 AM-6:00 PM
**REGISTRATION/SPEAKER READY ROOM OPEN**

7:00 AM-5:00 PM
**EXHIBITS, POSTER SESSION C**

## EYE OPENERS — GROUP 2

7:00 AM-8:00 AM

**Separate registration fee required.*

| Codes: | Instruction Level | Format |
|---|---|---|
| | B=Beginner | L=Lecture |
| | I=Intermediate | H=Hands-on |
| | A=Advanced | P=Panel |
| | V=Varied | R=Roundtable |

5
34 **COMPREHENSIVE REVIEW AND SUMMARY OF LAWS AND REGULATIONS RELEVANT TO CHILDREN WITH OROFACIAL CLEFTS**
**Educational O** will be able to: ident ant to children with OFC; exam te insurance benefits; define "medically necessary"; and list eligibility for Medicaid orthodontic services. In order to better understand the barriers many families face in obtaining treatment and services for children with orofacial clefts, we conducted a comprehensive review of state and federal laws and mandates to examine the variability of private insurance benefits, Medicaid definitions of "medically necessary" procedures, and Medicaid eligibility for orthodontic services. (B, R)
***Margot Neufeld, MA**, Tanya Wanchek, PhD, JD, Cynthia H. Cassell, PhD*
**Room: Oasis 4**

Withdrawn

6
35 **SPEECH THERAPY TECHNIQUES FOR COMPENSATORY ARTICULATION PATTERNS**
**Educational Objective:** Each learner will be able to describe and demonstrate speech therapy techniques for compensatory articulation patterns often related to craniofacial disorders.

Compensatory articulation patterns will be described and demonstrated to assist in the identification of these patterns. Current methods of treating compensatory misarticulation patterns will be described through lecture, demonstration and audience participation.

Participants will also brainstorm creative ways to actively engage patients in therapy sessions. (B, H)
***Lynn Fox, MA, Med**, Sarah Reid, MA*
**Room: Oasis 1-2**

7

36 **FEEDING PROBLEMS AND SOLUTIONS IN BABIES WITH CLEFT PALATE**

**Educational Objective:** Each learner will be able to describe 3 techniques to facilitate efficient intake by bottle in babies with cleft palate.

This session will provide knowledge about specialty bottles and finding the right match between baby, bottle and parent. Case presentations, hands-on experience with bottles, evaluation techniques, and tips for adapting bottles will be discussed along with positioning techniques, breast feeding questions, oral intake post-op, and introduction of solids. Common feeding problems, special issues with PRS, tracheostomy and reflux, and discussion of measurable goals will be presented. (B, L)
***Kathleen Borowitz, MS, CCC-SLP***
**Room: Rancho**

8

37 **ANATOMY OF THE UNILATERAL CLEFT LIP NASAL DEFORMITY**

**Educational Objective:** Each learner will be able to understand the anatomic components of the unilateral cleft lip nasal deformity. They will also be able to understand the aims of primary surgical correction.

This session will be in a lecture format, presenting anatomic studies related to normal and unilateral cleft lip nasal anatomy. The talk will focus on the following components of the nose: • Nasal bones • Septum • Piriform • Alar base • Upper lateral cartilages • Lower lateral cartilages Surgical approaches to correct each of the individual components of the unilateral cleft lip nasal deformity will be shown. Outcome studies of various maneuvers used in primary correction will be reviewed. (V, L)
***Kamlesh Patel, MD***
**Room: Polo**

9

38 **MAKING THE MOST OF PRENATAL COUNSELING OPPORTUNITIES**

**Educational Objective:** Each learner will be able to assess families' readiness to learn and knowledge deficits pertaining to a potentially stressful prenatal cleft diagnosis. Learners will be able to identify information the family has already received and clarify or build on this information based on the practices of their team.

The goal of this presentation is to promote competence and confidence in basic prenatal cleft counseling. A variety of scenarios will be presented and recommendations will be made regarding the purpose, content and structure of a prenatal counseling session. Suggestions will also be made regarding handouts, resources and visual aids to facilitate teaching during the counseling session. (B, L)
***Karla Haynes, RN, MPH, MS, CPNP**, Irene Klecha, RN, MSN*
**Room: Oasis 5-7**

10

39 **INNOVATION IN CLEFT PALATE RECONSTRUCTIVE SURGERY: HOW TO USE BUCCAL MYOMUCOSAL FLAPS**

**Educational Objective:** Each learner will increase their knowledge of the anatomy of the Buccal Flap. The learner will be able to effectively utilize the Buccinator Myomucosal Flap for primary and secondary cleft palate repair, and the treatment of primary VPI in patients without clefts.

By adding the Buccal Flap to your cleft palate treatment plan, you can improve your patients speech, reduce the number of secondary speech surgeries, lower your fistula rates and minimize your orthognathic surgical challenges. The lectures, slides and videos will teach you to easily incorporate this very useful tool into your cleft palate program. (V, L)
***Robert Mann, MD**, Michael Burton, MD*
**Room: Mirage**

11

40 **PREPARING YOUR PATIENT FOR JAW SURGERY – A MULTIDISCIPLINARY APPROACH TO A PATIENT CENTERED JAW SURGERY WORKSHOP**

**Educational Objective:** Each learner will be able to learn why it is important to prepare patients for jaw surgery and how to conduct a jaw surgery preparation workshop in their medical setting.

Patients undergoing jaw surgery often experience medical and psychosocial concerns that impact their pre and post surgery adjustment. Offering education and support often results in a patient's increased ability to cope with the surgical process and positively impacts the outcome. A multidisciplinary team model for preparing patients who are undergoing jaw surgery will be presented. Information from the different disciplines will be shared as well as video highlights. (V, L)
***Carolynne Garrison Howard, PhD**, Laura Takeuchi, MPA, CCLS*
**Room: Celebrity A**

THURSDAY, April 23, 2015

# Junior Investigator/General Session

## PAUL BLACK JUNIOR INVESTIGATOR SESSION

8:00 AM-10:00 AM
**Room: Celebrity D-E**

**Goal:** To encourage and support multidisciplinary research by investigators in or recently graduated from training programs dealing with cleft and craniofacial evaluation and treatment.
**Objective:** Learners will be able to discuss three research questions related to cleft and craniofacial care.

**Session Chair:** Harold Slavkin, DDS
**Session Co-Chair:** Koichi Otsuki, DDS

8:00 AM
41 **IMPACT OF A CLEFT AND CRANIOFACIAL CENTER ON A HEALTH CARE SYSTEM**
***Navid Pourtaheri,*** *Craig Anderson, David Blankfield, Aaron Kearney, Derrick Wan, Gregory Lakin*

8:10 AM
42 **MITIGATION OF SHP2 AND GRB2 ACTIVATION PREVENTS ABERRANT FGFR2 SIGNALING-INDUCED CRANIOSYNOSTOSIS THROUGH AN ERK-MAPK-DEPENDENT PATHWAY**
***Miles Pfaff****, Li Li, Eswarakumar Veraragavan*

8:20 AM
43 **SPONTANEOUS FOREHEAD REMODELING AFTER POSTERIOR VAULT RECONSTRUCTION IN SAGITTAL SYNOSTOSIS**
***Jose Gonzalez****, Olivia Linden, Margaret Byrne, Petra Klinge, Stephen Sullivan, Helena Taylor*

8:30 AM **DISCUSSION**

8:40 AM
44 **SPEECH OUTCOMES FOLLOWING CLINICALLY INDICATED POSTERIOR PHARYNGEAL FLAP TAKEDOWN**
***Evan Katzel****, Sanjay Naran, Zoe MacIsaac, Liliana Camison, Jesse Goldstein, Lorelei Grunwaldt, Matthew Ford, Joseph Losee*

8:50 AM
45 **LEVATOR VELI PALATINI MUSCLE LENGTH CHANGES AND VELOCITIES VARY ACROSS SOUNDS**
***Catherine Pelland****, Joshua Inouye, Kathleen Borowitz, Kant Lin, Silvia Blemker*

9:00 AM
46 **TIMING OF FURLOW PALATOPLASTY FOR PATIENTS WITH SUBMUCOUS CLEFT PALATE**
***Russell Ettinger****, Theodore Kung, Natalie Wombacher, Haskell Newman, Steven Buchman, Steve Kasten*

9:10 AM **DISCUSSION**

9:20 AM
47 **NORMATIVE VELOPHARYNGEAL DATA IN INFANTS: IMPLICATIONS FOR TREATMENT OF CLEFT PALATE**
***Graham Schenck****, Jamie Perry*

9:30 AM
48 **RECURRENT OTITIS MEDIA WITH EFFUSION AS A PREDICTOR OF VELOPHARYNGEAL INSUFFICIENCY REQUIRING SECONDARY PALATE SURGERY**
***Lauren Hanes****, Amanda Murphy, Raylene Delorey, Jill Hatchette, Paul Hong, Michael Bezuhly*

9:40 AM
49 **DIFFICULTIES IN TIMING PERCEPTION RELATED TO ABNORMAL BRAIN STRUCTURE IN CHILDREN AND ADOLESCENTS WITH NONSYNDROMIC CLEFT LIP AND/OR CLEFT PALATE**
***Ian DeVolder****, Amy Conrad, Vincent Magnotta, Peg Nopoulos*

9:50 AM **DISCUSSION**

10:00 AM **POSTER SESSION C, EXHIBITS, COFFEE BREAK**

**PAUL BLACK JUNIOR INVESTIGATOR AWARD PANEL MEETING**

## GENERAL SESSION 3 — OUTCOMES IN CLEFT AND CRANIOFACIAL CARE

10:30 AM-11:45 AM
**Room: Celebrity D-E**

**Goal:** To present outcomes in cleft and craniofacial care, and to describe findings related to needs of adults affected by cleft and craniofacial conditions.
**Objective:** Learners will be able to 1) identify two patient outcomes related to cleft and craniofacial care, and 2) explain identified needs of adults affected by cleft and craniofacial conditions.

**Session Chair:** Amelia Drake, MD
**Session Co-Chair:** Alex Kane, MD

10:30 AM
50 **THE UNIQUE NEEDS OF INCOMPLETELY TREATED ADULT PATIENTS WITH CLEFT LIP AND/OR PALATE**
***Tuan Truong****, Katharine Connolly, Davinder Singh, Edward Joganic, Patricia Glick, Stephen Beals*

10:40 AM
51 **CONTINUING MEDICAL AND DENTAL NEEDS OF ADULTS WITH CLEFT LIP AND/OR PALATE: A NEEDS ASSESSMENT**
***Maureen Libby****, Emet Schneiderman, Ann McCann, Alex Kane*

# General Session/Study Sessions



10:50 AM

52 **OUTSIDE, INSIDE: YOU DECIDE MIDDLE-SCHOOL PROGRAM FOSTERS ACCEPTANCE AND APPRECIATION OF THOSE WHO HAVE VISIBLE DIFFERENCES**
***Charlene Pell***

11:00 AM **DISCUSSION**

11:10 AM

53 **NON-SYNDROMIC SAGITTAL SYNOSTOSIS. A NORDIC MULTI-CENTER STUDY**
***Sven Kreiborg***, *Tron A. Darvann, Lars Bøgeskov, Leif Christensen, Bernt Due-Tønnessen, Stense Farholt, Ketil Heimdal, Arja Heliovaara, Jyri Hukki, Hanne Dahlgaard Hove*

11:20 AM

54 **PRESENTING CHARACTERISTICS AND MANAGEMENT OF SUBMUCOUS CLEFT PALATE: A SINGLE CENTER REVIEW SPANNING 16 YEARS**
***Solomon Obiri-Yeboah***, *Peter Ray, Nadia Abou Kheir, John Grant*

11:30 AM

55 **TIMING OF PALATOPLASTY AND SPEECH OUTCOMES IN SUBMUCOUS CLEFT PALATE**
***Jordan Swanson***, *Marilyn Cohen, Brianne Mitchell, Cynthia B. Solot, Oksana Jackson, Jesse Taylor*

11:40 AM **DISCUSSION**

11:45 AM **BREAK FOR LUNCH**

12:00 PM-2:00 PM
**ACPA/CPF ANNUAL AWARDS LUNCHEON**
Presentation of ACPA Honors, CPF Leadership Award, announcements of CPF Research Grant, Junior Investigator, Journal, and Scholarship Recipients; ASCFS Award Winners
**Room: Ambassador Ballroom**

2:15 PM **EXHIBITS, POSTER SESSION C**

## STUDY SESSIONS — GROUP 1

2:30 PM-4:00 PM

**Separate registration fee required.*

Codes:

| Instruction Level | Format |
|---|---|
| B=Beginner | L=Lecture |
| I=Intermediate | H=Hands-on |
| A=Advanced | P=Panel |
| V=Varied | R=Roundtable |

**A.**

*56 **THE AMERICLEFT LISTENER RATINGS PROTOCOL: A CALIBRATION SESSION FOR SPEECH-LANGUAGE PATHOLOGISTS**
**Educational Objective:** Each learner will be able to describe the Americleft Speech Outcomes Project and have knowledge in applying it for rating resonance distortions, articulation, and audible nasal air emission/turbulence in speakers with cleft palate and velopharyngeal dysfunction.

Valid and reliable perceptual speech ratings are needed for outcome measurements for individuals with CP and VPD. This course aims to facilitate skills for rating resonance and articulation characteristics using protocols developed for the Americleft Speech Outcomes Project. Using interactive polling software, participants will rate speech samples. Audience ratings will be displayed for discussion. Principles of consensus listening and listener guidelines from Americleft will be applied. (V , H)
***Anna Thurmes MA, CCC***, *Kelly Nett Cordero, PhD, Judith Trost Cardamone, PhD, Kathy Chapman, PhD, Cindy Dobbelsteyn, MSc, Kristina Wilson, PhD, Adriane Baylis, PhD, Angela J. Dixon, MA*
**Room: Oasis 5-7**

**B.**

57 **MEDICAL MANAGEMENT AND SURVEILLANCE PROTOCOLS FOR COMPLEX CRANIOFACIAL CONDITIONS**
**Educational Objective:** For each of four craniofacial conditions discussed, each learner will be able to describe diagnostic criteria and confirmatory testing, identify at least one health concern that could impact surgical readiness or result in an adverse outcome, and list one age-specific health care recommendation.

In this interactive course, attendees will review management protocols for children with four craniofacial conditions: Facial hemangiomas, Craniofacial plexiform neurofibromas, Hemihyperplasia, and Ectodermal Dysplasias. After this course, learners will be able to 1) define diagnostic criteria and confirmatory studies, 2) identify health concerns that could impact surgical readiness or result in an adverse outcome, and 3) provide critical appraisal of a health care supervision timeline. (V,P)
***Ann Hing, MD,*** *Robert Byrd, MD, MPH, Michael L. Cunningham, MD, PhD, Katrina M. Dipple, MD, PhD, Kelly Evans, MD, Emily R. Gallagher, MD, MPH, Yvonne R. Gutierrez, MD, Ophir D. Klein, MD, PhD, Howard M. Saal, MD*
**Room: Polo**

# Study Sessions

C.

58 **NARRATIVE VIDEO THERAPY: PSYCHOTHERAPY WORKSHOPS FOR CHILDREN, ADOLESCENTS AND ADULTS**

**Educational Objective:** Each learner will be able to attain information about the psychosocial concerns of individuals who have craniofacial differences and will be able to list 4 topics of primary concern. Each learner will be able to define the concept of narrative video therapy and 3 ways it is useful in a therapeutic setting.

This study session will present a psychotherapeutic individual/group approach called Narrative Video Therapy for children, teens and adults with CF differences. NVT originated out of a need our patients had to meet others will similar medical conditions and to share experiences and ways of coping. Program development, provision of our semi-structured interview, viewing of videos, and sharing information about grants/funding and the challenges of center based programs will be discussed. (V,L)

***Aileen Blitz, PhD***

**Room: Oasis 3**

D.

*59 **GUIDELINES FOR ACADEMIC AND CLINICAL TRAINING FOR THE CLEFT TEAM SLP**

**Educational Objective:** Each learner will be able to describe the roles, responsibilities, and prerequisite knowledge and skills for SLPs working on a cleft palate team.

This session will review and describe the multiple pathways that students, clinical fellows, and/or SLP clinicians that are new to the cleft palate team, may take as they embark on the process of obtaining clinical expertise in cleft/craniofacial anomalies and velopharyngeal dysfunction. This course will be of interest to students, professors, SLPs, and team leaders or surgeons interested in better understanding the required knowledge and skills for SLPs practicing in the cleft team setting. (B, L)

***Adriane Baylis,PhD, CCC-SLP**, Kerry Mandulak, PhD, Mary O'Gara, MA, CCC-SLP, Helen Sharp, PhD*

**Room: Oasis 1-2**

E.

*60 **PRACTICAL GUIDELINES FOR MANAGING PATIENTS WITH 22Q11.2 DELETION SYNDROME**

**Educational Objective:** Each learner will be able to describe the associated features of the 22q11.2 deletion syndrome including speech, palatal, and behavioral phenotypes.

22q11.2 deletion syndrome is the most common cause of syndromic palatal anomalies but systematic guidance for clinical management has been limited. In response, we present The International 22q11.2 Consortium Practical Healthcare Guidelines which transcend subspecialty bias to include: an overview of the condition and associated features; speech, language and behavioral differences; the approach to surgical interventions; and the need for coordinated multidisciplinary perioperative care. (V, P)

***Donna McDonald-McGinn, MS, LCGC**, Oksana Jackson, MD, Cynthia Solot, MA, CCC, Meg Maguire, Anne S. Bassett*

**Room: Celebrity B**

F.

61 **HOW TO TELL THE DIFFERENCE BETWEEN NON-ADHERENCE AND RISK: ASSESSING NEGLECT AND ABUSE IN THE CRANIOFACIAL POPULATION**

**Educational Objective:** Each learner will be able to identify examples of neglect and/or abuse indicators in the craniofacial population. They will learn techniques to both support families to be successful while also monitoring the health and safety of patients. Personal and professional ethics will be reviewed.

Making decisions regarding the referral to child protection when there is suspicion of child abuse and/or neglect is complicated. Defining when a situation requires a mandatory report versus one that represents a viable treatment choice or lifestyle that is safe for a child is difficult. After attending this session, participants will have reviewed concerns of abuse/neglect, but applied it to their patients and their own responsibilities as they relate to their professional obligations. (V, L)

***Cassandra Aspinall, MSW, ACSW, LICSW**, Ashley Peter, MSW, LICSW*

**Room: Rancho**

G.

62 **MAKING SENSE OF NASAL AIR EMISSION: CHARACTERISTICS OF OBLIGATORY AND LEARNED BEHAVIORS**

**Educational Objective:** Each learner will identify the perceptual and acoustical differences between obligatory and learned speech behavior resulting in nasal emission, apply acoustic instrumentation to facilitate their identification, and discuss treatment considerations based on perceptual and acoustic findings.

It can be a clinical challenge in determining whether nasal emission is an obligatory or learned speech pattern. Acoustic studies have the capability to detect the differences in the articulatory behavior between these two categories. The purpose of this presentation is to identify the perceptual features associated with obligatory and learned patterns of nasal emission and to demonstrate the Nasometer's recording capacity to analyze the oral and nasal signals that differentiate them. (V, L)

***Linda D. Vallino**, PhD, David J. Zajac, PhD*

**Room: Mirage**

# Study Sessions



H.

63 **ENDOSCOPIC CRANIOSYNOSTOSIS SURGERY**
**Educational Objective:** Each learner will be able to identify and discuss practical aspects of conducting an endoscopic craniosynostosis program.

This course will focus primarily on the practical aspects of endoscopic management and review technical considerations from a multidisciplinary perspective. We will focus specifically on 4 particular disciplines: plastic surgery, neurosurgery, nursing and orthotics. The long-term experience at a single institution with >150 endoscopic cases will be reviewed and a discussion will be held regarding modifications to treatment protocols which have developed during this time. (I, L)
***Albert Woo, MD**, Kamlesh Patel, MD, Matthew Smyth, MD, Sybill Naidoo, PhD, RN, CPNP, Douglas Reber, CO, LO*
**Room: Celebrity A**

I.

64 **CLEFT ORTHOGNATHIC SURGERY**
**Educational Objective:** Each learner will be able to: 1) understand the surgical-orthodontic considerations in the cleft dentofacial deformity, 2) recognize the criteria to be deemed ready for orthognathic surgery in a cleft patient, 3) understand and implement the technical steps and modifications to perform cleft orthognathic surgery.

This course will focus on cleft orthognathic surgery; including orthodontic setup; surgical preparation, technical aspects, and controversies, including management of the lateral region, distraction, and 3D planning. (A, L)
***Derek Steinbacher**, DMD, MD, Anand Kumar, MD, Lindsay Schuster, DMD, MS*
**Room: Oasis 4**

J.

65 **THE FURLOW PALATOPLASTY: OPTIMIZING OUTCOMES THROUGH SURGICAL TECHNIQUE**
**Educational Objective:** Each learner will be able to increase their understanding of the Furlow double opposing Z-palatoplasty.

The Furlow palatoplasty may be used to achieve excellent results in both primary and secondary palate repair. This course will provide a review of the surgical technique while providing tips to facilitate its execution and optimize results. Using a standard lecture format, the history and key concepts of the Furlow Z-palatoplasty will be reviewed. A video presentation will illustrate the technique in a step-by-step fashion. The course will conclude with a question and answer session. (V, L)
***Richard Kirschner, MD***
**Room: Celebrity C**

4:00 PM-4:30 PM
**POSTER SESSION C, EXHIBITS, COFFEE BREAK**

## STUDY SESSIONS — GROUP 2
4:30 PM-6:00 PM

**Separate registration fee required.*

| Codes: | **Instruction Level** | **Format** |
|---|---|---|
| | B=Beginner | L=Lecture |
| | I=Intermediate | H=Hands-on |
| | A=Advanced | P=Panel |
| | V=Varied | R=Roundtable |

K.

*66 **SPEECH OUTCOME DATA: TECHNIQUES FOR DATA COLLECTION AND MANAGEMENT WITHIN THE CLINICAL SETTING**
**Educational Objective:** Each learner will be able to list equipment used in obtaining audio and video recordings for speech outcome studies.

This session shares methods for outcome data collection that have grown out of the Americleft Speech Group's experience. The development of protocols will be discussed, with the focus on data collection, storage, and analysis. Audio and visual recording equipment and strategies for obtaining a quality recording will be illustrated. Various technologies will be discussed, including web-based products and a database that increases efficiency while maintaining compliance with HIPAA and the IRB. (B, L)
***Kristina Wilson, PhD, CCC-SLP,** Angela J. Dixon, MA, CCC-SLP, Adriane Baylis, PhD, CCC-SLP, Kelly Nett Cordero, PhD, CCC-SLP, Anna Thurmes, MA, CCC-SLP, Cindy Dobbelsteyn, MSc, SLP(C), Judith E Trost-Cardamone, PhD, CCC-SLP, Kathy L. Chapman, Ph.D.*
**Room: Oasis 3**

L.

67 **MULTIDISCIPLINARY STRATEGIES TO AVOID AND TO TREAT SHORT AND LONG-TERM COMPLICATIONS OF NEONATAL MANDIBULAR DISTRACTION**
**Educational Objective:** Each learner will be able to identify appropriate patients for mandibular distraction and understand surgical techniques to avoid complication.

In many institutions, mandibular distraction has become the primary management of the neonate with a hypoplastic mandible and respiratory compromise. This course will emphasize a muiltidisciplinary approach to selection of patients and the techniques of surgical planning including the use of medical modeling, with particlular emphasis on priniciples to avoid complications. Complications will be discussed, including treatment. (A, L)
***Michael Lipka, MD, DMD**, Jeffrey Goldstein, MD*
**Room: Celebrity C**

# Study Sessions

**M.**

*68 **SURGICAL MANAGEMENT OF VPD IN 22Q11.2 DELETION SYNDROME: MASTERS CLASS FOR THE SURGEON AND SLP**

**Educational Objective:** Each learner will be able to (1) describe components of presurgical evaluation for planning VPD surgery in patients with 22q; (2) list at least 5 different factors which influence the presence/severity of VPD in 22q; (3) describe modifications of traditional VPD surgery for patients with 22q.

The nature of VPD in 22q11DS is complex, thus treatment planning and surgical technique must be tailored to syndrome-specific and patient-specific factors to optimize outcome. This masters' class will provide a comprehensive overview of the multifactorial nature of VPD in 22q and algorithms for successful surgical-speech management. Attendees will be able to describe syndrome-specific considerations for pre-surgical, perioperative, and post-surgical VPD management and outcomes assessment. (I, L)

***Adriane Baylis,PhD, CCC-SLP,*** *Richard Kirschner, MD*

**Room: Oasis 1-2**

**N.**

69 **NASOALVEOLAR MOLDING AND COLUMELLA ELONGATION**

**Educational Objective:** Each learner will be able to explain why NAM is a paradigm shift in pre surgical infant orthopedics. The learner will be able to list 3 components of the NAM appliance and describe their role in therapy. The learner will be able to explain the relationship between NAM and primary surgical repair.

We will present NAM as a paradigm shift from the traditional methods and objectives of presurgical infant orthopedics and will demonstrate how NAM addresses the deformity of nasal cartilages and deficiency of columella tissue in infants with UCLP and BCLP. The relationship between NAM and surgery will be presented. Current scientific literature will be reviewed. (V, L)

***Barry Grayson, DDS****, Court B. Cutting MD, Pradip Shetye, DDS*

**Room: Oasis 5-7**

**O.**

*70 **NASOPHARYNGOSCOPY: METHODS FOR OBTAINING A SUCCESSFUL EXAMINATION WITH PRESCHOOL CHILDREN AND INTERPRETATION OF FINDINGS FOR SURGICAL PLANNING**

**Educational Objective:** Each learner will be able to describe methods for obtaining a successful nasopharyngoscopy evaluation with preschool-aged children and will also be able to describe how to use the observations from nasopharyngoscopy to determine best surgical options for each patient.

In this session, the presenter will describe the nasopharyngoscopy procedure, including tips and tricks to elicit cooperation from even very young children. The presenter will describe how nasopharyngoscopy can be used to determine the size, shape, location and cause of the velopharyngeal opening in order to determine which surgical procedure has the best chance of a successful outcome. This lecture will include many videos for illustration and discussion. (I, L)

***Ann Kummer, PhD***

**Room: Rancho**

**P.**

*71 **A "HANDS ON" THREE DIMENSIONAL EAR FRAMEWORK CARVING WORKSHOP**

**Educational Objective:** Each learner will be able to experience a hands on ear framework carving to improve their ability to surgically treat patients with microtia.

The learner will be provided with a costal cartilage carving model and the necessary templates and instruments to carve a Nagata type ear framework for a lobule type microtia reconstruction. A step by step manual will be provided as well as access to a downloadable app with step by step photos and video clips. There will be other surgical faculty present to offer advice and assistance. This exercise provides the learner with a model that can be used for evaluation and future learning purposes. (V, H)

***Gordon Wilkes, MD,*** *David Fisher, MB, Regan Guilfoyle, MD*

**Room: Oasis 3**

**Q.**

*72 **FEEDING AND SWALLOWING CONCERNS IN THE CHILD WITH CLEFT PALATE OR CRANIOFACIAL SYNDROMES: INTRODUCTION, TRAINING, AND DISCUSSION**

**Educational Objective:** Each learner will be able to identify the following: common feeding challenges in children with cleft and craniofacial anomalies, compensations to remediate those challenges, and the appropriate reasons for more extensive evaluation, all within the context of interdisciplinary team care.

The presentation will begin with a brief overview of cleft anatomy and physiology related to feeding and swallowing, and a short description of specific feeding practices for children with CLP at four age-related stages. Demonstration and hands-on experience with specific cleft feeders will be provided. Finally, a moderated small and large group discussion of 2 - 3 challenging cases will be presented, in order to practice collaborative problem-solving and allow for sharing of audience experience. (I, H)

***Kerry Mandulak, PhD, CCC-SLP****, Scott Dailey, PhD, CCC-SLP*

**Room: Celebrity B**

**R.**

73 **DENTO-SKELETAL RECONSTRUCTION OF THE PATIENT WITH A FACIAL CLEFT**

**Educational Objective:** Each learner will be able to discuss and identify: 1) timing and technical aspects of of cleft alveolar reconstruction 2) timing and technical

aspects of cleft orthognathic surgery 3) timing and technical aspects of dental implants 4) Dental, Orthodontic and Prosthodontic integration.

This study session will provide a comprehensive discussion focusing on dento-skeletal aspects from birth, through adulthood through an integrated surgical, dental, orthodontic and prosthodontic management. The session will focus on infant orthopedic appliances, timing of cleft alveolar bone grafting , indications for premaxillary repositioning, management of cleft orthognathic surgery, dental and orthodontic intervention and prothodontic management with osseointegrated implants and bridges. (V, L)
***Pravin Patel, MD**, Ronald Jacobson, DDS, MS, Kirk Kollman, DDS, David E. Morris, MD, David Reisberg, DDS*
**Room: Mirage**

S.
74 **PATIENT TREATMENT BURNOUT FOR INDIVIDUALS WITH CLEFT AND CRANIOFACIAL CONDITIONS**
**Educational Objective:** Each learner will be able to discuss and identify: 1) indirect implications/challenges of treatment on patients' lives outside the medical model. Each learner will be able to recognize the impacts of missing obligations: professional, educational, social, extracurricular, familial. Each learner will be able to explore unexpected negative impacts of surgery from the patient perspective.

When working with patients and families it is important for Health Care Professionals to be aware of implications that treatment can have beyond the medical model. Qualitative research indicates that the impact of surgical treatment is multifaceted and is a recurring concern for patients. By recognizing patients as experts in their own experience, Health Care Professionals should maintain an alliance with patients in order to create an implement an effective treatment plan. (I, L)
***Colleen Wheatley, MSW, RSW***
**Room: Polo**

T.
75 **CLEFT CARE FOR INTERNATIONALLY ADOPTED CHILDREN: CHALLENGES AND STRATEGIES**
**Educational Objective:** Each learner will be able to recognize key aspects of international adoptive process, post adoptive consulting and surgical challenges that are faced by patients with cleft who are adopted.

International adoption is on the rise in the US. Large percentage of the adoptees have cleft differences. Due to their care in their birth countries, they face a variety of challenges not routinely encountered by US born patients with cleft. Cleft care for this particular population needs to take into consideration many factors such as nutrition, infection control, prior surgeries and family integration. Care should be provided in a coordinated manner with the focus on the whole patient. (V, L)
***Shao Jiang, MD**, Alison Kaye*
**Room: Celebrity A**

## FRIDAY, April 24, 2015

7:00 AM-8:00 AM
**ASCFS BREAKFAST**
**Room: Oasis Den**

7:00 AM-3:30 PM
**EXHIBITS, POSTER SESSIONS D & E**

7:00 AM-5:30 PM
**REGISTRATION/SPEAKER READY ROOM OPEN**

8:00 AM-12:30 PM
**POSTER SESSION D**

## CONCURRENT GENERAL SESSIONS (A-C)

### SESSION A: QUALITY OF LIFE AND HEALTH SERVICES
8:00 AM-9:00 AM
**Room: Celebrity F-H**

**Goal:** To present quality of life issues impacting people affected by cleft and craniofacial conditions.
**Objective:** Learners will be able to recognize quality of life issues impacting people affected by cleft and craniofacial conditions.

**Session Chair:** Canice Crerand, PhD
**Session Co-Chair:** Cristina Hernandez, RN

8:00 AM
76 **SOCIAL AND SUPPORT SERVICES OFFERED BY CRANIOFACIAL CENTERS: A NATIONAL SURVEY AND INSTITUTIONAL EXPERIENCE**
*Mona Ascha, Gregory Lakin,* **Irene Link,** *Jarred McDaniel*

8:10 AM
77 **LONGITUDINAL PREDICTORS OF QUALITY OF LIFE AND SELF-IMAGE FOR CHILDREN AND ADOLESCENTS WITH CRANIOFACIAL CONDITIONS**
***Celia Heppner**, Crista Donewar, Lillian Hamill, Lauren Perrin*

8:20 AM
78 **MY MOTHER, MY DAUGHTER, MY SELF: THE MOTHER-DAUGHTER RELATIONSHIP & THE INFLUENCE OF FACIAL DIFFERENCE**
***Victoria Pileggi**, Carla Rice*

# Concurrent Sessions

8:30 AM
79 **GLOBAL ACADEMIC FAILURE IN THIRD GRADE AMONG CHILDREN WITH AN ISOLATED NONSYNDROMIC CLEFT: A POPULATION BASED STUDY IN NORTH CAROLINA**
***Stephanie Watkins**, Robert Meyer, Arthur Aylsworth, Ronald Strauss*

8:40 AM
80 **MEASURING QUALITY OF LIFE, ANXIETY AND DEPRESSION IN 101 CONSECUTIVE ADOLESCENTS WITH CLEFT LIP AND CLEFT PALATE**
*Cristina Hernandez, **Mark LLoyd**, Kristina Wilson, David Khechoyan, Edward Buchanan, Larry Hollier, Laura Monson*

8:50 AM **DISCUSSION**

## SESSION B: SPEECH LANGUAGE-PATHOLOGY
8:00 AM-9:00 AM
**Room: Celebrity E**

**Goal:** To present velopharyngeal insufficiency issues impacting people affected by cleft and craniofacial conditions.
**Objective:** Learners will be able to explain three aspects of velopharyngeal insufficiency issues impacting people affected by cleft and craniofacial conditions.

**Session Chair:** David Zajac, PhD
**Session Co-Chair:** Amy Morgan, MA

8:00 AM
81 **LONGITUDINAL ANALYSIS OF HYPERNASALITY IN SCHOOL-AGED CHILDREN WITH REPAIRED CLEFT PALATE**
***David Zajac**, John Preisser, Amelia Drake, Marziye Eshghi, Jamie McGee, Daniela Vivaldi, Maureen Feldbaum*

8:10 AM
82 **IMPACT OF ACHIEVING VELOPHARYNGEAL SUFFICIENCY EARLY IN MAXIMIZING CHILDREN'S ARTICULATION PERFORMANCE**
***Amy Morgan**, Claudia Crilly Bellucci, Brent Collett, Arthur Curtis, Mary O'Gara, Pravin Patel, Mitchell Grasseschi, David Morris, Kathleen Kapp-Simon*

8:20 AM
*83 **PREDICTORS OF HYPERNASAL SPEECH IN CHILDREN WITH 22Q11.2 DELETION SYNDROME**
***Adriane Baylis**, David Zajac, Caitlin Cummings, Gregory Pearson, Richard Kirschner*

8:30 AM
84 **PRE AND POST-PUBERTAL CHANGES: THE EFFECT OF GROWTH ON THE VELOPHARYNGEAL ANATOMY**
***Jamie Perry,** Lakshmi Kollara, Graham Schenck, Xiangming Fang, David Kuehn, Bradley Sutton*

8:40 AM
85 **PHARYNGEAL FLAP OUTCOMES BASED UPON AERODYNAMIC ASSESSMENT OF ORAL AND NASAL SPEECH SEGMENTS: PRELIMINARY FINDINGS**
*David Zajac, **Daniela Vivaldi**, Amelia Drake, John van Aalst, Taylor Warren, Marziye Eshghi, Maureen Feldbaum*

8:50 AM **DISCUSSION**

## SESSION C: ASCFS LINTON A. WHITAKER LECTURE
8:00 AM-9:00 AM
**Room: Celebrity D**

**Session Chair:** Jeffrey Fearon, MD

The American Society of Craniofacial Surgery Foundation is pleased to present the third Linton A. Whitaker Lecture. The Lecture recognizes Dr. Whitaker's years of service to the specialty of craniofacial surgery and his mentorship and education of a generation of plastic surgeons.

308 **CRANIOSYNOSTOSIS**
Dr. Fearon will review the etiology, functional implications, historical and current treatments of craniosynostosis. He will also address the outcomes of treatment.
***Jeffrey Fearon, MD***

9:00 AM-10:00 AM
**ACPA ANNUAL BUSINESS MEETING**
(open only to ACPA members)
**Room: Celebrity D-E**

10:00 AM-10:30 AM
**POSTER SESSION D, EXHIBITS, COFFEE BREAK**

## CONCURRENT SPECIALTY SESSIONS (1-5)
10:30 AM-12:00 PM

## CONCURRENT 1: ASCFS PART I
**Room: Celebrity D**

**Goal:** To provide those who treat craniofacial conditions surgically with a forum to discuss new concepts and share information.
**Objective:** Each learner will be able to interpret three new surgical management techniques which can be used for a variety of craniofacial conditions.

**Session Chair:** Jack Yu, MD, DMD
**Session Co-Chair:** Jesse Taylor, MD

# Concurrent Sessions



10:30 AM
86 **OUTCOMES ANALYSIS OF SURGICAL AND NON-SURGICAL INTERVENTION FOR NEONATES WITH PIERRE ROBIN SEQUENCE**
***Christopher Runyan***, *Christopher Gordon, Brian Pan, Shahryar Tork*

10:40 AM
87 **PREDICTING FAILURE OF MANDIBULAR DISTRACTION OSTEOGENESIS FOR INFANTS WITH ROBIN SEQUENCE: A BI-INSTITUTIONAL STUDY**
***Melinda Costa,*** *Sunil Tholpady, Mark Urata, Jeffrey Hammoudeh, Rachel Sargent, Ellynore Florendo, Luke Sanborn, Roberto Flores*

10:50 AM
88 **LONGITUDINAL STUDY OF MIDFACIAL ADVANCEMENT IN EARLY INFANCY FOR RELIEF OF SYNDROMIC CRANIOSYNOSTOSIS- ASSOCIATED AIRWAY OBSTRUCTION. AN 8 YEAR FOLLOW UP**
***Christian Albert El Amm***, *Aaron Morgan, Thomas Howard, Omar Beidas*

11:00 AM
*89 **EN BLOC SUBCRANIAL ROTATION DISTRACTION ADVANCEMENT FOR THE TREATMENT OF SEVERE OBSTRUCTIVE SLEEP APNEA IN YOUNG SYNDROMIC CHILDREN**
***Richard Hopper,*** *Christina Tragos, Hitesh Kapadia*

11:10 AM **DISCUSSION**

11:20 AM
90 **VOLUMETRIC CHANGES IN CRANIAL VAULT EXPANSION: COMPARISON OF FRONTO-ORBITAL ADVANCEMENT AND POSTERIOR CRANIAL VAULT DISTRACTION OSTEOGENESIS**
***Christopher Derderian,*** *Jason Wink, Amy Collinsworth, Jennifer McGrath, Scott Bartlett, Jesse Taylor*

11:30 AM
91 **NEW-ONSET CRANIOSYNOSTOSIS FOLLOWING POSTERIOR VAULT DISTRACTION OSTEOGENESIS**
***Fares Samra,*** *Youssef Tahiri, James Paliga, Valeriy Shubinets, Jordan Swanson, Scott Bartlett, Jesse Taylor*

11:40 AM
*92 **TIMING OF CLOSURE OF THE ANTERIOR SKULL BASE IN SYNDROMIC INFANTS: IMPLICATIONS FOR EARLY MONOBLOC**
***Richard Hopper,*** *Christina Tragos, Yifan Guo*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
**LUNCH BREAK** (on your own)

**ASCFS LUNCHEON/BUSINESS MEETING**
(separate registration fee required)
(open only to members of the American Society of Craniofacial Surgery)
**Room: Rancho**

12:00PM-3:00PM
**ACPA SECOND EXECUTIVE COUNCIL MEETING**
**Room: Polo**

## CONCURRENT 2: CLEFT LIP AND PALATE SURGERY 1
**Room: Celebrity E**

**Goal:** To provide those who treat cleft lip and palate surgically with a forum to discuss new concepts and share information.
**Objective:** Each learner will be able to interpret three new surgical management techniques which can be used for cleft lip and palate.

**Session Chair:** Alex Kane, MD
**Session Co-Chair:** Oksana Jackson, MD

10:30 AM
93 **SUPRA-BROW APPROACH FOR NEUROSURGICAL ACCESS TO ANTERIOR CRANIAL FOSSA AND ETHMOID SINUS: TECHNIQUE, EXPOSURE, AND CONSIDERATIONS**
***Raj Vyas***, *Michael Alperovich, David Staffenberg*

10:40 AM
94 **A COMPARATIVE STUDY OF 3D NASAL SHAPE IN UNILATERAL CLEFT LIP AND PALATE NOSES FOLLOWING ROTATION-ADVANCEMENT AND NAM- CUTTING PRIMARY NASAL REPAIR**
***Banafsheh Hosseinian***, *Asma Almaidhan, Pradip Shetye, Court Cutting, Barry Grayson*

10:50 AM
95 **THE DEVELOPMENT OF A NEW SCORING SYSTEM FOR THE ASSESSMENT OF NASOLABIAL APPEARANCE IN PATIENTS WITH NON-SYNDROMIC CLEFT LIP AND PALATE**
***David Mosmuller,*** *Lisette Mennes, Charlotte Prahl, Melissa Disse, Gem Kramer, Frank Niessen, Peter Don Griot*

11:00 AM
96 **INITIAL SEVERITY IN PATIENTS WITH CUCLP TREATED BY NAM AND TWO-STAGE SURGERY DOES NOT PREDICT NASOLABIAL AESTHETICS DURING PREADOLESCENCE**
***Supakit Peanchitlertkajorn***, *Saran Worasakwutiphong, Karen Yokoo, Robert Menard*

11:10 AM **DISCUSSION**

# Concurrent Sessions

11:20 AM

97 **PALATAL MEASUREMENTS PRE- AND POST-MODIFIED FURLOW REPAIR: ANALYSIS OF PALATAL LENGTHENING AND COMPARISON WITHIN CLEFT TYPES**
***Anthony Taglienti,*** *Oresta Borodevyc, Takiyah Mitchell, David Low, Jesse Taylor, Oksana Jackson*

11:30 AM

98 **THE EFFECT OF FOUR DIFFERENT TREATMENT PROTOCOLS ON CRANIO-MAXILLO-FACIAL GROWTH IN PATIENTS WITH UNILATERAL COMPLETE CLEFT LIP, PALATE AND ALVEOLAR**
***Xue Xu****, Bing Shi, Qian Zheng*

11:40 AM

99 **THE USE AND LIMITATIONS OF INTERCENTER OUTCOMES COMPARISONS PROTOCOLS FOR INTERNAL AUDITS AND QUALITY IMPROVEMENT**
***Patricia Glick****, Stephen Beals, Gunvor Semb, Ross Long, Jr, Kathleen Russell, Ronald Reed Hathaway, John Daskalogiannakis, Andrea Smith, Thomas Sitzman, William Shaw*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
**LUNCH BREAK (ON YOUR OWN)**

12:00PM **ACPA SECOND EXECUTIVE COUNCIL MEETING**
**Room: Polo**

## CONCURRENT 3: SPEECH
**Room: Oasis 1-4**

**Goal:** To provide those who treat speech and hearing aspects of people with cleft lip/palate and other craniofacial conditions with a forum to discuss new concepts and share information.
**Objective:** Each learner will be able to interpret three new findings or management techniques.

**Session Chair:** Michael VanLue, PhD, CCC-SLP
**Session Co-Chair:** Adriane Baylis, PhD, CCC-SLP

10:30 AM

100 **THE RELATIONSHIP BETWEEN ARTICULATION PERFORMANCE AND EARLY DECODING SKILLS FOR CHILDREN WITH OROFACIAL CLEFTS**
***Claudia Crilly Bellucci,*** *Amy Morgan, Brent Collett, Arthur Curtis, Pravin Patel, Jody Coppersmith, Mary O'Gara, Kathleen Kapp-Simon*

10:40 AM

101 **FLOW RATE COMPARISON BETWEEN SPECIALIZED BOTTLES FOR CHILDREN WITH CLEFT PALATE, CURRENT STANDARD BOTTLES, AND A NEW BOTTLE FEEDING MECHANISM**

***Thanh Tran****, Katrina Shah, Marcelle Huizenga, Catherine Pelland, Katherine R. Knaus, Kathleen Borowitz, Silvia Blemker*

10:50 AM

102 **PREVALENCE OF HEARING LOSS IN CHILDREN WITH CLEFT AND EFFECT OF DIFFERENT AUDIOLOGICAL GUIDELINES ON THE EPIDEMIOLOGY**
***Asmat Din****, Anand Muddaiah, Craig Napier, Mark Devlin, Arup Ray, Hafiz Sadiq, Craig Russell, David Wynne*

11:00 AM

103 **SUBMUCOUS CLEFT PALATE: A SINGLE SURGEON RETROSPECTIVE STUDY EVALUATING THE EFFICACY OF SELECTIVE USE OF VIDEO-FLOUROSCOPY TO IMPROVE DIAGNOSIS IN DIFFICULT CASES**
***Zoe MacIsaac****, Matthew Ford, Lorelei Grunwaldt*

11:10 AM **DISCUSSION**

11:20 AM

104 **HOW DOES DYNAMIC MRI COMPARE TO NASENDOSCOPY FOR THE STUDY OF VELOPHARYNGEAL FUNCTION?**
***Jamie Perry****, Graham Schenck, Lakshmi Kollara, Kazlin Mason, David Kuehn, Bradley Sutton*

11:30 AM

105 **EXTRAVELAR AND INTRAVELAR MORPHOLOGY OF THE LEVATOR VELI PALATINI: IMPLICATIONS FOR CLEFT PALATE SPEECH**
***Lakshmi Kollara****, Jamie Perry*

11:40 AM

106 **THE IMPACT OF OROFACIAL MYOFUNCTIONAL THERAPY ON THE REESTABLISHMENT OF NASAL BREATHING AND THE STABILITY OF ORTHODONTIC TREATMENT. TONGUE THRUST: TO TREAT OR NOT TO TREAT?**
***Alla Sorokin****, Natasha Cassir, Eve Desplats, Nelly Huynh*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
**LUNCH BREAK (ON YOUR OWN)**

12:00PM **ACPA SECOND EXECUTIVE COUNCIL MEETING**
**Room: Polo**

# Concurrent Sessions



## CONCURRENT 4: ORTHO/DENTAL
**Room: Celebrity F-H**

**Goal:** To provide those who treat orthodontic/dental aspects of people with cleft lip/palate and other craniofacial conditions with a forum to discuss new concepts and share information.
**Objective:** Each learner will be able to interpret three new findings or management techniques.

**Session Chair:** Ana Mercado, DMD, PhD
**Session Co-Chair:** Lindsay Schuster, DMD, MS

10:30 AM
107 **COMPARISON OF CUCLP NASOLABIAL APPEARANCE BETWEEN 4 CENTERS WITH INFANT MANAGEMENT PROTOCOLS +/- USE OF NAM, GPP, OR INFANT ORTHOPEDICS**
***Patricia Glick***, *Stephen Beals, Thomas Sitzman, Gunvor Semb, John Daskalogiannakis, Ronald Reed Hathaway, Kathleen Russell, Ross Long, Jr, Jennifer Fessler, Cristiane Muller*

10:40 AM
108 **DYNAMIC CLEFT INFANT MAXILLARY ORTHOPEDICS AND PERIOSTEOPLASTY: A 25 YEAR STUDY**
***Frederick Lukash***, *Michael Schwartz, Jessica Korsh, Katelin O'Brien, Kristen Aliano*

10:50 AM
109 **GENERATING EVIDENCE IN CLEFT CARE: A DELPHI-LIKE STUDY TO IDENTIFY AND ADDRESS BARRIERS TO CARRYING OUT RANDOMIZED CONTROLLED TRIALS**
***Karen Wong***, *Christopher Forrest, Holger Schunemann*

11:00 AM
110 **ORTHODONTIC MANAGEMENT OF ANTERIOR MAXILLARY DISTRACTION IN CLEFT MAXILLA**
***Siddhartha Raghav***, *Sehzana Fathima, Akhter Hussain*

11:10 AM **DISCUSSION**

11:20 AM
111 **DEVELOPMENT OF THE FIRST PERMANENT MANDIBULAR MOLAR IN YOUNG CHILDREN WITH UNILATERAL COMPLETE CLEFT LIP AND PALATE (UCCLP)**
***Nuno V. Hermann***, *Sven Kreiborg, Tron A. Darvann*

11:30 AM
112 **DENTAL MATURATION OF CHILDREN WITH UNILATERAL CLEFT LIP AND PALATE**
***Elaine Tan***, *Mimi Yow, Meaw Charm Kuek, Hung Chew Wong*

11:40 AM
113 **POOLED ANALYSIS OF ORTHODONTIC OUTCOMES AFTER ALVEOLAR BONE GRAFTING – A SYSTEMATIC REVIEW**
*Hannah Polus, Thomas Gildea,* ***Alexander Lin***

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
**LUNCH BREAK (ON YOUR OWN)**

12:00PM **ACPA SECOND EXECUTIVE COUNCIL MEETING**
**Room: Polo**

## CONCURRENT 5: BASIC RESEARCH
**Room: Celebrity A-C**

**Goal:** To provide researchers and clinicians with a forum to discuss new concepts and share research findings related to the management of cleft and craniofacial defects.
**Objective:** Each learner will be able to interpret three new research findings related to the management of cleft and craniofacial defects.

**Session Chair:** Mark Mooney, PhD
**Session Co-Chair:** Hyun-Duck Nah, DMD, MSD, PhD

10:30 AM
114 **THE DEVELOPMENT OF AN OSTEO-ENRICHED HYBRID SCAFFOLD SEEDED WITH HBMP2 AND MDCS TO AUGMENT THE HEALING OF CRANIAL DEFECTS**
***Denver Lough***, *Christopher Madsen, Edward Swanson, Devin Miller, Anand Kumar*

10:40 AM
115 **PATIENT SPECIFIC BILAMINAR RESORBABLE MESH WITH BMP-2 PROMOTES CRANIAL VAULT HEALING IN CHILDREN**
***David Hindin***, *Wellington Davis, Prithvi Narayan, Justine Lee, Xilin Jing, James Bradley*

10:50 AM
116 **BIOPATTERNED RECOMBINANT HUMAN BONE MORPHOGENETIC PROTEIN 2 DOES NOT INDUCE PANSYNOSTOSIS OR GROWTH RESTRICTION IN THE IMMATURE CRANIOFACIAL SKELETON**
***Sameer Shakir***, *Osama Basri, James Cray, Sanjay Naran, Darren Smith, Zoe MacIsaac, Seth Weinberg, Mark Mooney, Joseph Losee, Greg Cooper*

11:00 AM
117 **THE ROLE OF TGF-ALPHA IN THE WOUND HEALING CAPACITY OF CELLS DERIVED FROM HUMANS WITH CLEFT LIP/AND PALATE**
***Joël Beyeler***, *Isabelle Schnyder, Christos Katsaros, Matthias Chiquet*

# Concurrent Sessions

11:10 AM **DISCUSSION**

11:20 AM

118 **THE OPTIMAL RHBMP2 DOSE NECESSARY TO AUGMENT HEALING OF A MURINE CRANIAL DEFECT UTILIZING A NOVEL FIBRIN HYDROGEL SCAFFOLD**
***Christopher Madsen**, Denver Lough, Edward Swanson, Anne Tong Jia Wei, Devin Miller, Anand Kumar*

11:30 AM

119 **OPTIMIZING COLLAGEN SCAFFOLDS FOR BONE ENGINEERING: EFFECTS OF CROSSLINKING AND MINERAL CONTENT ON STRUCTURAL CONTRACTION AND OSTEOGENESIS**
***Deborah Martins,** Xiaoyan Ren, David Bischoff, Daniel Weisgerber, Dean Yamaguchi, Timothy Miller, Brendan Harley, Justine Lee*

11:40 AM

120 **EVALUATION OF ADIPOSE-DERIVED STEM CELL OSTEOGENIC POTENTIAL AND CRANIAL BONE REMODELING IN A MURINE MODEL OF CROUZON SYNDROME**
*Cheryl Gomillion, Andre Alcon, Andrew Le,* ***Derek Steinbacher***

11:50 AM` **DISCUSSION**

12:00 PM-1:30 PM
**LUNCH BREAK (ON YOUR OWN)**

12:00PM **ACPA SECOND EXECUTIVE COUNCIL MEETING**
**Room: Polo**

## CONCURRENT SPECIALTY SESSIONS (6-10)

1:30 PM-3:00 PM

### CONCURRENT 6: ASCFS 2

**Room: Celebrity D**

**Goal:** To provide a forum focused on research and surgical management of individuals with craniofacial anomalies.
**Objective:** Each learner will be able to explain three new research findings or surgical management techniques for craniofacial conditions.

**Session Chair:** Richard Hopper, MD
**Session Co-Chair:** Jesse Goldstein, MD

1:30 PM

121 **THE STATE OF OUTCOMES RESEARCH IN NON-SYNDROMIC CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW OF THE LITERATURE OVER 20 YEARS**
***Liliana Camison**, Justin Morse, Sanjay Naran, Karen Wong, Joseph Losee, Jesse Goldstein*

1:40 AM

122 **A PRELIMINARY REPORT ON THE USE OF POST-OPERATIVE STANDARDIZED OUTCOME TRACKING FOR INFANTS WITH SINGLE SUTURE CRANIOSYNOSTOSIS**
***Craig Birgfeld**, Amy Lee, Michael Collins, Richard Hopper, Charles Haberkern, Joseph Gruss, Richard Ellenbogen, Timothy Grieb, Carrie Heike*

1:50 AM

292 **EVALUATION OF DIRECT SURGICAL REMODELING OF FRONTAL BOSSING IN PATIENTS WITH SAGITTAL SYNOSTOSIS**
***Debra Yen,** Gary Skolnick, Dennis Nguyen, Sybill Naidoo, Kamlesh Patel, Matthew Smyth, Alex Kane, Albert Woo*

2:00 PM

123 **A TREATMENT PROTOCOL FOR ATYPICAL PRESENTING SAGITTAL CRANIOSYNOSTOSIS**
***Edward Ruane**, Liliana Camison, Regina Fenton, Ian Pollack, Mandeep Tamber, Joseph Losee, Jesse Goldstein*

2:10 PM **DISCUSSION**

2:20 PM

124 **IMPLEMENTATION OF TRANEXAMIC ACID TO REDUCE BLOOD LOSS DURING CRANIAL VAULT REMODELING FOR CRANIOSYNOSTOSIS AT A SINGLE INSTITUTION**
***David Martin**, Brian Diggs, Heike Gries, Jeffrey Koh, Martin Schreiber, Nathan Selden, Anna Kua*

2:30 PM

125 **A NEW OSTEOGENIC AGENT, OXYSTEROL, INDUCES BONE REPAIR IN RABBIT CRANIOFACIAL DEFECT**
***Reza Jarrahy**, Andrew Li, Situo Zhou, Akishige Hokugo, Andres Segovia, Kameron Rezzadeh*

2:40 PM

126 **DYNAMIC SKELETAL CHANGES OF AN OSTEOMYOCUTANEOUS FACIAL ALLOGRAFT FIVE YEARS FOLLOWING TRANSPLANTATION**
***Bahar Bassiri Gharb**, Gaby Doumit, Antonio Rampazzo, Steven Bernard, Maria Siemionow, Frank Papay, Risal Djohan*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

### CONCURRENT 7: CLEFT LIP/PALATE SURGERY 2

**Room: Celebrity E**

**Goal:** To provide a forum focused on patient outcomes following surgical management of individuals with cleft palate, including outcomes related to obstructive sleep apnea.

# Concurrent Sessions



**Objective:** Each learner will be able to explain three findings related to patient outcomes following surgical management of individuals with cleft palate, including outcomes related to obstructive sleep apnea.

**Session Chair:** John Jensen, MD
**Session Co-Chair:** Alexander Lin, MD

1:30 PM
127 **THE EFFECT OF CLEFT PALATE AND REPAIR ON GROWTH: A COMPARISON OF AMERICAN CHILDREN AND INTERNATIONAL ADOPTEES**
***Sandra Tomlinson-Hansen**, Brianne Mitchell, Patrick Gerety, Rami Sherif, Jordan Swanson, Jesse Taylor*

1:40 PM
128 **PERIOPERATIVE COMPLICATIONS IN POSTERIOR PHARYNGEAL FLAP SURGERY: REVIEW OF THE NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM PEDIATRIC (NSQIP-PEDS) DATABASE**
***Jordan Swanson**, James Johnston, Kaitlyn Paine, Jesse Taylor*

1:50 PM
129 **ACELLULAR DERMAL MATRIX IN PRIMARY PALATOPLASTY: IMPLICATIONS FOR SPEECH**
***Darren Smith,** Sanjay Naran, Sameer Shakir, Liliana Camison, Rick Mai, Jesse Goldstein, Joseph Losee*

2:00 PM
130 **VARIATION IN THE BURDEN OF SECONDARY PALATE SURGERY ACROSS US CLEFT CENTERS**
***Thomas Sitzman**, Monir Hossain , Maria Britto*

2:10 PM **DISCUSSION**

2:20 PM
131 **PATIENTS WITH CLEFTS WHO UNDERGO SLEEP STUDIES AFTER SURGERY DO NOT SHOW SIGNIFICANTLY IMPROVED SLEEP PARAMETERS AFTER ADENOTONSILLECTOMY**
*Justine McGauley, Jeremy Goss, Eric Adjei Boakye, Margie Hunter, Paula Buchanan, **Alexander Lin**, Shalini Paruthi*

2:30 PM
132 **SLEEP DISORDERED BREATHING IN PATIENTS WITH CLEFT PALATE: DO HOME OXIMETRY SLEEP STUDIES HAVE A CLINICAL UTILITY?**
***Asmat Din**, Jennifer Pettigrew, Justice Reilly, Anne Crawford, Shirley Wallace, Neil Gibson, Arup Ray, Mark Devlin, David Wynne, Craig Russell*

2:40 PM
133 **INCIDENCE AND SEVERITY OF OBSTRUCTIVE SLEEP APNEA IN ONE THOUSAND TWENTY CHILDREN WITH CLEFT-CRANIOFACIAL CONDITIONS**
*Justine McGauley, Jeremy Goss, Eric Adjei Boakye, Margie Hunter, Paula Buchanan, Shalini Paruthi, **Alexander Lin***

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

## CONCURRENT 8: ADVANCES IN BIOIMAGING

**Room: Oasis 1-4**

**Goal:** To provide a forum to present various aspects of advances in bioimaging.
**Objective:** Each learner will be able to discuss three aspects related to the advances in bioimaging.

**Session Chair:** Luiz Pimenta, DDS, MS, PhD
**Session Co-Chair:** Silvia Blemker, PhD

1:30 PM
134 **DEVELOPMENT AND VALIDATION OF COMPUTER-BASED 3D ANALYSIS OF SYMMETRY BEFORE AND AFTER CLEFT LIP REPAIR**
***Raymond Tse**, Jia Wu, Carrie Heike, Craig Birgfeld, Kelly Evans, Murat Maga, Morrison Clinton, Linda Shapiro*

1:40 PM
135 **DEFINING NORMAL: QUANTIFYING CRANIAL ASYMMETRY IN THE PEDIATRIC POPULATION**
***Rami Hallac**, Min-Jeong Cho, Jananie Ramesh, James Seaward, Nuno V. Hermann, Tron A. Darvann, Alex Kane*

1:50 PM
136 **CONTRIBUTIONS OF THE MUSCULUS UVULAE TO VELOPHARYNGEAL CLOSURE QUANTIFIED WITH A 3D MULTI-MUSCLE COMPUTATIONAL MODEL**
***Joshua Inouye**, Jamie Perry, Kant Lin, Silvia Blemker*

2:00 PM
137 **DIAGNOSTIC YIELD OF SKULL RADIOGRAPHS IN DIFFERENTIATING SYNOSTOTIC AND NON-SYNOSTOTIC PLAGIOCEPHALY**
***Min-Jeong Cho,** Loa Borchert, Alex Kane*

2:10 PM **DISCUSSION**

2:20 PM
138 **PRENATAL DIAGNOSIS OF CRANIOSYNOSTOSIS**
***Christopher DeFreitas**, Stephen Carr, Derek Merck, Margaret Byrne, Olivia Linden, Stephen Sullivan, Helena Taylor*

2:30 PM
139 **THE ROLE OF PREOPERATIVE IMAGING IN THE OPERATIVE PLANNING AND DETECTION OF INTRACRANIAL ABNORMALITIES IN SINGLE SUTURE LAMBDOID CRANIOSYNOSTOSIS**
***Asra Hashmi**, Kavitha Ranganathan, Antonio Rampazzo, Karin Murazsko, Christian Vercler, Jennifer Strahle, Steven Buchman*

# Concurrent Sessions

2:40 PM
140 **OPTICAL COHERENCE TOMOGRAPHY: AN OBJECTIVE MODALITY FOR DETECTING PAPILLEDEMA IN CRANIOSYNOSTOSIS PATIENTS WITH SUSPECTED INTRACRANIAL HYPERTENSION**
***Jordan Swanson**, Lloyd Bender, Brianne Mitchell, Greg Heuer, William Katowitz, Jesse Taylor*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

## CONCURRENT 9: PSYCHOSOCIAL
**Room: Celebrity F-H**

**Goal:** To provide a forum focused on psychosocial issues and outcomes related to individuals affected by cleft and craniofacial conditions.
**Objective:** Each learner will be able to express four psychosocial issues and outcomes related to individuals affected by cleft and craniofacial conditions.

**Session Chair:** Margot Stein, PhD
**Session Co-Chair:** Patricia Severns, MA

1:30 PM
141 **RELATIONSHIP BETWEEN RECEPTIVE LANGUAGE AND TEACHER AND PARENT REPORTS OF ATTENTION PROBLEMS IN CHILDREN WITH OROFACIAL CLEFTS**
***Jody Coppersmith,** Amy Morgan, Brent Collett, Claudia Crilly Bellucci, Arthur Curtis, Kathleen Kapp-Simon*

1:40 PM
142 **INTERNATIONALLY ADOPTED CHILDREN WITH CLEFT LIP AND PALATE: IMPLICATIONS FOR SOCIAL WORK**
***Farah Sheikh**, Emily Ho, Sally Hynes, David M Fisher, Christopher Forrest*

1:50 PM
143 **EXAMINING SOCIAL AND COMMUNICATIVE FUNCTIONING IN CHILDREN WITH VELOPHARYNGEAL INSUFFICIENCY**
***Agnieszka Dzioba**, Elizabeth Skarakis-Doyle, Philip Doyle, Murad Husein, Anne Dworschak-Stokan*

2:00 PM
144 **BODY IMAGE, QUALITY OF LIFE, AND SOCIAL STIGMATIZATION IN ADOLESCENTS WITH AND WITHOUT CRANIOFACIAL CONDITIONS**
***Canice Crerand,** Nichola Rumsey, Alexandra Clarke, Anne Kazak, David Sarwer*

2:10 PM **DISCUSSION**

2:20 PM
145 **FACING DIFFERENCES: AN ANALYSIS OF MEDIA REPRESENTATION OF FACIAL DIFFERENCE**
***Stephanie Chatland***

2:30 PM
146 **"MY KID IS AN HONOR STUDENT": PARENTS PERCEPTIONS OF ACADEMIC ABILITY IN THEIR CHILDREN WITH ISOLATED NON SYNDROMIC CLEFTS**
***Stephanie Watkins**, Robert Meyer, Arthur Aylsworth, Barry Ramsey, Jeffrey Marcus, Alexander Allori, Luiz Pimenta, Ronald Strauss*

2:40 PM
147 **QUALITY OF CARE BY CRANIOFACIAL TEAM – PARENTS PERCEPTION**
***Luiz Pimenta**, Stephanie Watkins, Robert Meyer, Arthur Aylsworth, Barry Ramsey, Jeffrey Marcus, Alexander Allori, Ronald Strauss*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

## CONCURRENT 10: GENETICS
**Room: Celebrity A-C**

**Goal:** To provide a forum to present new findings related to the genetics of individuals affected by cleft and craniofacial conditions.
**Objective:** Each learner will be able to discuss three new findings related to the genetics of individuals affected by cleft and craniofacial conditions.

**Session Chair:** Howard Saal, MD
**Session Co-Chair:** Donna McDonald-McGinn, MS, LCGC, MS, LCGC

1:30 PM
148 **ROBIN SEQUENCE WITHOUT CLEFT PALATE: GENETIC DIAGNOSES AND MANAGEMENT IMPLICATIONS**
***Howard Saal**, Robert Hopkin, Patricia Bender, Kathryn Nicole Weaver*

1:40 PM
149 **22Q11.2 DELETION SYNDROME: OBJECTIVE ASSESSMENT OF A NEWLY IDENTIFIED FACIAL PHENOTYPE**
***Kelly Mabry,** Charles Castiglione, Kerri Langevin*

1:50 PM
*150 **THE PERPLEXING PREVALENCE OF FAMILIAL NESTED 22Q11.2 DELETIONS**
***Donna McDonald-McGinn**, Meg Maguire, Patricia Schultz, Cynthia B. Solot, Lauren Dicairano, Megan McNamara, Daniel McGinn, Beverly Emanuel, Elaine Zackai, Oksana Jackson*

2:00 PM
151 **HARDIKAR SYNDROME, A RARE SYNDROME OF CLEFT LIP/PALATE, AND UROGENITAL ABNORMALITIES, MAY RESULT FROM VARIANTS IN MYELIN GENE REGULATORY FACTOR**
***Elizabeth Bhoj***, *Dong Li, Margaret Harr, Elaine Zackai, Hakon Hakonarson*

2:10 PM **DISCUSSION**

2:20 PM
152 **CLINICAL GENETICS EVALUATION ESSENTIAL IN MULTI-DISCIPLINARY CLEFT CLINIC**
***Julie Hoover-Fong***, *Colleen Gioffreda, Natalie Beck, Carrie Blout, Kim Seifert, Richard Redett*

2:30 PM
153 **PERFORMANCE OF WHOLE EXOME SEQUENCING FOR CHILDREN WITH CRANIOFACIAL DISORDERS**
***Cynthia Prows***, *Kristen Sund, Howard Saal*

2:40 PM
154 **DIAGNOSTIC EXOME SEQUENCING FOR CRANIOFACIAL ANOMALIES: THE NIJMEGEN EXPERIENCE**
***Charlotte Ockeloen***, *Carine Carels, Sonja de Munnik, Tjitske Kleefstra, Rolph Pfundt*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

## CONCURRENT SPECIALTY SESSIONS (11-15)
3:30 PM-5:00 PM

### CONCURRENT 11 — MANDIBLE MICROSOMIA
**Room: Celebrity D**

**Goal:** To provide a forum to present new findings related to the etiology and management of mandibular microsomia.
**Objective:** Each learner will be able to discuss three new findings related to the etiology and management of mandibular microsomia.

**Session Chair:** Mark Urata, DDS, MD
**Session Co-Chair:** Davinder Singh, MD

3:30 PM
155 **CLARIFYING THE RELATIONSHIP BETWEEN THE DIFFERENT FEATURES OF THE OMENS+ CLASSIFICATION IN CRANIOFACIAL MICROSOMIA**
***Jorien Tuin***, *Youssef Tahiri, Kaitlyn Paine, James Paliga, Jesse Taylor, Scott Bartlett*

3:40 PM
156 **SURGICAL INTERVENTION IN CRANIOFACIAL MICROSOMIA: THE EXPERIENCE OF 4 CRANIOFACIAL CENTERS WITHIN THE FACIAL NETWORK**
***Craig Birgfeld***, *Babette Saltzman, Scott Bartlett, Mark Urata, Luiz Pimenta, Amelia Drake, Daniela Luquetti, Kathleen Sie, Carrie Heike*

3:50 PM
157 **CONGENITAL AND ACQUIRED MANDIBULAR ASYMMETRY: MAPPING GROWTH IN THREE DIMENSIONS**
***R. Christian Solem***, *Antonio Ruellas, Lucia Cevidanes*

4:00 PM
158 **DISTINGUISHING GOLDENHAR SYNDROME FROM CRANIOFACIAL MICROSOMIA**
***Jorien Tuin,*** *Youssef Tahiri, James Paliga, Jesse Taylor, Scott Bartlett*

4:10 PM **DISCUSSION**

4:20 PM
312 **LONG TERM OUTCOMES OF CRANIOFACIAL MICROSOMIA TREATMENT: MANDIBULAR RECONSTRUCTION**
*Rachel Mandelbaum,* ***Deborah Martins***, *Emily Dubina, Sarah Park, James Bradley, Justine Lee*

4:30 PM
159 **PREVALENCE OF RENAL AND CERVICAL VERTEBRAL ANOMALIES IN PATIENTS WITH ISOLATED MICROTIA**
***Shane Zim***, *Craig Senders, Brian Rubinstein*

4:40 PM
160 **BREATHING, MACROGLOSSIA AND TONGUE REDUCTION IN INDIVIDUALS WITH BECKWITH-WIEDEMANN SYNDROME**
***Jeffrey Marsh***

4:50 PM **DISCUSSION**

### CONCURRENT 12 — CLEFT LIP/PALATE SURGERY 3
**Room: Celebrity E**

**Goal:** To provide a forum focused on new findings related to evaluation, surgical treatment and outcomes of individuals affected by cleft and craniofacial conditions.
**Objective:** Each learner will be able to discuss four new findings related to evaluation, surgical treatment and outcomes of individuals affected by cleft and craniofacial conditions.

**Session Chair:** Lisa David, MD
**Session Co-Chair:** Michael Friel, MD

3:30 PM
161 **DEVELOPMENT OF A ROBOTIC APPROACH TO CLEFT PALATE REPAIR. PHASE 1: CREATION AND VALIDATION OF A CLEFT PALATE SIMULATOR**
***Dale Podolsky,*** *David Fisher, Karen Wong, Thomas Looi, James Drake, Christopher Forrest*

# Concurrent Sessions

3:40 PM
162 **A CRANIOMETRIC ANALYSIS OF BILATERAL ENDOSCOPIC SUTURECTOMY AND HELMET THERAPY FOR MANAGEMENT OF BILATERAL CORONAL CRANIOSYNOSTOSIS**
***S. Alex Rottgers***, *Hasan Syed, Yasser Jeelani, Edward Yang, Subhash Lohani, John Meara, Mark Proctor*

3:50 PM
163 **COMPARISON OF CRANIAL ANTHROPOMETRIC MEASUREMENTS USING HAND CALIPER VERSUS LASER SCANNER TO DIAGNOSE SEVERITY AND ASSESS CHANGE IN PATIENTS WITH DEFORMATIONAL PLAGIOCEPHALY**
***Regina Fenton***, *Wei-Wei Lee, Lorelei Grunwaldt*

4:00 PM
164 **SLIDING TEMPORALIS MYOPLASTY FOR SINGLE STAGE SMILE RECONSTRUCTION IN 15 CONSECUTIVE PATIENTS WITH FACIAL PARALYSIS**
***Andre Panossian***

4:10 PM **DISCUSSION**

4:20 PM
165 **LONG TERM GROWTH OUTCOMES OF PATIENTS WITH PIERRE ROBIN SEQUENCE WHO UNDERWENT INFANT MANDIBULAR DISTRACTION OSTEOGENESIS**
***Michelle Scott***, *Stephen Yen*

4:30 PM
166 **NCIDENCE OF AMBLYOPIA AND ITS RISK FACTORS IN CHILDREN WITH ISOLATED METOPIC CRANIOSYNOSTOSIS**
***Thuan Nguyen***, *Tara Missoi, Leslie Shock, Arshad Muzaffar*

4:40 PM
167 **MANDIBULAR DISTRACTION OSTEOGENESIS IN THE VERY SMALL WITH ROBIN SEQUENCE: IS IT SAFE?**
***Shawn Greathouse***, *Sunil Tholpady, Robert Havlik, Tasha Hall, Roberto Flores, Youssef Tahiri*

4:50 PM **DISCUSSION**

## CONCURRENT 13 — SPEECH SURGERY
**Room: Oasis 1-4**

**Goal:** To provide a forum to present new findings related to the evaluation of velopharyngeal dysfunction and outcomes related to speech surgery in individuals with cleft palate or 22Q11.2 deletion syndrome.
**Objective:** Each learner will be able to discuss three new findings related to the evaluation of velopharyngeal dysfunction and outcomes related to speech surgery in individuals with cleft palate or 22Q11.2 deletion syndrome.

**Session Chair:** Jamie Perry, PhD, CCC-SLP
**Session Co-Chair:** Lynn Fox, MA, MEd

3:30 PM
168 **TREATMENT CENTER FACTORS ASSOCIATED WITH SECONDARY PALATE SURGERY**
***Thomas Sitzman***, *Monir Hossain, Maria Britto*

3:40 PM
169 **A COMPARISON OF THE NEED FOR SPEECH THERAPY FOLLOWING TWO PALATAL REPAIR TECHNIQUES**
***Debra Yen***, *Dennis Nguyen, Gary Skolnick, Sybill Naidoo, Kamlesh Patel, Lynn Grames, Albert Woo*

3:50 PM
170 **SYSTEMATIC REVIEW OF STUDIES COMPARING PRIMARY PALATOPLASTY WITH FURLOW VERSUS NON-FURLOW TECHNIQUES VIA PERCEPTUAL SPEECH OUTCOMES**
***Thomas Gildea***, *Hannah Polus, Alexander Lin*

4:00 PM
171 **LONG-TERM SPEECH OUTCOME IN ADULTS WITH COMPLETE UNILATERAL CLEFT LIP AND PALATE AFTER TWO-STAGE PALATE CLOSURE**
***Isabelle Kappen***, *Dirk Bittermann, Gerhard Bittermann, Corstiaan Breugem, Aebele Mink van der Molen*

4:10 PM **DISCUSSION**

4:20 PM
172 **INFLUENCE OF INTRAORAL AIR PRESSURE AND AUDITORY FEEDBACK ON VELOPHARYNGEAL CLOSURE DURING NORMAL, WHISPERED, PANTOMIME, AND ELECTROLARYNX SPEECH**
*Nicole Martin,* ***Jerry Moon***, *Michael Karnell*

4:30 PM
173 **PROGRESSIVE TIGHTENING OF THE LEVATOR VELI PALATINI MUSCLE IMPROVES VELOPHARYNGEAL DYSFUNCTION IN PRIMARY PALATOPLASTY**
***Dennis Nguyen***, *Kamlesh Patel, Gary Skolnick, Rachel Skladman, Lynn Grames, Mary Stahl, Albert Woo*

4:40 PM
174 **COMPARING SURGICAL AND NON-SURGICAL MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION IN PEDIATRIC PATIENTS WITH 22Q11.2 DELETION SYNDROME**
***Kelly Mabry***, *Kimberley Rutherford, Jessica Weiss, Charles Castiglione*

4:50 PM **DISCUSSION**

# Concurrent Sessions



## CONCURRENT 14 — HOSPITAL MANAGEMENT
**Room: Celebrity F-H**

**Goal:** To provide a forum to present new findings related to the hospital management of individuals affected by cleft and craniofacial conditions.
**Objective:** Each learner will be able to discuss three new findings related to the hospital management of individuals affected by cleft and craniofacial conditions.

**Session Chair:** Judy Marciel, MSN, RN, PCNS, CPNP, APN
**Session Co-Chair:** Michael Nelson, MD

3:30 PM
175 **POST-PALATOPLASTY PAIN PROTOCOL: A PILOT STUDY**
***Allison Nauta**, Lisa Piper, Heike Gries, Kenneth Azarow, Jeffrey Koh, Anna Kuang*

3:40 PM
176 **RECOVERY TIME AND COMPLICATIONS AFTER ILIAC CREST BONE GRAFT HARVEST FOR ALVEOLAR CLEFT BONE GRAFTING**
***Erika Henkelman**, Emily Liu, Damir Matic*

3:50 PM
177 **PATIENT PERCEPTIONS OF PERIOPERATIVE CARE FOLLOWING ILIAC BONE GRAFTING SURGERY: A SURVEY BASED STUDY OF PATIENTS TREATED IN A LARGE ACADEMIC MEDICAL CENTER**
***Bianca Chin**, Anthony Wilson, Anthony Taglienti, Takiyah Mitchell, Oresta Borodevyc, Charlene Deuber, Christine Stevenson, Taylor Shikitino, Oksana Jackson*

4:00 PM
178 **EARLY SURGICAL COMPLICATIONS AFTER PRIMARY LIP REPAIR- A REPORT OF 3108 CONSECUTIVE PATIENTS**
*Björn Schönmeyr, Lisa Wendby, **Alex Campbell***

4:10 PM **DISCUSSION**

4:20 PM
179 **CLEFT PALATE REPAIR: HOSPITAL LENGTH OF STAY**
***Alison Kaye**, Annie Crumbaker*

4:30 PM
180 **FACTORS AFFECTING DURATION OF ADMISSION AFTER PRIMARY PALATOPLASTY**
***Peter Olaitan**, Stephen Poteet, Gregory Pearson, Adriane Baylis, Richard Kirschner*

4:40 PM
181 **IMPROVING CONSISTENCY OF CARE AND TIMELY DISCHARGE FOR PATIENTS UNDERGOING CLEFT REPAIR OR ILIAC BONE GRAFTING**
***Charlene Deuber**, Oksana Jackson, Christine Stevens*

4:50 PM **DISCUSSION**

## CONCURRENT 15 — OUTCOMES AND INTERNATIONAL ISSUES
**Room: Celebrity A-C**

**Goal:** To provide a forum to present new findings related to international issues and surgical outcomes of individuals affected by cleft and craniofacial conditions.
**Objective:** Each learner will be able to discuss three new findings related to international issues and surgical outcomes of individuals affected by cleft and craniofacial conditions.

**Session Chair:** Iris Sageser, RDH, MS
**Session Co-Chair:** Laura Monson, MD

3:30 PM
182 **SCALABLE, SUSTAINABLE COST-EFFECTIVE SURGICAL CARE: A MODEL FOR SAFETY AND QUALITY IN THE DEVELOPING WORLD**
***Alex Campbell,** Carolina Restrepo, Donald R. Mackay, Randy Sherman, Ajit Varma, Ruben Ayala, Hiteswar Sarma, Gaurav Deshpande, William Magee*

3:40 PM
*183 **GLOBAL ONLINE TRAINING FOR CLEFT CARE – ANALYSIS OF INTERNATIONAL UTILIZATION**
***Derek Culnan**, Aaron Oliker, Court Cutting, Roberto Flores*

3:50 PM
184 **EVALUATION OF SURGICAL OUTCOMES IN CRANIOSYNOSTOSIS RECONSTRUCTION WITH A NOVEL OBJECTIVE AUTOMATIC COMPUTATIONAL FRAMEWORK**
***Mark Lloyd**, Edward Buchanan, Ron Goldman, Binhang Yuan, Laura Monson, David Khechoyan*

4:00 PM
185 **IMPROVED CLEFT LIP OUTCOMES AT A SURGERY SPECIALTY CENTER IN THE DEVELOPING WORLD**
***Carolina Restrepo**, Alex Campbell, Björn Schönmeyr, Gaurav Deshpande, Hiteswar Sarma*

4:10 PM **DISCUSSION**

4:20 PM
186 **ANTIBIOTIC USE IN PRIMARY PALATOPLASTY: A SURVEY OF PRACTICE PATTERNS, ASSESSMENT OF EFFICACY, AND PROPOSED GUIDELINES FOR USE**
***S. Alex Rottgers**, Liliana Camison, Rick Mai, Sameer Shakir, Lorelei Grunwaldt, Andrew Nowalk, Megan Natali, Joseph Losee*

4:30 PM
187 **ROLE OF ANTIMICROBIALS IN CLEFT PALATE SURGERY: PROSPECTIVE, DOUBLE BLIND, RANDOMIZED, PLACEBO-CONTROLLED CLINICAL STUDY**
*María Aznar, Björn Schönmeyr, Gaston Echaniz, Lismore Nebeker, Lisa Wendby, **Alex Campbell***

# Concurrent Sessions

4:40 PM

188 **ADULT CLEFT LIP REPAIR UNDER LOCAL ANAESTHESIA: THE GHANA EXPERIENCE**
***Solomon Obiri-Yeboah**, Alexander Oti Acheampong, Samuel Ansah, Peter Ray, John Grant, Peter Donkor*

4:50 PM **DISCUSSION**

6:30 PM - 10:30 PM
**ACPA'S 72ND ANNUAL GALA**
***A NIGHT AT THE OASIS***
Party under the palm trees at the Westin Mission Hills' Masters Plaza
*Supported in part by the KLS Martin Group*

Wrap up a fabulous week in paradise and join us for an evening of great food, music, and dance!

## SATURDAY, April 25, 2015

## CONCURRENT GENERAL SESSIONS (D-F)

8:00 AM-10:00 AM

### SESSION D: FIRST YEAR CARE PANEL

7:30 AM-8:30 AM
**Room: Celebrity A-C**

**Goal:** To introduce new multidisciplinary cleft team members to key concepts related to the management of children with cleft lip and/or palate during their first year of life.
**Objective:** Each learner will be able to 1) describe the roles of various members of the multidisciplinary team, and 2) restate an outline and timeline of care that is appropriate during the first year of life.

**Session Chair:** Noreen Clarke, RN, MSN

189 **AN INTRODUCTION TO THE CARE OF THE CHILD WITH A CLEFT: THE FIRST YEAR OF LIFE**
A multidisciplinary panel will describe their roles in caring for children and families affected by clefting. We will introduce family centered care for the child diagnosed prenatally or neonatally, emphasizing the role of nursing and care coordination. ACPA Standards for Cleft Palate and Craniofacial Teams will be incorporated. Psychosocial issues and interventions will be discussed. Delivery of culturally competent care to diverse families and socioeconomic groups will be addressed.
***Noreen Clarke, RN, MSN,** Alexis Johns, PhD, Karla A. Haynes, RN, MPH, MS, CPNP, Daniela Schweitzer, MD, Lori Howell, MD, Yvonne R. Gutierrez, MD*

### SESSION E: CLEFT CARE IN THE DEVELOPING WORLD PANEL

8:30 AM-9:30 AM
**Room: Celebrity E**

**Goal:** To develop an easy-to-use algorithm for international volunteer cleft trips to train local professionals and to ensure an exit strategy by developing a sustainable national cleft organization.
**Objective:** Each learner will be able to: 1) identify a place to perform international cleft care, 2) participate at this site in teaching cleft care, 3) identify local leaders to learn cleft care, 4) prepare local leaders to perform independent cleft care.

**Session Chair:** John van Aalst, MD

190 **DEVELOPING ALGORITHMS FOR TRAINING AND INDEPENDENCE IN CLEFT CARE IN THE DEVELOPING WORLD: AN OASIS IN THE SAND**
Over ten years we have performed 1,700 cleft surgeries in Government Hospitals in the Palestinian Territories. Our initial model employed teams from outside Palestine and has transitioned to a new model: in a recent surgical trip to Gaza all team members were Palestinians from the Territories. We demonstrate that teaching cleft care can be done safely with full reliance on local professionals and is a model for improving cleft care throughout the Middle East.
*Chris Gordon, MD, Haithem M. Elhadi Babiker, Ann Schwentker, MD, **John van Aalst, MD***

### SESSION F: ASCFS PANEL

7:30 AM-9:30 AM
**Room: Celebrity D**

**Goal:** Panelists will review the current research and provide recommendations regarding the timing of surgical managment of non-syndromic craniosynostosis, as well as alternative options.
**Objective:** Each learner will be able to analyze and compare the research and recommendations of early versus late surgery, as well as alternative treatment modalities, including early aggressive non-devascularizing surgery.

**Session Chair:** Joseph Losee, MD

*309 **TIMING OF THE SURGICAL MANAGEMENT OF NON-SYNDROMIC CRANIOSYNOSTOSIS**
Panelists will review the current research and provide recommendations for early surgery, late surgery, alternative options, and will present the current evidence available. Invited discussants will summarize the presentations and ensure lively discussion with the audience.
***Joseph Losee**, MD, John Persing, MD, Jeffrey A. Fearon, MD, Jesse Taylor, MD, Jack Yu, MD, Richard Hopper, MD, Mark Urata, MD*

# Poster Sessions



**WEDNESDAY, April 22 thru FRIDAY, April 24, 2015**

There will be five poster sessions (sessions A through E)
Two (2) sessions are scheduled per day except Thursday.
On Wednesday, Poster Session A will run from 7:00 AM-1:00 PM, and Poster Session B will run from 1:30 PM-6:30 PM.
On Thursday, Poster Session C will run from 7:00 AM-6:00 PM.
And on Friday, Poster Session D will run from 8:00 AM-12:30 PM, and Poster Session E will run from 1:00 PM to 5:00 PM.
The posters will be located in the Celebrity Patio (outdoor).

***Please note the top numbers correspond to the posterboard position number.***

**Goal:** To create a visual forum for the sharing of interdisciplinary research and treatments for patients with cleft and craniofacial conditions.

## POSTER SESSION A

WEDNESDAY, APRIL 22
7:00 AM-1:00 PM

**1.**
191
**COMPARISON OF MAXILLARY DEVELOPMENT IN PATIENTS WITH CUCLP TREATED BY NAM AND ONE-STAGE PALATAL REPAIR VERSUS NAM AND TWO-STAGE REPAIR**
***Supakit Peanchitlertkajorn***

**2.**
192
**A STANDARDIZED PROTOCOL FOR DECREASING MORBIDITY IN PATIENTS WITH HIGH COMPLICATION RISKS REQUIRING MONOBLOC OR LE FORT III FACIAL ADVANCEMENT**
***Devin Miller,*** *Edward Swanson, Denver Lough, Christopher Madsen, Anand Kumar*

**3.**
193
**CORONAL SUTURE MORPHOLOGY AND SYNOSTOTIC PROGRESSION IN RABBITS WITH DELAYED-ONSET CRANIOSYNOSTOSIS**
*Harman Deol, Allegra Wollenberg, Seth Weinberg, James Cray, Joseph Losee, Greg Cooper, Michael Siegel,* ***Mark Mooney***

**4.**
194
**DEVELOPING PSYCHOSOCIAL INTERVENTIONS FOR YOUTH WITH CRANIOFACIAL CONDITIONS: AN ASSSESSMENT OF ADOLESCENTS' CONCERNS AND INTERESTS**
***Canice Crerand,*** *Alexandra Clarke, Anne Kazak, David Sarwer, Brian Misiti, Nichola Rumsey*

**5.**
*195
**DEVELOPING YOUR OWN COLLABORATIVE CARE PROGRAM**
***Lynn Grames,*** *Mary Stahl*

**6.**
196
**DOES TYPE OF CLEFT PALATE REPAIR INFLUENCE POSTOPERATIVE EUSTACHIAN TUBE DYSFUNCTION?**
***Graham Grabowski,*** *Wendy Mackey, Derek Steinbacher*

**7.**
197
**EXECUTIVE COGNITIVE STRATEGIES FOR CHILDREN WITH CLEFT LIP AND PALATE: A COMPARATIVE GENDER STUDY**
***Marcia Regina Ferro,*** *Mariana de Pereira, Maria de Lourdes Tabaquim*

**8.**
198
**DEVELOPING CT IMAGING MEASURES TO GUIDE AIRWAY MANAGEMENT IN INFANTS AND YOUNG CHILDREN WITH ROBIN SEQUENCE**
*Victoria Lee, Francisco Perez, Jonathan Perkins, Michele Shaffer, Hitesh Kapadia, Richard Hopper,* ***Kelly Evans***

**9.**
199
**IMPROVING ACCESSIBILITY OF INFORMATION ON TREATMENT OF OROFACIAL CLEFTS FOR FAMILIES AND SCHOOL PROFESSIONALS**
***Michael VanLue,*** *Margot Neufeld, Cynthia Cassell*

**10.**
200
**MANAGEMENT OF CRANIOSYNOSTOSIS AT AN ADVANCED AGE: CLINICAL FINDINGS, SURGICAL TREATMENT, AND CONTROVERSIES**
***Rajiv Iyengar,*** *Jerrold Boxerman, Petra Klinge, Stephen Sullivan, Helena Taylor*

**11.**
201
**ECTOPIC THYMUS MASQUERADING AS A MALIGNANCY IN A PATIENT WITH VOCAL CORD PARALYSIS AND 22Q11.2 DELETION SYNDROME: A CASE REPORT**
***Phillip Chaffin Jr,*** *Jonathan Grischkan*

**12.**
202
**PARAVERTEBRAL NERVE BLOCK IMPROVES OUTCOME IN PATIENTS WITH CLEFT UNDERGOING MINIMAL ACCESS ILIAC CREST BONE HARVEST FOR ALVEOLAR BONE GRAFTING**
***Christopher Madsen,*** *Denver Lough, Edward Swanson, Anne Tong Jia Wei, Devin Miller, Christine Fisher, Zoe MacIsaac, Anand Kumar*

**13.**
203
**QUALITY OF LIFE IN CHILDREN AFFECTED WITH AN ORAL CLEFT: AGE AND REPORTER DIFFERENCES**
***Amy Conrad,*** *Nichole Nidey, Deborah Kacmarynski*

**14.**
204
**PATTERNS OF ANOMALOUS VENOUS DRAINAGE IN CHILDREN WITH SYNDROMIC CRANIOSYNOSTOSIS**
***Andrea Copeland,*** *Caitlin Hoffman, Suzanne Laughlin, Emily Ho, James Drake, Christopher Forrest*

# Poster Sessions

15. 205
**PSYCHOSOCIAL PREDICTORS OF BEHAVIORAL CHALLENGES AND CARIES EXPERIENCE OF CHILDREN WITH OROFACIAL CLEFTS IN THE DENTAL SETTING**
***Angela Cook,*** *Carolyn Kerins, Celia Heppner*

16. 206
**RELATIONSHIP BETWEEN SEVERITY OF OBSTRUCTIVE SLEEP APNEA AND VELOPHARYNGEAL AREA IN MIDDLE-AGED ADULTS WITH PHARYNGEAL FLAP: POLYSOMNOGRAPHIC AND RHINOMANOMETRIC STUDY**
***Letícia Campos,*** *Eliete Bighetti, Inge Elly Trindade, Ivy Suedam*

17. 207
**RETROSPECTIVE EVALUATION OF SLEEP STUDIES OF CHILDREN WITH ROBIN SEQUENCE WHO HAD UNDERGONE DISTRACTION OSTEOGENESIS OF THE MANDIBLE: DO THEY HAVE PERSISTENT CENTRAL APNEAS AFTER IMPROVEMENT OF OBSTRUCTIVE SLEEP APNEA?**
*Refika Ersu, Jeffrey Hammoudeh, Karla Haynes, Mark Urata,* ***Sally L. Davidson Ward***

18. 208
**STANDARDIZATION OF A PROTOCOL FOR THE ASSESSMENT OF QUÉBÉCOIS FRENCH-SPEAKING INDIVIDUALS WITH VELOPHARYNGEAL DYSFUNCTION — PART 1: DEVELOPMENT OF A SENTENCE SET**
*Caroline Erdos, Andreanne Mayrand, Miroslava Dimova, Alla Sorokin,* ***Annie Salois,*** *Kati Abel, Ericka Beaudoin, Johanie Bouchard, Sophie Lacour, Lisa Massaro, Elisa-Maude Mc Connell*

19. 209
**THREE-DIMENSIONAL FACIAL ANALYSIS VERSUS EXTRAORAL IMPRESSION MAKING FOR PNAM MEASUREMENTS: A METHODOLOGICAL COMPARISON**
***Cameron Francis,*** *Clifford Sheckter, Simon Gamer, John Groper, Sheila Nazarian Mobin, Elizabeth Rommer, Daniel Yu, Jesse Duncan, Mark Urata, Jeffrey Hammoudeh*

20. 210
**THE EFFECTS OF POSTNATAL HYPERTHYROIDISM ON SUTURE MORPHOLOGY AND FUSION IN RABBITS WITH DELAYED-ONSET CRANIOSYNOSTOSIS**
*Benjamin Levine, Banafsheh Hosseinian, Harman Deol, James Cray, Joseph Losee, Greg Cooper, Michael Siegel,* ***Seth Weinberg,*** *Mark Mooney*

21. 211
**THE NEED FOR A DEFINED GENETIC TESTING PROTOCOL IN THE INDIVIDUAL WITH CLEFT LIP AND/OR PALATE**
***Susan Starling Hughes,*** *Holly Welsh, Alison Kaye, Shao Jiang*

22. 212
**WHAT NOT TO MISS: OCCULT CAUSES OF MORBIDITY AND MORTALITY IN FGFR2-RELATED CRANIOSYNOSTOSIS SYNDROMES**
***Tara Wenger,*** *Elizabeth Bhoj, Jonathan Perkins, Elaine Zackai, Avni Santani, Carrie Heike, Donna McDonald-McGinn, Ralph Wetmore, Michael Cunningham, Anne Hing*

23. 213
**THE SIGNIFICANCE OF NASAL SUBSTITUTIONS IN THE EARLY PHONOLOGY OF TODDLERS WITH REPAIRED CLEFT PALATE**
***Mary Hardin-Jones,*** *Kathy Chapman*

24. 214
**TVELOPHARYNGEAL STATUS OF CHILDREN WITH CLEFT PALATE WHO PRODUCE NASAL FRICATIVES**
***David Zajac,*** *Linda Vallino*

## POSTER SESSION B

WEDNESDAY, APRIL 22
1:30 PM-6:30 PM

1. 215
**3D VIRTUAL MODELS VS. PLASTER MODELS USING THE BILATERAL YARDSTICK**
***Cristiane Luz,*** *Terumi Ozawa, Gunvor Semb, Daniela Gamba Garib, Amanda Ohashi, Daiana Broll, Telma Souza-Brosco, Araci Almeida, Rita de Cássia Lauris*

2. 216
**BILATERAL CLEFT LIP AND PALATE REPAIR: 30 YEARS FOLLOW-UP OF THE MANCHESTER TECHNIQUE**
***Jonathan Wheeler***

3. 217
**BONY SEPTOPLASTY DURING SECONDARY CLEFT RHINOPLASTY: ASSESSMENT OF COMPLICATIONS**
***Alessandra Ferrera,*** *Sunil Tholpady, Tahiri Youssef, Roberto Flores*

4. 218
**COLLAPSING THE MAXILLARY SEGMENTS PRIOR TO GRAFTING IN A PATIENT WITH A MISSING PREMAXILLA**
***Min Kyeong Lee,*** *Michelle Scott, David Precious, Stephen Yen*

# Poster Sessions



5. 219
**DEVELOPMENT OF VELOPHARYNGEAL INCOMPETENCE IN A WOODWIND MUSICIAN WITH A HISTORY OF CLEFT PALATE**
***Karen Tessler,*** *Paige Platenik*

6. 220
**CONGENITAL TONGUE MASS WITH CONCOMITANT CLEFT PALATE AND BIFID TONGUE: A CASE REPORT AND REVIEW OF THE LITERATURE**
***Jared Hiebert,*** *Adam Johnson, Hanh Tran, Zhongxin Yu, Robert Glade*

7. 221
**CRANIAL VAULT EXPANSION IN THE SETTING OF MULTISUTURE CRANIOSYNOSTOSIS AND ANOMALOUS VENOUS DRAINAGE: A METHOD OF AVOIDING INTRACRANIAL VENOUS HYPERTENSION**
***Melinda Costa,*** *Laurie Ackerman, Shawn Greathouse, Sunil Tholpady, Youssef Tahiri, Roberto Flores*

8. 222
**EXTENSIVE GINGIVOPER[illegible]ASTY — AN ALTERNAT[illegible]ONE GRAFTING IN PA[illegible]CULT CLEFT**
Withdrawn
***Susan*** *[illegible]p Chen*

9. 223
**LANGUAGE SKILLS OF PRESCHOOLERS WITH CLEFT PALATE**
***Kathy Chapman,*** *Mary Hardin-Jones, Kristin Moreau, Rebecca Fetrow*

10. 224
**MANAGEMENT OF THE LATERAL LIP ELEMENT IN ROTATION ADVANCEMENT TECHNIQUE FOR CLEFT LIP REPAIR: TIPS AND TRICKS**
*Gaurav Deshpande,* ***Alex Campbell***

11. 225
**NORMATIVE NASALANCE DATA IN MONGOLIAN CHILDREN**
***Shagdar Batsukh,*** *Bat-Erdene Myagmar, Amarsaikhan Bazar, Nagato Natsume, Ariuntuul Garidkhuu*

12. 226
**PARADOXICAL MANDIBULAR GROWTH PATTERN IN CRANIOFACIAL MICROSOMIA PATIENTS**
***Michelle Scott,*** *Won Lee, Luciane Menezes, Stephen Yen*

13. 227
**PREVENTION OF EYE SWELLING FOLLOWING FRONTO-ORBITAL ADVANCEMENT USING PERI-ORBITAL KENALOG INJECTION**
***M. Barbera Honnebier,*** *Gregory Albert, Rongsheng Cai, Eylem Ocal*

14. 228
**SOCIAL FUNCTIONING MODERATES THE RELATION BETWEEN APPEARANCE-RELATED CONCERNS, AND EMOTIONAL AND CONDUCT PROBLEMS AMONG YOUTH WITH CLEFT LIP AND/OR PALATE**
*Ashley Shields, Amy Paysnick,* ***Nicole Quinlan***

15. 229
**STANDARD PATIENTS IN CRANIOFACIAL SPEECH PATHOLOGY EDUCATION?**
***Lynn Grames***

16. 230
**STARTING AND MAINTAINING A CRANIOFACIAL ORTHODONTIC CLINIC — FINANCIAL CONSIDERATIONS**
***Lindsay Schuster,*** *Adriana Da Silveira, Pedro Santiago, Patricia Glick*

17. 231
**SURGICAL EDUCATION THROUGH VIDEO BROADCASTING**
***Eric Nagengast,*** *Margarita Ramos, Gaurav Deshpande, Hiteswar Sarma, Kristin Hatcher, William Magee, Alex Campbell*

18. 232
**THE BUCKY-BALL EVOLUTION TO FRACTAL Y PATTERN RECONSTRUCTION FOR SAGITTAL CRANIOSYNOSTOSIS**
***John Menezes,*** *William Scott*

19. 233
**THE CLEFT TEAM SOCIAL WORKER**
***Sandra Lybrand,*** *Helen Huff, Alison Kaye*

20. 234
**THE MOVING PARTS OF TEAM CARE: A VISUAL MODEL**
***Karla Haynes,*** *Alexis Johns, Laura Garcia*

21. 235
**THE NUMBER OF SURGICAL PROCEDURES FOR PATIENTS WITH CLEFT LIP AND PALATE FROM BIRTH TO 21 YEARS OLD AT A SINGLE CHILDREN'S HOSPITAL**
***Harleen Sethi,*** *Elissa Kim, Joyce McIntyre, Marilyn Jones, Amanda Gosman*

22. 237
**THREE DIMENSIONAL PLANNING & RECONSTRUCTION OF THE MANDIBLE IN CHILDREN WITH HEMIFACIAL MICROSOMIA TYPE IIB & III USING COSTOCHONDRAL GRAFT**
*Omri Emodi, Dror Aizenbud, John van Aalst,* ***Luiz Pimenta,*** *Adi Rachmiel*

# Poster Sessions

23. 238 **WEB-BASED DATA SHARING APPLICATION FOR ESTABLISHING HORIZONTALLY-INTEGRATED CLINICAL NETWORKS BETWEEN HUMANITARIAN CLEFT MISSIONS AND THEIR HOST NATIONS: MISSION TRACKER**
***Tom Walker,*** *Peter Ayliffe, Ambika Chadha, Paul Coles, Caroline Mills*

## POSTER SESSION C

THURSDAY, APRIL 23
7:00 AM-6:00 PM

1. 239 **A SLICE IN THE LIFE — A PRETEEN WITH AN UNUSUAL COMPLICATION**
***Umesh Parajuli,*** *Bonita Lippman-Hoskins*

2. 240 **ADDRESSING PSYCHOSOCIAL NEEDS: UTILIZATION OF A MEDICAL SOCIAL WORKER IN COMPREHENSIVE TEAM-CENTERED CLEFT CARE**
***Sandra Lybrand,*** *Helen Huff, Alison Kaye*

3. 241 **COMPARISON OF NON-OPIOID AND OPIOID ORAL ANALGESIA FOLLOWING PEDIATRIC PALATOPLASTY**
***Brandon Pierson,*** *Robert Glade*

4. 242 **COMPARATIVE STUDY OF TWO DIFFERENT PRESURGICAL ORTHOPEDIC METHODS IN PATIENTS WITH COMPLETE UNILATERAL CLEFT LIP AND PALATE**
***Tania Hechenleitner,*** *Luis Monasterio, Bolivar Valenzuela, Marcelo Nuñez, María Eugenia Tastets, Carolina Cornejo, Erin Balocchi*

5. 243 **DOES PERIOPERATIVE STEROID USE IMPROVE CLINICAL OUTCOMES IN OPEN REPAIR OF CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW AND META-ANALYSIS**
***Christopher Madsen,*** *Anne Tong Jia Wei, Arwa Al-Sheemy, Anand Kumar*

6. 244 **ENVIRONMENTAL FACTORS CONTRIBUTING TO GENETIC MUTATIONS IN THE PATHOGENESIS OF HUMAN OROFACIAL CLEFTS IN GHANA**
***Lord Gowans,*** *Pius Agbenorku, Azeeze Butal, Peter Donkor, Solomon Obiri-Yeboah, Gyikua Plange-Rhule, Jeffrey Murray*

7. 245 **EXTENT OF MAXILLARY DEFICIENCY IN PATIENTS WITH UCLP AND BCLP**
***Joerg Lisson,*** *Catharina Weyrich*

8. 246 **IT IS WORTHY ANTERIOR PALATAL CLOSURE DURING CLEFT LIP REPAIR IN INFANTS**
***Mamdouh Aboulhassan,*** *Seham Anwar, Ashraf Enb, Ahmed Sadat, Dawlat Emara*

9. 247 **KISS SMILEATHONS IN A VOLATILE ME COUNTRY**
***Bona Shitiri***

10. 248 **NASO PHARYNGEAL TUBE AND HYPERCAPNIA IN PIERRE ROBIN SEQUENCE**
***Jacques Saboye***

11. 249 **PHENOTYPIC SUB-GROUPING IN MICROTIA USING A STATISTICAL AND A CLINICAL APPROACH**
***Daniela Luquetti,*** *Babette Saltzman, Carrie Heike, Kathleen Sie, Craig Birgfeld, Kelly Evans, Brian Leroux*

12. 250 **NAVIGATING SOCIAL CHALLENGES: LIFE WITH A CLEFT LIP AND PALATE**
*Robert Mann, Alan McEvoy, Anthony Meir,* ***Matthew Fahrenkopf***

13. 251 **PILOT STUDY: SPEECH THERAPY APPLYING VENTRILOQUISM**
***Toko Hayakawa,*** *Chisako Inoue, Tomoko Mori, Yoshiko Aihara, Kyoko Banno, Hiyori Makino, Satoshi Suzuki, Nagato Natsume*

14. 252 **PRE-OPERATIVE CLEFT LIP MEASUREMENTS AND MAXILLARY GROWTH IN PATIENTS WITH UNILATERAL CLEFT LIP AND PALATE**
***Gregory Antonarakis,*** *Bryan Tompson, David Fisher*

15. 253 **PREVALENCE OF ANEMIA IN PATIENTS WITH THE DIAGNOSIS OF CLEFT LIP AND/OR PALATE**
***Ramon Aleman***

16. 254 **PREVALENCE OF FISTULAS FOLLOWING PRIMARY CLEFT SURGERIES IN MISSIONS AROUND PERU**
***Margot Escobedo,*** *Margarita Marchino*

17. 256 **ROLE OF A COMBINATION OF DEMINERALIZED FREEZED DRIED BONE AND PLATLETS RICH FIBRIN IN ALVEOLAR BONE GRAFTING**
***Sameh Monier,*** *Hazem Shawky*

# Poster Sessions



18. 259 **THE PREVALENCE OF ORAL CLEFTS IN PUERTO RICO (2001-2010)**
***Carmen Buxo,*** *Lydia López-Del Valle, Natalio Debs, Maria Salcedo, Lourdes García-Fragoso, José Cordero, Miguel Valencia Prado, Mairim Soto-Ortíz, María Angulo-Martínez, Jeffrey Murray*

19. 260 **THE PREVALENCE OF OROFACIAL CLEFTS IN ETHIOPIA**
***Mekonen Abebe,*** *Fikre Abate, Azeez Butali, Miliard Deribew, Mulualem Gesses, Paul Gravem, Taye Hailu, Ibrahim Mohammed, Peter Mossey*

20. 261 **VELOFARYNGEAL INSUFFICIENCY MANAGEMENT WITH A PALATOPLASTY WHICH COMBINES INTRAVELAR VELOPASTY AND Z PLASTY**
***Rolando Prada,*** *María Bibiana Mendoza, Pilar Echeverri*

21. 262 **"HOW DO I LIKE IT" - PATIENTS PERSPECTIVE ON REPAIRED CLEFT LIP OR PALATE**
***Tahir Sheikh***

## POSTER SESSION D

FRIDAY, APRIL 24
8:00 AM-12:30 PM

1. 263 **3D MAXILLARY DENTAL ARCH OF TWO PROTOCOLS IN CHILDREN WITH CLEFT LIP AND PALATE**
***Paula Karine Jorge,*** *Karine Vaz Laskos Sakoda, Cleide Felício de Carvalho Carrara, Daniela Gamba Garib, Terumi Okada Ozawa, Wanda Gnoinski, Maria Aparecida de Andrade Moreira Machado, Thais Marchini Oliveira*

2. 264 **A SURVEY OF THE LONG-TERM EFFECTS OF SURGERY FOR VELOPHARYNGEAL INSUFFICIENCY ON SLEEP**
***Grant Jameson,*** *Niyant Patel, Ananth Murthy, James Lehman*

3. 265 **AN EVALUATION OF THE SOCIAL WORK ROLE ON A CRANIOFACIAL TEAM**
***Cassandra Aspinall,*** *Ashley Peter, Daniela Luquetti, Sarah Bergman-Lewis, Carrie Heike*

4. 266 **THE ROLE OF HEALTH CARE SUPPORT IN EDUCATIONAL PERFORMANCE OF LOW-SOCIOECONOMIC CHILDREN WITH BILATERAL SENSORINEURAL HEARING LOSS WITH AND WITHOUT CLEFT PALATE**
***Naeimeh Daneshmandan,*** *Pouya Mahmoudzadeh Tussi, Samaneh Hosseinzadeh*

5. 267 **COST OF CARE FOR CHILDREN WITH 22Q11.2 DELETION SYNDROME: NATIONAL TRENDS**
***Jennifer Rhodes,*** *Richard Youn, Ruth Trivelpiece*

6. 268 **DECELLULARIZED PORCINE MAXILLA AS A NOVEL SCAFFOLD FOR AUTOLOGOUS STEM CELL TREATMENTS OF THE ALVEOLAR CLEFT**
***Justin Morse,*** *Amita Shah, Montserrat Caballero, Jeyhan Wood, John van Aalst*

7. 269 **DEFORMATIONAL PLAGIOCEPHALY AND CRANIOSYNOSTOSIS: TRENDS IN DIAGNOSIS AND TREATMENT AFTER THE "BACK TO SLEEP" CAMPAIGN?**
*Leslie Branch, Kendra Kesty, Elizabeth Krebs, Lindsey Wright, Stephanie Leger,* ***Lisa David***

8. 270 **DESCRIPTIVE EPIDEMIOLOGY OF OROFACIAL CLEFTS IN AFRICA USING DATA FROM 46,502 SMILE TRAIN SURGERIES**
***Azeez Butali,*** *Keyla Pagan-Rivera, Deborah Dawson, Mekonen Eshete, Wasiu Adeyemo, Ronald Munger, Peter Mossey*

9. 271 **DEVELOPMENT OF A NOVEL SONOGRAPHIC GRADING SYSTEM TO EVALUATE PRIMARY ALVEOLAR GRAFTING IN CLEFT LIP/PALATE TREATMENT**
*Daniel Chang,* ***Melissa Kanack,*** *Dolores Pretorius, Stephanie Calvert, Cesar Patino-Ochoa, Amanda Gosman*

10. 272 **DIGITAL IMAGING 101 FOR THE CLEFT LIP/PALATE AND CRANIOFACIAL TEAM**
***Mary Spano,*** *Patricia Chibbaro*

11. 273 **EDUCATIONAL VIDEO ABOUT THE POSTOPERATIVE CARE OF LIP REPAIR AND PALATOPLASTY**
***Ana Paula Ribeiro Razera,*** *Armando dos Santos Trettene, Cleide Carolina da Silva Demoro Mondini, Maria de Lourdes Merighi Tabaquim*

# Poster Sessions

12. 274 **FACTORS ASSOCIATED WITH OCCURRENCE OF COMPLICATIONS IN PATIENTS UNDERGOING SURGICAL REPAIR FOR CRANIOSYNOSTOSIS**
***Veerasathpurush Allareddy***

13. *275 **EXPANSION OF THE SPEECH PATHOLOGY SECTION OF THE CRUX DATABASE TO FACILITATE THE RECORDING OF EARLY SPEECH AND LANGUAGE DATA**
***David Fitzsimons,*** *Anna Cronin*

14. 276 **HOW DOES PLASTIC SURGICAL TRAINING AFFECT AESTHETIC PREFERENCE IN HYPERTELORISM REPAIR? AN EMPIRIC RE-EXAMINATION OF CLASSIC AESTHETIC NORMS**
***Michael Alperovich,*** *Raj Vyas, Mary Spano, David Staffenberg, Joseph McCarthy*

15. 277 **IN UTERO EXPOSURE TO THYROXINE RESULTS IN ALTERED POST-NATAL SKULL SHAPE IN MICE**
*Trish Parsons,* ***Seth Weinberg,*** *Mohammed Elsalanty, R. Howie, Jack Yu, James Cray*

16. 278 **OUTCOMES OF PEDIATRIC CALVARIAL RECONSTRUCTION WITH POROUS POLYETHYLENE ALLOPLASTIC IMPLANTS: AN INTERIM UPDATE**
***Liliana Camison,*** *Wei-Wei Lee, Renata Maricevich, Lorelei Grunwaldt, Jesse Goldstein, Joseph Losee*

17. 279 **INITIAL CLEFT SIZE IN UNILATERAL CLEFT LIP AND PALATE IS CORRELATED WITH DENTAL MALPOSITIONING AND ENAMEL HYPOPLASIA**
***Fatima Jabbari,*** *Daniel Nowinski, Erika Reiser*

18. 280 **OUTCOMES OF ROBIN SEQUENCE AT CINCINNATI CHILDREN'S: A 12-YEAR RETROSPECTIVE ANALYSIS**
***Kathryn Nicole Weaver,*** *Xue Zhang, Patricia Bender, Robert Hopkin, Howard Saal*

19. 281 **NASOENDOSCOPIC AND VIDEOFLUOROSCOPIC PREDICTORS OF OUTCOMES OF VPI SURGERY**
***Christian Albert El Amm,*** *Ramesh Kaipa, Erika Lee, Aaron Morgan, Thomas Howard, Omar Beidas, Cheryl Giddens*

20. 282 **PEDIATRIC DENTAL APPOINTMENT ATTENDANCE IN CHILDREN WITH CRANIOFACIAL ANOMALIES**
*Jacob Johnson, Erin Shope,* ***Lenora Colaruotolo***

21. 283 **SUBTLE GENOMIC MOSAICISM AS AN UNDERLYING CAUSE OF CRANIOSYNOSTOSIS**
***Pedro Sanchez,*** *Chi Phan, Howell Lori, Mark Urata*

22. 284 **TEASING PREVENTION IN PRESCHOOL CHILDREN WITH REPAIRED CLEFT LIP AND PALATE**
***Sharon Vargas***

23. 285 **"I HEARD IT THROUGH THE GRAPEVINE" : COMMUNICATION AS A CLEFT TEAM PROVIDER**
***Terri McCaffrey***

## POSTER SESSION E

FRIDAY, APRIL 24
1:00 PM-5:00 PM

1. 286 **A NASOPHARYNGOSCOPY ANALYSIS OF THE SOFT PALATE AFTER FURLOW Z-PLASTY**
***Wancong Zhang,*** *Shijie Tang, Sitian Xie, Hongmin Luo Tansipek*

2. 287 **COMMUNITY ETHNIC/LINGUISTIC MATCH AND QUALITY OF LIFE IN CHILDREN WITH CRANIOFACIAL ANOMALIES**
***Lillian Hamill,*** *Celia Heppner, Crista Donewar, Lauren Perrin*

3. 288 **CRANIOFACIAL MICROSOMIA: LONGITUDINAL OUTCOMES IN CHILDREN PRE-KINDERGARTEN (CLOCK)**
***Daniela Luquetti,*** *Carrie Heike, Babette Saltzman, Alexis Johns, Amelia Drake, David Sarwer, Brian Leroux, Kathleen Kapp-Simon, Matthew Speltz*

4. 289 **A MODEL FOR ADHERENCE IN HIGH RISK CRANIOFACIAL PATIENTS**
***Laura Garcia,*** *Karla Haynes, Alexis Johns*

5. 290 **ENHANCEMENT OF THE PATIENT AND FAMILY EXPERIENCE THROUGH IMPLEMENTATION OF CRANIOFACIAL PROGRAM SPONSORED EVENTS**
***Bethany Lechtanski,*** *Coreen Abston, Carolyn Walborn, Christian Vercler*

6. 291 **EVALUATING USER EXPERIENCE OF CLEFT PERSONALIZED MEDICAL RECORD (PHR) FOR PATIENTS WITH CLEFT LIP AND PALATE OR THEIR PARENTS**
***Byungjun Kim,*** *Jisan Mari Lee, Meiling Jin, James G. Boram Kim, Jeongeun Kim, Kiwhan Ahn, Joonkyu Park, Sukwha Kim*

# Poster Sessions



7. 311
**OUT-OF-POCKET COSTS IN DENTAL AND ORTHODONTIC MANAGEMENT OF PATIENTS WITH CLEFT LIP AND/OR PALATE**
*Erin Shope, **Yasmine Zangeneh,** Peter Koltz*

8. 293
**EVIDENCE FOR USE OF FRONTOZYGOMATICUS AND CONTRALATERAL EURIONS AS HAND-CALIPER LANDMARKS FOR ASSESSMENT OF DEFORMATIONAL PLAGIOCEPHALY**
***Gary Skolnick,** Sybill Naidoo, Dennis Nguyen, Kamlesh Patel, Albert Woo*

9. 294
**EXPLORING TRENDS IN MEDICAL MALPRACTICE CLAIMS IN PATIENTS WITH CRANIOFACIAL ABNORMALITIES**
***Rounak Rawal,** Lauren Kilpatrick, Jeyhan Wood, Amelia Drake*

10. 295
**FACTORS ASSOCIATED WITH CONCEPTION AND BIRTH OF CHILDREN WITH NON SYNDROMIC CLEFT LIP AND PALATE IN A SOUTH WESTERN NIGERIAN POPULATION**
***Fadekemi Oginni,** Olufemiwa Makinde, Ayodeji Oladele, Anthony Adenekan, Abimbola Phillips*

11. 296
**HIGHT IMPACT PAPERS IN CLEFT LIP AND PALATE LITERATURE: A CITATION ANALYSIS**
***Kashyap Tadisina,** Bahar Bassiri Gharb, Karolina Mlynek, Grzegorz Kwiecien, Susan Orra, Huseyin Elbey, Antonio Rampazzo, James Zins*

12. 297
**LONGITUDINAL COMPARISON OF THE SPEECH AND LANGUAGE PERFORMANCE OF US-BORN AND INTERNATIONALLY ADOPTED TODDLERS WITH CLEFT LIP AND PALATE**
***Nancy Scherer,** Shauna Baker, Ann Kaiser, Lauren Kleinert*

13. 298
**MORPHOLOGIC VARIATION BETWEEN PARTIAL- AND COMPLETE-SAGITTAL SUTURE FUSION IN NONSYNDROMIC ISOLATED SAGITTAL SYNOSTOSIS**
***Leahthan Domeshek,** John Li, Gary Skolnick, Sybill Naidoo, Dennis Nguyen, Kamlesh Patel, Albert Woo*

14. 299
**SPHINCTER PHARYNGOPLASTY DOES NOT PREDICT MAXILLARY HYPOPLASIA AND LE FORT I ADVANCEMENT SURGERY IN CLEFT PATIENTS**
*Li Han Lai, Brian Hui, Frances Yoshikane, **Deborah Martins,** Roop Gill, James Bradley, Libby Wilson, Justine Lee*

15. 300
**PREOPERATIVE VELOPHARYNGEAL MORPHOLOGY IN OLDER PATIENTS WITH CLEFT PALATE**
***Hongfang Ma,** Li Ma, Qian Zheng, Bing Shi*

16. 301
**THE CHOP CLEFT APP™: AN IPAD™-BASED APPLICATION FOR TEACHING AND LEARNING CLEFT LIP TECHNIQUES**
***Brianne Mitchell,** Jordan Swanson, Patrick Gerety, Mary Sun, Ari Wes, Jesse Taylor*

17. 302
**SCREENING FOR AUDITORY HALLUCINATIONS IN CHILDREN WITH HEARING LOSS IN CRANIOFACIAL TEAM**
*Iris Richardson, Victoria Mena, **Alexis Johns***

18. 303
**SECONDARY CORRECTION OF MICRONOSTRIL IN INCOMPLETE CLEFT LIP DEFORMITY**
***Xilin Jing,** David Hindin, Justine Lee, James Bradley*

19. 304
**SECONDARY CRANIOSYNOSTOSIS IN CHILDREN WITH SHUNTED HYDROCEPHALUS: SYSTEMATIC REVIEW OF PRESENTATIONS AND TREATMENT OUTCOMES**
*Bayan Al-Saihati, Hannah Polus, Samer Elbabaa, **Alexander Lin***

20. 305
**SEVERITY OF CLEFT VERSUS AESTHETIC PRIMARY LIP REPAIR OUTCOMES: PILOT STUDY WITH COMPLETE UNILATERAL CLEFT OF LIP AND PALATE CASES**
***Pollyana De Moura,** YongJong Park, Alex Kane, James Seaward, Christopher Derderian, James Smartt*

21. 306
**USE OF BMP-2 IN ALVEOLAR CLEFT REPAIR DOES NOT RESULT IN STATISTICALLY HIGHER INCIDENCE OF NASAL STENOSIS**
***Jeremy Goss,** Margie Hunter, Alexander Lin*

22. 307
**"DIGITAL 3D BILATERAL YARDSTICK" FOR ASSESSING DENTAL ARCH RELATIONSHIP IN PATIENTS WITH COMPLETE BCLP**
***Terumi Okada Ozawa,** Gunvor Semb, William Shaw, Christos Katsaros, Anne Marie Kuijpers-Jagtman, Catharina Hagberg, Elisabeth Ronning, Daniela Gamba Garib, Cristiane Luz, Amanda Ohashi, Daiana Broll*

23. 326
**THE EVOLUTION OF THE SURGICAL TREATMENT OF ROBIN SEQUENCE**
***Shawn Greathouse,** Melinda Costa, Alessandra Ferrera, Youssef Tahiri, Sunil Tholpady, Robert Havlik, Roberto Flores*

## Important Notice

The following pages contain a roster of the full text of the oral presentation abstracts. A roster of all abstracts is available online via the 'ACPA 2015' app, and through the Detailed Program Schedule available at http://meeting.acpa-cpf.org/schedule.html. The Scientific Program Agenda lists abstract titles with the primary author listed first, followed by co-authors, if any. The presenter's name is bolded.

All program planners, faculty, presenters, authors and relevant staff members are required to disclose any financial as well as professional or personal relationships that they could be affected by, or which could have an effect, on the content of the presentations. This information is requested during the planning and abstract submission process. Faculty members are required to declare disclosures, if any, at the beginning of his/her presentation.

Abstract numbers that are marked with an asterisk (*) indicate that an author or presenter disclosed commercial or industrial funding, consulting, or equity holdings, or personal relationship(s) potentially relevant to his or her presentation. Asterisks placed next to a session chair or co-chair name indicate these individuals had disclosures to report.

Otherwise, all remaining authors, presenters, and session chairs and co-chairs indicated they had nothing to disclose.

**Disclosures for all participants can be found online at http://meeting.acpa-cpf.org/abstract-disclosures.html**

***For more information on disclosure policies and disclaimers, please refer to page 4 of this program.***

## *1 JOURNAL MANUSCRIPT PREPARATION AND SUBMISSION

**Jack Yu,** Georgia Regents University, Augusta, GA

Contact Email: jyu@gru.edu

BACKGROUND & PURPOSE: This Eye Opener will be given by members of the "Cleft Palate-Craniofacial Journal" Editorial Board.

METHODS & DESCRIPTION: Section Editors from a variety of disciplines will discuss what constitutes a good scientific manuscript, what kinds of manuscripts are accepted, and what is required by the "Cleft-Palate Craniofacial Journal." Common problems in manuscript preparation and ways of avoiding them will be addressed.

**Disclosure:** Salary- Editor-in-Chief, Cleft Palate-Craniofacial Journal

## *2 COMMISSION ON APPROVAL OF TEAMS (CAT)

**David Kuehn,** University of Illinois at Urbana-Champaign

Contact Email: dkuehn@illinois.edu

BACKGROUND & PURPOSE: An overview of the team approval application and review by the Commission on Approval of Teams (CAT) will be presented.

METHODS & DESCRIPTION: There will be particular emphasis placed on questions requiring explanations relative to a team's total quality improvement process and measures of treatment and protocol outcomes. The major problems encountered in the application process by the teams which have already completed the process will be discussed along with strategies offered to address specific areas of concern such as outcome measures of a team's procedures.

**Disclosure:** Chair – ACPA Commission on Approval of Teams

## 3 CHALLENGING CASES OF VELOPHARYNGEAL DYSFUNCTION: SPEECH ASSESSMENT AND MANAGEMENT

**Kristen DeLuca** (1), Sara Kinter (2), Jamie Perry (3), Angela Dixon (4)**.** (1) Joe DiMaggio Children's Hospital, Hollywood, FL, (2) Seattle Children's Hospital, Seattle, WA, (3) East Carolina University, Greenville, NC, (4) Riley Hospital for Children at Indiana University Health, Indianapolis, IN

Contact Email: kDeluca@mhs.net

BACKGROUND & PURPOSE: Speech outcomes are of paramount importance to members of craniofacial teams, however, the decision-making process to achieve the end goal is just as important as the final result. This session explores the decision-making process involved with the management of several challenging cases of velopharyngeal dysfunction. ASHA Division 5, Speech Science and Orofacial Disorders, offers this eye opener session of case presentations to ACPA attendees.

METHODS & DESCRIPTION: The authors will present a variety of cases with cleft and noncleft causes of VPD, with variable speech profiles, and different team frameworks for diagnosis and treatment decision-making. Multicultural factors which may influence treatment decision-making will also be discussed. Case information will be presented using a "choose your own adventure" style, in which audience participation will direct the discussion for each case. Each stage of the patient diagnostic and treatment process will be reviewed including information on case history, diagnostic protocol and findings, instrumental assessment choices and findings, treatment options, and pre- and post- treatment speech outcomes. Options for who judges the speech outcome and how the outcome is judged will also be discussed. Cases will be presented in both audio and video format.

## 4 THE AMERICLEFT PROJECT: PROGRESS AND GUIDELINES FOR PARTICIPATION IN COLLABORATIVE INTERCENTER OUTCOMES STUDIES

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BACKGROUND & PURPOSE: The purpose of this eye opener is to 1) provide an update on the current status of the Americleft Project; 2) provide details about carrying out actual outcomes comparisons of internal quality assurance audits; 3) encourage participation by other individuals, centers, and disciplines; and 4) discuss the requirements necessary for others centers to collaborate and participate in the project.

METHODS & DESCRIPTION: The presentation will include background information about the inception and growth of the project and progress made by the Orthodontic Group. Information will also be provided about the progress made by the Speech Group in developing standard procedures for data collection and analysis and conducting reliability studies to allow for reliable rating of speech data. In addition to providing an update on progress with data collection across participating centers, goals for the next phase of the Speech project will be presented. The Psychology/Social Work Group will report on several outcomes that are being pilot tested, including: social, behavioral, emotional, cognition/learning, self-perception, and quality of life. A new Surgical Group has also been started and will report on its initial efforts on prospective evaluation of outcomes after lip and palate repairs with development of a common set of measures including establishment of a system for consistent outcome measurement across teams. Using this information to support quality improvement efforts, all Groups are attempting to coordinate and synergize their initiatives. The session will conclude with an open discussion between the audience and presenters.

## 5 HOW QUALITATIVE METHODS CAN BE USED TO ENSURE CONTENT VALIDITY IN A PATIENT REPORTED OUTCOME (PRO) INSTRUMENT FOR PATIENTS WITH CLEFT LIP AND/OR PALATE WHO VARY BY AGE AND CULTURE: DEVELOPMENT OF THE CLEFT-Q

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BACKGROUND & PURPOSE: Cleft lip and/or palate (CLP) is the most common congenital craniofacial anomaly. The CLEFT-Q is a PRO instrument designed to measure outcomes that matter to patients with CLP. Content for the CLEFT-Q were developed from qualitative interviews with 138 patients with CLP from 6 countries (Canada, US, UK, India, Kenya, Philippines). CLEFT-Q scales measure the following concepts: appearance, speech, psychological, social and functional issues. The aim of presentation is to describe the cognitive phase of the study. This phase used qualitative methods (interviews with patients and experts) to ensure maximum content validity based on two key variables hypothesized to cause group-level differences in responses, patient age and country. The overall goal was to identify items of the CLEFT-Q that are relevant to all patients or are age and/or country-specific.

METHODS & DESCRIPTION: We completed multiple separate rounds of data collection with patients 5-29 years of age, and focus groups or individual feedback with healthcare providers. Input was used to revise the instructions, response options, item wording, and identify missing content.

RESULTS: Round 1 involved 17 patients and 13 experts. All found the instructions easy to understand. Feedback identified changes required to the response options and items (e.g., 8 items were kept without revision; 101 were revised; 47 were dropped; 2 new scales added). Round 2 involved 23 participants and 5 experts. This round clarified the best response options to use, and identified 52 items that required revision. Subsequent rounds resulted in fewer identified changes and helped to clarify items that were challenging to translate in other languages (i.e., in Dutch, there are multiple translations for the word 'some'), and items relevant to patients of younger vs. older age (e.g., younger patients felt the question 'it sounds like I speak out of my nose (nasally)' was the same as 'it sounds like I have a cold when I speak), as well as those specific to particular countries (e.g., patients from the Netherlands suggested to add a question to the eating and drinking scale about getting food stuck in the palate).

CONCLUSIONS: Cognitive interviews are vital to ensuring content validity in PRO instruments. The CLEFT-Q is now being field-tested internationally.

## 6 PRACTICE PATTERNS FOR MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION IN PATIENTS WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: To assess practice patterns for the management of velopharyngeal dysfunction (VPD) in 22q11.2 Deletion Syndrome (22Q11.2DS).

METHODS & DESCRIPTION: An anonymous electronic survey was administered to the surgeon membership of the American Cleft Palate–Craniofacial Association and the Society for Ear Nose and Throat Advances in Children

querying practice demographics and management preferences. Responses were analyzed by specialty, geographic location, and presence of a dedicated 22q Center.

RESULTS: 126 respondents performed cleft surgery in patients with 22Q11.2DS. 61.9% were plastic surgeons, 27.8% otolaryngologists, 4.8% oral surgeons. 90.0% were fellowship trained. 73.0% were from the United States (US), 9.5% from Western Europe, and 7.9% from Canada. The majority of respondents worked in an academic setting (63.5%) and in an urban location (83.3%). 24.6% reported their hospital had a dedicated 22q Center. For management of submucosal cleft palate (SMCP) in infancy, the majority reported waiting for speech to emerge before proceeding with treatment in both nonsyndromic and 22q11.2DS patients (83.3% and 77.8%, respectively), with no difference by specialty, nationality, or presence of a 22q Center. Overall, surgeons were more likely to proceed with SMCP repair alone as their first approach in nonsyndromic patients (p=0.017), and more likely to perform posterior pharyngeal flap without SMCP repair in 22Q11.2DS patients (p=0.0312). Otolaryngologists were more likely to base treatment decisions on the severity of VPD in both patient groups (p=0.028; p=0.016), while plastic surgeons were more likely to perform SMCP repair alone as the first approach in nonsyndromic patients with SMCP and VPD (p=0.027). For velopharyngeal imaging, the majority of respondents preferred nasoendoscopy in 22Q11.2DS (92%) and nonsyndromic patients (89%). In addition to nasoendoscopy, US surgeons were more likely to use videofluoroscopy in all patients and lateral neck xrays in 22Q11.2DS patients (p=0.045). Videofluoroscopy was more commonly used by plastic surgeons in 22Q11.2DS patients (p=0.013), and less commonly by otolaryngologists (p=0.045). Prior to proceeding with pharyngoplasty for VPD in 22Q11.2DS patients, surgeons required the following evaluations: speech evaluation (79%), velopharyngeal imaging (51%), cardiac evaluation (50%), carotid artery MRI (29%), and cervical spine x-rays (11%). No differences were noted in pre-operative requirements with the presence of a 22q Center. Upper airway management prior to pharyngoplasty differed by specialty. Otolaryngologists were more likely to perform post-operative sleep studies when symptoms were present (p=0.050), and to base airway management decisions on the type of procedure planned (p=0.010) in patients with 22q11.2DS. Otolaryngologists were also more likely to recommend tonsillectomy and adenoidectomy for hypertrophy or a positive sleep study in 22Q11.2DS and nonsyndromic patients.

CONCLUSIONS: Management of VPD varies worldwide and by specialty.

## 7 THE RELATIONSHIP BETWEEN CEACAM1, CK13, AND TGFB IN PALATAL FUSION

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BACKGROUND & PURPOSE: Cleft palate is one of the most common congenital craniofacial anomalies in humans. It has a varied etiology resulting from a mixture of genetic and environmental factors and results in the failure of the bilateral palatal shelves to fuse. We reported at the previous ACPA meeting that CEACAM1 (carcinoembryonic antigen-related cell adhesion molecule 1) and CK13 (cytokeratin 13) were identified as new regulators for palatogenesis using microarray analysis. TGFβ is already known as an important factor involved in palatal fusion. The objective of this study was to elucidate the relationship between CEACAM1, CK13, and TGFβ in palatal fusion.

METHODS & DESCRIPTION: To investigate the developmental role of CEACAM1, functional blocking antibody (CC1) was added into organ culture of embryonic mouse palate, and also pathogenesis in Ceacam1-deficient (Ceacam1-/-) mice was characterized histologically. We performed immunohistochemical analysis to investigate TGFβ expression, apoptosis, and proliferation in the palate of Ceacam1-/- mice. CEACAM1 expression was also examined in TGFβ-deficient mice for comparison. Furthermore, the distribution of CK13 during palatal fusion was investigated.

RESULTS: Palatal fusion of wild-type mice ex vivo was inhibited by CC1. We observed that MES (medial epithelial seams) in Ceacam1-/- mice remained even at E16, which means that palatal fusion was delayed in Ceacam1-/- mice. CEACAM1 expression was observed in the MEE (medial edge epithelium) of anterior and posterior regions of palatal shelves in wild-type mice before and during fusion, so CEACAM1 may be involved in early palatal fusion. TGFβ3 expression, apoptosis, and proliferation were not changed in the palate of Ceacam1-/- mice, compared with wild-type mice. CEACAM1 expression was retained in the remaining MEE of the palate of TGFβ-deficient mice, compared with wild-type mice. CK13 was also retained in the remaining MEE.

CONCLUSIONS: The CC1 antibody and Ceacam1-/- mice showed an inhibition of palatal fusion. These results demonstrate that CEACAM1 could be related to the initiation of palatal fusion. The status of the TGFβ3 signaling pathway could influence CEACAM1 and CK13 expression. Further analysis would be important to elucidate the relationship of CEACAM1, CK13, and TGFβ3 in palatal fusion for the future treatment of cleft palate.

## 8 COMPARISON OF CUCLP DENTAL ARCH RELATIONSHIPS BETWEEN 5 CENTERS WITH VARIED INFANT MANAGEMENT PROTOCOLS (NAM, GPP, PRIMARY GRAFTING, INFANT ORTHOPEDICS

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BACKGROUND & PURPOSE: The benefits of additional features of infant management protocols such as NAM +/- GPP and IO +/- primary bone grafting remain controversial. This study compared mixed dentition CUCLP dental arch relationships treated at centers using a range of such infant management protocols.

METHODS: Dental casts of 157 consecutively treated patients with CUCLP in the mixed dentition (mean age 8yrs/6mos) were blindly rated by 5 calibrated raters (3 orthodontists, 1 prosthodontist, 1 surgeon) using the Goslon Yardstick, which scores dental arch relationship outcomes using a 5 point scale (1=best, 5=worst). In addition to lip and palate repair, the primary protocol at Center 1 (n=26) included use of NAM or IO +/-GPP; Center 2 (n=16) protocol was limited to lip and palate repair only; Center 3 (n=39) used IO with primary bone grafting; Center 4 (n=36) used NAM without GPP; Center 5 (n=40) used lip and palate repair only. Dental casts were prepared identically for blinding, and were rated twice. All 10 scores for each patient were averaged to calculate mean Goslon ratings. Inter- and intra-rater reliabilities were tested using the weighted Kappa statistic. Medians and SD's were calculated for each group and tested statistically using the Kruskal-Wallis test with multiple comparisons setting Family Alpha at .10 with Bonferroni individual Alpha of .01.

RESULTS: Intra- and inter-rater reliability scores were excellent (mean=.864, range=.824-.902; and mean=.836, range=.785-.866 respectively). Kruskal-Wallis pairwise comparisons identified significant differences in Goslon scores between Center 5 (mean 2.58, SD 0.732), and the other four centers (1 mean=3.84, SD=0.649; 2 mean=3.23, SD=.912; 3 mean=3.68, SD=.552; 4 mean=3.23, SD=.687) . The distribution of scores was different also with more Center 5 patients in the better categories of 1 or 2 and more of Center 1 and 3 patients in the poorer categories of 4 and 5. In addition, half of Center 1's 26 patients were treated with GPP and half without. There was no significant difference in the Goslon ratings of these subsets (+GPP mean=3.91; -GPP mean= 3.75). However, there was a significant difference between Center 1 and Center 4 which used NAM but without GPP.

CONCLUSIONS: The center with the most favorable dental arch relationships used no additional procedures in its infant management protocol than lip and palate repair. The inclusion of additional procedures (NAM, IO, GPP primary bone grafting) did not result in any benefit to dental arch relationships. However, a second center also without use of any additional procedures had similarly poorer outcomes emphasizing the need to examine other protocol features to understand differences in dental arch relationships. Finally, although inclusion of GPP in Center 1's protocol was associated with ratings similar to those seen after primary bone grafting, there was no evidence that it negatively impacted Center 1's mixed dentition dental arch relationships.

## 9 A NEW CONCEPT FOR CRANIOFACIAL REPAIR USING A CHEMOTACTIC SCAFFOLD

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BACKGROUND & PURPOSE: Currently the gold standard for bone reconstruction involves autologous bone grafting, which creates significant donor site morbidity. Regenerative medicine approaches to these clinical problems aim to obviate the need for autologous bone grafting through the use of bioengineered constructs that combine stem cells, growth factors, and biocompatible vehicles. Human mesenchymal stem cells (hMSCs) and vascular endothelial growth factor (VEGF) have both shown promise for use in this context, the former due to their pluripotent capacity and the latter due to its osteogenic and chemotactic activity. In this study we harness the regenerative potential of these cells and this growth factor to develop a "Smart Scaffold" for use in bone tissue engineering.

METHODS & DESCRIPTION: MSCs were transfected with human VEGF-A and red fluorescent protein (RFP) via lentivirus vectors. Expression of RFP in the hMSCs confirmed successful transfection. Levels of VEGF were measured in conditioned media taken from transfected and non-transfected hMSCs through enzyme-linked immunosorbent assay (ELISA). The chemotactic activity of VEGF-transfected cells was evaluated via a trans-well assay: conditioned media was collected from transfected and non-transfected hMSC cultures. For the chemotactic in vivo study, VEGF-transfected hMSCs cells were seeded on apatite-coated PLGA scaffold to prepare the "Smart Scaffold". The scaffold was then implanted in dorsal subcutaneous pocket and cranial defect of immunocompromised animal. HMSCs tagged with a dye (DiR) were injected intravenously in the postoperative period to evaluate the chemotactic and osteogenic capabilities (N=5).

RESULTS: Transfection of RFP occurred at nearly 100%, as evidenced by red fluorescence of transfected hMSCs. Non-transfected hMSCs did not express red fluorescence. Levels of VEGF secreted by transfected hMSCs were significantly higher than levels secreted by non-transfected hMSCs. Migration through semipermeable membranes was significanty greater in chambers filled with medium conditioned by VEGF-transfected cells. In the result of in vivo chemotactic examination, DiR-tagged hMSCs were accumulated in the chemotactic scaffold. Successful bone regeneration was shown in the defect treated with "Smart Scaffold".

CONCLUSIONS: These observations suggest that incorporation of VEGF may play a vital role in the design of clinically relevant bone graft substitutes, or chemotactic scaffolds attracting pluripotent cells to the site of reconstruction.

## 10 EFFECTIVENESS OF A PHONOLOGICAL INTERVENTION FOR PRESCHOOL CHILDREN WITH NONSYNDROMIC CLEFT PALATE

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BACKGROUND & PURPOSE: Children with nonsyndromic cleft palate (CP) are at risk for delays in speech [e.g., Bzoch, 1965; Chapman & Hardin, 1992, Chapman, 1993] and language [see Hardin-Jones & Chapman, 2011, Peterson-Falzone et al, 2001]. Approximately 73% require speech intervention following surgery [Hardin-Jones & Jones, 2005]. Phonological disorders occur in young children with CP [Chapman, 1993]. While early studies employed a motor approach to treat speech sound disorders (SSD) of children with CP [e.g., Chisum et al, 1969], given the nature of children's speech errors, a phonological approach (PA) may be effective. To our knowledge, there are no studies examining the use of PA for the remediation of SSD in a group of preschool children with nonsyndromic CP through a waitlist control trial. As such, the study sought to address the following questions: 1. Compared to children not receiving treatment, does a 10-week period of intervention using PA lead to improved speech in 4 to 5-year-olds with CP and SSD? 2. Do children with CP and SSD who receive 10 weeks of intervention maintain or improve their speech skills once treatment is withdrawn? 3. Does PA lead to improved quality of life?

METHODS & DESCRIPTION: Children with nonsyndromic CP were recruited from craniofacial teams (2011-2014). After completing eligibility and pre-treatment testing, children with CP (N=18) were matched on critical variables. One child from each pair was randomly assigned to a group, with his/her match entering the opposite group. Children in group 1 (G1) received 10 weeks of PA followed by 10 weeks without treatment. Children in group 2 (G2) received 10 weeks of PA after a 10 week wait period. Progress in treatment, measured by the primary outcome of Percent Consonants Correct (PCC), and the secondary measures of Goldman-Fristoe Test of Articulation 2 raw scores (GFTA2), Khan-Lewis Phonological Analysis – Second Edition standard scores (KLPA2), probe word production accuracy (target generalization composite score; TGC), intelligibility (INT), and quality of life (PedsQL), were compared between groups (G1; G2), over time (baseline; 10 weeks; 20 weeks) using repeated measures analysis of variance (RMANOVA).

RESULTS: Significant group by time interactions emerged for PCC, KLPA2 and TGC using RMANOVA, indicating that PA leads to improved speech for children with CP. Significant pre- to post-treatment improvements in PCC, KLPA2, INT and TGC and decreases in GFTA2 were noted. Depending on the speech variable assessed, children exhibited maintenance or improvement from 10- to 20-weeks as noted by t-tests. While no pre- to post-treatment changes in PedsQL total scores emerged, when compared to normative data, participants exhibited lower social functioning prior to intervention with non-significant differences post-treatment.

CONCLUSIONS: Results show PA can be used to remediate the SSD and leads to improved social functioning of children with nonsyndromic CP. These results contribute to body of intervention research for children with CP.

## 11 DYNAMIC FACIAL ASYMMETRY IN PATIENTS WITH CLEFT LIP AND PALATE – WHAT 4D VIDEO STEREOPHOTOGRAMMETRY CAN TELL US ABOUT MOTION OF THE REPAIRED LIP

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BACKGROUND & PURPOSE: Unilateral Cleft Lip is a profoundly asymmetrical condition affecting all hard and soft tissue layers from the nose to the upper lip. Although the asymmetry is minimized through cleft lip repair, nasal reconstruction and subsequent revision procedures as necessary, a degree of asymmetry inevitably persists. Studies investigating asymmetry in patients with Cleft Lip started with analysis of facial measurements and 2D photography, and more recently have moved to analysis of 3D photographs in static facial expressions. The nose / lip / mouth area, however, is rarely static in our day to day social interactions.

METHODS & DESCRIPTION: Non-syndromic patients with cleft lip and palate, and a control group of patients with isolated cleft palate underwent 60 frame per second 4D imaging while generating facial expressions including smiling and pouting, and while speaking. Key landmarks were tracked throughout the expression, corrected for head movement and a motion path of each landmark was generated. Asymmetry of the motion path was investigated using Procrustes analysis of the shape of the motion path.

RESULTS:12 patients were compared in each group, with an age range from 8-18. Comparing the motion path of the Cupid's Bow peaks from rest to maximal orbicularis oris contraction (pouting) demonstrated a mean asymmetry of magnitude of the motion path of 26% in the cleft lip group vs 9% in the control group and a mean asymmetry of the shape of the motion path itself of 0.055 in the cleft lip group vs 0.039 in the control group. These were both statistically significant results at $p<0.05$. Smaller asymmetry levels, which were not statistically significant, were identified for smile and speech.

CONCLUSIONS: Video stereophotogrammetry of the repaired cleft lip demonstrates asymmetry of both the magnitude of motion as well as asymmetry of the path of the motion itself. This may be due to the effect of the scar tissue from the repair, from the abnormal anatomy involved with cleft lip or a combination of the two. The psychosocial impact of this asymmetry of motion on the individual remains unclear and we intend to investigate this further in due course.

## 12 IS CRANIOSYNOSTOSIS REPAIR KEEPING UP WITH THE TIMES? RESULTS FROM THE LARGEST NATIONAL SURVEY ON CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Given the great variability in perioperative management of craniosynostosis, a large-scale national survey of current practice patterns was conducted.

METHODS & DESCRIPTION: Using scaphocephaly as a test diagnosis, 115 craniofacial surgeons at all levels of career experience across the United States were invited to participate in an anonymous survey. Surgeons were asked about practices related to pre-operative evaluation and planning, intraoperative monitoring, operative team composition, and post-operative care.

RESULTS: Fifty three surgeons (46%) completed the survey. The overwhelming majority of craniofacial surgeons work with pediatric neurosurgeons (100%), fellowship-trained pediatric anesthesiologists (95.8%), and use arterial lines (95.8%) and urinary catheters (97.9%). All respondents complete repair before 1 year of age with a majority operating between 4-8 months. Surgeons with greater than 10 years of experience were significantly more likely to perform open repair at extremes of age (<4 months and 8-12 months) ($p=0.03$) and reported shorter operative times ($p=0.01$) compared to their less experienced colleagues. More than two-thirds of surgeons (68.8%) obtain pre-operative imaging for every case; 83% of these prefer CT scans. Over a fourth of respondents (28%) routinely prescribe an extended course (>24 hours) of antibiotics. Overall transfusion rates remain high, with nearly two in three (65.2%) transfusing in 76-100% of operations. The overwhelming majority of respondents (93.6%) routinely send patients to an intensive care unit (ICU) post-operatively.

CONCLUSIONS: We present the largest United States survey of craniosynostosis surgical practice patterns to date. General consensus exists regarding safety and emergency preparedness standards. Craniosynostosis repair remains a high-risk operation that can be performed safely. Additionally we identified several patterns that deviate from published evidence-based guidelines and impact on patient care and healthcare expenditures.

Specifically, these practices relate to the routine use of high-dose radiation imaging, long-term antibiotics, blood transfusions, and intensive postoperative surveillance. For the first time, stratifying by surgeon experience revealed significant differences in clinical practice.

## 13 A SYSTEMATIC REVIEW OF THE EVIDENCE FOR NEUROTOXICITY ASSOCIATED WITH EARLY CHILDHOOD EXPOSURE TO ANESTHESIA

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BACKGROUND & PURPOSE: Children undergo millions of surgical, diagnostic, and therapeutic procedures each year using anesthesia that has become safe and effective. However, numerous animal studies clearly show significant cognitive deficiency, and pathologic changes including dendritic cell damage and neural apoptosis associated with anesthetic administration during periods of rapid brain growth. Human research suggests that administration of routine general anesthesia with surgery in an otherwise healthy child may be associated with later developmental, cognitive, or behavioral deficits.

METHODS & DESCRIPTION: Publications were identified by the PubMed search:(pediatric OR neonat* OR child*) AND anesth* AND (learning OR academic OR development*), from 1990, limited to full text, English language, human and child. The publications from this search were evaluated; commentary, editorial, review and irrelevant articles were excluded. Two reviewers independently assessed publications.

RESULTS: There were 1731 publications yielded by this search. After exclusions there were 14 studies; all were retrospective. With respect to developmental, cognitive, or behavioral outcome: 3 showed no adverse effect, 9 showed an adverse effect, and 2 showed an uncertain effect. Of the 9 studies showing an adverse effect, 3 showed it after only a single exposure, 3 only with multiple exposures, and 3 did not specify.

CONCLUSIONS: It appears that there is an association between the administration of general anesthetic agents during early critical phases of neural development and later neurologic deficit. It has been recommended "until the risk of neurocognitive injury is understood, pediatric surgery specialties, in conjunction with anesthesiologists and pediatricians, should identify surgical procedures that can be delayed until older ages without incurring additional risk." There two multi-center, prospective trials underway addressing this question: the Pediatric Anesthesia & Neurodevelopment Assessment (PANDA) and the General and Spinal (GAS) trial; their conclusions are likely years away. The ongoing multi-center, prospective Timing of Primary Surgery for Cleft Palate (TOPS) trial also may give insight to this issue. Cleft surgeons routinely treat children with cleft palate using protocols calling for surgery in infancy, before critical periods of language acquisition, necessary to affect the best speech outcomes. Craniofacial surgeons perform surgery on patients during infancy and early childhood, and also refer children for perioperative diagnostic imaging procedures that routinely require general anesthesia. Surgeons need to consider whether effective care could be delivered to these children with fewer or delayed studies. Although it is uncertain whether surgical treatment protocols can be appropriately adjusted, cleft and craniofacial surgeons will have to assess the potential and unquantifiable risk of the anesthetic along with the benefits of these procedures.

## 14 INTERDISICPLINARY CLEFT/CRANIOFACIAL TEAM CARE: AN OASIS OR A MIRAGE?

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BACKGROUND & PURPOSE: This presentation will explore whether the concept of interdisciplinary team care for cleft and other craniofacial deformities has been fully realized from its inception in the 1920s to current practice. The goal of this presentation is to assist the current and the upcoming generation of team care providers in forward planning for the optimization of resource utilization and patient/family outcome.

METHODS & DESCRIPTION: The presenters represent the major disciplines of cleft/craniofacial teams (dentistry, education/research, genetics, psychology, speech, surgery). Each participant has a minimum of 3 decades of personal experience creating, managing and participating in cleft/craniofacial team care as well as significant leadership roles in ACPA, CPF and the CPCJ. The successes, failures and challenges of interdisciplinary team care will be presented and discussed.

## 15 IMPLEMENTING A DYNAMIC CLINIC MANAGEMENT SYSTEM AND ITS EFFECT ON CRANIOFACIAL TEAM CLINIC EFFICIENCY AND PATIENT EXPERIENCE

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BACKGROUND & PURPOSE: During Craniofacial Team Clinic, multiple patients are seen by multiple providers, allowing varied and complex needs to be addressed in one visit. Our Craniofacial Team Clinic uses a model whereby patients occupy rooms, which providers move between. This allows contemporaneous communication between providers, who pass one another regularly during clinic, and allows for simultaneous consultations with multiple providers, when appropriate, without disrupting patient flow. During our clinics, 30 patients are each seen by 10 providers in a half-day.

METHODS & DESCRIPTION: In order to run our clinic efficiently, we designed and implemented a computerized dynamic clinic management system. This consists of a database of information about each patient's journey through clinic, with relevant information displayed efficiently for each individual provider. Information is reviewed and updated simultaneously in multiple locations benefiting all providers, clinic staff and patients.

RESULTS: Team providers benefit as they can view rapidly and clearly which patients need to be seen and who is available to be seen. Benefits for our nursing and administrative staff are that they can instantly determine into which rooms arriving patients can be placed, which patients are waiting, and when patients have seen all necessary providers and can go home; and they can update the patient status from whichever location is most convenient. Patients benefit both because they have information in their room about which providers they are due to see during their clinic visit and who remains to be seen, and because waiting time between providers has reduced, resulting in an overall shorter visit. In addition, our clinic management system allows our Craniofacial Team Coordinator to review timing information to optimize clinic scheduling and planning, and to reduce the waiting time for patients between providers.

CONCLUSIONS: The authors will present this clinic management system, designed and written by Craniofacial surgeons, and demonstrate how implementing our dynamic clinic management system has improved not only the efficiency of clinic but has also improved the patient experience. This system runs on regular hospital PC's with no additional equipment required, and we intend to make this system available to other Craniofacial units.

## 16 Z-SCORES AND MIXED EFFECT MODELING: A PRACTICAL METHOD FOR ANALYZING GROWTH PATTERNS IN CHILDREN WITH CRANIOFACIAL DISORDERS

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BACKGROUND & PURPOSE: While standard growth data is often frequently and accurately recorded, retrospective growth data has remained notoriously difficult to analyze and interpret. As a result, patterns of overall growth in children with cleft and cranial differences have not been well delineated in the literature. We have designed a growth model and novel method to accurately analyze retrospective growth data.

METHODS & DESCRIPTION: Growth measurements were abstracted from the electronic medical record, and all data input into STATA. A growth model was fit, and length, weight, and head circumference were adjusted for age and sex according to World Health Organization's (WHO) standards and converted to z-scores. Z-score modeling accounts for expected growth rate changes in childhood. Therefore, a child without any medical or nutrition issues would be expected to have an unchanged z-score throughout childhood. Changes in z-score indicate deviation from normal growth patterns and point to potential external causes. A clinical time point of interest was selected (such as date of surgery, or removal of a device). Three time periods were identified: birth, pre-event of interest and post-event. To accommodate the complex nature of this data, a growth model based on mixed effects regression analysis was fit to standardized anthropometric data, with time as a discrete variable and a

random effect at the patient level. For each measure, contrasts were calculated between each of the three time periods.

RESULTS: This model has been successfully applied to our patients with cleft palate and Pierre Robin Sequence undergoing surgical intervention. For a specific disorder, growth patterns in different populations of patients have been successfully described and compared between time periods (e.g. pre- and post-repair) and across patient populations (e.g. cleft palate patients who are adopted internationally versus their domestic counterparts).

CONCLUSIONS: Procedures and defects in children – particularly involving the face and neck – have the potential to affect nutrition and subsequently growth and development. Being able to quantitatively characterize the nature of these changes using existing data, in relationship to conditions, procedures, or care practices would be of tremendous value in a wide variety of clinical situations, and have the potential to change recommendations about care. Our model enables researchers and clinicians to do just this in a practical manner.

## 17 THE USE OF A NOVEL MOBILE TECHNOLOGY PLATFORM TO FACILITATE INSTANTANEOUS HIPAA-SENSITIVE PERIOPERATIVE MESSAGING IMPROVES PATIENT CARE AND PHYSICIAN-PATIENT COMMUNICATION

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BACKGROUND & PURPOSE: Mobile device technology has revolutionized interpersonal communication, but the application of this technology to the physician-patient relationship remains limited due to concerns over patient confidentiality and the security of digital information. Nevertheless, there is a continued focus on improving communication between doctors and patients in all fields of medicine to improve patient care. In this study, we introduce a novel communications platform that has been designed to share information with surgical patients and their friends and family in real time within a secure HIPAA-compliant format.

METHODS & DESCRIPTION: 351 consecutive patients scheduled to undergo elective surgical procedures were offered registration to a secure, web-based service designed to distribute perioperative updates to a group of recipients designated by each patient via Short Message Service (SMS) and/or email. Messages were created by attending surgeons and delivered instantaneously through the web-based platform. In the postoperative period, patients and their designated message recipients completed a survey designed to assess their experience with the messaging system. Survey results were statistically analyzed to determine overall satisfaction with the service.

RESULTS: 313 patients enrolled in the study. On average, patients selected a total of 3.5 recipients to receive perioperative updates. A total of 1,195 electronic messages were generated for distribution to designated recipients during the study period and delivered to recipients located around the world. There were no documented errors or failures in message delivery. Satisfaction surveys were completed by 190 users for a response rate of 73%. Respondents identified themselves as either patients (n=48, 25.5%), family/friends (n=120, 63.8%), or healthcare providers (n=15, 12%). Satisfaction with the service was high: 94.2% of users “enjoyed this software” and 92.5% would “recommend their loved ones to sign up for this service.” Ninety percent of patients who completed the survey reported “an improved hospital experience” and 94.2% of family/friends “felt more connected to their loved ones during surgery.”

CONCLUSIONS: Digital communications platforms can facilitate the transfer of immediate HIPAA-compliant data to patients and their designees. Such systems can greatly improve the level of communication between physicians, patients, and patients’ support networks. We have observed high levels of satisfaction using such a system from healthcare providers, patients, and their loved ones.

## *18 INCREASING LIKELIHOOD OF PARENTS PROVIDING ACCURATE FEEDING HISTORY FOR INFANTS WITH A CLEFT BY LEVERAGING THE PREVALENCE OF SMARTPHONE APPS

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BACKGROUND & PURPOSE: One of the most difficult and immediate aspects of care of infants with non-syndromic cleft lip and palate (CLP) or cleft palate (CP) only is oral feeding. Feeding difficulty is a source of significant stress and concern for parents and caregivers (P/C). There is evidence of delayed growth in children with clefts versus children without clefts. Successful oral feeding and subsequent optimal growth and nutritional status are therefore of paramount importance to the care of these infants.

METHODS & DESCRIPTION: In addition to actually observing the infant feed, the cleft feeding specialist must obtain an accurate feeding history (FH) to evaluate the infant’s current intake in order to make appropriate recommendations. Historically a pen and paper three day diet history has been used to obtain one of the best records of intake. This involves the P/C to both record feedings in real time, and then to actually bring the record back to the clinician. It is not infrequent that the P/C either does not complete the record in real time, or forgets to bring the record to the clinic visit. The prevalence of use of smartphones in the current generation of parents aged 18 to 34 years old is 64% to 81%. Smartphones are a part of their daily lives. Smartphone apps may be perceived by P/C as much more user friendly than a pen and paper form. Although there are a plethora of apps related to health care and specific disease management, market research shows that there are no currently available Android or iOS apps specifically for P/C to address tracking feedings for infants with clefts. Writers have criticized some health care apps because they were not developed by health care providers. This initiative is a collaborative effort of a cleft feeding specialist and the developer to create an app for Android smartphones to both track feedings of infants with clefts (specifically addressing cleft specific feeding issues), as well as providing feeding related education in a non-intimidating user friendly fashion. Cleft specific feeding issues include time of feeding, volume taken, amount of time to complete feeding, breastmilk or formula and caloric content used, frequency of burping, type of bottle and nipple used, occurrence of emesis and nasal regurgitation. The P/C can then provide detailed accurate data to their clinician/ feeding specialist via this app. During this presentation, the app will be described and visual examples of the app will be provided. The audience will be provided with all the information needed to give the P/C of infants with clefts access to this free Android app. Future directions may include developing an app for iOS, should the Android app be widely used.

**Disclosure:** Michael Marciel is the owner of Ocean Vector Design, and has developed 2 health care apps in the past. 1 app was free, and with the other app, made less than approximately $25.00. The app referred to in this abstract is completely free for anyone to download.

## 19 ”FACE IT WITH FRIENDS”: AN EVENT FOR TEENS WITH A HISTORY OF CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: There is limited information for teens and young adults with a history of cleft lip and palate regarding surgical decisions, psychosocial issues and genetic involvement. Teens and their families affected by a cleft may not have had the opportunity to meet or interact with one another to share their experiences. Therefore, a “Face it with Friends” event was developed to unite and educate adolescents with a history of cleft lip and/or palate (CL/P) and their families. The main goals of the four hour event were to provide the participants with opportunities to: 1) learn more about the genetics of clefts and facial development, 2) learn about future medical and surgical options, 3) discuss the unique psychosocial issues that have affected them and their families, 4) develop a network of peers with similar backgrounds and experiences, and 5) learn from parents and young adults who have overcome the challenges of growing up with CL/P.

METHODS & DESCRIPTION: A list of adolescents and young adults, ages 12-20 years with a history of CL/P, was generated from our craniofacial team’s database. Participants were contacted through mailings, phone calls, e-mail, or in person at clinic visits. Speakers included representatives from plastic surgery, genetics, psychology, and speech pathology. Topics, such as jaw surgery, facial development, genetics, and psychosocial issues were presented and discussed. Community involvement was solicited. Make-up artists from a local department store volunteered to provide information about skin care and make-up tips. A local photographer volunteered to take pictures of participants. In addition, a local bookstore donated copies of the book “Wonder” for each participant. A panel of teens and young adults as well as some of their parents concluded the event by discussing their personal experiences. Local media was invited and showed up to document portions of the event.

RESULTS: There were 18 participants in 2009, 22 participants in 2010 and 40 participants in 2014. Positive feedback was obtained in the surveys that were collected at the end of each event and taken into consideration when planning the next event.

CONCLUSIONS: “Face it with Friends” is a valuable opportunity for patients and families to network with each other and informally interact with the medical team members who often treat them. It is also a chance to provide additional education regarding cleft lip and palate during adolescence.

## 20 PATIENT- AND PARENT-REPORTED OUTCOMES ONE YEAR FOLLOWING AN INTERNATIONAL CLEFT MISSION

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BACKGROUND & PURPOSE: Understanding outcomes following an international cleft mission, particularly parental perceptions of outcomes, is important but often difficult. However the increasing use of mobile telephones even among rural, disadvantaged families may enable this patient group to be better evaluated. This project aimed to assess patient satisfaction, cost, social impact, and surgical outcomes in patients operated on during Changing Children's Lives, Inc.'s 2013 surgical mission to Udon Thani, Thailand.

METHODS & DESCRIPTION: Changing Children's Lives (CCL) performed a cleft surgical mission to Udon Thani, Thailand in January 2013. Telephone numbers collected at the time of initial patient screening were used to survey the patients or their parents 1.5 years postoperatively.

RESULTS: 56 patients with cleft lip and/or palate underwent surgery: 31 (55%) underwent primarily lip repair, 15 (27%) underwent primary palatoplasty, and 10 (18%) underwent lip or palate revision. Mean age was 12.1 ± 12.4 years. Thirty patients (54%) were reachable by telephone. All volunteered to participate in the survey. The mean total out of pocket cost for families (travel, food, and lodging, but no medical fees) was USD103.85±112.44 . Nine (30%) families found these expenses to be burdensome, but the majority (N=26, 87%) believed their money was well spent. Follow up care was received by 22 (73%) patients, and all but one family (N=29, 97%) felt that their child received all of the medical care and support required. Only one family (3%) who's child did not receive postoperative care attributed it to inaccessibility of care. Postoperatively, by parent report, two patients (7%) had surgical site infections and were prescribed antibiotics. Wound dehiscence occurred in one child (3%), and palatal fistulas occurred in two patients treated for cleft palate (13%). All families (N=30) would recommend pursuing similar cleft care to a friend based on their mission-based surgical experience. For the 24 (80%) patients younger than 18 years old, 20 (80%) of their families thought the operation resulted in making their child more comfortable interacting with peers, more comfortable interacting with adults, and more confident. Additionally, 18 (72%) stated that their child has performed better academically since the operation.

CONCLUSIONS: This study was able to utilize the increased adoption of mobile phones in a rural setting to obtain follow-up in a difficult to reach population. We found that nearly all parents and patients of an international cleft mission are very satisfied with the care that they received, despite a relatively high out of pocket cost of care. We hope this paper will foster more interest in verifying the quality and impact of surgical missions.

## 21 IDENTIFYING GENETIC REFERRALS THROUGH DEVELOPMENTAL SCREENING IN SAGITTAL CRANIOSYNOSTOSIS: CASE EXAMPLES

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BACKGROUND & PURPOSE: Studies of the longitudinal development of children with isolated single suture craniosynostosis have found mild delays compared to healthy peers and recommend close developmental monitoring. However, children with sagittal craniosynostosis show a pattern of performing relatively higher than other single suture craniosynostoses and a large proportion of these children are in the average range. This pattern and clinical impressions may contribute to some inconsistency in medical providers ensuring developmental testing is completed. Thus, it is possible that deficits are not recognized leading to a lack of intervention and the delay of genetic consultation. We provide case examples of children with sagittal craniosynostosis identified as having delays through developmental testing and referred to genetics with positive chromosomal microarrays (CMA).

METHODS & DESCRIPTION: We review cases highlighting the usefulness of developmental testing along with genetic referrals and the role of molecular diagnostics.

RESULTS: In the first case, a Latina female with sagittal craniosynostosis and no other significant medical findings was tested preoperatively at age six months with the Bayley Scales of Infant and Toddler Development – Third Edition (Bayley-III) in Spanish. Her scores were in the far below to below average ranges and referrals for early intervention and genetic consultation were made; however, due to family social concerns, they did not follow up with genetics. Her brother was born two years later with sagittal craniosynostosis and his preoperative Bayley-III at age three months showed results in the well below to below average range. A genetics evaluation was completed and a chromosome microarray analysis identified a 584Kb deletion on the long arm of chromosome 16 encompassing eight protein coding genes. Family testing was completed and the same deletion was identified in two paternal half siblings with sagittal craniosynostosis and their father with macrocephaly. All deletion carriers had mild-moderate intellectual disability. This case deletion emphasizes the importance of follow up testing and the need to facilitate team care recommendations. In another case, a Chinese male with sagittal craniosynostosis was referred to genetics after preoperative Bayley-III with a Mandarin interpreter at age three months showed scores in the well below to average ranges. Parents had concerns for lower tone, but were reassured by outside providers that sagittal synostosis is isolated. CMA results identified a large 13.8Mb terminal genomic deletion of chromosome 10 (10q26 11q26.3). Similar deletions have been reported in children with craniosynostosis, hypotonia, congenital heart anomalies, and/or cryptorchidism. Parents were glad that an underlying cause was recognized for advocacy of therapies and future family planning.

CONCLUSIONS: These illustrative cases demonstrate the use of developmental testing for appropriate genetic referrals and the identification of deletions by CMA.

## 22 TWO-STAGED TOTAL EAR RECONSTRUCTION WITH CONCOMITANT ATRESIAPLASTY FOR PATIENTS WITH MICROTIA

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BACKGROUND & PURPOSE: Most patients with microtia have simultaneous hearing loss from aural atresia. Atresiaplasty to reconstruct the middle ear is usually performed following auricular reconstruction, to avoid leaving scars on the periauricular skin needed for ear reconstruction. We have developed a novel two-staged microtia reconstruction that includes a concomitant atresiaplasty during the second stage. For the first time we present this technique and our initial series of five consecutive patients.

METHODS & DESCRIPTION: The first operation includes placement of a detailed cartilage framework with transposition of skin flaps as described by Nagata. The combined second stage follows at least six months later. The entire construct and overlying skin are elevated at the level of the capsule and hinged anteriorly. Beneath this an anteriorly-based fascioperiosteal flap is reflected exposing the underlying bone. With this wide exposure the canal is drilled, and the middle ear reconstructed. The new tympanic membrane is then created with a graft of deep temporal fascia, and a trap door conchal skin flap is used to resurface one side of the canal. The fascioperiosteal flap is then replaced to seal the new ear canal from the retroauricular space. A cartilage strut is laid behind the auricular construct to provide ear projection and this is covered with a mastoid fascial turnover flap. Split-thickness skin graft from the scalp is used to resurface the posterior ear and line the external auditory canal.

RESULTS: Since 2011 five patients have completed this two-staged reconstruction at our institution. The two-stage procedure is currently offered to every atresiaplasty candidate. Average age at the beginning of reconstruction was 8.1±1.6 years. Duration of the modified second stage operation averaged 416±44 minutes, which is comparable to the combined operative time for a traditional second stage and a separate atresiaplasty. One patient with a very large construct had partial exposure of the construct requiring coverage with a TPF flap and skin graft. One patient developed auditory canal stenosis requiring revision, due in part to TMJ proximity. This is comparable to our revision rates for auricular reconstruction performed separately, but higher than our prior rate of atresia revision. All patients had an excellent cosmetic outcome with improved hearing. The combined procedure facilitates exposure of the middle ear and allows better integration of the external meatus with the conchal bowl and tragus, especially when the middle ear and external ear have different positions.

CONCLUSIONS: This study demonstrates a novel two-staged technique for combined microtia and middle ear reconstruction. The operative design appears to allow for complete mobilization of the construct with adequate vascularization except for in the largest construct in our series, and facilitates middle ear reconstruction. A larger sample will be necessary to evaluate auditory thresholds and complication rates.

## 23 OPTIMAL LANDMARKS FOR THE DIAGNOSIS OF METOPIC CRANIOSYNOSTOSIS: A COMPUTATIONAL APPROACH

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BACKGROUND & PURPOSE: The diagnosis of metopic synostosis is primarily made based on cranial shape given the normal closure of the metopic suture in early infancy. The largely subjective nature of that approach introduces a degree of controversy into the management algorithm for this condition. The purpose of this study was to create a simple, reproducible radiographic method to quantify forehead shape and distinguish normal variation from abnormal trigonocephaly.

METHODS & DESCRIPTION: CT scans were acquired from the image repository system at our institution for 93 control patients (mean age 4.2 ± 3.3 months) and 18 patients (mean age 6.2 ± 3.3 months) with a diagnosis of metopic synostosis. A statistical shape model was constructed, and deformation fields were calculated for each of the metopic synostosis patients. Optimal and simplified inter-frontal angles (IFA) were defined based on the three points of maximum average deformation. Statistical analysis was performed to assess the accuracy and reliability of the diagnostic procedure.

RESULTS: The optimal IFA was found to be significantly different between the index (116.5° ± 5.8°, min 106.8°, max 126.6°) and control (136.7° ± 6.2°, min 123.8°, max 169.3°) groups ($p<0.001$). Receiver operating characteristic (ROC) analysis resulted in an area under the curve (AUC) of 0.998 and 0.996 for the optimal and simplified IFA, respectively. There was no significant difference between optimal and simplified IFA in identifying index cases ($p=0.86$).

CONCLUSIONS: A systematic method for quantifying the severity of frontal narrowing based on cranial shape analysis may help reduce the over-diagnosis of metopic synostosis. The proposed method uses a simple planar angle measurement on CT imaging that is reproducible and accurate.

## 24 ANATOMICAL STUDY OF THE EFFECTS OF FIVE SURGICAL MANEUVERS ON NASAL MUCOSA MOVEMENT

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BACKGROUND & PURPOSE: A biomechanical study by Mendonca et al. evaluating the movement of the oral mucosa during cleft palate repair showed that the greatest medial movement occurred with dissection overlying the palatine aponeurosis. As a corollary to the previous work, this study aims to characterize the nasal mucosa during palatoplasty, describing the soft tissue attachments at different zones and quantifying the movement following their release.

METHODS & DESCRIPTION: Ten adult cadaver heads were dissected. The palatal nasal mucosa was exposed and divided in the midline. Five consecutive maneuvers were then performed: (1) elevation of nasal mucosal off lateral walls of maxilla, stopping at inferior turbinate; (2) dissection of nasal mucosa from soft palate oral mucosa; (3) separation of nasal mucosa from palatine aponeurosis, including hamulus attachments, (4) release of a newly identified ligamentous attachment tethering mucosa at the pterygopalatine junction; (5) mobilization of vomer flaps. The movements across the midline at the midportion of the hard palate (MP) and posterior nasal spine (PNS) following each maneuver were measured.

RESULTS: The age range of the 10 heads (4 males: 6 females) was between 79-97 years (mean: 84.4). Completion of step 1 obtained a mean release of 3.8 mm and 1.3 mm at the MP and PNS, respectively. By the completion of step 4, a mean cumulative release of 10.3 mm (MP) and 12.9 mm (PNS) was obtained. The vomer flaps alone resulted in a mean width of 10.5 mm (MP). The cumulative movement of the lateral nasal mucosa (steps 1-4) and from the vomer flap are equivalent at the MP ($p=0.72$). As an isolated maneuver, step 4 yielded the greatest amount of movement at the MP (3.9 mm) and PNS (7.2 mm).

CONCLUSIONS: Oronasal fistulas occur at the MP and the hard-soft palate junction primarily because of repair under tension. When tension is at the hard palate, the vomer flap is a powerful tool and achieves as much movement as complete release of the lateral nasal mucosa achieved in steps 1-4. At the PNS, our proposed maneuvers progressively add to the movement of the lateral nasal mucosa. Notably, the most powerful maneuver is one which has not previously been described: release of the attachments at the posterior aspect of the medial pterygoid.

## 25 EFFICACY OF THE VOMER FLAP DURING CLEFT LIP REPAIR FOR CLOSURE OF ANTERIOR PALATE

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BACKGROUND & PURPOSE: This study presents the institutional experience of the use of vomer flap for early closure of hard palate during unilateral complete cleft lip repair. The purpose of this study was to find out the survival rate of the vomer flap and to investigate the effects on the subsequent palatoplasty.

METHODS & DESCRIPTION: This retrospective analysis includes 101 non-syndromic patients at a single center who received a vomer flap for the early closure of the hard palate during cleft lip repair. Patients were aged 6 months to 28 years (median =1 year) and none of the patients received any kind of pre-surgical orthopaedics. Success rates of the vomer flaps were assessed clinically or through the pre- operative photographs at the time of subsequent palate repair. 92 patients returned for second stage palate repair and out of these, 74 patients with adequate post -operative follow up information were statistically analysed with logistic regression.

RESULTS: Of the 101 patients that were operated with primary lip repair and simultaneous vomer flap, only 54 (52.4 %) vomer flaps healed completely. There was no statistically significant correlation between the success of the flap and age of the patient. Out of 92 patients that returned for subsequent palatoplasty, the 71 (77.2%) was operated with the two flap technique and 19 (20.7%)received von Langenbeck repairs. Seven patients (9.1 %) suffered a surgical complication (2 fistulas, 1 partial flap necrosis, 4 dehiscence). Logistic regression analysis identified the failure of previous vomer repair and von Langenbeck surgical technique as factors associated with postoperative complications.

CONCLUSIONS: We conclude that the vomer flap is a complex procedure and far from successful in all cases. In this study, failed vomer flaps increased the risks of complications in the subsequent palate repair. Furthermore, efforts to use von Langenbeck technique rather than two flap technique also resulted in increased surgical complications. Therefore, the use of vomer flaps to minimize scarring and the extent of second stage palatal surgery can be questioned.

## 26 THE ELECTRONIC TABLET AS A TEACHING TOOL FOR MARKING CLEFT LIP

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BACKGROUND & PURPOSE: For a student, the learning curve in understanding cleft lip marking is often long. One more factor that makes it even more challenging to understand is an array of techniques that are followed at the same institution. Understanding the exact technique and applying it to a particular case is most of the time very tough. Innovative teaching methods and tools are required to facilitate this process. The most useful tool in this situation would be the one that is easily available, should be cost effective and most importantly should be handy so that it can be used at any time. We propose the use of electronic tablets for teaching cleft lip markings.

METHODS & DESCRIPTION: A commercially available tablet is used by the authors, with built in camera for high quality photos an electronic pen for writing on the screen. The following procedure is used: A good quality picture of the patient is captured with the tablet, either during screening or in the preoperative ward. The picture can be zoomed to the appropriate size and in the editing mode, the fellow is asked to do digital markings on the image before the surgery. Attending surgeons guide the fellows, revising and clarifying when needed. The markings can easily be erased and both the size of the marker and the eraser can be controlled to achieve maximum precision. Different techniques and variations can thus also be discussed for each patient. Also, the undo function can be used to reverse any faulty marks or lines. The fellow can thus by trial and error understand the markings of the particular case that he/ she will be assisting/ performing the next day. Furthermore, the edited image can at any time be saved for the fellow's record. Once the fellow has successfully marked all the points, he is gradually asked to do markings on the patients. Most teaching will thus be done before anaesthesia induction and a lot of the pitfalls for that particular case can be discussed without wasting anaesthesia time.

RESULTS: There has been a very positive response on this type of teaching tool from all our fellows. This, according to them, is a good method to gain ample

confidence before they start practicing on the patients. Furthermore, this method can be used for examinations and is a helpful tool when evaluating the progress of fellows and residents.

CONCLUSIONS: We conclude that the rapidly developing technology in the field of electronic tablets can very successfully be used to teach markings of cleft lip. The advantage of this tool for teaching is that it is affordable, easily available and reproducible.

## 27 PRIMARY ABBE FLAP FOR MIDLINE AND SEVERE BILATERAL CLEFT LIP DEFORMITY: NEW TRENDS ON AN OLD CONCEPT

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BACKGROUND & PURPOSE: The Abbe flap is commonly employed for secondary correction of a tight upper lip following initial bilateral cleft lip repair. Supple tissue from the lower lip is transferred to the upper lip, enabling the excision of scar as well as lengthening of the columella. Although primary Abbe flap use for cases of severe of prolabial tissue deficiency was first described over 50 years ago, the technique has not been emphasized in modern reports. We present our experience using primary Abbe flaps not only for cases of bilateral cleft lip with severe prolabial agenesis, but also for midline clefts with a completely absent prolabium.

METHODS & DESCRIPTION: The records of 8 patients who underwent primary Abbe flaps were reviewed for indications, operative details, and major/minor complications. Flaps were designed in a "W" fashion and with variable thickness distally to allow columellar reconstruction following rotation and inset.

RESULTS: From 2010-2014, 6 patients with midline cleft lips and 2 with severe complete bilateral cleft lips were treated with a primary Abbe flap. Mean age was 9.6 months. All patients with midline clefts had an associated diagnosis of holoprosencephaly, while 1 of 2 bilateral cleft lip patients had an associated syndrome. Flap division was performed at a mean of 3.6 weeks. Operative time averaged 78 min. Patients were followed for a mean of 12 months. One patient with holoprosencephaly expired for reasons independent of surgery. No major surgery-related complications were otherwise noted. No feeding or airway complications including reintubation were experienced and maxillomandibular fixation was not required. No flaps were lost to vascular compromise. Two of 8 patients have thus far been scheduled for lip revisions.

CONCLUSIONS: The Abbe flap may be safely and advantageously employed for the primary repair of midline and severe bilateral cleft lips. The recruitment of new tissue for lip and nasal reconstruction may prevent the stigmata often associated with conventional repair of these defects as well as reduce the need for multiple revisional surgeries. This is significant given recent medical advances and longer life expectancies for children with such deformities.

## 28 COMPUTER SIMULATED NEONATAL DISTRACTION OSTEOGENESIS

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BACKGROUND & PURPOSE: The importance of imaging for craniofacial reconstruction has facilitated the development of computer-aided design (CAD) and computer-aided modeling (CAM) to produce precise 3D imaging. Integrating basic imaging techniques, such as CT scans with contemporary software allows the surgeon to analyze a detailed patient model preoperatively. In addition, the surgeon can also manipulate the model using computer-aided surgical simulation (CASS) software. The ability to perform 3D measurements and virtually reconstruct deformed or missing anatomy is exceptionally valuable. The benefits of CAD/CAM and CASS in preoperative planning include the construction of custom surgical instruments. The surgeon can design, based on patient specific measurements, necessary stereolithographic models, guide stents and occlusal splints. The ability to analyze and manipulate a 3D patient model and individualize surgical appliances transforms the surgical process. The application and success of CAD/CAM and CASS in craniofacial surgery has been well documented for orthognathic surgery but no study has addressed micrognathia in Robin sequence. In this study, seven cases of upper airway obstruction in the neonatal patient with Robin sequence were corrected with mandibular distraction osteogenesis utilizing CAD/CAM and CASS.

METHODS & DESCRIPTION: Seven neonatal patients with Robin sequence were assessed and determined to be appropriate candidates for mandibular distraction osteogenesis. Each patient underwent a CT-scan of the head and neck. The images were subsequently evaluated for treatment planning with a computer engineer at Medical Modeling using VSP® software. Simulated osteotomies in an inverted-L fashion were utilized to plan the optimal vector for distraction while allowing protection of the developing tooth buds and inferior alveolar nerve. Surgical guides were created for use with Zurich microdistractor (KLS, Jacksonville, Fla) accounting for the planned osteotomies and screw positions. The CASS plan was then compared to the cephalometric outcome at distractor removal. All devices were pre-bent on stereolithgraphic models which demonstrated the planned screw hole position.

RESULTS: All patients had successful osteotomies and device placement as planned. All patients were either successfully decannulated or extubated and discharged home. Cephalometric tracing overlays of the surgical plan with the final outcome were nearly identical.

CONCLUSIONS: Computer assisted surgical simulation improves the accuracy of preoperative planning as well as postoperative outcomes. Application of this technology provides advantages in predicting the osteotomy type and location, vector of distraction, placement of the distraction device, and length of distraction. This technology minimizes the risk of injuring adjacent structures and has been shown to be an accurate predictor of the final mandibular position. These benefits ensure a more predictable and safer surgical procedure and improve the probability of a successful outcome.

## 29 PANCRANIOSYNOSTOSIS FOLLOWING ENDOSCOPIC-ASSOCIATED STRIP CRANIECTOMY FOR SAGITTAL CRANIOSYNOSTOSIS IN THE SETTING OF POOR COMPLIANCE WITH FOLLOW-UP: A CASE REPORT

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BACKGROUND & PURPOSE: Orthotic helmet therapy is an accepted treatment of positional plagiocephaly, as well as of postoperative cranial molding after endoscopic strip craniectomy. Complications of helmet therapy have been described, including the development of pressure sores, local ethanol erythema (related to build up of cleaning fluids at the helmet–skin interface), skin infection, subcutaneous abscess, unsatisfying fit affecting adherence to therapy, and failed correction of head deformity. Our report documents postoperative development of pansynostosis in a patient who initially presented with an uncomplicated single-suture sagittal synostosis treated with endoscopic-assisted strip craniectomy and postoperative molding helmet therapy. We discuss the potential contributions of poor adherence to helmeting and the natural progression of synostotic disease in the development of postoperative pansynostosis.

METHODS & DESCRIPTION: The authors present a case of inadvertently prolonged orthotic helmet therapy after endoscopic strip craniectomy for isolated sagittal synostosis, with an unexpected complication.

RESULTS: The patient developed pansynostosis, requiring a subsequent open total cranial vault reconstruction for correction for this secondary deformity.

CONCLUSIONS: There is limited craniofacial literature on the complications of helmet therapy, and controversy regarding the effects of inadequate orthotic helmet therapy. Although it remains unclear whether postoperative development of pansynostosis is the result of prolonged helmeting or the consequence of progressive synostotic disease, this report highlights the importance of parent education and judicious scheduled follow-up for the avoidance of potential helmet therapy complications.

## 30 DOES A REPORTED CONFLICT OF INTEREST AFFECT STUDY OUTCOMES IN HELMET THERAPY FOR POSITIONAL PLAGIOCEPHALY?

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BACKGROUND & PURPOSE: A conflict of interest (COI) is any circumstance in which a primary interest, such as patient health, is compromised by a secondary interest, such as financial gain. The "back to sleep" campaign initiated in 1994 has significantly decreased the incidence of SIDS and simultaneously increased the incidence of deformational plagiocephaly. In parallel to this development, there has been a dramatic increase in the marketing for molding helmets to treat positional plagiocephaly. Many families with children who have deformational plagiocephaly are aware of helmet therapy as a treatment option long before consulting with physicians, adding to the pressure to treat with helmets. Given the increase in demand for helmets, and the growing market for helmets, we recognize a potential COI in favor of treating children with positional plagiocephaly using helmets. In this abstract, we examine whether a stated COI influences the outcomes of helmet studies. We hypothesized that helmet studies performed by physicians

with a stated COI would lead to outcomes in favor of helmet treatment.

METHODS & DESCRIPTION: We reviewed all studies in Pubmed written in English that examined the use of helmets to treat deformational plagiocephaly in infants (n = 45 studies). Studies were categorized as retrospective or prospective; duration of treatment was identified, as well as length of follow up, which was divided into greater than, or less than a year, or unspecified; whether treatment was beneficial or not; the specialties of the treating physicians, and the presence of a stated COI.

RESULTS: A vast majority of studies (93%) supported the beneficial outcome of helmet treatment. Among these studies, 64% were prospective studies; 36% were retrospective. The authors of seventeen studies declared no COI and demonstrated a benefit in helmet treatment; eight studies declared a COI and demonstrated benefits with helmet treatment. Twenty studies did not specifiy a COI (44%); seventeen of these studies demonstrated a benefit with helmet treatment while three demonstrated no benefit. In general, Plastic Surgeons were more supportive of helmet treatment than Neurosurgeons.

CONCLUSIONS: Based on our review, most studies examining helmet treatment for positional plagiocephaly demonstrated a benefit with the treatment. Based on our findings, a declared COI did not appear, in and of itself, to increase the likelihood of a favorable outcome with helment treatment. What is more concering in this data set is the number of studies where no COI is declared.

## 31 STICKLER SYNDROME: IMPORTANCE OF MULTIDISCIPLINARY ASSESSMENT OF ENTIRE FAMILY!

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BACKGROUND & PURPOSE: Until recently, Stickler syndrome was a clinical diagnosis. Now combining clinical and molecular analysis, we can provide more accurate assessment of patients as well as their siblings, therefore identifying potential risk for ocular issues. We present a case of a patient born with Pierre Robin sequence, subsequently diagnosed with Stickler syndrome. His older sister was not seen as a patient initially, but was later diagnosed with Stickler Syndrome after presenting with a retinal hole sustained after being bumped in the head, while playing with her younger brother. Stickler syndrome occurs in 1/10,000 newborns, often with clinical findings that include retrognathia,glossoptosis and cleft palate. Pediatric Opthalmology is always consulted given the concern for potential ocular issues and should also include evaluation of siblings as well, given the risk for opthalmologic complications if the family is unaware.

METHODS & DESCRIPTION: It is important to establish a diagnosis of Stickler syndrome as early as possible for appropriate counseling and treatment. In mild cases, the clinical diagnosis can be challenging. Molecular analysis should be offered to those patients with a high suspicion and/or family history. Patients with Stickler syndrome and their siblings benefit from a multidiscplinary approach, including pediatric opthalmology, given the high risk of visual issues. Stickler syndrome is the most common cause of rhegmatogenous retinal detachment. Children often do not report any visual changes (flashes,floater,visual field loss) and therefore must be monitored frequently. The risk of a retinal detachment in Stickler Syndrome has been reported to be as high as 50-70% in genetically confirmed type I subgroup. These children are often highly myopic, from a very younger age, with some patients being hyperopic. Children with Stickler syndrome are at increased risk of cataracts as well as anterior chamber abnormalities, thereby predisposing them to glaucoma. Lack of awareness of these risks, could result in unfortunate, long term consequences. Fortunately for this family, both children were accurately diagnosed. Our original patient with Stickler syndrome was highly myopic with astigmatism, as was his older sister when ultimately tested. Because of the family's knowledge of the diagnosis, they responded quickly and appropriately after the mild head trauma. She underwent emergent laser treatment and currently has no retinal detachment. Both children are followed closely by the full team, including pediatric opthalmology.

CONCLUSIONS: Stickler syndrome remains underdiagnosed in many craniofacial centers. Increased awareness of the potential risk involved with this diagnosis could improve visual outcomes and prevent potential ocular damage. Our experience supports the need for a multidisciplinary approach in caring for these patients, as well as their siblings.

## 32 TREATING SPANISH SPEAKERS WITH CLEFT PALATE AND CRANIOFACIAL CONDITIONS: CLINICAL CONSIDERATIONS, ADAPTATIONS, AND RESOURCES.

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BACKGROUND & PURPOSE: This presentation will focus on ways to apply the key therapy guidelines of cleft lip and palate related speech disorders when treating Spanish speakers though discussion of material adaptations and resources. Participants will gain an understanding of useful resources and adapted materials for development of goal, treatment plan, and delivery of services to Spanish speakers with craniofacial conditions.

METHODS & DESCRIPTION: This presentation will focus on treatment planning and service delivery of Spanish speakers with cleft palate and craniofacial conditions. Video clips will be used to highlight useful resources and adapted materials when treating Spanish speakers with cleft palate and craniofacial conditions. Background information on the cultural and linguistic differences of Spanish speakers will be reviewed. Also, the importance of collaboration and sharing of resources between the treating clinician and team SLP will be stressed.

RESULTS: Adapted therapy materials and other resources have been found to be useful in treating and educating Spanish speaking children and families with cleft palate and craniofacial conditions.

CONCLUSIONS: Through sharing of resources and discussion of cases, participants will gain an understanding for applying and adapting therapy materials when treating Spanish speaker with cleft palate and craniofacial conditions.

## *33 SPECIALTY COURSE AND CLINIC IN CLEFT AND CRANIOFACIAL DISORDERS: A UNIQUE TRAINING EXPERIENCE FOR GRADUATE SPEECH – LANGUAGE PATHOLOGY STUDENTS

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BACKGROUND & PURPOSE: Master's level students in speech-language pathology are expected to obtain clinical hours in a wide variety of clinical sites, across the lifespan, and across a large number of disorder areas. Clinical practica focused on specific disorder areas, like cleft and craniofacial disorders, are limited, in addition to being highly competitive. Because of the evidence that approximately half of speech-language pathologists do not feel competent in treating children with errors related to repaired cleft palate (Bedwinek et al., 2010), providing opportunities for graduate students to receive clinical training in this area is needed.

METHODS & DESCRIPTION: The purpose of this presentation is to present a unique model of clinical training that provided master's level speech – language pathology students a concurrent graduate level course and direct clinic experience, working with children demonstrating speech disorders related to repaired cleft palate, craniofacial disorders, or both. The benefit of this model is multifaceted. Families often do not enroll children in speech therapy during the summer months due to service limitations in rural areas or insurance and financial barriers. This lapse in service often halts progress and can even result in a regression of skills. This model provides a valuable service to the community in that it provides an additional provision of service to help bridge the gap between school years. In addition to providing therapy services to children, this model facilitates connection between families to foster community and generate supportive relationships. The presentation will provide an overview of the structure and content of the graduate level course and clinic. This graduate level course and clinical training experience was developed as a collaborative effort between a university academic program, a local teaching hospital, and a non-profit organization in the community. An internal community service grant through the university was awarded to two of the authors to start the clinic, the other two authors served as consultants and clinical experts for student training purposes, and the non-profit organization provided scholarships for families that required financial assistance.

RESULTS: The course / clinic was held during the a 9-week summer semester. Course content was delivered weekly through seminar – style instructional sessions, and weekly clinic sessions with infants, toddlers and children age 4-6 years of age. Caregivers were encouraged to participate in treatment. A team-based, collaborative model was presented to the students, in order to emulate clinical service delivery on a cleft palate and craniofacial team.

CONCLUSIONS: Student feedback was exceedingly positive, and parents reported high levels of satisfaction of having a clinical opportunity for their children over the summer, in addition to the specialized level of service. Replication of this course/clinic could easily occur in other speech - language pathology programs.

**Disclosure:** Salary - All presenters receive salary from their respective institutions related to teaching or clinical service delivery in the area of cleft and craniofacial disorders. Royalty - Mandulak receives a quarterly royalty for an online education program about assessment and treatment of cleft palate speech disorders. Professional - Mandulak serves on the Board of Directors of a non-profit organization that provides financial access to care and family support to those affected by cleft and craniofacial disorders.

## 34 COMPREHENSIVE REVIEW AND SUMMARY OF LAWS AND REGULATIONS RELEVANT TO CHILDREN WITH OROFACIAL CLEFTS

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BACKGROUND & PURPOSE: Many families face challenges obtaining essential treatment and services for children with orofacial clefts (OFC). Potential barriers include: lack of accurate information about eligibility and availability of healthcare insurance coverage, misperceptions of medical need and cost, and legal mandates and regulations regarding services covered. In order to better understand these barriers, a comprehensive review of [illegible] and federal laws and regulation relevant to children with OFC was co[illegible]amine: the variability of private insurance benefits, Medicaid [illegible]dically necessary" procedures, and Medicaid eligibility fo[illegible]es. The purpose of this presentation is to describe th[illegible]overage for children with OFC among the 50 states an[illegible]nd to obtain feedback from the audience about th[illegible]egal mandates.

METHODS & DESCRIPTION: Prese[illegible]rticipants from professional organizations de[illegible] and a representative from the Centers for Disease C[illegible]n's Birth Defects Branch. The session will begin with[illegible]ation and rationale for the project. Then, an extensive[illegible]thods used to identify, classify, and compare the la[illegible]pertaining to coverage of children with OFC will be disc[illegible]law legal database and online state legislative websit[illegible]ch all 50 states' laws, Washington, DC, and federal law[illegible]ng to OFC (e.g., cleft lip/palate, birth defect, co[illegible]ormality, special healthcare needs, and early inter[illegible]m July 1, 2012, to June 30, 2014. Regulations were searched for sta[illegible]dicaid "medically necessary" definitions if they were not found in the law. Data collected for each law and regulation included: law name, applicability, eligibility, services, and relevant keywords. According to this catalogued information, the legal text shows wide variation in approaches used to facilitate healthcare coverage. Following the presentations, the audience will be invited to provide their experiences and knowledge regarding laws and regulations within their own states. Audience input will help facilitate a better understanding of how the laws and regulations are being interpreted in practice and how this affects a child's ability to receive treatment. For example, the presenters and audience will discuss how each state's Medicaid definition of "medically necessary" influences healthcare coverage.

Withdrawn

## 35 SPEECH THERAPY TECHNIQUES FOR COMPENSATORY ARTICULATION PATTERNS

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BACKGROUND & PURPOSE: Craniofacial team care does not end when the team visit is over. When speech therapy is recommended, successful speech outcomes are dependent on the quality of that therapy. Unfortunately, outdated, disproven methods continue to be used in many community settings. Since successful speech outcomes impact a patient's communication, education, socialization, and even surgical timing in some cases, speech-language pathologists should maintain a repertoire of evidence-based therapy techniques to address the compensatory articulation patterns unique to the craniofacial population. As craniofacial team members, we need this knowledge both to treat our own team patients and to provide information to speech-language pathologists in our patients' home communities.

METHODS & DESCRIPTION: This eye opener is geared toward the craniofacial team member who has not had extensive experience with speech therapy techniques specific to the craniofacial population or who would like to refresh his or her knowledge in this area. Compensatory articulation patterns will be described and demonstrated to assist in the identification of these patterns. Current methods of treating compensatory misarticulation patterns will be described through lecture, demonstration and audience participation. Participants will also brainstorm creative ways to actively engage patients in therapy sessions.

## 36 FEEDING PROBLEMS AND SOLUTIONS IN BABIES WITH CLEFT PALATE

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BACKGROUND & PURPOSE: Infants with cleft lip and palate must feed with a special bottle and nipple system. Finding the right feeding method for an individual baby can mean the difference between G-tube placement and oral feeding. Adequate weight gain early in life is especially important for these children as failure to thrive could result in delayed surgical repair. Many care providers, even some who are part of a cleft care team, do not have knowledge or experience in feeding issues in this population. This Eye Opener Session is intended to provide SLPs and other professionals working with infants and families with knowledge about the different specialty bottles available and how to find the right match between baby, bottle and parent.

METHODS & DESCRIPTION: This presentation will include case presentations and hands-on experience with specialty bottles. Content will address evaluation techniques to determine readiness for oral feeding trials covering the emergence of oral reflexes in the premature infant, respiratory issues and motor patterns that interfere with efficient feeding, assessing latch and suck, and swallow safety. A review of current specialty bottles available and how they work will include discussion of which bottles provide the most efficient intake for different anatomies. Tips for adapting bottles will be discussed as well as positioning techniques to facilitate latch and transfer of milk while ensuring swallow safety. Addressing questions of breast feeding and supplemental nursing systems will also be covered. Ideas for promoting adequate oral intake in the immediate post-op period and addressing questions about introduction of solids in children with cleft palate will be shared. Case studies will address solutions to common feeding problems as well as special issues with PRS, tracheostomy, and reflux. The session will end with a discussion of how to develop measurable goals for therapy.

## 37 ANATOMY OF THE UNILATERAL CLEFT LIP NASAL DEFORMITY

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BACKGROUND & PURPOSE: Cleft lip nasal deformity is not a malformation, but rather a distortion caused by the labial cleft. The stigmata of the cleft lip nasal deformity includes: deviation of the tip and caudal septum to the non-cleft side, dislocated lower lateral cartilage, obtuse angle between middle and lateral crura, posterior-laterally displaced alar base, and short columella on the cleft side. The aim is to describe six components of the cleft nasal deformity, comparing normal anatomy to cleft anatomy.

METHODS & DESCRIPTION: This session will be in a lecture format, presenting anatomic studies related to normal and cleft nasal anatomy. The talk will focus on the following components of the nose: • Nasal bones • Septum • Piriform • Alar base/Nasal sill • Upper lateral cartilages • Lower lateral cartilages Based on anatomic principles, surgical approaches to correct each of the individual components of the cleft nasal deformity will be shown. Outcome studies of various maneuvers used in primary correction of the cleft nasal deformity will be reviewed.

CONCLUSIONS: Primary correction of the cartilaginous and soft tissue components of the cleft nasal deformity can be performed safely with improvement in long-term aesthetic outcomes.

## 38 MAKING THE MOST OF PRENATAL COUNSELING OPPORTUNITIES

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BACKGROUND & PURPOSE: Many providers on Craniofacial Teams will be asked to speak to a family expecting a baby with a cleft at some point, either formally or informally, possibly without ever having been trained to provide this type of sensitive counseling. It is optimal for this counseling to be provided in conjunction with a perinatology team to confirm the cleft diagnosis and to provide education to decrease fear and anxiety, however this

type of team approach is not always possible. This talk will prepare Team members to provide basic counseling to families seeking information about the diagnosis of cleft lip and/or palate in a variety of settings.

METHODS & DESCRIPTION: The goal of this session is to promote competence and confidence in basic prenatal cleft counseling. Several new scenarios will be presented and recommendations will be made regarding the purpose, content and structure of a prenatal counseling session. Suggestions will be made regarding handouts and visual aids to facilitate teaching during the counseling session. Information will also be given regarding common psychosocial concerns of families expecting an infant with a cleft.

## 39 INNOVATION IN CLEFT PALATE RECONSTRUCTIVE SURGERY: HOW TO USE BUCCAL MYOMUCOSAL FLAPS

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BACKGROUND: The challenge for the cleft palate reconstructive surgeon is to successfully repair every type and anatomical variation of cleft palate. Presently, the vast majority of surgeons use single pattern repairs which are highly inflexible and may only work well on certain anatomic presentations. Many surgeons revert to older, more growth restricting techniques on complete or wide clefts. This leads to variability of success based on the width or type of the cleft.

PURPOSE: To improve the outcome of cleft palate reconstruction with the use of buccal flaps in both primary and secondary cleft palate repair.

METHODS & DESCRIPTION: The buccal myomucosal flap has proven that it has great applicability in cleft palate repair. This will be demonstrated through video, slide, didactic presentation and audience interaction. The senior presenter will relate his experiences with over 1,000 buccal flaps surgeries used in various cleft palate applications.

## 40 PREPARING YOUR PATIENT FOR JAW SURGERY – A MULTIDISCIPLINARY APPROACH TO A PATIENT CENTERED JAW SURGERY WORKSHOP

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BACKGROUND & PURPOSE: Teens and young adults undergoing orthognathic surgical procedures often experience anxiety and psychosocial concerns that impact their pre and post surgery adjustment. Offering education and support to patients undergoing Le Fort procedures often results in an increased ability to cope with the surgical process and improved outcomes. The goal of this session is to present a multidisciplinary team model for preparing patients who are undergoing a Le Fort procedure. Content from the different disciplines will be shared as well as video highlights of the workshop. Participants will learn about what specialists to include, what information to share and what resources to offer patients. The session will allow participants to design a jaw surgery preparation workshop in their own medical setting.

METHODS & DESCRIPTION: There will be a verbal review of the process of coordinating the jaw surgery workshop. Video highlights from the actual jaw surgery workshop presentation which will include 3 minute vignettes of each of the presenters. A review of the results from the satisfaction surveys complete by patients and their parents.

## 41 IMPACT OF A CLEFT AND CRANIOFACIAL CENTER ON A HEALTH CARE SYSTEM

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BACKGROUND & PURPOSE: A cleft and craniofacial center (CFC) requires resources to provide long-term care for its patients. Given financial pressures in our health care system, physicians must justify resources based on cost-benefit analyses. We hypothesize that a CFC generates profitable downstream productivity for the health system.

METHODS & DESCRIPTION: To evaluate impact, we studied clinic records of patients presenting to CFC in the first quarter of 2011 and performed a rigorous analysis of subsequent health system encounters over a two-year period using EPSi queries of the Soarian financial database. We studied patient age, gender, travel distance, and primary craniofacial diagnoses. For encounters we evaluated inpatient/outpatient status, length of stay, attending physician, ancillary clinical services, ICD-9 codes, CPT codes, RVUs, line item charges, payor type, reimbursement, direct and indirect costs.

RESULTS: 62 patients (61.3% male, 38.7% female) were seen in CFC over one day in January (17.7%), two days in February (40.3%), and two days in March (41.9%) of 2011. 29.0% were new and 71.0% were return patients. Ages ranged from 2.7 to 19.5 years (mean 11.4±4.9). Travel distance ranged from 2.1 to 143 miles (mean 27.7±26.1) not including one patient from overseas. Patients had cleft lip and/or palate (CLP) (71.0%), skull/facial bone anomaly (21.0%), CLP and skull/facial bone anomaly (4.8%), or other congenital craniofacial disorder (3.2%). Syndromes seen included Pierre Robin, Stickler, 22q11, Freeman-Sheldon, LADD, Downs, Treacher-Collins, pituitary dwarfism, and ectodermal dysplasia. Over a two-year period, the 62 patients generated a total of 618 health system encounters (mean of 10.0 and maximum of 56 per patient), 19 inpatient stays, 68 hospital days (mean stay of 3.6 days), and 112 procedures (mean of 1.8 and maximum of 10 per patient). Visits involved 32 different physician specialties (51.5% plastic surgery, 22.4% pediatrics and subspecialties, 12.9% otolaryngology, 13.2% other) and 7 non-physician specialists (256 speech therapy encounters, 71 audiology, 13 physical and occupational therapy, 8 sleep medicine, 8 voice lab, 2 genetics, 2 nutrition). The most common payor type for all encounters was Medicaid (60.2% compared to 35.8% managed care, 2.1% self-pay, 1.6% state disability, and 0.3% Medicare). Only 20.2% of outpatient visits were profitable, whereas 63.2% of inpatient stays were profitable. The gross profit margin for all visits to the health system was profitable.

CONCLUSIONS: Our study shows that a comprehensive CFC generates positive financial impact on a health care system in terms of downstream revenue from hospital stays, procedures, and encounters across nearly 40 different specialties. We believe that this impact justifies allocation of resources to establish or run the CFC. In return, this study suggests that future potential growth of the CFC will lead to additional increased productivity for the health care system.

## 42 MITIGATION OF SHP2 AND GRB2 ACTIVATION PREVENTS ABERRANT FGFR2 SIGNALING-INDUCED CRANIOSYNOSTOSIS THROUGH AN ERK-MAPK-DEPENDENT PATHWAY

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BACKGROUND & PURPOSE: Crouzon syndrome is characterized by craniosynostosis (premature cranial suture fusion) and craniofacial anomalies and arises from activating mutations within the fibroblast growth factor receptor IIIc splice variant gene (Fgfr2c) that disrupt normal osteoblast activity. ERK-MAPK hyperactivation has been shown to result in craniosynostosis. The docking protein FRS2α mediates FGFR2c signaling to positively regulate ERK-MAPK activation through the tyrosine phosphatase Shp2 and the adapter protein Grb2. The objective of this study was to determine the role of FRS2α-mediated Shp2- and Grb2-induced ERK-MAPK activation in craniosynostosis and craniofacial development in an animal model of Crouzon syndrome.

METHODS & DESCRIPTION: Crouzon syndrome-like mice (Fgfr2cC342Y/+) were crossed with mice deficient in the two Shp2- or four Grb2-specific tyrosine phosphorylation sites within Frs2α to produce Fgfr2cC342Y/+:Frs2αΔShp2/+ or Fgfr2cC342Y/+:Frs2αΔGrb2/ΔGrb2 mice. Mouse skull morphology and sutures were analyzed grossly, histologically, and by micro-Computed Tomography. P1 – 3 pup coronal sutures were microdissected and analyzed for ERK protein activation and whole calvaria were cultured and analyzed for alkaline phosphatase (ALP) activity. All comparisons were made to wild-type (WT) and Frs2αΔShp2/+ or Frs2αΔGrb2/ΔGrb2 control mice. A Analysis of Variance test used to compare multiple groups. An observed P value ≤0.05 was considered statistically significant.

RESULTS: Fgfr2cC342Y/+ mice demonstrated coronal synostosis with severe craniofacial dysmorphia; Fgfr2cC342Y/+:Frs2αShp2/+ mice presented with patent coronal sutures and craniofacial morphology similar to WT mice (n=8-11/group; $p<0.01$). Fgfr2cC342Y/+ mice demonstrated hyperphosphorylation of ERK protein that was reduced to WT levels in Fgfr2cC342Y/+:Frs2αΔShp2/+ mice (n=3-4/group). Osteoblasts from Fgfr2cC342Y/+ mice showed increased ALP activity that was restored to WT levels in Fgfr2cC342Y/+:Frs2αΔShp2/+ (n=5-8/group; $p<0.05$). Fgfr2cC342Y/+:Frs2αΔGrb2/ΔGrb2 mice demonstrated craniofacial morphometry similar to WT mice in a subset of measurements (n=6-8/group; $p<0.05$); however, only 1/3 of Fgfr2cC342Y/+:Frs2αΔGrb2/ΔGrb2 presented with patent coronal sutures. Coronal suture ERK activation(n=3-4/group) and calvarial osteoblast ALP activity was reduced in Fgfr2cC342Y/ +:Frs2αΔGrb2/ΔGrb2 mice compared to Fgfr2cC342Y/+ mice (n=3-7/group; $p<0.05$).

CONCLUSIONS: Genetic uncoupling of FRS2α and Shp2 prevents craniosynostosis and completely restores normal craniofacial growth in Fgfr2cC342Y/+ mice while uncoupling of FRS2α and Grb2 partially rescues the WT phenotype. This is the first study to identify Shp2 and Grb2 as regulators of craniosynostosis. This study highlights the therapeutic potential of these proteins as targets for the treatment of craniosynostosis and other skeletal disorders.

## 43 SPONTANEOUS FOREHEAD REMODELING AFTER POSTERIOR VAULT RECONSTRUCTION IN SAGITTAL SYNOSTOSIS

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BACKGROUND & PURPOSE: Surgeons advocate various methods to correct scaphocephaly secondary to sagittal synostosis, but little quantitative data exists to support one technique over another. One approach uses parietal and posterior vault reconstruction, which relies on post surgical forehead remodeling. The degree of indirect forehead remodeling following this approach remains unknown. We utilize three dimensional (3D) photogrammetry to measure the degree of spontaneous forehead remodeling following posterior vault reconstructions. We hypothesize that 1) spontaneous forehead remodeling occurs when the parietal and occipital cranium is reconstructed 2) this remodeling results in a normal forehead shape.

METHODS & DESCRIPTION: After IRB approval we used 3D photogrammetry to image children with sagittal synostosis undergoing posterior vault reconstructions, and age-matched controls. We measured the frontal bossing (FB) angle pre- and postoperatively, as well as in controls, and assessed differences through Welch's t-test. Root mean square deviation (RMSD) values and color maps were generated to evaluate areas and degree of forehead remodeling over time. One-way MANOVA analysis tested for statistical differences in 3D forehead shape between groups. This analysis utilized a comparison of 44 surface landmarks per forehead.

RESULTS: We collected data on seven subjects (mean follow-up age of 16 months), and five age-matched controls. Preoperatively, children with sagittal synostosis had a mean FB angle of 109.5° ± 0.4° which decreased towards control values (102.3° ± 2.3°) at a mean follow-up of 10 months (106.5° ± 0.7°, $p<0.01$). Comparing pre- and postoperative forehead surfaces resulted in an average RMSD change of 0.67mm ± 0.17mm. RMSD changes were seen as early as 1 week and up to 2 years after surgery. RMSD color mapping demonstrated decreased bossing above the orbital rims, with minimal midsagittal change. MANOVA analysis showed statistically significant differences between pre- and postoperative forehead shape, satisfying hypothesis one (Pillais' Trace = 1.000, observed power = 1.000, $p <0.01$). Differences between postoperative and control shapes were not statistically significant, satisfying hypothesis two (Pillais' Trace = 0.924, observed power = 0.145, $p >0.05$).

CONCLUSIONS: 3D photogrammetry can quantitatively assess forehead shape over time after posterior vault reconstruction for sagittal synostosis. Patients with sagittal synostosis and a posterior approach to reconstruction had spontaneous forehead remodeling and improvement in FB angle toward control measurements, without performing forehead craniectomy and reconstruction. Surface changes, measured by RMSD, increased over time and continued 2 years post-operatively. Patients had a statistically different mean forehead shape after surgery, which approximated that of age-matched controls. This data suggests that the forehead spontaneously remodels after a posterior approach to scaphocephaly, and that removal and reconstruction of the forehead is unnecessary.

## 44 SPEECH OUTCOMES FOLLOWING CLINICALLY INDICATED POSTERIOR PHARYNGEAL FLAP TAKEDOWN

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BACKGROUND & PURPOSE: Velopharyngeal insufficiency (VPI) affects as many as one in three patients following cleft palate repair. Correction using a posterior pharyngeal flap (PPF) has been shown to improve clinical speech symptomatology; however, PPFs can be complicated by hyponasality and obstructive sleep apnea (OSA). The goal of this study was to assess if speech outcomes revert following clinically indicated PPF takedown.

METHODS & DESCRIPTION: The Cleft-Craniofacial Database of the Children's Hospital of Pittsburgh of UPMC was retrospectively queried to identify patients with a diagnosis of VPI treated with a PPF who ultimately required takedown. Using the Pittsburgh Weighted Speech Score (PWSS), pre-operative scores were compared to those following PPF takedown. Outcomes following two different methods of PPF takedown (PPF takedown alone or PPF takedown with conversion to Furlow Palatoplasty), were stratified & cross-compared.

RESULTS: A total of 64 patients underwent takedown of their PPF. Of these, 18 underwent PPF takedown alone, and 46 underwent PPF takedown with conversion to Furlow Palatoplasty. Patients averaged 12.43 (Range: 3.0-22.0)(SD: 3.93) years of age at the time of PPF takedown, and 58% were male. Demographics between groups were not statistically different. The mean duration of follow up after surgery was 38.09 (Range: 1-104)(SD: 27.81) months. For patients undergoing PPF takedown alone, the mean pre-operative and post-operative PWSS was 3.83 (Range: 0.0-23.0)(SD: 6.13) and 4.11 (Range: 0.0-23.0)(SD: 5.31) respectively ($p=0.89$). The mean change in PWSS was 0.28 (Range -9.0-7.0)(SD: 4.3). For patients undergoing take down of PPF with conversion to Furlow Palatoplasty, the mean pre-operative and post-operative PWSS was 6.37 (Range: 0-26)(SD: 6.70) and 3.11 (Range: 0.0-27.0)(SD:4.14) respectively ($p<0.01$). The mean change in PWSS was -3.26 (Range: -23.0-4.0)(SD: 4.3). For all patients, the mean pre-operative PWSS was 5.66 (Range: 0.0-26)(SD:6.60) and 3.39 (Range 0.0-27)(SD:4.48) respectively ($p <0.05$). The mean change in PWSS was -2.26 (Range: -23.0-7)(SD:5.7). There was no statistically significant regression in PWSS for either surgical intervention. Two patients in the PPF takedown alone cohort demonstrated deterioration in PWSS that warranted delayed conversion to Furlow palatoplasty. Approximately 90% of patients who undergo clinically indicated PPF takedown alone, without conversion to Furlow Palatoplasty, will show no clinically significant reduction in speech.

CONCLUSIONS: While there is concern that PPF takedown may degrade speech, this study finds that surgical takedown of PPF, when clinically indicated, does not result in a clinically significant regression of speech.

## 45 LEVATOR VELI PALATINI MUSCLE LENGTH CHANGES AND VELOCITIES VARY ACROSS SOUNDS

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BACKGROUND & PURPOSE: Velopharyngeal dysfunction (VPD) is a common issue for children with repaired cleft palates, preventing proper production of certain sounds, especially plosives and fricatives. Velum measurements are used to quantify velopharyngeal closure but often cannot distinguish between plosives/fricatives and easier-to-achieve sounds, partly due to inter-subject variability even among healthy subjects. Velum characteristics result from the velar muscles, primarily the levator veli palatini (LVP), acting on the velum soft tissue. Quantifying LVP behavior during speech could provide vital insight to understanding VPD and why certain sounds are particularly challenging. Muscle length and velocity impact the force-generating potential of muscle and could affect speech production. The goal of this study was to develop a method for calculating LVP muscle length and muscle velocity during speech using dynamic MRI.

METHODS & DESCRIPTION: Six healthy adult subjects pronounced eight English syllables: plosives (/bʌ/,/kʌ/), fricatives (/sʌ/,/fʌ/), nasals (/mʌ/,/nʌ/), and vowels (/æ/,/i/). Each was voiced three times during a real-time dynamic MRI on Siemens Avanto 1.5T scanner with head and neck coils. One two-dimensional oblique-coronal slice of the velum was acquired with image plane chosen to lie along LVP length. Spatial resolution is 1.2*1.2mm2 with 8mm slice thickness and temporal resolution of 18.2 frames-per-second. In each image, lateral reference lines, marking pharyngeal port center and velum midline, and superior-inferior reference lines, marking mid-sagittal and pharyngeal port's lateral edge, were manually placed. LVP muscle length for each image was calculated from these reference lines. For each subject, LVP lengths were normalized by resting length. We computed the numerical time derivative of normalized LVP muscle length to calculate LVP muscle velocity and determined the maximum shortening velocity for each syllable and subject.

RESULTS: Fricatives and plosives had statistically greater LVP muscle length changes (14.7±5.3% and 15.3±5.6% respectively) than nasal consonants (8.4±4.0%) with vowels in-between (12.1±4.7%). A similar trend held true for maximum contraction velocity. Plosives and fricatives had the greatest velocities while vowels and nasals had lower. While length change differences were not significant between the plosives, maximum contraction velocity for /bʌ/ (.657±.307 lengths/sec) was statistically higher than for /kʌ/ (.389±.195 lengths/sec).

CONCLUSIONS: The results suggest that LVP length changes can distinguish between different types of sounds, and LVP shortening velocity has potential to differentiate between similar sounds. The length changes and high shortening velocities required to produce plosives and fricatives could affect LVP force-generating capacity and its ability to produce proper speech. Future research will elucidate how shortening velocity affects production of challenging sounds and how length change and velocity relationships hold in children with VPD.

## 46 TIMING OF FURLOW PALATOPLASTY FOR PATIENTS WITH SUBMUCOUS CLEFT PALATE

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BACKGROUND & PURPOSE: Submucous cleft palate (SMCP) is the most common form of cleft involving the posterior palate and can result in velar dysfunction and speech disturbances. While early surgical intervention is indicated for patients with true cleft palate, the indications for palatoplasty and timing of surgical intervention for patients with SMCP remain controversial. The purpose of this study is to evaluate the timing of Furlow palatoplasty for patients with SMCP and determine if early repair optimizes language development and ultimate speech quality. We hypothesize that early palatal repair does not result in superior outcomes to undergoing palatal repair beyond the age of early language acquisition.

METHODS & DESCRIPTION: Thirty patients with the diagnosis of SMCP were retrospectively identified from medical records. Patient demographics, age at presentation, age at surgery, syndromic status, medical comorbidities, formal speech evaluations, operative details, nasometry and nasendoscopy results were recorded. Patients treated with Furlow palatoplasty were dichotomized into groups: 1) Early language development (<=4 y/o) and 2) Post language development (> 4 y/o). Mean pre and postoperative intragroup nasometry scores within groups were compared with Student pairwise T-test. Postoperative nasometry scores between groups were compared with Student T-test. Patients managed non-operatively were included for comparison of early and late speech outcomes.

RESULTS: The average age at time of surgery for the early operative group (n=9) was 2 years and 6 years for the late operative group (n=9). Primary diagnoses included patients with isolated SMCP, Van der Woude, VATER, 4p- syndrome, and velocardiofacial syndrome. The primary indication for surgery in both groups was hypernasality as determined by nasometry and perceptual speech assessment. Both groups demonstrated improvement in qualitative assessment of hypernasal resonance following Furlow palatoplasty. Both early and late groups demonstrated significant improvement in pre to postoperative nasometry scores from 7.4 to 2.3 SD from norm (p=0.01) and 6.1 to 4.1 (p=0.02) respectively. There was no difference in postoperative nasometry scores between early and late groups 2.3 and 4.1 (p=0.11).

CONCLUSIONS: Furlow palatoplasty significantly improves the degree of hypernasality in patients with SMCP based on pre and postoperative nasometry scores and on qualitative speech assessment of hypernasal resonance. There were no differences in speech resonance outcomes based on early compared to late operative intervention. Therefore, perfunctory early palatal repair is not required for optimal speech outcomes in children with SMCP and surgery should be considered on an individual basis based on the degree of speech dysfunction.

## 47 NORMATIVE VELOPHARYNGEAL DATA IN INFANTS: IMPLICATIONS FOR TREATMENT OF CLEFT PALATE

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BACKGROUND & PURPOSE: Identifying normative data related to VP muscles and structures may have clinical significance for infants born with cleft palate, especially as they relate to selection of surgical intervention and post-surgical outcomes. Research has demonstrated a relationship between abnormal levator muscle morphology and VPI in individuals with repaired cleft palate (Ha et al., 2007). These findings suggest that patients whose anatomy post-surgically are dissimilar to that of their normative counterparts are at risk for symptomatic VPI (i.e., hypernasal speech). However, studies have not documented what constitutes “normal” for the clinically relevant population-that is, the infant population. The purpose of this study is to examine an MRI database (N= 29) related to normative VP musculature and structures, and provide a preliminary comparison to two selected patients with repaired cleft palate.

METHODS & DESCRIPTION: Twenty-nine healthy infants between 9-23 months of age (M = 15.2) with normal craniofacial and VP anatomy were recruited to participate in this study. Normative data was compared to two infants with repaired cleft palate between 13-15 months of age (M = 14). Quantitative craniometric and VP measures of the sagittal and oblique coronal image planes were completed utilizing Amira 5 visualization software. Variables of interest included: levator muscle, velum, and craniometric measures. Multiple independent, two-sample t-tests were used to examine gender differences between mean VP measures.

RESULTS: Females demonstrated significantly larger intravelar segments (2.9 mm) compared to males. No other craniofacial or VP structures demonstrated differences based on sex. The effect of head size was not significant between gender groups, and therefore was not included as a covariate in the analysis. The following normative values (mm) were observed for males and females: levator muscle length (28.9; 28.8), angle of origin (47.7; 47.1), velar length (22.6; 22.3), velar thickness (8.3; 7.9) and pharyngeal depth (34.9; 34.3). Infants with repaired cleft palate demonstrated increased overall levator muscle length, extravelar length, angle of origin, sella to basion distance, nasion-sella-basion angle, and decreased hard palate length, pharyngeal depth, and velar thickness compared to infants with normal VP anatomy.

CONCLUSIONS: The present study is the first to provide normative levator and VP anatomical data in healthy infants utilizing a large sample size. Infants with repaired cleft palate in the present study demonstrated differences in levator muscle integrity and position compared to infants with normal VP anatomy. Longitudinal studies should investigate the effects of abnormal levator parameters on speech and resonance in infants and children with repaired cleft palate to optimize surgical intervention and improve treatment outcomes.

## 48 RECURRENT OTITIS MEDIA WITH EFFUSION AS A PREDICTOR OF VELOPHARYNGEAL INSUFFICIENCY REQUIRING SECONDARY PALATE SURGERY

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BACKGROUND & PURPOSE:Children with repaired cleft palate are known to experience secondary velopharyngeal insufficiency and recurrent otitis media with effusion. These complications can be attributed to persistent abnormalities in the levator and tensor veli palatini muscles, respectively, following primary palatoplasty. The purpose of this retrospective chart review was to identify whether recurrent otitis media with effusion requiring myringotomy tubes was predictive of the need for secondary speech surgery.

METHODS & DESCRIPTION: Institutional ethics approval was obtained for this case-control study. Records of all patients who underwent primary palatoplasty at our institution between 1990 and 2006 were reviewed to ensure adequate follow-up. Data extracted included age at primary palatoplasty, gender, Veau classification, surgeon, number of post-palatoplasty myringotomy tube procedures (0-1 sets vs. 2+ sets), hearing loss, syndrome diagnosis, fistula, and secondary speech surgery recommended or performed. Univariate analysis was used to identify covariates associated with increased odds of requiring secondary speech surgery. A multivariate regression model was constructed using a backwards stepwise approach, fitting covariates of gender, age at primary repair, Veau classification, diagnosed syndromes, surgeon, fistula, and number of myringotomy tubes.

RESULTS: A total of 249 patients met criteria for study inclusion. Of these patients, 44 (18%) had secondary speech surgery recommended or performed. While the majority of children required one set of myringotomy tubes following primary palatoplasty, a greater proportion of children who went on the have secondary speech surgery recommended or performed required two or more sets of myringotomy tubes compared to patients for whom secondary surgery was not recommended (59% vs. 37%, OR= 7.5, p=0.006). Univariate analysis revealed a significant association between Veau classification, presence of a syndrome, or two or more myringotomy tube procedures with secondary speech surgery. Adjusting for multiple covariates, children requiring two or more sets of myringostomy tubes were at 2.39 times more likely to require secondary speech surgery than patients who required one or fewer sets of myringotomy tubes (95% CI 1.49-6.74, p=0.015).

CONCLUSIONS: Adjusting for a variety of relevant variables, we demonstrate that recurrent otitis media with effusion requiring two or more myringostomy tube procedures is associated with a statistically significant increased risk of requiring secondary speech surgery. Using otitis media with effusion as a clinical predictor for secondary velopharyngeal insufficiency could allow for the early identification of “at-risk” patients in need of more intensive speech therapy and/or timely secondary speech surgery.

# Abstracts

## 49 DIFFICULTIES IN TIMING PERCEPTION RELATED TO ABNORMAL BRAIN STRUCTURE IN CHILDREN AND ADOLESCENTS WITH NONSYNDROMIC CLEFT LIP AND/OR CLEFT PALATE

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BACKGROUND & PURPOSE: Abnormalities in brain structure have previously been reported in individuals with nonsyndromic cleft lip and/or cleft palate (NSCLP). These include reductions in the overall volume of the brain as well as more specific volumetric reductions of both the cerebellum and basal ganglia. These regions are important for a number of functions related to the motor system. One test commonly used to test motor function involves finger-tapping, and both the production and perception of specific timing intervals. Based on the brain structure abnormalities as well as previously reported motor dysfunction, we hypothesized that children and adolescents with NSCLP would show difficulties in a finger-tapping task. Furthermore, we anticipated these difficulties would directly correlate with abnormal brain structure in these individuals.

METHODS & DESCRIPTION: For the current study we examined 79 children and adolescents with NSCLP compared to 89 healthy controls (age range = 6-18). For all participants we administered a finger-tapping task with both a self-paced interval production component along with an interval perception component. For both components there was a long (730ms) and short (400ms) interval condition. In addition, all participants received an MRI scan to assess structural brain measures.

RESULTS: Children and adolescents with NSCLP were found to have difficulties in both the production and perception portions of the finger-tapping task. For interval production the mean interval time did not differ between groups. However, there was a very significant difference in standard deviation of the interval time between groups ($F = 15.59$; $p < .001$). Individuals with NSCLP had significantly more variation in the length of the intervals produced, implying that they were not as efficient at internally generating and maintaining a constant rhythm. This difference in variability was only significant in the longer interval condition (730ms; a more difficult condition requiring additional cognitive control). Similarly, for the interval perception portion, children and adolescents with NSCLP showed lower perception accuracy compared to normal healthy children for both the long ($F = 13.76$; $p < .001$) and short ($F = 12.53$; $p = .001$) conditions. All of these results were significantly correlated to total intracranial volume in individuals with NSCLP, such that those with the smallest brain volumes performed the worst on the finger-tapping tasks. Surprisingly, neither the cerebellum nor basal ganglia regions correlated with the finger-tapping results.

CONCLUSIONS: In conclusion, the results find that children with NSCLP show difficulties in both the production of and perception of timing intervals. These difficulties appear to directly relate to abnormalities in brain structure, but in a very diffuse manner (not related to a specific motor system). These results lend further support to an abnormal neurodevelopmental component in nonsyndromic forms of orofacial clefting.

## 50 THE UNIQUE NEEDS OF INCOMPLETELY TREATED ADULT PATIENTS WITH CLEFT LIP AND/OR PALATE

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BACKGROUND & PURPOSE: Adult patients with cleft have functional and aesthetic needs that are unique compared to the pediatric population. There is paucity in the literature regarding this population and how to identify those common needs. Additionally, the long-term influence of a team-based approach to cleft care on adult functional and aesthetic needs has not yet been defined. We present that, on average, adults have 6 common identifiable problems related to cleft care. In addition, adults with consistent team care have fewer problems and exam findings than those who have either multiple teams or no care at all. The purpose of this study is to evaluate one team's 20-year experience with adult patients with cleft lip and/or palate and develop a surgical approach for adult cleft rehabilitation.

METHODS & DESCRIPTION: A retrospective chart review of patients was performed on 205 identified adult patients over the age of 16 with a diagnosis of cleft lip and/or palate. Data analysis included those with unilateral or bilateral cleft lip only, unilateral or bilateral cleft lip and palate, cleft palate only and form fruste. Patients were further organized by their declaration of team status. A total of 148 patients met inclusion criteria. The common complaints and treatment for these patients were recorded and analyzed.

RESULTS: The age of the patients ranged from 16-67. The mean age was 24.7 years. There were 79 men and 69 women that met inclusion criteria. Nasal/lip aesthetics, fistula, general dental/malocclusion, failure of restorative surgery, and speech abnormalities were the most identified sequelae of inadequate follow up and care. Patients fell into 4 categories regarding cleft team care – continued care, continued care with interruption, multiple teams and no team. Less than 20% of patients had no team care at all.

CONCLUSIONS: The care of adult patients with cleft is more complicated than those of the pediatric population. This study shows that there are problems common to adult needs and are increased when no continuity of care is provided. Function and appearance are recognized areas for issues of self-esteem, social avoidance and distress in patients. The utilization of adult teams must be developed to address the needs of a population heretofore unrecognized.

## 51 CONTINUING MEDICAL AND DENTAL NEEDS OF ADULTS WITH CLEFT LIP AND/OR PALATE: A NEEDS ASSESSMENT

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BACKGROUND & PURPOSE: Adults with cleft lip/palate (CLP) in the US may have difficulties addressing continuing health care needs once they age-out of medical coverage. The extent of such ongoing dental and medical needs related to their clefts is currently unknown. The purpose of this exploratory study was to assess such needs by means of a regional and national survey. The survey asked about aspects of satisfaction, which procedures had been completed, what procedures were still desired, and how far they were willing to travel to receive care.

METHODS & DESCRIPTION: A novel online survey was developed based on prior quality of life surveys and the literature on adults with CLP. It was reviewed by experts for content & design, and approved by the _ IRB. It was confidential, with the option to provide contact information. Initially a regional survey, it was extended nationally to achieve our target of 200 responses; this was done by using Cleftline's national database of people with CLP who had sought information regarding adult care. Invitations were sent to all 69,127 email addresses at a major US university. 516 email invitations & 88 letters were sent to Cleftline contacts. The invitation was posted on 19 cleft-related web sites (Ameriface.org & Facebook Groups). Dozens of flyers were posted regionally. Allegiance software was used to build and host the 42 item survey. It included demographic questions, dichotomous and Likert scales, & open-ended questions about subjective life experiences. The survey was open from Sept. 18, 2013 to Jan. 15, 2014.

RESULTS: Of 204 completed surveys 27 were excluded because they were <18 years old, foreign or redundant; resulting in 177 usable responses. Of these, 51 were from the local region. Populous US states were best represented in the sample (CA, IL, NY, TX). The mean(SD) age was 37(14) years. Caucasians (77%), Hispanics (10%) & Asians (6%) were best represented. The sample was disproportionately female (67%). The proportions of cleft types were similar to national averages. The most common surgical procedures reported were lip repair (82%), palate repair (77%), & nose repair (53%). The 3 greatest areas of dissatisfaction (profile, 52%; occlusion, 50%; dental appearance, 50%) did not correspond with the 3 most-desired additional treatments/surgeries (for upper lip appearance, 43%; nose appearance, 41%; profile, 33%). The 3 greatest areas of satisfaction were swallowing, speech, & hearing (84-71%). In general, respondents were willing to travel significant distances to receive care (eg, 18% would go 100+ miles or "anywhere").

CONCLUSIONS: Adults with CLP can be a very difficult population to identify. This sample may have been biased regarding gender, higher education level & internet access. At a national level, the survey identified highly motivated individuals seeking dental/medical assistance. All respondents requested at least one procedure. These findings can help health care professionals better understand this population & develop strategies to meet their needs.

## 52 OUTSIDE, INSIDE: YOU DECIDE MIDDLE-SCHOOL PROGRAM FOSTERS ACCEPTANCE AND APPRECIATION OF THOSE WHO HAVE VISIBLE DIFFERENCES

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BACKGROUND & PURPOSE: Children with visible difference often draw unwanted sympathy, patronizing remarks and behavior, intrusive stares,

teasing, and bullying. The Outside, Inside: You Decide program incorporates CASEL Social and Emotional Learning (SEL) programming in a middle-school intervention that inspires students to explore their personal beliefs about differences. Students learn the SEL competencies of self-awareness, relationship skills and responsible decision-making through acceptance and appreciation of those with visible differences. There is nothing similar to this program in the U.S., wherein a disfigured individual shares experiences and interacts with students in a structured program.

METHODS & DESCRIPTION: The 45-minute program was presented to six classes of middle-school students in 2001, 2004 and 2007. About 175 students participated in the program developed to incorporate preferred components of a disability awareness program that supports and promotes integration and inclusion. Students participated in interactive exercises emphasizing sameness, self-awareness, self-management, social awareness and responsible decision making. Students listened to others, discussed, reflected, and expressed their impressions about others as well as themselves. Students responded to open-ended questions, and wrote about their impressions. A total of 125 students were asked to write their impressions about the workshop. Fifty were not asked to write about their impressions.

RESULTS: All students reported improved social emotional competencies of empathy, responsible behaviors and appreciation of diversity represented in people with visible differences. The most frequent comment was, “I will never stare at someone who looks different again, because I found out that it is not what they look like on the outside; it is what they are on the inside.”

CONCLUSIONS: Intense peer pressure will continue to motivate middle-school students to conform to the norms of the majority of individuals who value beauty above character and intellect. An intervention such as this program may influence middle-school students to become more accepting of themselves, each other, and those with visible differences. This program could be expanded to middle schools throughout America. It would be helpful to develop a tool to measure the short and long term effects of participating in the Outside,Inside:You Decide program.

## 53 NON-SYNDROMIC SAGITTAL SYNOSTOSIS. A NORDIC MULTI-CENTER STUDY

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BACKGROUND & AIM: In the Nordic countries, treatment of non-syndromic sagittal synostosis is centralized to 1-2 centers in each country. Four Nordic centers use a common database for rare diseases (Raredis) allowing for pooling of data. The hypotheses tested were: (1) the pre-op cephalic index (CI) in infants with NSS is significantly reduced; (2) CI in children with NSS is normal 3 months after surgery, and it remains normal 2 years after surgery; (3) CI of parents to children with NSS is normal, and not related to the pre-op CI of their child.

METHODS & DESCRIPTION: A total of 132 consecutive children with NSS and normal gestational age were enrolled in the study. The gender distribution was M:F=3.4:1. The CI was recorded pre-op and 3 months and 2 years post-op (the mean age at surgery at the different centers varied between 5 and 8.5 months). In addition, the CI of the parents was recorded. Data collection was not complete for all subjects. Available normative data from the literature were used as controls. Maximum head width and head length were measured with a sliding calliper or from 3D CT-scans. CI was calculated as: head widthx100/head length. Differences between mean values were tested with Student’s t-test (significance level 5%). The Pearson correlation coefficient R with 95% confidence interval (c-int) was calculated between the CI of mothers and offspring, and between the CI of fathers and offspring.

RESULTS: Mean CI for infants with NSS (n=88) was 67.8 pre-op compared to a normative mean of 77.9 +/- 4.1 ($p < .0001$). Three months post-op, the mean CI in NSS (n=62) had increased to 76.9 +/- 6.0 which was similar to the normative mean (77.7 +/- 5.2) (p=.54); 2 years after surgery, the mean CI for the children with NSS (n=42) was 75.4 +/- 5.1 which was similar to the norm for that age (76.8 +/- 4.2) (p=.65). Mean CI for mothers (76.8 +/- 3.7; n=81) was significantly lower (p=.005) than the norm (79.0 +/-4.5; n=37). Mean CI for fathers (77.5 +/- 4.5; n=74) was also smaller than the norm (78.5 +/- 3.9; n=30), but this difference was not statistically significant (p=0.3). There was a significant positive correlation between CI for offspring and for both mothers (R=0.30, c-int:[0.05-0.51], n=61) and fathers (R=0.36, c-int:[0.10-0.57], n=54).

CONCLUSIONS: Hypothesis (1) and (2) could not be refuted. However, hypothesis (3) was refuted. Early surgery for NSS seems to normalize the CI in children with NSS and the CI remains normal 2 years after surgery. The findings that parents of children with NSS seem to have smaller CI than normal and that their CI is significantly correlated with the CI of their offspring prior to surgery suggest that a genetic predisposition toward dolichocephaly could be a contributing factor in the development of NSS.

## 54 PRESENTING CHARACTERISTICS AND MANAGEMENT OF SUBMUCOUS CLEFT PALATE: A SINGLE CENTER REVIEW SPANNING 16 YEARS

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BACKGROUND & PURPOSE: The diagnosis of submucous cleft palate may be subtle. Hence many patients present late after developing speech problems. This study seeks to determine the presenting characteristics and management of submucous cleft palate. Factors that may be predictive of a need for secondary surgery will be discussed.

METHODS & DESCRIPTION: An IRB approved retrospective review of our database from 1998 to 2014 was undertaken to identify patients with submucous cleft palate at a tertiary craniofacial care center. Gender, age at presentation, prior medical/surgical history, presence or absence of associated syndrome, and speech at presentation were analysed. The Sommerlad classification scale was used to characterize physical findings noted at presentation and intraoperatively. Our center’s treatment protocol for submucous cleft palate consists of a trial of speech therapy followed, in the event of persistent VPI, by awake fiberoptic nasoendoscopic evaluation of the velopharyngeal closure mechanism. Our primary operation is palatoplasty. Secondary surgery, if needed, is directed by nasoendoscopic findings.

RESULTS: We identified seventy-six patients who presented to our center during the study period and were diagnosed with submucous cleft palate. Thirty-five (46.05%) were male and forty-one (53.95%) were female. The mean age at presentation was 5.31 years (range three weeks to 20.75 years). An associated syndrome was identified in 44.7%. Of these, the majority (88.23%) were diagnosed with DiGeorge syndrome. Twenty-two (28.95%) patients had adenoidectomy with or without tonsillectomy prior to presentation. Of the seventy-six, only four have not required surgery. Thirty-nine (51.32%) had VPI corrected with palatoplasty alone. Of these, fourteen (35.90%) had an associated syndrome (11 DiGeorge, 1 Kabuki, 1Proteus, 1Goldenhar), while fourteen (35.90%) had no syndrome and eleven (28.20%) were undetermined. Thirty-three (42.20%) patients required more than one operation to achieve correction of VPI. Out of the thirty-three who had secondary surgery, eighteen (54.55%) had an associated syndrome of which seventeen (94.44%) had DiGeorge syndrome. Of the group requiring secondary speech surgery twenty-two (66.67%) were noted to have had adenoidectomy prior to presentation. In fact all patients presenting with prior history of adenoidectomy required additional speech surgery.

CONCLUSIONS: Submucous cleft palate remains a challenging condition. Patients frequently present late, by which time they may have numerous compensatory speech errors. Primary palatoplasty to reposition the levator veli palatine muscle was effective therapy in half of the cases in this series. DiGeorge syndrome was frequently associated with submucous cleft palate but was not an absolute predictor of need for secondary surgery. Prior history of adenoidectomy concomitant with a diagnosis of submucous cleft palate was a clear predictor of a need for secondary surgery.

## 55 TIMING OF PALATOPLASTY AND SPEECH OUTCOMES IN SUBMUCOUS CLEFT PALATE

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BACKGROUND & PURPOSE: Because many children with submucous cleft palate (SMCP) are thought to be asymptomatic, surgical intervention is conventionally delayed until after the acquisition of speech if velopharyngeal insufficiency (VPI) is identified. However increasing evidence suggests that

palatal repair prior to speech development is crucial to optimal speech outcomes. We aim to identify patterns of SMCP outcome based on age of presentation and timing and type of repair.

METHODS & DESCRIPTION: We retrospectively analyzed all children who underwent cleft palate repair at our institution between 1975 and 2011, and performed subgroup analysis on those with SMCP. Syndromic and nonsyndromic patients were independently stratified. Surgical treatment and complications were analyzed and speech outcomes evaluated by Pittsburgh Weighted Speech Score (PWSS) after 5 years of age.

RESULTS: Among 1,726 patients with cleft palate, 60 patients (3.4%) with SMCP underwent repair. Twelve (20%) patients were diagnosed with genetic syndromes and repaired at a mean age of 4.5 years; 48 nonsyndromic patients, underwent repair at a mean age of 5.3 years. Among the 10 syndromic patients with speech assessments after repair, only two (20%) were diagnosed with competent speech. 8 (80%) were diagnosed with borderline (40%) or incompetent (40%) speech, compared to a total of only 35% of syndromic patients with overt palatal clefts. ($p < 0.05$). Eleven patients (23%) underwent simultaneous Furlow palatoplasty and posterior pharyngeal flap with 45% achieving competent and 55% borderline speech, however this cohort showed high rates of postoperative obstructive sleep apnea. Among 12 nonsyndromic patients with long-term speech assessment, only four (33%) exhibited competent speech. Eight (67%) exhibited borderline or incompetent speech, compared to only 30% with overt palatal clefts ($p < 0.05$). Mean PWSS component scores were most abnormal for nasal emission (1.9) and articulation (1.1), whereas nasality was less abnormal (0.7.) All four patients who underwent palatoplasty younger than 2.5 years of age obtained competent speech. No oronasal fistulas were identified among either syndromic or nonsyndromic SMCP patients.

CONCLUSIONS: Among children with cleft palate, those with a diagnosis of SMCP undergo palatoplasty at a much older age. They have significantly higher frequency of both borderline and incompetent speech compared to other cleft types. Performing surgery at a younger age may be associated with improved speech outcomes.

## *56 THE AMERICLEFT LISTENER RATINGS PROTOCOL: A CALIBRATION SESSION FOR SPEECH-LANGUAGE PATHOLOGISTS

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BACKGROUND & PURPOSE: In order to gather meaningful outcome measurements for individuals with cleft palate and velopharyngeal dysfunction, it is necessary to make valid and reliable perceptual ratings of speech articulation and resonance. This hands-on, "ears on" course aims to facilitate skills for rating resonance and articulation characteristics using the protocol developed for the Americleft Speech Outcomes Project. Using interactive polling software, participants will rate speech samples. Audience ratings will be compiled and displayed during the course for discussion. Principles of consensus listening and listener guidelines from the Americleft project will be applied to the calibration process.

METHODS & DESCRIPTION: The Americleft Speech Outcomes Project has established a protocol for rating articulation, resonance and audible nasal emission/turbulence parameters in order to obtain valid and reliable data for intra-center and cross-site comparisons. This interactive course aims to develop skills for assessment in this area, including ratings of hypernasality, nasal air emission, and compensatory articulation. This protocol is available for use clinically and will be shared with the audience. Using interactive polling software, attendees will have a hand-held unit to make judgments regarding these speech parameters. Judgments will be compiled and displayed on the projection screen for learning and discussion. To move towards consensus of judgments, discussion of ratings will include reference to the guidelines developed for the Americleft project.

**Disclosure:** Salary - Authors receive salaries from employment in hospitals and universities related as SLPs in the area of cleft-craniofacial. Contracted Research - Americleft Speech Project is supported by a NIDCR grant. All authors receive consulting financial support or are contracted for this except Anna Thurmes. Professional - Authors are members of the Americleft Speech Group, ACPA, and ASHA SIG 5. Adriane Baylis: ACPA council member ASHA SIG 5 Coordinating Committee and Editor, SIG 5 Perspectives. Angela Dixon: Member of Professional Development Committee for ASHA SIG 5. Kristine Wilson: ACPA: Chair of Archives Committee, member of Ethics committee ASHA: Member of SIG5 Coordinating Committee

## 57 TMEDICAL MANAGEMENT AND SURVEILLANCE PROTOCOLS FOR COMPLEX CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Although many patients cared for by multidisciplinary cleft and craniofacial teams have isolated cleft lip and/or cleft palate and single suture craniosynostosis for whom there are published guidelines for health care supervision, few management protocols are available for patients with less common craniofacial conditions, and this may result in variability in care. In the absence of guidelines, this variability makes it difficult to evaluate outcomes or to conduct comparative effectiveness research in craniofacial care. The goals of this forum are to 1) address the need for the development and integration of nonsurgical management and surveillance protocols for patients with less common craniofacial conditions into multidisciplinary team setting and 2) create a shared resource for tracking and improving patient outcomes.

METHODS & DESCRIPTION: A panel of experts in Craniofacial medicine (pediatricians and geneticists) will discuss the development and implementation of nonsurgical management protocols for patients with complex craniofacial conditions. We will focus on: craniofacial hemangiomas (including PHACES syndrome), Neurofibromatosis type 1 with plexiform neurofibromas of the head and neck, hemihyperplasia (including Beckwith-Weidemann syndrome), and Ectodermal Dysplasias. For each condition, the panel member will provide a timeline for clinical assessments and radiographic studies, including the evidence-based rationale when possible. The audience will be encouraged to participate and contribute to the discussion of each protocol.

## 58 NARRATIVE VIDEO THERAPY: PSYCHOTHERAPY WORKSHOPS FOR CHILDREN, ADOLESCENTS AND ADULTS

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BACKGROUND & PURPOSE: This eye opener will present a psychotherapeutic group approach called Narrative Video Therapy (NVT), based on an adaptation of an inpatient, psychotherapeutic treatment model with pediatric surgical inpatients. These patients learned how to make computer generated videos of themselves describing strategies they developed to cope with various aspects of their medical condition. NVT originated out of the psychological and social needs our patients had to meet other people with craniofacial conditions and share experiences and ways of coping with being visibly different. The salient aspect of this therapeutic model relies on the belief that people learn best from others who are close in age and have undergone similar experiences. The team psychologist and social worker along with devoted volunteers facilitated an inclusive, emotionally safe environment for participants to access ideas about their strengths, vulnerabilities and belief systems and inform and educate others through their own words. By developing, writing and presenting a cohesive narrative about their lives, participants were able to become self reflective, find their voice, and individually and collectively give meaning to their unique experiences. Workshop participants felt a desire to 'give back' and share with others what has helped them along the way. An outline of how to develop, recruit, promote, attain funding and address some of the difficulties and benefits of a center based NVT Workshop will be provided.

METHODS & DESCRIPTION: Psychosocial Workshops with children, adolescent and adult patients who have craniofacial medical conditions.

## *59 GUIDELINES FOR ACADEMIC AND CLINICAL TRAINING FOR THE CLEFT TEAM SLP

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BACKGROUND & PURPOSE: This session will review and describe the multiple pathways that students, clinical fellows, and/or SLP clinicians that are new to the cleft palate team, may take as they embark on the process of obtaining clinical expertise in cleft/craniofacial anomalies and velopharyngeal dysfunction. It is well-recognized that there is a significant shortage of comprehensively-trained SLPs who are prepared to work with this specialized population. This course will be of interest to students, professors, SLPs, and team leaders interested in better understanding the required knowledge and skills for SLPs practicing in the cleft team setting.

METHODS & DESCRIPTION: The first part of the session will focus on the academic prerequisites consistent with ASHA's Council for Clinical Certification in Audiology and Speech-Language Pathology (CCFC) accreditation standards. Standard learning objectives for graduate-level coursework that are specific to resonance and craniofacial anomalies will be discussed as well as how they can be achieved through a variety of flexible and innovative approaches to teaching and clinical practica. The second portion of this course will focus on clinical training pathways and clinical competencies for speech-language evaluation, treatment, and feeding for working with cleft/craniofacial populations. Suggested training opportunities including observation and fellowship experiences, mentored clinical practice, instrumentation/imaging training, as well as strategies for selecting quality continuing education resources to facilitate evidence-based practice will be discussed.

**Disclosure:** Salary - All presenters receive a salary from their affiliated institutions. Professional - Baylis: Council Member of ACPA, ASHA SIG 5 Coordinating Committee Member and Editor for Perspectives. Mandulak: Board of Directors for Smile Oregon.

## *60 PRACTICAL GUIDELINES FOR MANAGING PATIENTS WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: Chromosome 22q11.2 deletions have been identified in the majority of patients with DiGeorge syndrome, velocardiofacial syndrome and conotruncal anomaly face syndrome; and in a subset of patients with Opitz G/BBB syndrome and Cayler Cardiofacial syndrome. Although clinically under-recognized, the 22q11.2 deletion syndrome (22q11.2DS) is the most common microdeletion with an estimated prevalence of 1 in 1000 – 1 in 4000 live births. Furthermore, 22q11.2DS is the second most common cause of developmental delay and congenital heart disease after Down syndrome, and importantly, it is the most common cause of syndromic palatal anomalies.

METHODS & DESCRIPTION: Despite these facts and figures, broad recognition of the condition and systematic anticipatory guidance for clinical management remains limited. That said, the International 22q11.2 Deletion Syndrome Consortium established practical guidelines, developed in multiple stages, including three international consensus meetings where participants with broad expertise including 18 subspecialties representing >15 countries determined best practice based on experiences, data and review of 239 relevant publications with a goal of transcending nationalities, health care systems, and subspecialty biases. These recommendations were synthesized by the lead authors of this Study Session; published in the Journal of Pediatrics in 2011; and are currently being followed routinely by the multidisciplinary panel members. Therefore, their comprehensive experiences will be shared with the audience during this interactive workshop. Specific topics to be discussed will include: assessment and treatment of palatal abnormalities; speech and language challenges; intellectual and behavioral deficits; genetic counseling and psychosocial concerns; and a coordinated approach to medical and surgical care including important considerations prior to scheduling operative procedures and across the perioperative period. Finally, as these recommendations appear applicable to patients presenting to the Cleft Palate Clinic with atypical nested 22q11.2 deletions, as well as, 22q11.2 duplications, these conditions will also be defined in the setting of this collaborative workshop.

**Disclosure:** Other (including honoraria) - I have been a speaker for Natera.

## 61 HOW TO TELL THE DIFFERENCE BETWEEN NON-ADHERENCE AND RISK: ASSESSING NEGLECT AND ABUSE IN THE CRANIOFACIAL POPULATION

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BACKGROUND & PURPOSE: Making decisions regarding the referral to child protection agencies when there is suspicion of child abuse and/or neglect is neither simple nor pleasant. Defining what constitutes a situation requiring a mandatory report versus one that represents a viable treatment choice or lifestyle that is safe for a child can be very difficult. Background on identification of abuse and neglect will be reviewed along with general guidelines regarding the mandatory nature of the reporting of such observations. Case examples will then be used to demonstrate the initial identification of such situations, how they can be assessed along with describing the consequences of referral and non-referral to state agencies.

METHODS & DESCRIPTION: Presenters are experienced social work professionals who work with a large craniofacial center that serves a broad population of families. These social workers are the primary contact for review of cases involving child abuse and neglect. The tools used to track compliance, identify abuse and/or neglect will be reviewed in the context of the presentation of data collected by the social workers for their department about case components over time. Descriptions of effective team communication around such difficult cases will also be shared.

## 62 MAKING SENSE OF NASAL AIR EMISSION: CHARACTERISTICS OF OBLIGATORY AND LEARNED BEHAVIORS

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BACKGROUND & PURPOSE: Although nasal emission is one common symptom of cleft palate speech, there are many terms that have been used to describe it. Despite the fact that nasal emission is regularly encountered during the perceptual speech assessment, not all clinicians agree on the descriptive terms to identify it or its characteristic features. Clinicians are often in a position of determining if the nasal emission is obligatory or learned pattern of speech, the diagnostic significance of which is paramount to prescribing appropriate treatment. Acoustic studies (i.e., nasometry, spectrograms) have the capability to detect the differences in the articulatory behavior resulting in categories of nasal emission. Instrumentation is valuable in identifying the characteristics of obligatory and learned behaviors that might otherwise be missed during the perceptual evaluation, giving rise to a plausible causation. The purpose of this presentation is to provide basic science-based evidence to identify and classify types of nasal emission, demonstrate how acoustic studies (i.e., Nasometry recordings) can be used to differentiate between obligatory and learned behaviors, and the clinical implications for management.

METHODS & DESCRIPTION: A description of obligatory nasal emission and learned patterns of nasal emission will be presented. The various descriptive terms often resulting in confusion will be discussed. By way of audio recordings the audience will listen to samples of perceived nasal emission and identify their perceptual features, after which the value and limitations of perceptual judgments will be reviewed. The clinical merit of instrumentation in detailing the acoustic components of obligatory nasal emission and that which is considered learned behavior will be underscored. Among the several techniques available to the clinician and which will be discussed is the Nasometer's recording capacity in which we will describe a method for analyzing the oral and nasal signal data to differentiate between the two classes on nasal emission. Limitations of low-tech devices such as the See-Scape and listening tubes will be highlighted.

## 63 ENDOSCOPIC CRANIOSYNOSTOSIS SURGERY

**Albert Woo** (1), Douglas Reber (2), Kamlesh Patel (3), Matthew Smyth (1), Sybill Naidoo (4). (1) Washington University in St. Louis School of Medicine, Saint Louis, MO, (2) Hanger Clinic, Saint Louis, MO, (3) Washington University in St. Louis, St. Louis, MO, (4) Washington University School of Medicine, St Louis, MO

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BACKGROUND & PURPOSE: The management of craniosynostosis with endoscopic techniques is becoming widely accepted throughout the fields of plastic surgery and neurosurgery. The purpose of this study session is to offer a practical 90 minute course on the particulars of this technique.

METHODS & DESCRIPTION: Endoscopic treatment for craniosynostosis continues to increase in popularity among plastic surgeons and neurosurgeons who manage this disorder. This course will focus primarily on the practical aspects of endoscopic management and review technical considerations from a multidisciplinary perspective. We will focus specifically on 4 particular disciplines: plastic surgery, neurosurgery, nursing and orthotics. The long-term experience at a single institution with greater than 150 endoscopic cases will be reviewed and a discussion will be held regarding modifications to treatment protocols which have developed during this time. Presentations will include particular details regarding the use of specialty instruments, positioning and surgical technique. Specifics of management for different affected sutures will also be reviewed, as well as outcomes for individual sutures. A presentation focused on the particular details regarding helmet therapy will be given, and our orthotic helmeting experience and protocol will be outlined.

## 64 CLEFT ORTHOGNATHIC SURGERY

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BACKGROUND & PURPOSE: Maxillary growth restriction is evident in a significant proportion of the repaired cleft-lip and palate population. In these cases, the resultant concave profile, poor upper lip and piriform support, anterior crossbite, and class III malocclusion require orthognathic surgery, at least a Le Fort I osteotomy, for correction. Orthognathic surgery in this setting is challenging given the altered vascularity and scar contracture, frequent necessity for concurrent bone grafting, possible fistulae closures, and impact on postoperative speech. It is incumbent upon any cleft team member, especially the orthodontist and surgeon, to appropriately diagnose, understand the presurgical orthodontic phase, effectively perform the surgical procedure, and understand the pitfalls, post-surgical finishing, and additional procedures that may be required.

METHODS & DESCRIPTION: Goals: -Understand the surgical-orthodontic considerations in the cleft dentofacial deformity -Recognize the criteria to be deemed ready for orthognathic surgery in a cleft patient -Understand and implement the technical steps and modifications to perform cleft orthognathic surgery -Recognize and implement concurrent, adjunctive, or staged procedures in the setting of the cleft jaw deformity -Understand the impact and long-term effects of orthognathic surgery on the speech, respiratory, and masticatory functions, long-term **-Understand and consider different treatment strategies, vantage points, and controversies in treating the cleft orthognathic patient – point-counterpoint and case based discussion will be carried out between the two surgeons with different strategies of treatment Description: This course will be given in a multidisciplinary fashion by practitioners involved in cleft orthodontics and surgery, and orthognathic surgery. The focus will be for the practicing orthodontist and surgeon who treats these patients from infancy through adulthood. We will devote 30 minutes to the orthodontic challenges, and setup necessary to adequately prepare these patients for surgery. We will devote 60 minutes to considerations in the unilateral deformity, bilateral deformity, with requisite attention to technical modifications, dealing with residual fistulae, segmental osteotomies, simultaneous bone grafting, management of existing posterior pharyngeal flap, and impact on sleep apnea and speech postoperatively. Additional emphasis will be placed on preoperative planning, including conventional model surgery, splint type and fabrications, virtual surgical planning, and speech and airway assessments. Final considerations of orthodontic finishing will be discussed as well.

## 65 THE FURLOW PALATOPLASTY: OPTIMIZING OUTCOMES THROUGH SURGICAL TECHNIQUE

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BACKGROUND & PURPOSE: The Furlow double-opposing Z-palatoplasty may be used to achieve excellent results both in primary cleft palate repair and in secondary management of velopharyngeal dysfunction. This study session will provide a review of the detailed step-by-step surgical technique while providing tips on how to optimize surgical outcomes through patient selection and technical precision.

METHODS & DESCRIPTION: Using an interactive lecture format, the history and key concepts of the Furlow Z-palatoplasty will be reviewed. A video presentation will then illustrate the the technique in a step-by-step fashion, providing attendees with an understanding of how to simply and successfully perform the operation in all cleft types while minimizing complications and optimizing surgical outcomes. Ample time will be devoted to audience participation, including a question and answer session at the end of the course.

## *66 SPEECH OUTCOME DATA: TECHNIQUES FOR DATA COLLECTION AND MANAGEMENT WITHIN THE CLINICAL SETTING

**Kristina Wilson** (1), Adriane Baylis (2), Angela Dixon (3), Judith Trost-Cardamone (4), Anna Thurmes (5), Kelly Cordero (6), Cindy Dobbelsteyn (7), Kathy Chapman (8). (1) Texas Children's Hospital, Houston, TX, (2) Nationwide Children's Hospital, Columbus, OH, (3) Riley Hospital for Children at Indiana University Health, Indianapolis, IN, (4) California State University at Northridge, Northridge, CA, (5) University of Minnesota, Minneapolis, MN, (6) Gillette Children's Specialty Healthcare, St. Paul, MN, (7) Dalhousie University, Halifax, Nova Scotia, (8) University of Utah, Salt Lake City, UT

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BACKGROUND & PURPOSE: Monitoring short-term and long-term speech outcomes is now recognized as a critical component of cleft team care, both to ensure the best possible patient outcomes and to meet standards in place by professional organizations and funding sources. Clinicians conducting quality improvement investigations and/or research face numerous challenges related to time, equipment, and finding a reliable and valid process for data collection, analysis, and reporting of speech outcomes. This session shares practical methods for outcome data collection that have grown out of the Americleft Speech Group's experience. The target audience includes speech-language pathologists, surgeons, and any other professionals on cleft teams involved in quality improvement or research.

METHODS & DESCRIPTION: This session will provide an overview of the implementation of a systematic protocol to measure speech outcomes, whether it is for quality improvement or research. The development and refinement of protocols will be discussed, with the focus of the session on data collection, storage, and analysis. Audio and visual recording equipment and strategies for obtaining a quality recording will be illustrated. A range of technologies will be discussed, including web-based products and a database that increases efficiency while maintaining compliance with HIPAA and the IRB. Presenters will share their experiences of collecting speech outcome data within busy clinical settings. Audience discussion will be facilitated to share successes and challenges related to conducting speech outcome studies.

**Disclosure:** Salary - Authors receive salary from employment in hospitals and universities related to cleft and craniofacial care, connected to this session. Contracted Research - Americleft Speech Project is supported by a NIDCR grant. All authors receive consulting financial support or are contracted for this except Anna Thurmes. Professional - Authors are members of the Americleft Speech Group, ACPA, and ASHA SIG 5. Adriane Baylis: ACPA Council Member; ASHA SIG 5 Coordinating Committee and Editor, SIG 5 Perspectives. Angela Dixon: Member of Professional Development Committee for ASHA SIG 5 Kristina Wilson: ACPA Chair of Archives Committee, member of ethics committee; ASHA Member of SIG 5 Coordinating Committee

## 67 MULTIDISCIPLINARY STRATEGIES TO AVOID AND TO TREAT SHORT AND LONG-TERM COMPLICATIONS OF NEONATAL MANDIBULAR DISTRACTION

**Michael Lypka** (1), Jeffrey Goldstein (2). (1) Children's Mercy Hospital, Kansas City, MO, (2) Children's Mercy Hospital, Kansas City, MO

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BACKGROUND & PURPOSE: In many institutions, mandibular distraction has become the primary management of the neonate with a hypoplastic mandible and respiratory compromise. Yet distraction is associated with multiple short and long-term complications. Short-term perioperative complications include infection, distractor malfunction, malunion, partial or complete facial nerve injury, and failure leading to tracheostomy. Long-term complications include TMJ ankylosis, mandibular growth restriction, facial asymmetry, excessive neck scarring, and dental injuries. A multidisciplinary team approach is necessary to identify neonates who would benefit from this procedure, and who are more likely to fail. Specialists in the newborn period include the neonatologist, pulmonologist, radiologist, occupational therapist for feeding, geneticist, otolaryngologist, cleft team nurse coordinator, respiratory therapist, anesthesiologist, neonatal and operating room nurses, and the performing surgeon. This course will identify the necessary components of the workup to determine if distraction or another modality of treatment is the appropriate management for each individual neonate. Once distraction is decided upon, preoperative virtual surgical planning is usually undertaken, leading to necessary operative precision. This course will emphasize the techniques of surgical planning including the use of three-dimensional medical modeling and virtual surgical planning as well as emphasizing the importance

of the vector of distraction. In addition, important technical steps of the procedure will be demonstrated. Longer-term complications also require a multidisciplinary approach. The timing and treatment of TMJ ankylosis will be presented, again emphasizing preoperative planning with three-dimensional medical models and virtual surgical planning, as well as the intra-operative use of distraction. Multidisciplinary management of secondary growth restrictions, malocclusions, and dental concerns will also be addressed in detail. Lastly, techniques and principles at the time of neonatal distraction to minimize these early and late complications will be presented.

METHODS & DESCRIPTION: The Study Session will be composed of lectures with time for audience interactions and questions.

## *68 SURGICAL MANAGEMENT OF VPD IN 22Q11.2 DELETION SYNDROME: MASTERS CLASS FOR THE SURGEON AND SLP

**Adriane Baylis** (1), Richard Kirschner (1). (1) Nationwide Children's Hospital, Columbus, OH

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BACKGROUND & PURPOSE: It is well-recognized that management of velopharyngeal dysfunction (VPD) in children with 22q11.2 deletion syndrome (22q11DS) poses a challenge to surgeons and SLPs. Multiple reports in the literature confirm that even for clinicians with extensive cleft/craniofacial experience, speech surgery outcomes for 22q11DS are often less optimal than that of children with cleft palate or other causes of VPD. The nature of VPD in 22q11DS is complex, and thus treatment planning and surgical technique must be tailored to syndrome-specific and patient-specific factors to optimize outcome. The purpose of this masters' class is to provide a comprehensive overview of the multifactorial nature of VPD in 22q and an algorithm for successful surgical-speech management.

METHODS & DESCRIPTION: This course will cover (1) presurgical speech assessment and guidelines for VP imaging, (2) preoperative medical evaluation and surgical planning for 22q11DS, (2) surgical techniques and modifications, (3) perioperative airway management, and (4) post-operative monitoring and speech outcomes assessment. Discussion of the various risks and benefits, as well as a summary of the current literature base, regarding pharyngeal flap vs sphincter vs Furlow palatoplasty procedures, will be included. This course will be presented by a plastic surgeon and SLP who currently direct a large 22q Center at a pediatric academic medical center with over 25 years of combined experience in the treatment of VPD in 22q11DS, have conducted clinical research on 22q11DS and have published and presented at the national and international level on this topic. Format of this course includes a combination of lecture, video and audio case examples, and extensive audience participation.

**Disclosure:** Salary - Both authors receive a salary from Nationwide Children's Hospital and the Ohio State University. Professional - Both authors are members of ACPA Council. Dr. Baylis is also on the Coordinating Committee for ASHA SIG 5.

## 69 NASOALVEOLAR MOLDING AND COLUMELLA ELONGATION

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BACKGROUND & PURPOSE: This in-depth instructional course addresses NasoAlveolar Molding and Columella Elongation from a clinical viewpoint. We present a greater then 20-year experience with NasoAlveolar molding (NAM) and presurgical columella elongation in infants born with unilateral (UCLP) and bilateral (BCLP) clefts of the lip, alveolus and palate. The purpose of this study session is to describe the clinical method, review the current NAM literature and report our long-term clinical research findings. The target audience for this study session is the clinician who seeks a better understanding of the NAM technique and clarity regarding the controversy associated with presurgical infant orthopedics.

METHODS & DESCRIPTION: In this Study Session, we present NAM as a paradigm shift from the traditional methods and objectives of presurgical infant orthopedics. NAM addresses the deformity of nasal cartilages and deficiency of columella tissue in UCLP and BCLP. This technique utilizes wire and acrylic nasal stents, attached to the vestibular shield of an oral molding plate to mold the nasal alar cartilages into normal form and position during the neonatal period. The objective of presurgical NAM is to reduce severity of the nasolabial and alveolar deformity, enhancing conditions for a successful surgical repair. Utilization of the NAM technique has eliminated surgical scars associated with traditional columella reconstruction, reduced the number and cost of revision surgeries and has become the standard of care in this Cleft Palate Center. Current research and long term clinical outcomes will be reported. The format will be informal, allowing for questions and answers both during and after presentations.

## *70 NASOPHARYNGOSCOPY: METHODS FOR OBTAINING A SUCCESSFUL EXAMINATION WITH PRESCHOOL CHILDREN AND INTERPRETATION OF FINDINGS FOR SURGICAL PLANNING

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BACKGROUND & PURPOSE: Nasopharyngoscopy allows direct visualization of the velopharyngeal valve during speech. Therefore, it is commonly used by craniofacial professionals to evaluate velopharyngeal function and dysfunction. Nasopharyngoscopy can show the size, shape, location, and cause of a velopharyngeal opening. This information is valuable in determining the best surgical procedure to achieve the most successful outcome for the patient. If either residual hypernasality or nasal emission is noted after secondary surgery, or if there is evidence of airway obstruction, nasopharyngoscopy is particularly useful in determining the type of treatment or revision surgery that is needed for further correction. Although nasopharyngoscopy is an excellent diagnostic procedure, it can be challenging to perform on young children. The purpose of this session is to provide methods, tips, and tricks for obtaining a successful nasopharyngoscopy evaluation in children as young as age three, while causing minimal distress to the child (and the parent). In addition, this session will focus on interpretation and use the nasopharyngoscopy findings to determine the surgical procedure that has the best chance of success for each individual patient.

METHODS & DESCRIPTION: In this study session, the presenter will discuss the basic techniques of nasopharyngoscopy and also describe some tips and tricks to elicit necessary cooperation from very young children. The presenter will then explain how nasopharyngoscopy can be used to determine the size, shape, location, and cause of the velopharyngeal opening. Numerous short videos of nasopharyngoscopy examinations will be presented for participants to evaluate and discuss. The presenter will describe how the nasopharyngoscopy findings can be used to determine which surgical procedure has the best chance of a successful outcome for the patient. Finally, the presenter will discuss how nasopharyngoscopy can be used to evaluate secondary surgery for velopharyngeal insufficiency in order to develop appropriate strategies for revision, when necessary.

**Disclosure:** Royalty - from textbook: Kummer, AW. (2014). Cleft Palate and Craniofacial Anomalies: Effects on Speech and Resonance, 3rd Edition. Clifton Park, NY: Cengage Learning.

## *71 A "HANDS ON" THREE DIMENSIONAL EAR FRAMEWORK CARVING WORKSHOP

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BACKGROUND & PURPOSE: Microtia reconstruction continues to be a challenging endeavour for all plastic surgeons. Previous training methods have proved inadequate to prepare reconstructive surgeons for an autogenous ear reconstruction using costal cartilage. Surgical simulation is becoming an increasingly effective way to augment traditional surgical teaching. We have a developed a three dimensional rib cartilage model, a three dimensional ear framework model as well as an iPad app for teaching ear reconstruction.

METHODS & DESCRIPTION: The course would consist of a 1.5 - 3 hour workshop where the participants carve an ear framework from the rib model. They would be supervised by the faculty during the carving process to optimize the potential for success. Surgical instruments and all models would be provided.

**Disclosure:** Professional - Dr. Wilkes has acted as a consultant for KLSMartin for which he receives no remuneration. KLSMartin markets the ear training model used.

# Abstracts

## *72 FEEDING AND SWALLOWING CONCERNS IN THE CHILD WITH CLEFT PALATE OR CRANIOFACIAL SYNDROMES: INTRODUCTION, TRAINING, AND DISCUSSION

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BACKGROUND & PURPOSE: While cleft lip and palate (CLP) is the most prevalent birth defect in the United States (CDC, 2006), very little research is available regarding the best practices for feeding in this population.
A review of the available literature on feeding interventions revealed vague recommendations that primarily consisted of the use of squeezable versus rigid bottles, and no evidence for the use of maxillary plates (Bessell et al., 2011; Reid, 2004). Currently, no recommendations exist for the best use of specific bottles or nipples, or how to best instruct parents. Infants who have cleft palate, with or without cleft lip as part of a syndrome, may have additional feeding and swallowing difficulties due to the other associated characteristics within a particular syndrome or association. Feeding modifications may include those typically used for infants with isolated cleft palate, with or without cleft lip, with additional positioning compensations, nipple modifications, and supplemental feedings. The scope of practice for the SLP has been gradually increasing over the past ten years, which has had the unfortunate impact of decreasing the amount of training students receive for CLP and related craniofacial syndromes. Consequently, there are fewer professionals who can provide this training and fewer graduate programs that are even offering such coursework. In addition, opportunities for collaboration and collective problem-solving and knowledge sharing are limited.
The combined issues of a lack of practice standards and hesitant clinicians results in a population that has the potential to be underserved. The purpose of this presentation will be to provide foundational knowledge and hands-on experience with special bottles / feeding equipment related to feeding practices for clinicians working with children with CLP and other cleft related syndromes and disorders. In addition, challenging cases will be presented with the opportunity for small-group discussion and large-group consensus to be conducted.

METHODS & DESCRIPTION: The presentation will begin with a brief overview of cleft anatomy & physiology related to feeding and swallowing, and a short description of specific feeding practices for children with CLP at four age-related stages. Within each stage, the effect of CLP on the typical developmental course of feeding skills will be emphasized. Feeding issues specific to cleft related syndromes and disorders will be addressed. Demonstration and hands-on experience with specific cleft feeders will be provided. Finally, a moderated small and large group discussion of two to three challenging cases will be presented, in order to practice collaborative problem-solving and allow for sharing of audience experience and knowledge. Throughout the presentation, the authors will focus on the evaluation process and an interdisciplinary team management approach. Encouraging clinicians to feel confident and competent working with this population is the overall goal.

**Disclosure:** Salary - Salaries received at our respective positions for work involved with cleft and craniofacial clinical service delivery or teaching. Royalty - Mandulak receives a quarterly royalty for two online continuing education programs regarding assessment and treatment of cleft palate speech disorders. Professional - Mandulak and Dailey both serve on ASHA committees related to cleft lip and palate (Special Interest Group 5). Mandulak serves on the Board of Directors for a non-profit (Smile Oregon) that provides access to care for children with cleft and craniofacial disorders (mostly financial support).

## 73 DENTO-SKELETAL RECONSTRUCTION OF THE PATIENT WITH A FACIAL CLEFT

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BACKGROUND & PURPOSE: This study session will provide a comprehensive discussion focusing on dento-skeletal aspects from birth, through adulthood through an integrated surgical, dental, orthodontic and prosthodontic management. The session will focus on infant orthopedic appliances, timing of cleft alveolar bone grafting, indications for premaxillary repositioning, management of cleft orthognathic surgery, dental and orthodontic intervention and prothodontic management with osseointegrated implants and bridges. With over 2 decades of experience, emphasis will be placed on a thoughtful restrospective assessment, technical nuances, management of failures and complications from each specialty. The material will be presented in a lecture format, but with active open dialogue for audience participation. Audience members will gain an appreciation for an organized, concrete algorithm to managing the skeletal component of cleft deformity grounded in experience.

METHODS & DESCRIPTION: Study Session Lecture Format 90 minutes Still Images and Video Presentation.

## 74 PATIENT TREATMENT BURNOUT FOR INDIVIDUALS WITH CLEFT AND CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: The purpose of this presentation is to explore patient perspective and the contributors to patient burnout. Patient treatment burnout being when the patient is resistant to following a treatment plan despite potential positive outcomes. Qualitative research indicates that burnout can be experienced by cleft and craniofacial patients. It is important for Health Care Professionals to understand the patient perspective and mental and emotional needs as they are a part of patients overall health. Best practice should incorporate potential patient burnout into the initial treatment plan.

METHODS & DESCRIPTION: This session will consist of a lecture format and power point presentation. Information will include a combination of literature review as well as results from focus groups and case studies of affected individuals while applying biopsychosocial theories to patient care.

## 75 CLEFT CARE FOR INTERNATIONALLY ADOPTED CHILDREN: CHALLENGES AND STRATEGIES

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BACKGROUND & PURPOSE: Congenital facial clefting involving the lip and/or palate are some of the most common birth defects worldwide, with an average incidence of 1:750 live births. These children may or may not have coincident syndromes and/or other associated medical problems. In some countries these children are frequently abandoned or put up for adoption. As a result, cleft teams can see an influx of children with cleft conditions originating from other countries who may or may ot have already had surgery or other interventions. Helping these adoptive families establish a new care plan and determine what these children's needs will be can be very challenging for Cleft Team members. In addition there is the possibility for other medical, genetic, speech and language, or behavioral issues that can further impact their care.

METHODS & DESCRIPTION: This presentation will use a power point format to delineate the process of international adoption of children with a cleft condition and their integration into a comprehensive cleft team. Case examples will be used to highlight challenging surgical and medical situations with which these patients may present. This includes previous surgeries, typical and atypical developmental delays, language acquisition, common infections, and a variety of nutritional challenges. Understanding what additional challenges these children may provide can help the cleft team and family work more effectively at obtaining optimal outcomes for these patients.

## 76 SOCIAL AND SUPPORT SERVICES OFFERED BY CRANIOFACIAL CENTERS: A NATIONAL SURVEY AND INSTITUTIONAL EXPERIENCE

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BACKGROUND & PURPOSE: The needs of patients with craniofacial abnormalities are complex and multifaceted. A multidisciplinary care approach throughout the life of the patient is standard of care. However, the availability of services is not uniform. Furthermore, sources of funding differ across institutions. The purpose of this investigation is to evaluate the availability of services provided by Craniofacial Centers, and the sources of funding for each service.

METHODS & DESCRIPTION: A survey was submitted to the team leaders of all approved American Cleft Palate-Craniofacial (ACPA) teams (N=161). The survey focused on auxiliary services considered to be potentially beneficial, as well as sources of funding for these services. The areas of interest included dedicated social work staff, Craniofacial Center-sponsored parties, support groups, summer camps, scholarship opportunities, and social media interaction. A second survey was administered to patient families inquiring about interest in these services, on a scale from one to five, with five indicating maximal interest.

RESULTS: 29 out of 161 (18%) of ACPA team leaders responded to the survey, and 39 out of 54 (72%) families. 79% of Craniofacial Centers offer social work or similar support, of which the majority (61%) are funded by the hospital. 31% of respondents host outside events such as parties, with 60% of those paid for by fund-raising. 48% of respondents offer support groups to parents, while only 29% offer support groups to patients. 25% of Centers provide summer camp opportunities for patients. No respondents offered scholarship opportunities to patients. Finally, 37% of respondents utilize social media to connect with patients and families. Patient families surveyed indicated an average interest of 2.4 out of 5 for support groups, 3.2 out of 5 for Facebook/social media, 2.9 out of 5 for parties, 2.5 out of 5 for summer camps, and 4 out of 5 for scholarships.

CONCLUSIONS: Auxiliary service utilization is heterogeneous among Craniofacial Centers. Interest in these services at our institution is above average for all groups with the exception of support services, and highest for scholarship opportunities, which is the least offered service among respondents. Sources of funding are likewise heterogeneous among Craniofacial Centers.

## 77 LONGITUDINAL PREDICTORS OF QUALITY OF LIFE AND SELF-IMAGE FOR CHILDREN AND ADOLESCENTS WITH CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Existing literature on psychosocial outcomes in the craniofacial population indicates that adverse psychosocial experiences have been linked to lower quality of life in children and adolescents with craniofacial conditions (Topolski, Edwards, & Patrick, 2005). Additionally, youth with a craniofacial anomaly have been found to have lower satisfaction with their appearance than controls (Hunt et al., 2006), and satisfaction with appearance has been identified as a predictor of overall psychosocial adjustment (Berger & Dalton, 2011). Despite the focus on quality of life and self-image as important constructs within this population, few studies have addressed factors which may impact changes in these variables over time. The present study aims to identify factors that contribute to changes in quality of life and self-image in children with craniofacial conditions.

METHODS & DESCRIPTION: Retrospective chart review was conducted for patients seen in craniofacial team clinic between March 2011 and August 2014. Patients ages 8 to 18 who were seen for both initial and follow-up visits with more than 6 months and less than 2 years between visits were included in the sample. Information gathered via chart review included medical and surgical history, findings from clinic psychosocial evaluations, and child self-reported scores from questionnaires given at clinic visits (PedsQL and craniofacial screening questionnaire).

RESULTS: The sample consisted of 68 patients (57.4% male, mean age 12.79). Hierarchical multiple regression was used to identify predictors of self-reported PedsQL scores at follow-up. Worry about others' perception of appearance at baseline predicted PedsQL scores at follow-up, after controlling for initial PedsQL scores and time between visits ($R^2$ = 0.56; p = 0.01). Other variables of interest (interim surgery, mood symptoms, and social support) were not significant in this model. Hierarchical multiple regression also was utilized to identify predictors of self-image composite scores at follow-up. After controlling for self-image scores at baseline and time between visits, depressive symptoms reported at baseline and craniofacial surgery between visits together ( $R^2$ = 0.47; p < 0.05) were found to predict self-image scores at follow-up.

CONCLUSIONS: These findings suggest that worry regarding the social impact of a facial difference may act as a risk factor for poorer quality of life over time. Additionally, depressive symptoms at baseline may put patients at risk for lower self-image ratings in the future, while undergoing craniofacial surgery appears to predict higher self-image ratings at follow-up. Further research is warranted to examine the differential effects of various types of surgery on self-image. Interventions targeting self-image also should be evaluated to determine efficacy in improving quality of life.

## 78 MY MOTHER, MY DAUGHTER, MY SELF: THE MOTHER-DAUGHTER RELATIONSHIP & THE INFLUENCE OF FACIAL DIFFERENCE

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BACKGROUND & PURPOSE: While research on facial differences has burgeoned in recent decades, critical scholars note that the existing literature overemphasizes the negative impacts of living with a difference, and limits the discussion of individuals' relationships, especially with their parents. The purpose of this study was to examine the mother-daughter relationship when the daughter is living with a facial difference. The present study sought to answer the following: a) what role do mothers play in helping their daughters navigate through medical, family, social and media systems?; b) in what ways do mothers influence their daughters' adolescent development?; c) what has a daughter's facial difference contributed to her sense of self and her relationship with her mother?; and d) is the relationship different when the mother is also living with a facial difference?

METHODS & DESCRIPTION: Ten daughters, age 13-22 with facial differences, and 12 mothers were recruited through a community organization and interviewed individually. The majority of participants were living in Canada, while one mother lived in the United States. Interview transcripts were analyzed using thematic analysis.

RESULTS: Mothers assumed a number of roles in their daughters' lives, including their advocate, physical and emotional support, coordinator, defender, educator, gatekeeper, and liaison. Mothers similarly communicated empowering messages of validation to their daughters about adolescent issues, so to afford them emotional armour in the face of marginalization. Mothers and daughters also demonstrated "exquisite attunement" in their relationship, respecting each other as vital sources of learning and support. Mothers and daughters also felt the facial difference had afforded them an increased sense of personal strength and respect for others. Finally, while there were few differences found between mothers with and without facial differences, mothers without facial differences were more likely to equate their own insecurities growing up with their daughters' experiences with their facial differences, whereas mothers with facial differences were far less willing to acknowledge that they knew what their daughters were experiencing.

CONCLUSIONS: The results the study demonstrates that mothers are far more in-tune with their children than previously suggested, and that mothers assume roles that are very similar to mothers raising children without facial differences, albeit more frequently or earlier in development. Furthermore, the results reflect that the mother-daughter relationship is a critical site of resistance and renewal for both members of the dyad. Lastly, the results also suggest that there are potentially positive contributions of facial difference to the lives of individuals living with facial differences and their families that need to be acknowledged.

## 79 GLOBAL ACADEMIC FAILURE IN THIRD GRADE AMONG CHILDREN WITH AN ISOLATED NONSYNDROMIC CLEFT: A POPULATION BASED STUDY IN NORTH CAROLINA

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BACKGROUND & PURPOSE: Children with isolated orofacial clefts (OFCs) may experience learning impairments affecting academic achievement. This study examined the association between presence of isolated nonsyndromic OFC and global academic failure in both reading and math on third grade end of grade assessments (EOG).

METHODS & DESCRIPTION: We identified 559 children with an isolated OFC (531 isolated nonsyndromic, 5 suspected Pierre Robin sequence, and 23 with diagnosed Pierre Robin sequence) from the North Carolina Birth Defects Monitoring Program, and a random sample of 6,822 children without a structural birth defect identified from birth certificates born between 1997 and 2003. We classified children by cleft type (cleft lip alone (CL), cleft lip with cleft palate (CLP), cleft palate only (CPO)) and matched subjects to NC Department of Public Instruction EOG scores from grades 3-8. We estimated the odds of failing third grade reading and math EOG tests among children with an isolated OFC and by cleft type using logistic regression controlling for maternal education, race, and public pre-k enrollment. A "failing score" is the inability to demonstrate proficiency in NC State Standards.

RESULTS: In adjusted models, children with an isolated OFC were 28% (OR: 1.28, 95% CI: 0.98, 1.68) more likely to experience global academic failure in third grade compared to children without a known structural birth defect. Among all children with an isolated OFC who failed both assessments, 51% had CLP. Children with CLP were 1.74 times as likely to fail both reading and math assessments compared to children without a structural birth defect (OR: 1.74, 95% CI: 1.19, 2.56).

CONCLUSIONS: Children with CLP may be more likely to experience academic failure in both reading and math in early elementary school. Additional support service may be required to promote academic success in this population.

## 80 MEASURING QUALITY OF LIFE, ANXIETY AND DEPRESSION IN 101 CONSECUTIVE ADOLESCENTS WITH CLEFT LIP AND CLEFT PALATE

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BACKGROUND & PURPOSE: Because the face is critical and unique in human development and social interactions, having a cleft lip and/or cleft palate (CL/P) can put youth at higher risk for psychosocial difficulties than their non-affected peers. Stigmatizing social responses to facial disfigurement can lead to negative self-perceptions of competence and physical attractiveness. Our aim is to see if our adolescent patients have increased levels of anxiety, depression and/or poor quality of life (QOL) as a result of having a CL/P and if their current quality of life can be correlated with severity of the initial cleft, presence of velopharyngeal insufficiency (VPI), age, race, sex or socioeconomic status (SES).

METHODS & DESCRIPTION: Children aged 11-18 who were seen in the TCH Cleft Clinic and consented to participate were administered the PROMIS anxiety and depression questionnaires and the YQOL-FD (Youth Quality of Life-Facial Differences) questionnaire which assesses five domains: negative consequences of having a facial difference, negative self image, experienced stigma, positive consequences of having a facial difference, and coping. Data was also collected on the type of cleft (cleft lip only, unilateral cleft lip and palate or bilateral cleft lip and palate), age, race and sex of the patient and presence of VPI. Cleft palate only patients were excluded. Children who scored outside the normal range for anxiety, depression or coping were referred to neuropsychiatry for additional testing. Means and standard deviations of the scores were reported Kruskal-Wallis Tests (for 3 or more groups) and Wilcoxon rank tests (for 2 groups) were applied to test for differences between genders, diagnoses, races, and hypernasality. Multivariate regressions were applied as well.

RESULTS: 101 children (52 female, 49 male) enrolled; 4 CL only, 27 Bilateral CL/P and 74 unilateral CL/P. Average age 14.5 years, SD 2.4yrs, 54 Hispanic, 35 White, 6 Asian, 5 African American. Anxiety Score 46.6 +/- 11.7, Depression Score 46.2 +/- 11.9, Negative Consequences 36 +/- 29.7, Positive consequences 57.4 +/- 27.1, Coping 55.4 +/-30.1, Stigma 26.1 +/- 23.6. In univariate analysis, the anxiety and depression scores differed significantly by gender (P=0.001). There are no differences among the 3 different diagnoses for Anxiety Score or Positive Consequences, (P=0.73) and (P=0.12). In multivariate analysis, females were expected to have 9.0 +/- 2.3 points higher Anxiety scores (P<0.0001) and 8.7 +/- 2.2 points higher depression scores after adjusting for other risk factors. Females were more likely to report negative consequences, as were children with unilateral cleft lip and palate.

CONCLUSIONS: Children with CL/P are at significant risk of having anxiety, depression and decreased quality of life, especially our adolescent females. More research and a higher index of suspicion are needed to determine the timing and best intervention strategy for patients and families.

## 81 LONGITUDINAL ANALYSIS OF HYPERNASALITY IN SCHOOL-AGED CHILDREN WITH REPAIRED CLEFT PALATE

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BACKGROUND & PURPOSE: Hypernasality is one of the primary symptoms of velopharygeal (VP) dysfunction in children with repaired cleft palate. While there is rather robust evidence of changes in voice and speech parameters such as fundamental frequency (fo) and speaking rate with age, there is little evidence to show if hypernasality changes with age. The purpose of this study was to determine a) if hypernasality changed in children with repaired cleft palate from ages 5 to 7 years, and b) what specific speech parameters accounted for ratings of hypernasality.

METHODS & DESCRIPTION: Twenty-three children (7 males, 16 females) with repaired nonsyndromic cleft palate (21 cleft lip and palate, 2 cleft palate only) were recorded at two or three time points for a total of 53 recordings between the ages of 5 to 7 years. Seven children were recorded at three time points corresponding to ages 5, 6, and 7. The remaining 16 children were recorded for two of the three ages. None of the children had secondary palatal surgeries and/or oronasal fistulas. Recordings consisted of the children counting from one to five. Nine adult listeners used direct magnitude estimation (DME) to judge the hypernasality of the children at different ages. A reference sample with a modulus value of 100 was used to judge the recordings. Mean fo, speaking rate in syllables-per-second (SPS), mean duration of voiced segments, percentage of voicing, and mean relative intensity were determined from the audio recordings as potential explanatory variables. Linear mixed models with random intercepts and slopes and with age as a categorical fixed effect were used to evaluate the data; voice/speech parameters were assessed by adding them to the model individually.

RESULTS: Inter-listener reliability of DME was moderately high as reflected by an intraclass correlation coefficient of .837. On average (geometric means), listeners rated hypernasality as 138.5 (SE 13.4) at age 5, 119.9 (SE 9.6) at age 6, and 118.3 (SE 11.6) at age 7. Thus, hypernasality was rated to be approximately 38% greater at age 5 (relative to the modulus value) with this effect declining to about 20% at ages 6 and 7. While the F-test for overall differences across ages was not significant at the .05 level (p=.099), there was a significant difference between ratings at ages 5 and 7 (p=.037) and a nearly significant difference between ages 5 and 6 (p=.069) in post hoc tests. Had the sample size been larger, both the main effect of age as well as pairwise comparisons would likely have reached statistical significance. None of the voice/speech parameters was statistically significant in accounting for hypernasality adjusting for age.

CONCLUSIONS: These findings suggest that perceived hypernasality tends to decrease as a function of increasing age in school-aged children with repaired cleft palate. The findings will be discussed relative to possible physiologic reasons and diagnostic decisions relative to the necessity and/or timing of secondary surgical interventions.

## 82 IMPACT OF ACHIEVING VELOPHARYNGEAL SUFFICIENCY EARLY IN MAXIMIZING CHILDREN'S ARTICULATION PERFORMANCE

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BACKGROUND & PURPOSE: Medical professionals interested in improving speech outcomes of children with cleft palate have debated the impact of timing of primary palatoplasty. One confounding variable in determining this effect is the adequacy of the initial repair, which may not create a sufficient speech mechanism. The current study investigates the following relationships: 1) the impact of age at which velopharyngeal sufficiency (AgeS) is established on articulation and 2) the effect of severity of persistent velopharyngeal insufficiency (VPI) on the articulation outcomes of children with repaired cleft palate.

METHODS & DESCRIPTION: Children between 3 and 9 years of age (N=108) with nonsyndromic cleft palate with or without cleft lip were recruited. All children participated in pressure-flow testing of VP function and the Goldman-Fristoe Test of Articulation-2nd Edition (GFTA). GFTA transcriptions were used to identify the presence and number of cleft related speech errors (e.g., backing and nasal substitutions [CRE]). For children determined to have sufficient VP function based on pressure flow testing (n=73), AgeS was estimated based on medical chart review (age at most recent VP surgical procedure). We used ordinary least squares regression (OLS) with robust standard errors to analyze the relationship between AgeS and performance on the GFTA as well as number of CRE after controlling for parent SES, adoption status, gender, and age at time of assessment. The impact of severity of persistent VPI (pressure-flow gap size) on articulation was analyzed in regression models, controlling for the covariates listed above. A linear probability model was used to analyze the relationship between both AgeS and gap size with presence of CRE, again with the same controls.

RESULTS: The OLS regression model revealed a statistically significant relationship between AgeS and GFTA score (B=-2.91, p=0.04). AgeS also contributed meaningfully towards the presence of CRE (B=0.07, p=0.04), but not number of CRE. When examining the impact of severity of VPI on articulation performance, a statistically significant correlation was found between gap size and GFTA score (B=-.68, p = .01,), presence of CRE (B=.02, p=.01), and number of CRE (B=.70, p<.001). Analysis of descriptive statistics (e.g., mean GFTA score as well as score range) also suggested a clinical threshold shift in GFTA scores at 2-3mm2 gap size, with children who demonstrated area measures above that limit having lower performance on articulation measures.

CONCLUSIONS: A negative effect of older age at VP sufficiency on standardized articulation score and presence of CRE was identified, suggesting that prolonged VPI continues to impact articulation even after sufficiency is established. Furthermore, increased VP area measurements were associated with worse articulation and higher rate of cleft related articulation errors. These findings highlight the importance of active assessment and monitoring of VPI in children with cleft palate.

## *83 PREDICTORS OF HYPERNASAL SPEECH IN CHILDREN WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: Management of velopharyngeal dysfunction (VPD) in children with 22q11.2 deletion syndrome (22q) poses a unique challenge due to its multifactorial etiology. A combination of both structural and neuromuscular factors has been shown contribute to VPD in 22q (Hultman et al., 2001; Baylis et al., 2009). The purpose of this study was to investigate group differences in VP physiology and ratings of hypernasality in children with 22q, as compared to age-matched nonsyndromic peers with and without VPD.

METHODS & DESCRIPTION: Participants included 21 children with 22q (n=13 with a pharyngeal flap), 9 children with repaired cleft palate (CLP group), and 18 noncleft typically-developing children (TD group) matched for age and gender. Participants completed a perceptual speech evaluation, nasometry, and pressure-flow (PERCI-SARS) testing. A subset completed nasopharyngoscopy. Procedures were recorded and a standard speech sample was used. Measures of VP physiology included: VP orifice area (VPA), peak intraoral pressure (IOP), nasal airflow (peak V) and VP closure timing as derived from the duration of the nasal airflow pulse (V pulse) in the stimulus "hamper." Blinded listener ratings of hypernasality were obtained using visual analog scaling (VAS). Results were analyzed using descriptive statistics, one-way ANOVA, and regression analysis.

RESULTS: Statistically significant differences were detected between the groups on IOP, peak V, VPA, V pulse, and VAS ratings (all p<.005). Post-hoc analysis revealed that the 22q and CLP groups were similar on many of the aerodynamic variables. VAS ratings of hypernasality were significantly higher for the 22q and CLP groups than the TD group (p<.0001). VPAs and nasalance scores for the 22q and CLP groups were not significantly different. Nasalance scores were highly correlated with VAS ratings of hypernasality (R2= 0.664) and modestly with VPAs (R2 = .397). Linear regression analysis revealed that VPA (R2=0.312, p<.001) was a significant predictor of VAS ratings of hypernasality, however a polynomial (curvilinear) model best predicted the relationship between VPA and VAS ratings for all participants (R2=0.509). Results of VP imaging analysis are pending.

CONCLUSIONS: Overall, the 22q group behaved similar to the CLP group across most measures of VP physiology and ratings of hypernasality, with some individual differences observed. A curvilinear relationship was observed between VP orifice size and listener ratings of hypernasality. Interestingly, some participants with 22q with minimal aerodynamic evidence of VPD (i.e., aerodynamic findings consistent with "adequate" closure per Warren et al., (1964)), were still perceived to have hypernasal speech. Other factors such as rate, pitch, or articulation, may play an important role in determining listener judgments of hypernasality in children with 22q and warrant further investigation.

**Disclosure:** Salary- All authors receive a salary at their respective academic institutions and medical centers. Professional - Dr. Baylis and Dr. Kirschner serve on Council of the American Cleft Palate Craniofacial Association. Dr. Baylis also serves on the Coordinating Committee of ASHA SIG 5.

## 84 PRE AND POST-PUBERTAL CHANGES: THE EFFECT OF GROWTH ON THE VELOPHARYNGEAL ANATOMY

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BACKGROUND & PURPOSE: Horizontal and vertical dimensions of the vocal tract across growth are critical factors that relate to the ability to execute proper velopharyngeal (VP) function. Studies have demonstrated a significant sex effect in the length of the vocal tract and the relative proportions of oral and pharyngeal cavities (Fitch & Giedd, 1999). However, these sex differences were not evident in children prior to puberty. The nasopharynx and velum display similar pubertal effects in which sex differences for nasopharyngeal area become significant only after 13 years of age (Jeans et al., 1981). Growth rates of nasopharyngeal soft tissue, however, are not aligned with pharyngeal growth rates (Jeans et al., 1981). It is not known how these soft tissue observations relate to the variations found in the underlying VP muscles. Perry et al. (2014) reported significant muscle differences between adult males and females. However, Kollara et al. (2014) did not observe a sex differences in children between 4-9 years of age. Growth effects of the VP port are seldom considered as factors of interest in surgical planning for pharyngoplasties involving augmentations to the pharyngeal space. The paucity of these data may thus negatively affect surgeries that involve the medio-lateral axis, such as those effecting the cranial vault or pharyngeal cavity. The purpose of this study is to examine the effects of growth, sex, and race on the VP musculature.

METHODS & DESCRIPTION: A high resolution, T2-weighted turbo-spin-echo 3D anatomical scan (SPACE) was used to acquire static velopharyngeal data on 114 children with normal velopharyngeal anatomy between 4-17 years of age. Children were divided into three groups based on age including: (1) pre-pubertal age (4-8 yr), (2) peri-pubertal (9-12 yr), and (3) post-pubertal (13-17 yr). Variables include the levator muscle, velum, VP port, vocal tract, and cranial base angle growth changes.

RESULTS: Consistent with previously published vocal tract data, a pubertal effect was observed for the levator muscle and velum. Significant racial differences were observed for the velum. Age was a significant factor ($p < 0.05$) across all muscle, velar, and vocal tract variables. Linear regression analyses demonstrated predictive factors of cranial base angle and vocal tract on the growth and changes in the levator muscle and velum. The four-variable model for levator muscle length (gender, race, age, and cranial base angle) is able to account for 51% of the variability for this muscle measure.

CONCLUSIONS: Results from this study demonstrate a pubertal effect on the interaction of sex and race variables in the VP anatomy. This information is valuable in understanding how changes in the height and depth of the VP portal are controlled by muscle variations.

## 85 PHARYNGEAL FLAP OUTCOMES BASED UPON AERODYNAMIC ASSESSMENT OF ORAL AND NASAL SPEECH SEGMENTS: PRELIMINARY FINDINGS

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BACKGROUND & PURPOSE: Pharyngeal flaps are arguably the most recommended secondary procedure to correct velopharyngeal inadequacy (VPI) for speech. While Peterson-Falzone et al. (2001) noted a wide range of reported success rates of 60% to 100% across studies, they also emphasized that "too many authors" used only vague categories of speech outcomes such as "normal" or "improved". They also noted that many studies did not consider overcorrection (i.e., hyponasality) as a negative outcome. Successful pharyngeal flap surgery should include adequate function for: 1) oral speech segments, 2) nasal speech segments, and 3) nasal breathing. The purpose of this retrospective study was to use aerodynamic criteria to evaluate oral and nasal speech segments following pharyngeal flap surgery in children with cleft palate.

METHODS & DESCRIPTION: Pressure-flow assessments were done on 14 children (9 boys, 5 girls) who underwent superior pharyngeal flap procedures by a single surgeon. They ranged in age from 3 to 15 years (mean=8.1 years); 12 had cleft lip and palate while 2 had cleft palate only. Mean interval from surgery to follow-up was 6.5 months (range of 3 to 12 months). Mean velopharyngeal (VP) orifice areas associated with the oral /p/ in the syllable /pi/ and the word "hamper" were categorized as "adequate" if less than or equal to 5 mm2; mean VP orifice area associated with the nasal /m/ in "hamper" was categorized as "adequate" if greater than 5 mm2.

RESULTS: Ten of 14 children (71%) were categorized as "adequate" on both oral speech segments following surgery. Eight of 12 children (67%) were categorized as "adequate" on the nasal speech segment (data not available for two children). Only 4 of 12 children (33%), however, were categorized as "adequate" on both oral and nasal speech segments.

CONCLUSIONS: Success of pharyngeal flap surgery for a single surgeon was moderately high when only oral speech segments were considered. When a more stringent criterion was used that included nasal speech segments, success rate was more measured. These preliminary results suggest the need for prospective studies that consider aerodynamic and perceptual outcomes of both oral and nasal speech segments to fully assess the success of pharyngeal flap surgery.

## 86 OUTCOMES ANALYSIS OF SURGICAL AND NON-SURGICAL INTERVENTION FOR NEONATES WITH PIERRE ROBIN SEQUENCE

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BACKGROUND & PURPOSE: Pierre Robin Sequence (PRS) is caused by micrognathia, which leads to glossoptosis and airway obstruction. Multiple treatment modalities are described including conservative treatment, bypass of the obstruction, airway repositioning and correction of the anatomic deficiency. This study presents an outcomes analysis of the largest series of neonates with PRS.

METHODS & DESCRIPTION: An IRB approved, 18-year retrospective review of all neonates treated with PRS was performed. Examined variables included patient demographics, syndromic and neurologic status, feeding outcomes, and polysomnography and microlaryngoscopy data.

RESULTS: 170 neonates were identified and divided into three cohorts based on initial treatment: conservative management (n=47), external mandibular distraction (MD, n=69) and tracheostomy (n=54). Neonates initially receiving tracheostomy were more likely to be syndromic (OR=2.93, p=0.005), have neurologic impairment (OR=2.54, p=0.03), GE reflux (OR=2.1, p=0.05) and require intervention within 5 days of birth (OR=60.65, p=0.005) compared with those receiving MD. Polysomnograms obtained pre- and post-intervention had similar significantly improved profiles for patients receiving both MD (obstructive index (OI) decrease 43.8 (p=0.03)) and tracheostomy (OI decrease 44.7 (p=0.008)). However those receiving MD had significantly greater avoidance of gastrostomy (19.1 vs 83.7%, p<0.0001) and higher success in exclusive oral diet (85.7% vs 38.9%, p<0.0001) compared to the tracheostomy patients. Four factors were found to strongly associate with failure of MD: low birth weight (OR=12.57, p=0.03), syndromic status (OR=8.48, p=0.05), neurologic impairment (OR=8.33, p=0.02) and poor post-intervention polysomnogram (OR=11.0, p=0.04). These factors may be used to predict those at risk for failure of MD with high sensitivity and specificity. Lastly, the presence of multilevel obstruction identified on microlaryngoscopy was not associated with need for tracheostomy (38.6% vs 26.9% for MD group, OR 1.77, p=0.22); and when present in patients receiving MD multilevel obstruction was not associated with higher failure rates (p=0.71).

CONCLUSIONS: Mandibular distraction is an efficacious treatment modality for neonates with PRS, and should be considered the first line intervention to avoid tracheostomy. Patient variables including birth weight, syndromic status, neurologic impairment and multi-level airway obstruction do not preclude the utilization of MD; however, predicting the future necessity of tracheostomy and the ability to decannulate following MD of these patients is less reliable. The presence of multi-level airway obstruction should not preclude the use of mandibular distraction to treat neonates with PRS-associated airway obstruction.

## 87 PREDICTING FAILURE OF MANDIBULAR DISTRACTION OSTEOGENESIS FOR INFANTS WITH ROBIN SEQUENCE: A BI-INSTITUTIONAL STUDY

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BACKGROUND & PURPOSE: The primary purpose of this study is to identify variables associated with failure of mandibular distraction osteogenesis (MDO) in infants with Robin sequence. The secondary purpose is to analyze the ability of the GILLS score to predict outcome of MDO in this patient population. We combined the clinical experience of two active infant distraction centers to collect sufficient MDO failures for statistical analysis resulting in the largest study of neonatal distraction to date.

METHODS & DESCRIPTION: A retrospective review (2004 – 2013) was conducted at two tertiary care children's hospitals. Infants with Robin sequence who underwent MDO as the primary surgical intervention at less than 6 months of age were identified. Variables reported in the literature to be risk factors for failure as well as those considered to be potential risk factors were analyzed. These included cardiac, Central nervous system (CNS), gastrointestinal, lower airway anomalies including laryngomalacia, genetic anomaly/syndromic diagnosis, isolated disease, Nissen fundoplication, intact palate, gastroesophageal reflux disease (GERD), preoperative intubation, late operation (> 2 weeks of age), and low birth weight (<2500 g). The GILLS score was calculated. Success of MDO was defined as avoidance of tracheostomy.

RESULTS: 91 consecutive infants were identified. Mean age at distractor placement was 36 days. Incidence rates included cardiac (22%), CNS (19.8%), gastrointestinal (36%), lower airway anomalies (23%), laryngomalacia (18.7%), genetic/syndromic diagnosis (33%), isolated disease (38.5%), Nissen fundoplication (14.3%), intact palate (18.7%), GERD (31.9%), preoperative intubation (13.2%) late operation (77%), and low birth weight (17.6%). Tracheostomy was needed after MDO in 6 patients (6.6%). Patient variables associated with failure of MDO were: CNS anomaly (p <0.0003), Nissen fundoplication (p <0.0007), and intact palate (p <0.0042). There were 3 deaths; none were related to obstructive sleep apnea. A score, INC, based on these risk factors was determined. For infants with < 3 risk factors, NIC predicts success with 99% sensitivity, 98% positive predictive value (PPV), 67% specificity, and 80% negative predictive value (NPV). The GILLS score resulted in a 79% sensitivity, 96% PPV, 50% specificity, and 14% NPV.

CONCLUSIONS: Central nervous system anomaly, need for Nissen fundoplication and intact palate are associated with failure of MDO in infants with Robin sequence. The INC scoring system based on the presence of these variables has a high sensitivity and positive predictive value and better predicts failure of MDO compared to the GILLS classification. Prospective analysis should be considered to validate the INC score.

## 88 LONGITUDINAL STUDY OF MIDFACIAL ADVANCEMENT IN EARLY INFANCY FOR RELIEF OF SYNDROMIC CRANIOSYNOSTOSIS-ASSOCIATED AIRWAY OBSTRUCTION. AN 8 YEAR FOLLOW UP

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BACKGROUND & PURPOSE: Midface advancement in early infancy has been previously described as an effective method for relief of Obstructive Sleep Apnea and tracheostomy decannulation in infants with Syndromic Craniosynostosis affected with severe midface retrusion. Concerns have been raised about detrimental effects on growth, risk of relapse, and need for secondary surgery. To our knowledge, there are no published studies addressing these issues. This study reports the 8 year clinical, cephalometric and polysomnographic results.

METHODS & DESCRIPTION: Prospectively collected data of the craniofacial clinic. Indications for surgery were severe Obstructive Sleep Apnea that failed a trial of BiPAP and would have otherwise undergone a tracheostomy. Patients that underwent midfacial advancement were followed with yearly polysomnogram, clinical evaluation, and photographic records. Post-Operative CT scans were obtained at 1 year and 5 years post operatively. Patients that were younger than 42 months of age at the time of operation were included in the study. Multiplanar reformats and Minimal Intensity Projection reformats were performed on the pre and post- operative CT scans to generate images a digital cephalogram suitable for Cephalometric Analysis. CT scans were selected from our Craniofacial Imaging Library from patients with sagittal synostosis to serve as control population.

RESULTS: Eight patients fit the inclusion criteria. Average age at operation was 22.3 months (range 6-42 months). All patients had intraoperative Nasoendoscopy to confirm nasal site of obstruction. Four patients had Crouzon Syndrome (50%), three had Apert's (37.5%) and one unconfirmed (12.5%). All patients underwent midface distraction using internal distractors, with a horizontal vector for Crouzon patients (as described by Denny et al) and a vertical oblique vector for Apert's patients (Marchac et al). 87.5% (7/8) underwent Midfacial advancement as part of a Monobloc/FrontoFacial advancement. 87.5% (7/8) underwent concomitant mandibular distraction using the internal curvilinear distractor (25%) or external multiguide (62.5%). Apnea Hypopnea Index improved from 46.2+/-12.1 preoperatively to 7.3+/-8.1 postoperatively. Longitudinal follow up showed mild worsening of the Polysomnographic data two years postoperatively, and 37.5% of patients (3/8) underwent ancillary airway procedures (Tonsillectomy and Adenoidectomy). No patient required a repeat Midfacial advancement. Patients were found to have an average of 1.4 CT scans per year, likely due to involvement of multiple specialties. Growth velocities of the Midfacial measurements (UPFH, UAFH and Facial depth) were found to be statistically significant at 0-24 month, but not at the 48-60 month intervals.

CONCLUSIONS: Midfacial advancement offers lasting relief of Upper Airway Obstruction. Transient limitation of growth velocities were observed, emphasizing the importance of mild-moderate overcorrection. These growth disturbances became undetectable after two years postoperatively.

## *89 EN BLOC SUBCRANIAL ROTATION DISTRACTION ADVANCEMENT FOR THE TREATMENT OF SEVERE OBSTRUCTIVE SLEEP APNEA IN YOUNG SYNDROMIC CHILDREN

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BACKGROUND & PURPOSE: Craniofacial Microsomia (CFM) and Treacher Collins Syndrome (TCS) have variable presentations, but both can present at a young age with symmetric subcranial clockwise rotation hypoplasia deformity with acceptable maxillo-mandibular (MM) relationship but with severe obstructive sleep apnea (OSA). Airway evaluation in these children demonstrates multiple levels of obstruction that cannot be treated with isolated jaw surgery resulting in tracheostomy dependence. Purpose: To describe the rotation deformity in symmetric CFM and TCS and to evaluate the success of simultaneous subcranial LeFort III rotation advancement with bilateral mandible ramal distraction lengthening in treating severe OSA.

METHODS & DESCRIPTION: Two children with CFM and one with TCS were included with AHI of 84 and 38 (TCS patient was tracheostomy dependent). Superimposition skullbase analysis was performed on CT scans pre- and post-treatment. OSA was measured using polysomnography. Patients were treated with subcranial LeFort III rotation advancement hinged at the nasion along with simultaneous bilateral ramal lengthening. They were maintained in MMF during activation, and the movement was driven by an external halo based device with simultaneous mandible distraction.

RESULTS: The MM plane rotated 20, 12, and 25 degrees respectively, and SNA increased 10, 8, and 11 degrees. AHI decreased from 84 to 1 and 38 to 3, with resolution of the need for tracheostomy.

CONCLUSIONS: Simultaneous clockwise rotation of the entire subcranial facial skeleton in primary dentition is possible. The differential advancement and the posterior lengthening of the maxilla and mandible had a dramatic effect on multi-level severe OSA to avoid tracheostomy.

**Disclosure:** Receipt of Intellectual Property Rights/Patent Holder - Richard Hopper is the inventor of a patented device licensed to KLS Martin. The device is not discussed in this presentation.

## 90 VOLUMETRIC CHANGES IN CRANIAL VAULT EXPANSION: COMPARISON OF FRONTO-ORBITAL ADVANCEMENT AND POSTERIOR CRANIAL VAULT DISTRACTION OSTEOGENESIS

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BACKGROUND & PURPOSE: The goal of cranial vault expansion in patients with syndromic craniosynostosis is to increase the intracranial volume and normalize the head shape. Traditionally, we have relied heavily upon single-stage procedures as our primary means of achieving these goals. The posterior vault holds a theoretically greater potential for volumetric change per millimeter advancement than does the anterior vault. Occipital flattening and the shallow posterior cranial fossa typically found in patients with syndromic craniosynostosis present significant functional and aesthetic problems which make the posterior skull an excellent focus for cranial vault remodeling. Posterior vault distraction osteogenesis (PVDO)can routinely provide advancements over 30 mm, and may provide a greater efficiency in volume expansion compared to single stage procedures such as FOA, but to date no clinical study comparing the volumetric gains of these two modalities has been carried out. The current study is a retrospective review of patients who underwent either FOA or PVDO to determine the gains in intracranial volume provided by each procedure.

METHODS & DESCRIPTION: This was a two-center retrospective study of pre- and post-procedure CT scans of two groups of 15 patients each with syndromic multi-suture craniosynostosis treated with either FOA or PVDO. CT data were analyzed volumetrically with Mimics software. In order to control for growth expected during the interval between the preoperative and postoperative CT scans, a normative data set of intracranial volumes of healthy infants was used. The standard growth curve formulated from this data set was used to estimate the change in intracranial volume expected from growth between the pre- and postoperative CT scans in each patient.

RESULTS: The means of age of PVDO patients at the time of surgery were was 19.9 months (+/- 15.2 months). The FOA group was then selected to have as close a mean age match and repeat procedure match as possible. The mean ages of the FOA group at the time of surgery was 20.2 months (+/- 20.3 months). The mean advancement for FOA was 12.5 mm (+/- 2.59 mm) and for PVDO was 24.8mm (+/- 6.71 mm). The mean difference in volume between the preoperative and postoperative CT scans was 144 cm3 for FOA and 274 cm3 for PVDO (p=0.009). After controlling for growth, the corrected mean volume difference was 66 cm3 for FOA and 142 cm3 for PVDO (p=0.0017). The corrected mean volume difference per millimeter of advancement was 4.6 cm3 for FOA and 5.8 cm3 for PVDO (p=0.357). Secondary changes in the cranial base below the distraction segment were noted in the PVDO group.

CONCLUSIONS: PVDO can provide more than twice the intracranial volume expansion obtained by FOA. This is largely attributable to the greater advancement of the distraction segment achieved by the expansion of the scalp that accompanies PVDO. A trend towards a greater volume gain per millimeter expansion in the PVDO group may involve secondary changes in the cranial base below the distraction segment.

## 91 NEW-ONSET CRANIOSYNOSTOSIS FOLLOWING POSTERIOR VAULT DISTRACTION OSTEOGENESIS

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BACKGROUND & PURPOSE: With posterior vault distraction osteogenesis (PVDO) being an increasingly popular choice for initial management of patients with syndromic craniosynostosis, there have been concerns raised about iatrogenic change to the patient's open posterior cranial sutures. The aim of this study is to document the incidence of new-onset craniosynostosis (NOC) following PVDO, to determine risk factors for the development of NOC, and to deduce the cranial ramifications of NOC.

METHODS & DESCRIPTION: An IRB-approved retrospective review of all patients who underwent PVDO at our center between 2008-2013 was performed. Demographics, peri-operative data, and pre-operative and post-operative 3D CT scans were analyzed. Cranial suture patency was assessed by 2 craniofacial surgeons independently, using fine-cut preoperative and postoperative 3D CT scans. Inter-rater agreement was evaluated using the Cohen's kappa coefficient. Statistical analysis was performed using Chi-squared and Fischer's exact tests.

RESULTS: 30 patients underwent PVDO for suspected increased intracranial pressure and/or severe turribrachicephaly during the study period. 24 patients (80%) had syndromic diagnoses. The average age at the time of PVDO was 2.03 years. Distraction distances ranged from 19 to 40 mm, with an average of 28.7mm. Among the 19 children who had patent lambdoid sutures prior to PVDO, 17 patients (89.5%) were noted to have new-onset lambdoid synostosis. New-onset lambdoid fusion was not significantly associated with age at distraction (p=0.28), gender (p=0.47), length of distraction (p=0.93), or diagnosis (p=0.61). Similarly, new-onset sagittal synostosis was observed in 7 of the 17 children who had previously had patent sagittal sutures (41%). NOC of the sagittal suture was also not associated with age at distraction (p=0.06), gender (p=0.64), length of distraction (p=0.83), or diagnosis (p=0.25). None of the patients who developed NOC had characteristic head shape changes such as mastoid bulges or scaphocephaly, all continued on their cranial growth curve, and no patients developed increased intra-cranial pressure during the study period.

CONCLUSIONS: New-onset lambdoid and sagittal synostosis occur frequently following PVDO. While the diagnosis of NOC may be obvious radiographically, the clinical significance of the diagnosis morphometrically, neurodevelopmentally, and in cranial growth have yet to be fully determined. Future work will be aimed at further elucidating the clinical significance of this radiographic finding.

## *92 TIMING OF CLOSURE OF THE ANTERIOR SKULL BASE IN SYNDROMIC INFANTS: IMPLICATIONS FOR EARLY MONOBLOC

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BACKGROUND & PURPOSE: Early monobloc distraction advancement has been proposed as a treatment option for infants born with complex craniosynostosis. We have observed abnormal dural adhesion to the anterior skull base in young children undergoing this procedure that we have not observed in older children. Our hypothesis is that this anterior skull base defect persists in syndromic craniofacial patients in the first few years of life but then closes before the time of traditional monobloc treatment.

This abnormal adhesion may explain the high rate of dura violation experienced during early monobloc surgery, and we propose a modification to allow improved visualization. Purpose: To determine the presence and timing of closure of anterior skull base defects in syndromic craniofacial patients.

METHODS & DESCRIPTION: All syndromic patients who underwent intracranial surgery from 2000-2013 were included. Preoperative CT scans were examined for the presence of an anterior skull base defect which was measured based on defined coronal and sagittal planes. The sizes of the defects were plotted relative to age of patient to estimate timing of closure in this population.

RESULTS: 22 syndromic patients were included with age at CT scan ranging from 1 to 62 months. All patients less than age 10 months had a defect present, with an coronal size range of 6-14mm. There was a progressive decrease in defect size with age, with all patients after 24 months age not demonstrating a defect.

CONCLUSIONS: The anterior skull base defect in syndromic infants has not been well described. Any surgery requiring dissection in this area before two years of age, such as early monobloc, is at risk of tearing the dural adhesion. We have successfully performed five monobloc osteotomies in patients with anterior skull defects without a dural tear by using an anterior window approach to directly visualize this area during dissection.

**Disclosure:** Receipt of Intellectual Property Rights/Patent Holder- Richard Hopper is an inventor of a patented device licensed to KLS Martin which is not discussed in the presentation.

## 93 SUPRA-BROW APPROACH FOR NEUROSURGICAL ACCESS TO ANTERIOR CRANIAL FOSSA AND ETHMOID SINUS: TECHNIQUE, EXPOSURE, AND CONSIDERATIONS

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BACKGROUND & PURPOSE: Traditional neurosurgical access to tumors or vascular anomalies of the anterior cranial fossa and/or ethmoid sinus requires coronal incision and extensive frontal dissection. Here we detail a limited supra-brow approach, focusing on operative technique, anatomic exposure, and clinical considerations.

METHODS & DESCRIPTION: Operative Technique: After epinephrine infiltration, a supra-brow incision is made. Intermuscular dissection separates preorbital orbicularis oculi from inferior frontalis. Frontal periosteum is identified and supraperiosteal exposure is obtained from glabella medially to deep temporalis fascia laterally. The periosteum surrounding the supraorbital nerve is incised and the nerve is reflected inferiorly with periorbita (making an osteotomy for true foramina). Next, a medially based pericranial flap is raised, exposing frontal bone for mini-craniotomy; this flap is kept protected beneath the medial frontalis muscle. After neurosurgical intervention and dural repair, cranial bone is rigidly restored. Overlying soft tissue is closed in layers. Anatomic Exposure: Before craniotomy, various maneuvers provide additional exposure. Subperiosteal dissection within the supero-medial orbit permits supraorbital craniotomy and access to the ethmoid sinus. Elevating anterior temporalis permits more lateral craniotomy and access to neurosurgical targets within the lateral anterior cranial fossa. Clinical Considerations: To prevent injury to the fronto-temporal branch of the facial nerve, dissection over the frontal bone is supraperiosteal and dissection over temporalis is just above deep muscle fascia. When the craniotomy includes lateral frontal sinus, mucosa is burred off the removed bone and in situ sinus; the nasofrontal outflow tract is obliterated with the pericranial flap and sealed with fibrin glue. The preserved pericranial flap can also be used to restore dural integrity. When bone is deficient, the removed cranium can be split for additional graft.

RESULTS: We used the supra-brow approach in 14 patients to provide sufficient access for definitive neurosurgical management of an anterior clinoid meningioma, three lateral frontal lobe meningioma, nine aneurysms of the anterior communicating artery, and an intra-ethmoidal arterio-venous malformation. Blood loss during exposure was minimal in all cases. There was no injury to the ophthalmic division of trigeminal nerve or frontal branch of facial nerve. Split calvarial grafts were used in nine of fourteen patients. At one year follow-up, all patients had excellent frontal contour, bony union, and an aesthetic scar.

CONCLUSIONS: A supra-brow approach limits extensive dissection and permits sufficient neurosurgical exposure to tumors and vascular anomalies of the entire anterior cranial fossa and ethmoid sinus.

## 94 A COMPARATIVE STUDY OF 3D NASAL SHAPE IN UNILATERAL CLEFT LIP AND PALATE NOSES FOLLOWING ROTATION-ADVANCEMENT AND NAM- CUTTING PRIMARY NASAL REPAIR.

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BACKGROUND & PURPOSE: The aim of this study was to compare 3D symmetry of the nose in patients with UCLP, subsequent to rotation advancement (Millard) without primary nasal repair and the NAM/ Cutting primary nasal repair.

METHODS & DESCRIPTION: Nasal casts were made for 12 consecutively appearing patients with UCLP, in each of two groups. Group 1 patients had a Millard repair without primary nasal repair (Bardach) while Group 2 patients had NAM and primary nasal repair. Patients were 6 to 18 years of age (mean=12.04). Surgery was performed at the mean age of 3.8 months. None of patients in Group 1 had primary nasal surgery as it was believed at the time by the surgeon that nasal growth might be inhibited. A two flap palatoplasty was performed at 12-24 months (mean age 19.75). All operations were performed by one surgeon in Group 1 and another surgeon in Group 2. Nasal casts were scanned using the 3Shape ™ scanner. All noses were scaled to the same size prior to evaluation. Procrustes analysis of 3D nasal symmetry was performed using 3dMD Vultus software. The Procrustes technique, determines nasal symmetry by performing a superimposition of its surface with its mirror image (ref Maull 1999). 4 linear measurements including columellar height, nasal dome height, alar base and nasal projections were performed on cleft and non-cleft side in both groups (ref Cutting 1984). For 3D analysis, student's t-test was used to determine the difference between the mean asymmetry index for each group. If symmetry is perfect the asymmetry index is zero. For linear analysis, student's T test was utilized to compare the differences. SPSS was used to perform a descriptive analysis of the groups.

RESULTS: The mean asymmetry index in the Millard rotation advancement repair was 4.41 and the NAM plus primary nasal repair was 2.45. The difference was statistically significant (P=0.006). In linear measurements, columellar length and alar base were significantly different when cleft side was compared to non-cleft side in Millard group (P=0.04 and 0.005). There was no significant difference in columellar length, nasal dome height, alar base and nasal projection in cleft versus non-cleft side in NAM group. Inter-group analysis showed that alar base in cleft and non-cleft side is significantly different in Millard versus NAM group (P=0.02).

CONCLUSIONS: To our knowledge this is the first long-term, quantitative 3D study to analyze the asymmetry of the nose in the Millard rotation advancement versus NAM plus primary nasal repair in patients with complete UCLP. This study shows that the NAM plus primary nasal repair results in significantly less asymmetry of the nose compared to the Millard rotation advancement without nasal correction.

## 95 THE DEVELOPMENT OF A NEW SCORING SYSTEM FOR THE ASSESSMENT OF NASOLABIAL APPEARANCE IN PATIENTS WITH NON-SYNDROMIC CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: The surgical repair of the cleft lip is in most cases the first operation performed. An important goal of this operation is achieving symmetry and improvement of nasolabial appearance. In order to assess and compare the outcome of cleft lip and palate surgery it is essential to have a reliable scoring system. However, for the assessment of esthetic outcome of cleft-related facial deformities, a widely accepted, reliable scoring system is not available. One of the most frequently used scoring systems in literature is the system proposed by Asher-McDade et al., which uses frontal and lateral views (Asher-McDade et al., 1991). However this scoring system is complicated and time-consuming which results in a significant burden when assessing a large amount of photographs. Therefore over the last years a new scoring system was developed, which is reliable, easy to use and less time consuming.

METHODS & DESCRIPTION: From our database post-operative photographs from the last 32 years were selected. All photographs were taken at the age of six years old, all clefts were presented as being left-sided and all photographs

were cropped. From earlier ratings with the use of the Asher-McDade rating system 5 reference photographs for the nose were chosen and 5 photographs for the lip were chosen. The 10 selected photographs for the nose and lip were used to create a sliding photographic scale, making it possible to create different faces. For the nose, scores ranged from A – E and for the lip the scores ranged from 1 - 5, representing a very good to very poor appearance. Three plastic surgeons and three orthodontists used this new method of scoring to assess 62 photographs. Inter- and intraobserver scores were calculated by using the Intraclass Correlation Coefficient (ICC).

RESULTS: For the assessments 62 photographs were used (44 boys and 18 girls; 10 right-sided and 52 left-sided clefts). The inter-observer reliability was 0,62 for the nose and lip together (total score) obtained with the ICC. The inter-observer reliability for the nose and lip scored separately, were 0,59 and 0,61 respectively. For the total score a Cronbach's alpha of 0,91 was calculated and a estimated reliability for three observers of 0,84. The intra-observer reliability for the total score varied from 0,59 to 0,75.

CONCLUSIONS: The presented new scoring system has an acceptable level of inter-observer reliability and an excellent level of internal consistency. The scoring system has a good reliability when used by three or more observers. The main advantage of the developed scoring system is that it's easy to use and less time consuming in comparison with existing scoring systems.

## 96 INITIAL SEVERITY IN PATIENTS WITH CUCLP TREATED BY NAM AND TWO-STAGE SURGERY DOES NOT PREDICT NASOLABIAL AESTHETICS DURING PREADOLESCENCE

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BACKGROUND & PURPOSE: Families are often counseled that a wider cleft may lead to a less aesthetic outcome. This notion, however, has not been substantiated. To date, few studies directly investigated correlation between the initial severity and long-term nasolabial aesthetic outcomes. To address this, we analyzed correlation between the severity at birth in patients with non-syndromic CUCLP treated by NAM pre-surgically and nasolabial appearance during preadolescence.

METHODS & DESCRIPTION: Longitudinal records of 28 consecutive patients with CUCLP were examined. The initial severity was measured by anterior cleft width and cleft area on plaster models taken after birth. The width was measured from the widest points of the larger and smaller alveolar segments. The cleft area was calculated from pictures taken directly from those models using Partometer software. Frontal and profile pictures taken in preadolescence (mean= 8 yrs) were rated twice using Asher-Mcdade scale by 3 craniofacial surgeons. All raters were experienced surgeons and did not perform surgeries on the subjects. All subjects were treated in one center with NAM pre-surgically, followed by lip repair and 1 or 2-stage palate repair. No surgical revision was performed on the subjects. Weighted Kappa statistics and Interclass correlation coefficients were calculated to demonstrate intra and inter-rater reliability respectively. Spearman's rank correlation tests were performed to determine correlation between each initial severity variable and nasolabial parameters. Multiple regression analyses were calculated to determine correlation between combined initial severity variables and nasolabial parameters.

RESULTS: The intra and inter-rater reliability tests showed moderate to very good results (k= 0.57-0.94; ICC= 0.51-0.71). We did not find a significant correlation between the anterior cleft width and most nasolabial parameters (Mean aesthetic score ρ=-0.29; Nasal deviation ρ= 0.36; Nasal form ρ= 0.03; Profile ρ= 0.16). Only Vermillion shape (ρ= 0.48, P value= 0.01*) was found to be statistically significant. The initial cleft area does not statistically correlate with most nasolabial parameters (Mean aesthetic score ρ = 0.28; Nasal deviation ρ= -0.21; Profile ρ= -0.20, Vermillion shape ρ= -0.07). Only Nasal Form (ρ= -0.47, P value= 0.01*) was found to be statistically significant. Multiple regression analyses revealed that the initial severity does not have statistical correlation with any nasolabial parameters (Mean aesthetic score R-square= 0.19; Nasal deviation R-square= 0.19; Nasal form R-square= 0.13; Profile R-square=0.24; Vermillion shape R-square= 0.

CONCLUSIONS: Results showed that the initial cleft severity does not predict nasolabial aesthetic outcomes. It is possible that the lack of correlation is specific to our treatment protocols. This study did not investigate effects of the protocols. Other variables including surgeon's skill may also have a significant effect. Further studies are needed to address these.

## 97 PALATAL MEASUREMENTS PRE- AND POST-MODIFIED FURLOW REPAIR: ANALYSIS OF PALATAL LENGTHENING AND COMPARISON WITHIN CLEFT TYPES

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BACKGROUND & PURPOSE: The modified Furlow double opposing z-plasty technique for cleft palate repair has repeatedly demonstrated low rates of oronasal fistulae formation and low rates of velopharyngeal insufficiency. This technique has the theoretic advantage of lengthening the soft palate and also preventing secondary shortening due to straight-line scar contracture. The purpose of this study was to anatomically describe the range of palatal clefts encountered in clinical practice and to objectively quantify and compare intraoperative palatal lengthening between cleft types.

METHODS & DESCRIPTION: Intra-operative measurements were recorded for all patients undergoing modified Furlow cleft palate repair from 2/2011 to 9/2014. These included cleft length, widest cleft width and location, and cleft width at the hard-soft palate junction, as well as the soft palate length, total palate length, and velopharyngeal depth pre- and post- repair. The velopharyngeal depth was measured from the tip of the uvula to posterior pharyngeal wall and the total palate length was measured in two ways: along the surface of the palate as well as along a straight line from the central alveolus to tip of the uvula. Additionally, patient demographics and Veau cleft type were recorded. Descriptive statistics and paired t-tests were conducted utilizing STATA.

RESULTS: 153 patients, 77 females and 76 males were included and the median age of repair was 10 months (range of 7-240 months). The most commonly encountered cleft types were Veau classification 3 (45 patients) followed by Veau classification 2 (43 patients). On average, the widest clefts were encountered with Veau classification 4 (12.1 mm), followed closely by Veau classification 3 (11.2 mm) and 2 (10.9mm); the widest cleft was nearly split at either the base of the uvula or the hard-soft palate junction for these cleft types. The mean curved post-operative total palate length increased by 3.5mm (p<.00001); the mean straight post-operative total palate length increased by 6.7mm (p<.00001); and the mean post-operative soft palate length increased by 6mm (p<.00001). No difference was seen between genders. Additionally, the mean increase in total palatal length was statistically significant in all cleft types except Veau 4, which only trended towards significance.

CONCLUSIONS: This study describes significant palatal lengthening utilizing the modified Furlow cleft palate repair. Predicting palatal lengthening based on cleft and palatal dimensions may be a useful tool in anticipating surgical outcomes. Correlation with oronasal fistula rates and eventual speech outcomes will determine the significance of these findings in clinical practice.

## 98 THE EFFECT OF FOUR DIFFERENT TREATMENT PROTOCOLS ON CRANIO-MAXILLO-FACIAL GROWTH IN PATIENTS WITH UNILATERAL COMPLETE CLEFT LIP, PALATE AND ALVEOLAR

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BACKGROUND & PURPOSE: To minimize maxillary growth restriction and achieve normal speech, many different surgical treatment protocols were proposed to treat patients with a cleft. This study aimed to evaluate which treatment protocol did the least detrimental effect on cranio-maxillo-facial growth of patients with unilateral complete cleft lip, palate and alveolar.

METHODS & DESCRIPTION: By evaluating cranio-maxillo-facial skeleton morphology of patients with unilateral complete cleft lip, palate and alveolar (UCCLPAs) in their early mixed dentition. 56 patients with non-syndromic UCCLPAs were selected into this study. They were treated by four different surgical protocols, and all finished cleft lip repair at 6 to 12 months and cleft palate repair with sommerlad surgical method at 12 to 24 months. 16 UCCLPAs were selected as group 1, who repaired cleft lip and hard palate with vomer flap simultaneously at 6 to 12 months, and soft cleft palate at 12 to 24 months. 14 UCCLPAs were selected as group 2, who repaired cleft lip at 6 to 12 months and cleft palate at 12 to 24 months. 11 UCCLPAs were selected as group 3, who received lip adhesion at 1 to 3 months, cleft lip repair and vomer

flap repair simultaneously at 6 to 12 months, and soft cleft palate repair at 12 to 24 months. 15 UCCLPAs were selected as group 4, who repaired only cleft lip at 6 to 12 months, and reserved unrepaired cleft palate. The control group (Group 5) consisted of 18 age and gender matched patients with unilateral incomplete cleft lip, who repaired cleft lip at 6 to 12 months. One-sample Kolmogorov-Smirnov test was used to analyze the nature of data distribution. Bonferroni test and Kruskal-Wallis H test were used for multiple comparisons.

RESULTS: Both case groups had retrusive A and ANS point (SNA, Ba-N-A, Ba-N-ANS, S-N-ANS, P<0.05), retrusive maxilla (Ba-PMP, P<0.05) and short anterior cranial base (S-N, P<0.05). Patients in group 1 and 3 showed reduced maxilla sagittal length (A-PMP, ANS-PMP, P<0.05). Patients in group 3 showed a more retrusive maxilla than group 1(Ba-N-A, Ba-N-ANS, S-Ptm, P<0.05). Patients with repaired cleft palate showed a more retrusive maxilla than patients with unrepaired cleft palate (Ba-N-A, Ba-N-ANS, P<0.05).

CONCLUSIONS: Cleft palate repair at 12 to 24 months of age did detrimental effect on maxillofacial protrusion and anterior cranial basal length until patients in the early mixed dentition. Vomer flap repair inhibited maxillary growth in sagittal direction. Lip adhesion operated within 3 months of age aggravated maxillary retrusion.

## 99 THE USE AND LIMITATIONS OF INTERCENTER OUTCOMES COMPARISONS PROTOCOLS FOR INTERNAL AUDITS AND QUALITY IMPROVEMENT

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BACKGROUND & PURPOSE: Intercenter comparisons are effective to identify treatment outcomes associated with varied protocols. An added benefit may be the use of the standards/protocols for these comparisons for individual centers to audit internally their own outcomes for of quality improvement. The purpose of this investigation was to determine the value and limitations of current intercenter outcomes comparisons methods for intra-center audits.

METHODS & DESCRIPTION: 7 major cleft centers participated in a comparison of treatment outcomes. Patients with CUCLP were rated for dental arch relationships in primary (n=148) and mixed (n=157) dentitions using the Goslon Yardstick, and for nasolabial appearance at mean age 6yrs (n=166) using Asher-McDade method. Weighted Kappa was used for inter- and intra-rater reliabilities and Kruskal-Wallis was used for significant differences. This was Ctr 1's (n=65) first intercenter comparison to explore the effects of its varied infant management protocol (+/- NAM/IO, +/-GPP) on its diverse patient population: Hispanic (n=35), Native American (n= 9) and Caucasian (n=13), mixed (n=8). The other centers participated in previous intercenter comparisons with a range of outcomes from varied infant management protocols. Guidelines for such comparisons required Caucasian samples. Comparisons of the pooled multi-racial/ethnic Ctr 1 sample with the others, revealed several significant differences including less favorable dental arch relationships. The scores for Ctr 1's sample were then assessed internally with an intra-center comparison of outcomes by racial/ethnic groups and also by treatment protocol to determine if race/ethnicity or protocol contributed to the final pooled outcome.

RESULTS: For patients treated with GPP+NAM/IO, the mean dental arch relationship scores in primary (mean= 3.84) and mixed (mean=3.91) dentitions were not significantly different from the subset of patients treated without (means=3.90 and 3.75 respectively) and the total pooled sampled (means=3.87 and 3.84). For racial/ethnic subgroups there was a tendency for better scores in the Caucasian group but no significant differences between subgroups (means= Hispanic-4.02, Caucasian-3.70, Native American-3.94) and the total pooled sample. For nasolabial ratings there were no significant differences between ratings for treatment or racial/ethnic subgroups compared to each other and to the pooled center averages.

CONCLUSIONS: The overall Ctr 1 results with racial/ethnic subgroups pooled seemed to be the same regardless of the mixed racial/ethnic sample. However, establishing adequate sample sizes for intercenter comparisons with control of race/ethnicity, for many centers will continue to be an obstacle. Pooling of these groups would enable more centers to participate, but whether different racial/ethnic distribution affects comparisons needs to be determined. For protocol differences within centers, these studies allow for internal assessment of differing protocols.

## 100 THE RELATIONSHIP BETWEEN ARTICULATION PERFORMANCE AND EARLY DECODING SKILLS FOR CHILDREN WITH OROFACIAL CLEFTS

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BACKGROUND & PURPOSE: Children with orofacial clefts (OFC) have increased rates of learning and language disorders compared to the general population. The relationship between articulation skills and reading decoding abilities in children with OFC has not been well explored. This study investigates the relationship between articulation and sight wording reading as well as phonemic decoding.

METHODS & DESCRIPTION: The sample included 70 children (Male=44; CLO=6, CPO=8; CLP=56) ages 6-8 years (M=7.5 yrs, SD=0.93), of whom 28 children were foreign-born adoptees. Articulation skills were measured using the Goldman Fristoe Test of Articulation-Second Edition (GFTA2). Single word reading skills were assessed using the Test of Word Reading Efficiency-Second Edition (TOWRE2) Sight Word Efficiency (SWE) subtest and the Letter Word Identification (LWI) subtest of the Woodcock Johnson-Third Edition (WJ-III). Phonemic decoding was measure with the Phonemic Decoding Efficiency (PDE) subtest of the TOWRE2 and the Word Attack (WA) subtest of WJ-III. Regression analyses using robust standard error were used to assess the association between articulation skills and reading decoding after controlling for child sex, adoption status, socioeconomic status (SES) and nonverbal cognitive ability (NV) as measured by the Differential Ability Scales – Second Edition (DAS-II).

RESULTS: After adjusting for potential confounds, GFTA2 scores were significantly positively associated with sight word reading as measured by the TOWRE2 SWE (Beta = .213, p = .009) and WJ-III LWI (Beta = .230, p < .001). Additionally, higher GFTA scores were significantly associated with better phonemic decoding abilities on the TOWRE2 PDE (Beta = .230 p = .001) and WJ-III WA (Beta = .204, p = .001).

CONCLUSIONS: Among young school-aged children with OFC, speech articulation was positively associated with single word reading and phonemic decoding. Future studies are warranted to determine whether early, intensive intervention for speech problems in this population offset later academic deficits.

## 101 FLOW RATE COMPARISON BETWEEN SPECIALIZED BOTTLES FOR CHILDREN WITH CLEFT PALATE, CURRENT STANDARD BOTTLES, AND A NEW BOTTLE FEEDING MECHANISM

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BACKGROUND & PURPOSE: Prior to the cleft repair surgery (up to one year), children with cleft palate (CP) require the use of specialized bottles due to the lack of separation between nasal and oral cavities. While several specialized bottles for children with CP exist, feeding remains a critical challenge because of long feeding time and issues with nasal regurgitation. The goals of this project were to: (i) determine the flow rates of the current specialized bottles for children with CP as compared to the current bottle designs for healthy children, and (ii) design a new specialized feeding mechanism that best models standard bottle design and flow rates across a range of infant ages. We hypothesized that the average flow rates at each age group (0, 3, and 6+ months) for standard bottles could be achieved through a combination of newly designed bottle inserts and varying size nipple slits.

METHODS & DESCRIPTION: The flow rates of the Tommee Tippee (TT), Nuk Orthodontic (NO) and Avent Classic (AC) bottles were tested using the breast pump test described in Jackman (2013). The flow of specialized bottles (Mead Johnson nurser, Pigeon Feeder and Haberman Feeder) was created manually. The average flow rate (mL/min) was determined based on three testing trials of one minute each. Through observation of issues with the current specialized bottles, we developed a new feeding mechanism which only requires the baby to apply pressure to the nipple using peristaltic tongue movement and/or lower jaw movement. A lever testing system, which mimics the baby's upward tongue motion, was used to test the flow rate of the new feeding system.

RESULTS: The flow rates of the three current specialized bottles listed previously (10, 14 and 7 mL/min respectively) were consistent with the slow setting (0 month) of the TT (8 mL/min), NO (13 mL/min) and AC bottle (15 mL/min). However, the flows of the specialized bottles could not reach the flow rates of the medium (3 months), 37 mL/min, and fast (6+ month), 61 mL/min, flow setting of the TT bottle. Our three proposed feeding systems achieved approximately similar flow rates of the three flow settings of the TT bottle (15, 38, and 59 mL/min respectively).

CONCLUSIONS: Current specialized bottle designs may be lacking in providing sufficient flow rates for infants three months and older. The new feeding system proposed here provides improvement in varying the flow rate through three different age settings, which benefits children trying to obtain nutrition needed for growth. Future research will demonstrate the nipple position inside the oral cavity of children with CP, and from that, suitable changes in the nipple shape will be suggested for different cleft types.

## 102 PREVALENCE OF HEARING LOSS IN CHILDREN WITH CLEFT AND EFFECT OF DIFFERENT AUDIOLOGICAL GUIDELINES ON THE EPIDEMIOLOGY

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BACKGROUND & PURPOSE: • Describe the prevalence of hearing loss in a population of children with cleft • Demonstrate the need to standardize the audiological guidelines of various scientific societies.

METHODS & DESCRIPTION: A retrospective review of audiological assessment conducted between 2006-2011was collected. In total 335 patients who underwent audiological assessment were selected for the study. The data was analyzed for differences in prevalence and severity of hearing impairment. This was compared with the published audiological guidelines for hearing impairment thresholds by various scientific societies (WHO, BSA, American speech language and hearing association, Clinical Standards Advisory Group etc)

RESULTS: Data was analyzed using minitab15 statistical software to investigate differences in the apparent 'epidemiology' of hearing loss as described by five different published UK and International guidelines. Chi square analysis was used to compare hearing impairment vs. age based on British Society of Audiology guidelines to find the prevalence of hearing loss in children with cleft. The prevalence ($p<0.001$) and severity ($p<0.001$) of hearing impairment in the cohort examined varies significantly dependent upon published thresholds used. Prevalence by sex also varies significantly for all thresholds apart from GG Brownings ($p<0.02$). Full age and sex specific data will be presented for all thresholds.

CONCLUSIONS: Hearing impairment in children with cleft is commonly encountered in clinical practice; this study highlights the need for a concordance on hearing thresholds by various scientific societies to facilitate uniformity in the representing the problem in this subgroup of patients. This not only means that patients and their parents may be inappropriately reassured or even denied helpful intervention; it inhibits discussion between clinicians, across specialities, national borders and continents. Internationally standardized guidelines would go a long way to support research in the field and therefore facilitate care in an evidence based manner.

## 103 SUBMUCOUS CLEFT PALATE: A SINGLE SURGEON RETROSPECTIVE STUDY EVALUATING THE EFFICACY OF SELECTIVE USE OF VIDEOFLOUROSCOPY TO IMPROVE DIAGNOSIS IN DIFFICULT CASES

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BACKGROUND & PURPOSE: Submucous cleft palate (SMCP) may be seen in its overt form (bifid uvula, zona pelucida, notched hard palate) or in its occult form (vaulted "v shaped" elevation). If the findings are very subtle, diagnosis can be difficult in the case of an occult SMCP; this can be compounded when the patient has other motor speech concerns. Videofluoroscopy can be helpful in diagnosis when the VP motion is not clear on physical exam. When an adynamic or hypoplastic palate is identified on this study, recommendation for pharyngoplasty is made. If subtle findings of SMCP are identified that were not clear on physical exam, then a primary palatoplasty is offered.

METHODS & DESCRIPTION: A retrospective chart review was performed on all patients operated on by a single cleft surgeon between 2009 and 2014 and who were also confirmed to have clefted or anteriorly displaced levator muscles at the time of surgery. Charts of all patients who underwent a palatoplasty as a primary procedure for velopharyngeal insufficiency (VPI) were reviewed in detail. Data analyzed included age, sex, diagnosis, confounding diagnosis (syndromic), occult vs overt cleft, televex use, Pittsburgh Weighted Speech Scores PWSS (pre and postop), and failures requiring other intervention.

RESULTS: 63 patients with SMCP were identified, 4 were excluded for lack of postop followup. 12 were overt and 47 occult. 18 had televex to help confirm diagnosis (1 overt, 17 occult). 3 overt SMCP (25 percent) failed primary palatoplasy and required PPF, and 5 occult SMCP (10.6 percent) failed and required PPF. Of those who failed, 3 were syndromic. PWSS was assessed preop, approximately 3 months postop, and most recent. A normal PWSS was 1-2, borderline acceptable 3-6, and abnormal >7. 15 patients (25.4 percent of all SMCP patients) had a normal score and 25 patients (42.4 percent) had a borderline score at 3 months and most recent follow up. Of those having a normal score, 5 patients (33.3 percent) had a televex. Of those who had had a televex and achieved normal postoperative scores, 0 were overt and 5 were occult and 2 out of 5 were syndromic. Overall PWSS were significantly improved postoperatively (14.1 prepoerative PWSS versus 6.1 postoperative PWSS average, $p<0.05$). Patients undergoing preoperative televex had slightly greater improvement in post, versus pre-operative PWSS (7.72 improvement with televex, versus 6.9 improvement without televex, $p=0.19$.)

CONCLUSIONS: Diagnosis of occult SMCP can sometimes be difficult. Televex is a useful study to help confirm diagnosis and lead to successful outcomes when palatoplasty is performed to correct VPI as measured by PWSS. The latter is especially true when there are other motor speech concerns clouding the clinical picture.

## 104 HOW DOES DYNAMIC MRI COMPARE TO NASENDOSCOPY FOR THE STUDY OF VELOPHARYNGEAL FUNCTION?

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BACKGROUND & PURPOSE: Technological advances are bringing MRI closer to clinical implementation; however, the value of dynamic MRI as compared to imaging methods such as nasendoscopy is not well understood. Velopharyngeal (VP) imaging and perceptual assessment each contribute significantly to understanding the cause of VPI and identifying the optimal treatment. It is not clear, however, what clinical information dynamic MRI can provide and how it may contribute to understanding the complex nature of VP function. Additionally, it is unknown how such information relates to more common imaging methods such as nasendoscopy. The purpose of this study is to determine the potential clinical utility of dynamic MRI in the treatment of VP dysfunction as compared to nasendoscopy. Advantages and disadvantages of both imaging methods are discussed in detail.

METHODS & DESCRIPTION: Seven adults with normal VP and craniofacial anatomy were assessed using dynamic MRI and nasendoscopy during the production of "ampa." Dynamic speech assessment was obtained using a fast-gradient echo FLASH multi-shot spiral technique to acquire 15.8 fps of the oblique coronal image plane sampled directly in the plane of VP closure. Frame-by-frame analysis of the percent change in lateral wall movement and anterior-to-posterior VP movement were calculated across both imaging methods during the same speech production.

RESULTS: Changes in lateral pharyngeal wall movement proved to be reliable and comparable between nasendoscopy and dynamic MRI. Anterior-to-posterior portal changes, however, were not reliably obtained across both procedures. The portal closure and closure type were identified consistently across subjects. Findings suggest anterior-to-posterior measures between imaging methods are not comparable. This may be due in part to the depth-distortion effect present in nasendoscopy and an inability to find a reliable posterior wall reference point. Additionally, participant and scope movement likely limit the reproducibility of any quantifiable findings. Alternatively, lower spatial and temporal resolution in dynamic MRI may account for poor reliability in the same variable.

CONCLUSIONS: The ideal imaging should be noninvasive, repeatable, and reproducible (Beer et al., 2004). MRI is non-invasive and provides a view of the exact plane of closure without the depth-distortion effect commonly seen in nasendoscopy. Interpretations based on nasendoscopy are limited to inferences of muscle function based on gross positional changes of the velum. MRI offers a wider view of oropharyngeal area (Witt et al., 2000; Shinagawa et al., 2005) and provides valuable information about the internal VP muscles. Results from the present study, elucidate the need for technological advances

in dynamic acquisition to increase imaging speed and resolution prior to clinical implementation. Continued research is also needed to provide details of how knowledge of the internal musculature can improve and optimize patient care.

## 105 EXTRAVELAR AND INTRAVELAR MORPHOLOGY OF THE LEVATOR VELI PALATINI: IMPLICATIONS FOR CLEFT PALATE SPEECH

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BACKGROUND & PURPOSE: The levator veli palatini (levator) is the primary muscle responsible for elevation of the velum. MRI is the only imaging modality that enables in vivo visualization of the levator muscle as well as the extravelar (EV) and intravelar (IV) segments that constitute this muscle. Perry et al. (2013) observed the portion of the levator muscle contained within the velum (IV segment) to show variability across subjects, whereas the EV segment demonstrated significant consistency between subjects. These findings suggest that the IV segment morphology may be of less relevance to levator contraction for velopharyngeal closure compared to that of the EV segment. However, this study was limited to static observations of adult subjects. There are no reported data on how the EV and IV segments of the levator muscle contract and contribute to muscle kinetics during a dynamic activity such as speech. The purpose of this study was to examine the contraction of the EV and IV segments of the levator muscle using MRI during sustained phoneme production in children between 4-8 years of age with normal velopharyngeal anatomy and children with repaired cleft palate.

METHODS & DESCRIPTION: 20 children with normal velopharyngeal anatomy and 5 children with repaired cleft palate between 4-8 years of age were scanned using an established child-friendly MRI scanning protocol (Kollara & Perry, 2014). A high resolution, T1- weighted turbo-spin-echo (TSE) 3D anatomical scan called SENSE was utilized. Measurements were made to: 1. Determine the percent contribution of the EV and IV segments to the total levator muscle length, at rest. 2. Determine contraction percentages of the EV and IV segments and its contribution to the total levator muscle contraction.

RESULTS: All MRI data has been collected across all subjects. Preliminary analyses on normative data demonstrated the EV segment contributes to 70.8% to the total levator length and the IV segment accounted for 29.2% of the levator length, at rest. The contraction percentages of the EV and IV segments differed across phonemes. For example, during production of /s/, the EV segment demonstrated greater contribution to the overall levator muscle contraction as compared to the IV segment. This may be related to increased velar height as evidenced by midsagittal MRI. Statistical analyses on subjects with repaired cleft palate are under way and will be completed by November 2014.

CONCLUSIONS: Perry et al. (2013) hypothesized that the force is greatest in the EV segment. Our preliminary data suggests that the levator muscle contracts differently across different phonetic contexts. These findings are pertinent to cleft palate surgery where each surgery results in a different IV muscle configuration.

## 106 THE IMPACT OF OROFACIAL MYOFUNCTIONAL THERAPY ON THE REESTABLISHMENT OF NASAL BREATHING AND THE STABILITY OF ORTHODONTIC TREATMENT. TONGUE THRUST: TO TREAT OR NOT TO TREAT?

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BACKGROUND & PURPOSE: It is commonly believed that the tongue thrust (the presence of the tongue between the upper and lower incisors during swallowing) is a causal factor in dental malocclusion. The idea that the tongue "pushes" against the incisors during swallowing and thus moves the teeth has led oro-facial myofunctional therapists treat the atypical swallowing as part of an extensive pre-orthodontic myofunctional treatment. In reality, the factors with a potential to cause a malocclusion are in fact the continuous forces of the tongue against the teeth at rest as opposed to the brief but numerous stronger forces of the tongue during swallowing (Profitt, 1977). Myofunctional treatment should then focus on establishing nasal breathing by solely normalizing tongue position and lip closure at rest. The current study investigates the efficacy of myofunctional therapy and its orthodontic short and long-term outcomes. It aims to answer the following research questions: Is treating a low tongue position and lip closure at rest sufficient for orthodontic short and long-term outcomes? Does treating tongue thrust along with an incorrect tongue position help achieve and maintain higher outcomes of the myofunctional and orthodontic treatment?

METHODS & DESCRIPTION: This is a prospective randomized single-blind controlled clinical trial. Seventy subjects (aged 6 - 14 years) with a tongue thrust and a low tongue posture will be recruited and assessed for nasal or mouth respiration, swallowing pattern and for tongue resting posture. Then they will be randomized to receive either a complete therapy (10 sessions) to correct their swallowing pattern and tongue posture (n=35), or to modify their tongue posture alone (2 sessions) (n=35). Both groups will be reassessed 3 months following treatment completion (T1) for nasal or mouth respiration, swallowing pattern and for tongue resting posture. Inter-rater validity and reliability will be assessed using a second blind evaluator. For the longitudinal component, these patients will complete a second follow-up appointment (T2) at the end of their orthodontic treatment to assess the long-term impact of the two types of oro-facial myofunctional therapies on the orthodontic treatment success.

RESULTS: A Preliminary ANOVA analysis (N=24) revealed no significant differences between the two groups pre and post treatment. The difference between the two visits was significant (p=0.014). Subjects in both groups have improved regardless of the type of treatment they received. Furthermore, significant changes in tongue posture and type of respiration were observed 3 months post-treatment in both groups. Complete results will be presented at the Congress.

CONCLUSIONS: The preliminary results suggest that treatment outcomes are similar when treating tongue-lip posture at rest along with with tongue thrust, or tongue-lip posture at rest alone. Treating tongue thrust may not be a necessary component of an efficient oro-facial myofunctinal treatment program to reestablish nasal breathing.

## 107 COMPARISON OF CUCLP NASOLABIAL APPEARANCE BETWEEN 4 CENTERS WITH INFANT MANAGEMENT PROTOCOLS +/- USE OF NAM, GPP, OR INFANT ORTHOPEDICS

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BACKGROUND & PURPOSE: The benefits of additional features of infant management protocols such as NAM +/- GPP and IO +/- primary bone grafting remain controversial. This study compared CUCLP nasolabial appearance at centers using a range of such infant management protocols.

METHODS & DESCRIPTION: Cropped photographs of 166 consecutively treated patients with CUCLP (mean age 6yrs 0 mos) were blindly rated by 8 calibrated and experienced raters (6 orthodontists, 2 surgeons) using the Q-sort modification of the Asher-McDade rating system and a 5-7 year old Nasolabial (NL) Yardstick. In addition to lip and palate repair, the protocol at Center 1 (n=49) included use of NAM or IO +/-GPP; Center 2 (n=39) protocol was limited to lip and palate repair with no secondary revisions; Center 3 (n=33) used NAM without GPP; and Center 4 (n=40) used lip and palate repair with secondary revisions in some patients prior to the assessment. Judges were given cards with frontal and profile photographs of each patient and rated them on a scale of 1-5 for three features (NL profile, NL frontal, and vermillion border) using the Q-Sort method. Q-sort utilizes placement of the cards into categories sequentially up to the 5 categories of the scale. The ratings were done twice with all 16 scores for each patient averaged for each of the three features. Inter- and intra-rater reliabilities were tested using Weighted Kappa. Medians and SD's were calculated for each group and tested statistically using the Kruskal-Wallis test setting Family Alpha at .06 with Bonferroni individual Alpha of .01.

RESULTS: Intra- rater reliability scores were good (vermilion border mean=.772, range=.742-.833; NL frontal mean=.682, range=.525-.828; NL profile mean=.720, range=.571-.885). Inter-rater reliability scores were fair to good (vermilion border mean=.700, range=.662-.739; NL frontal mean=.547, range=.510-.590; NL profile mean=..512, range=.440-.556). Kruskal-Wallis multiple comparisons identified significant differences in NL profile view between Ctr 3 (mean=3.39, SD=0.792), and Ctr 4 (mean=2.66, SD= .759). For vermilion border, Ctr 1 (mean=3.74, SD=.765) was significantly different from Ctr 2 (mean=3.04, SD= .774) and Ctr 3 (mean=2.48, SD=.735). There were no significant differences between centers in the NL frontal view and when all views were combined for a cumulative score. There was a trend for the

centers using NAM (1 and 3) to have better nasolabial appearance from the frontal view but poorer profile scores.

CONCLUSIONS: Additional procedures in the infant management protocols (NAM, IO, GPP) did not result in any benefit to nasolabial appearance by age 5-7. Although a possible benefit to frontal view esthetics was suggested, profiles were found to actually be better in the centers using only lip and palate surgery on the infant. Evidence of differing effects of the different protocols emphasizes the likely influences of other management features (surgical proficiency, varied approaches to NAM/IO, etc)

## 108 DYNAMIC CLEFT INFANT MAXILLARY ORTHOPEDICS AND PERIOSTEOPLASTY: A 25 YEAR STUDY

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BACKGROUND & PURPOSE: In 1990 Drs. Millard and Latham published an early experience with Dynamic Maxillary Appliances (DMA) and periosteoplasty in patients with cleft lip and palates. This approach is based on the concept of "normal to normal and keep it there," with the goal to align the alveolar segments, close the oral-nasal fistula and provide better facial balance with tension free closures. Opponents to this approach argue that it increases the incidence of mid facial retardation and creates orthodontic cripples. In 1998, the senior authors reported a 13-year longitudinal study on 35 unilateral and 10 bilateral complete clefts with radiographs, cephalometrics, and serial occlusograms with very encouraging results structurally and psychosocially (Dynamic Cleft Maxillary Orthopedics and Periosteoplasty: Benefit or Detriment? Annals of Plastic Surgery 1998 40: 321-327). Twenty five of these patients were monitored and treated into adulthood. Our research demonstrates that the DMA concept should be strongly considered as a program in treating patients with complete clefts.

METHODS & DESCRIPTION: This study continued the principles followed in format of the initial paper. Patients were assessed as to the need and the amount of bone required to consolidate the maxillae, the complexity of orthodontics, the need for orthognathic surgery and the number of interim surgeries performed throughout the growth period. The same team of plastic surgeon, orthodontist, and maxillofacial surgeon rendered care throughout this study. A psychosocial questionnaire was administered to the parents of the cleft patients to evaluate satisfaction with the early active intervention and early normalization.

RESULTS: Early intervention with maxillary orthopedics and complete closure of the primary palate at 3 months, eliminated the oral-nasal fistula, and provided excellent facial balance. Alignment of the cleft segments allowed for easier closure of the secondary palate and eliminated velo-pharyngeal insufficiency procedures. Bone was demonstrated in the cleft segments, and for those needing additional grafting, the requirements were much less. Consolidation of the maxillae was more successful because the bone was placed in a healthy recipient bed. Anterior and lateral cross-bites were dental, not skeletal, and were managed with orthodontics. Orthognathic procedures were decreased (0/21 unilateral, 2/4 bilateral) and when performed were easier because of the unification of the upper jaws. Serial photographs and occlusograms, as well as interval cephalometrics will be presented to demonstrate the positive outcomes of this study and technique. The parental survey further reinforces the psychosocial well being that accompanied early intervention, especially with family and peer bonding and with feeding without nasal escape.

CONCLUSIONS: We can conclude that we did no harm and that the DMA concept should be strongly considered as a treatment for patients with clefts. Early normalization was beneficial for the parents.

## 109 GENERATING EVIDENCE IN CLEFT CARE: A DELPHI-LIKE STUDY TO IDENTIFY AND ADDRESS BARRIERS TO CARRYING OUT RANDOMIZED CONTROLLED TRIALS

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BACKGROUND & PURPOSE: Cleft lip and/or palate (CLP) is a complex condition requiring multiple interventions from infancy to adulthood. The majority of research in cleft care has been observational in nature. While other specialties have been able to implement randomized controlled trial (RCT) methodology over time, RCTs in cleft care are relatively rare. The nature of CLP and its treatment pose unique methodological challenges in generating evidence. The purpose of this study was to identify barriers to carrying out RCTs in cleft care and to generate solutions to overcome these barriers, through a survey of the American Cleft Palate-Craniofacial Association (ACPA).

METHODS & DESCRIPTION: Using Delphi-like consensus methodology, participants were recruited through an email sent to the ACPA membership containing a link to the online survey. Phase 1 included open-ended questions regarding barriers to RCT methodology in cleft care and potential solutions. Responses were coded into a framework using constant comparison. Barriers and solutions identified were sent out in Phase 2 for rating, and participants also ranked the top ten solutions for implementation. Consensus was defined as ≥80% of responses being within a range of 2 categories on a 7-point scale.

RESULTS: 153 members responded to Phase 1. Respondents represented 19 different disciplines, and 75% had previously been involved in research. A framework of six domains (patient population factors, health care provider factors, research methods, delivery of care, outcomes, and resources) including 47 barriers and 42 solutions was developed. The most frequently cited barrier was variation in surgical skill or treatment protocol. The most frequently cited suggestions for overcoming barriers were increasing multi-centered collaboration, standardizing outcome measures, obtaining financial support, and developing surgical benchmarks. One hundred participants agreed to be contacted for Phase 2, and 50 had responded at the time of data analysis. Consensus has not been reached on any items. The barriers with the greatest perceived limitations on carrying out RCTs were the long period of follow-up, variation in skill or protocol, unclear generalizability of results, and time constraints for providers performing research. The solutions rated most feasible unfortunately did not address the barriers listed.

CONCLUSIONS: A wide variety of barriers limit the application of RCT methodology in cleft care. There are some barriers that can be overcome based on the feasibility of solutions identified, but there are major barriers for which no solutions were generated. Rigorous planning of research studies is required to address the major barriers in order to increase the level of evidence in cleft care. Knowledge translation strategies will be required in the implementation of potential solutions.

## 110 ORTHODONTIC MANAGEMENT OF ANTERIOR MAXILLARY DISTRACTION IN CLEFT MAXILLA

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BACKGROUND & PURPOSE: Distraction Osteogenesis (DO) techniques have become increasingly popular in the craniofacial region and large numbers of studies have reported successful advancement of jaw bones with extra oral distraction devices. However due to problems like discomfort with head frame and social problems associated with extra oral distraction, a better alternative would be internal and intraoral devices. Here,we present cases treated with tooth borne palatal distractor along with its orthodontic management and a comparison study of the distraction needed for a patient based on cephalometric values and clinical examination.

METHODS & DESCRIPTION: • Patients under age group 18 to 22 years with Maxillary hypoplasia secondary to cleft lip and palate were chosen for the study. • Preoperative profile photographs, orthopantomograph and lateral cephalogram and study models were taken.. • Surgical technique- Osteotomy cut was made above the apices of the maxillary teeth from the pyriform rim to the predetermined distraction site.. A vertical interdental osteotomy was initially made through the buccal cortex at the predetermined site, and then deepened by a osteotome.. The anterior maxilla was then down fractured and slightly mobilized, while the palatal mucosal pedicle was maintained. The prefabricated modified Hyrax appliance is then fitted into the maxilla.. • Modified hyrax orthodontic appliance is a tooth borne custom made appliance, that produces anterior movement of maxilla.. It has 4 arms, the anterior arms are soldered to the orthodontic bands of the first or second premolars of either side, and 2 posterior arms are soldered to either the first or second molars. The appliance was activated after a latency period of 1 week at a rate of 1 mm per day, using 5 rhythms, 3 in the morning and 2 in the evening. Activation was carried out until the desired clinical results are achieved. The appliance was then left inactive for a consolidation period of 3 months. • Post distraction radiographs and photographs are taken. cephalometric analysis done. Comparitive study – was done on the distraction procedure based on cephalometric values and clinical examination of the patient is carried out and analyzed.

RESULTS: • There was marked changes in the facial profile with positive overjet relationship in the patient after distraction osteogenesis. • Statistical analysis was done using SPSS software. • In compliance with the paired T test for comparison of the distraction required for clinical and cephalomatric

analyasis, the outcome reveals that the distraction required in accordance to clinical evaluation is significantly greater than the distraction required as per cephalomatric analysis.

CONCLUSIONS: • Tooth borne distractors are effective alternative technique for treating patients with cleft in order to improve the skeletal dysplasia. • Based on statistical study the amount of distraction pertaining to clinical evaluation is significantly greater than those pertaining to cephalomatric analysis.

## 111 DEVELOPMENT OF THE FIRST PERMANENT MANDIBULAR MOLAR IN YOUNG CHILDREN WITH UNILATERAL COMPLETE CLEFT LIP AND PALATE (UCCLP)

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BACKGROUND & PURPOSE: Studies have shown that the facial profile of children with cleft palate with/without a cleft lip is characterized by a short mandible. In addition, previous studies have shown that the development of the first permanent mandibular molar (M1inf.) is deviant in children with isolated cleft palate (CP) both in terms of delayed maturation and reduced tooth size. Furthermore, a significant correlation between severity of CP and delay of M1inf. maturation has been found. The aim of the present study was to test if similar deviations are present in children with Unilateral Complete Cleft Lip and Palate (UCCLP). The following hypotheses were tested: (1) M1inf. is delayed in maturation in children with UCCLP. (2) M1inf. is reduced in size in children with UCCLP. (3) The size of M1inf. is correlated with the size of the mandible.

METHODS & DESCRIPTION: Material: Study group: 47 consecutive children with UCCLP at 2 and 22 months. Control group: 44 consecutive children with Unilateral Incomplete Cleft Lip (UICL) at 2 and 22 months of age. METHODS: In lateral cephalometric x-rays, the width of the M1inf. follicle (Wf), as well as total mandibular length (cd-pgn) (ML) was measured at 2 and 22 months of age, The width of the tooth (Wt) was measured only at 22 months of age. Follicle maturation (M) was assessed according to Haavikko. Intra-rater error was determined by duplicate measurements in 30 subjects. Significance of difference in M was determined using Mantel-Haenszel test. Pearson's correlation coefficient R was used to describe the relationship between follicle width and tooth width, respectively, and mandibular length. Differences between the mean Wf and Wt between groups were tested using Student's t-test. Differences in mean growth between groups were tested using ANCOVA. Level of significance: 5%.

RESULTS: Intra-rater errors: M kappa = 0.87 (excellent agreement); Wf and Wt coefficient of variation = 1.8%; Dahlberg's s(i) = 0.2 mm. Follicle maturation was significantly delayed in UCCLP at both 2 (p=0.0006) and 22 months of age (p=0.003). Mean Wf (UICL) at 2/22 months: 10.9+/-0.6mm / 13.5+/-0.8mm; (UCCLP) at 2/22 months: 9.9+/-0.7mm / 13.0+/-0.6mm. Correlations between Wf / and ML were positive but small for both groups and ages. Correlations between Wt and ML were positive but small for both groups. Differences between Wf means were significant at both ages ($p < 0.001$) and growth was significantly larger in UCCLP ($p = 0.02$). Differences between Wt means were significant ($p < 0.001$). However, after correcting for mandibular size (corresponding to dividing Wf and Wt by ML) neither differences in mean values of Wf, Wt nor growth were statistically significant ($p > 0.09$).

CONCLUSIONS: The maturation of the M1inf. in young children with UCCLP was delayed compared to controls. The size of the tooth and its follicle was, in both UCCLP and controls, related to mandibular size, i.e. small teeth are located in small mandibles.

## 112 DENTAL MATURATION OF CHILDREN WITH UNILATERAL CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Cleft lip and palate (CLP) is a craniofacial birth defect with a spectrum of phenotypes commonly associated with dental anomalies. Reports also suggest that children with CLP have delayed dental development and asymmetrical timing of tooth-pair formation. The aim of this study is to investigate the timing and symmetry of dental maturation of permanent dentition in children with unilateral CLP (UCLP) and compare the findings with children without CLP.

METHODS & DESCRIPTION: Panoramic radiographs of 55 subjects with UCLP taken at 5-9 years old (mean 6.64 ± 0.90 years) and at an older age of 9-13 years old (mean 11.06 ± 1.16 years) were studied. These radiographs were investigated using the Demirjian's method (1973) and compared with 55 control subjects to determine if there were any differences in dental maturation with age.

RESULTS: Children with UCLP in the younger age group were delayed in dental maturation compared to children without CLP by a mean of 0.55 ± 0.75 year and this delay was found to be statistically significant ($p<0.001$). There was no statistically significant difference in the dental maturation of children in the older age group with UCLP and children without CLP ($p=0.744$). The group with UCLP had significantly higher risk of asymmetrically developing tooth pairs than the control group at both the younger and older age groups ($p<0.001$).

CONCLUSIONS: Children with CLP demonstrated asymmetric and delayed dental maturation when compared to children with no CLP. The delay in dental maturation was not sustained at an older age.

## 113 POOLED ANALYSIS OF ORTHODONTIC OUTCOMES AFTER ALVEOLAR BONE GRAFTING – A SYSTEMATIC REVIEW

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BACKGROUND & PURPOSE: There is disparate literature regarding the orthodontic outcomes after alveolar bone grafting (ABG) in children with cleft lip-palate. Although it is understood that dental goals of ABG include eruption and movement of teeth, our aim was to perform a systematic review of the literature to establish historical baselines.

METHODS & DESCRIPTION: Searches were conducted on June 4, 2014 on PubMed, Scopus, and Cochrane. Search terms used were: tooth movement AND (cleft palate OR cleft lip OR bone graft OR alveolar bone graft). Duplicates, case series with less than five subjects, and literature reviews were eliminated. Papers must study patients with clefts and evaluate some orthodontic outcomes to be included. Pooled analysis was performed with available data.

RESULTS: After duplicates were removed, 237 articles had abstracts examined, resulting in 147 articles where full-text was obtained for review. 17 articles fulfilled our criteria. 12 papers contained data on dental eruption, and 9 contained data that could be analyzed. Pooled analysis showed 207 subjects with 247 cleft sites, of which 145/247 (59%) had normal eruption, 78/247 (32%) required surgical or orthodontic extraction, 9/247 (4%) remained unerupted, and 15/247 (6%) had unknown outcomes. 6 papers contained orthodontic horizontal movement data, of which 2 contained facial, buccal, and palatal movement. Pooled analysis showed 51 patients with 61 cleft-side canines, of which 20/61 had mean facial movement of 2.5 mm, 36/61 had mean buccal movement of 7.17 mm, and 5/61 had mean palatal movement of 2.4 mm. The other 4 papers evaluated dental arch closure, and pooled analysis showed 233 patients with 241 clefts, of which successful closure of the gap in the dental arch occurred in 136/241 (56%). 3 papers contained data on root development. Pooled analysis showed 127 patients with 156 cleft teeth, of which 51/156 (33%) showed complete root development and 101/156 (65%) showed partial root development. 4 papers contained data on incisor tipping, and 2 contained data that could be analyzed. Pooled analysis showed 22 patients, with mean incisor proclination increasing from 96.6 degrees to 103.8 degrees. 2 papers contained cephalometric data related to dental position only, and pooled analysis showed 22 patients in which the average overjet improved from -2.83 mm to 2.53 mm.

CONCLUSIONS: The orthodontic outcomes of children with alveolar clefts are critical to restoring normal function. This systematic review looked at literature with available orthodontic outcomes for pooled analysis. Overall, we found a combined rate of eruption success 59% and need for surgical assistance 32%, successful closure of dental gap arch 56%, partial or complete root development 97%, dental tipping increasing from 96.6 degrees to 103.8 degrees, and dental overjet changing from -2.83 mm to 2.53 mm. Most of these results appear satisfactory, with the lowest being eruption and gap closure, which should remain focus areas for improvement in alveolar cleft management.

## 114 THE DEVELOPMENT OF AN OSTEO-ENRICHED HYBRID SCAFFOLD SEEDED WITH HBMP2 AND MDCS TO AUGMENT THE HEALING OF CRANIAL DEFECTS

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BACKGROUND & PURPOSE: Contemporary surgical reconstruction of large craniofacial defects, commonly suffered during trauma and lifesaving decompressive craniectomies secondary to intracranial pathology, has seen tremendous evolution with the development of custom alloplast implants and rigid fixation elements. Although these implants and fixation elements are often capable of providing coverage and stabilization to smaller or less complex defects, they remain prone to infection, extrusion, migration and failure with larger complicated wound features. Within this study, we aim to assess the functionality and osteo-inductive capacity of an easily deliverable osteo-enriched solidifying scaffold system containing hBMP2 and traceable muscle derived stem cells (MDCs) within large cranial defects.

METHODS & DESCRIPTION: Utilizing a murine model, C57BL/6 (n=60) mice received two identical 5mm full-thickness craniectomy defects using a standardized micro-drill core bit. Five groups: 1.) Control – defect only 2.) Defect + infused scaffold 3.) Defect + 5µg hBMP2 4.) Defect + infused scaffold + 5µg hBMP2 5.) Defect + infused scaffold + 5µg hBMP2 + 1x106 MDCs (isolated from GFP expressing C57BL/6-Tg(CAG-EGFP)1Osb/ mice). At 8 weeks, defects were imaged using a mini-CT and tissues collected for downstream assays including: focused osteo-induction gene and proteome arrays as well as imaging. Concurrently, an in-vitro study utilizing Bac transduced MDCs (fluorescent correlation to cell cycle stage) were monitored using a FV10i-LIV live cell confocal imaging system to monitor multi-sequence daily cell migration, proliferation and interaction patterns when challenged with scaffolding and/or hBMP2 and compared to fibroblast controls.

RESULTS: All groups depicted some form of healing, while defects treated with scaffolding, hBMP2 and isolated MDCs showed complete healing. FACS re-isolated GFP expressing MDCs showed significantly up-regulation of osteo-induction pathway genes, while imaging and proteome assays validated relative transcript expression. In-vitro studies indicated that MDCs more readily migrate, proliferate and differentiate when compared fibroblast controls when added to scaffolding and/or hBMP2. Subsequent, downstream gene and proteome arrays of in vitro defect modeling indicated significant MDC lineage differentiation when compared to controls (p-value < 0.05).

CONCLUSIONS: Contemporary research in cranial bone defect healing has been reported in both human and animal modeling systems, each applying a range of enhancement elements such as rhBMP2, MSCs or scaffolding. The conclusion of many of these studies is that there is more than one variable promoting osteogenic healing within a critical sized defect. Our study provides a unique mechanism for the delivery of therapeutic BMP2 scaffolding construct while synergistically employing the intrinsic capacity of the MDC niche to induce tissue regeneration, polarization and osteogenesis within a cranial defect wound bed.

## 115 PATIENT SPECIFIC BILAMINAR RESORBABLE MESH WITH BMP-2 PROMOTES CRANIAL VAULT HEALING IN CHILDREN

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BACKGROUND & PURPOSE: Immature dura in children has a greater osteogenic potential than mature dura in adults, making problematic large cranial (skull) defects less likely. However, when such large cranial defects do occur in children, fewer reconstructive options are available in comparison to adults (titanium mesh, patient-specific implants, cryopreserved bone). For these challenges, we studied a novel technique of a patient-specific, bilaminar resorbable mesh utilizing BMP-2 as a strategy to provide initial structural support for the skull, followed by bone healing, without permanent foreign body problems.

METHODS & DESCRIPTION: Outcomes of consecutive children (less than 12 years of age) with long-standing critical-sized cranial vault defects were studied (n=21). Our technique of patient-specific, bilaminar resorbable mesh with BMP-2 was compared to previously-used techniques: bone substitutes (calcium phosphates), titanium mesh, or autologous bone grafts (split bone or bone mill granules). We evaluated operative times, blood loss, complications, reoperations, and bone healing (3D CT scans) after 6 and 12 months.

RESULTS: Defects in the groups were similar overall, (avg. 82cm2, range 55-135cm2), with the exception of the autologous bone graft group (avg. 64cm2). Autologous bone grafting had the longest operative time (1.5 times longer than the BMP-2 group) and the greatest blood loss (1.6 times greater than the BMP-2 construct group). Perioperative complications and reoperation rates were highest in the bone substitute and titanium mesh groups (46% and 38%) in comparison to the autologous and BMP-2 construct groups (12% and 5%). The bone substitution group had difficulties with wound breakdown and implant exposure. Bone healing was superior in the BMP-construct group (80% at 6 months and 95% at 12 months). Autologous bone had good healing (74%) in the smaller defects only (< 50cm2). There was minimal to no healing in the bone substitution group and the titanium mesh groups.

CONCLUSIONS: For the challenging problem of large cranial defects in children, patient-specific bilaminar resorbable mesh with BMP-2 provides a novel option for reconstruction with minimal complications compared to existing alternative methods.

## 116 BIOPATTERNED RECOMBINANT HUMAN BONE MORPHOGENETIC PROTEIN 2 DOES NOT INDUCE PANSYNOSTOSIS OR GROWTH RESTRICTION IN THE IMMATURE CRANIOFACIAL SKELETON

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BACKGROUND & PURPOSE: When other therapeutic options have failed, rhBMP-2 may help to heal problematic calvarial defects. While rhBMP-2 remains a potent osteoinductive agent, current off-label applications normally far supersede physiologic concentrations and likely contribute to previously reported side effects including ectopic bone formation, inflammation, and cancer. Furthermore, the efficacy of rhBMP-2 therapy in the skeletally immature pediatric patient with a nonhealing calvarial defect remains unknown. The study aimed to compare the effects of rhBMP-2 dose on cranial growth in a juvenile New Zealand White rabbit strip suturectomy model with the hypothesis that higher dose rhBMP-2 will negatively affect cranial growth.

METHODS & DESCRIPTION: Twenty juvenile New Zealand White rabbits underwent bicoronal strip suturectomies treated with 0.4-mg/mL rhBMP-2/absorbable collagen sponge (n=7), 100-ug/mL biopatterned rhBMP-2/acellular dermal matrix (n=6), or left empty (n=7). Amalgam markers were placed at suture confluences to radiographically track suture separation and cranial growth at 10, 25, and 42 days of age. Means and standard deviations for craniofacial growth variables were calculated and compared using two-way ANOVA statistical analysis. Cranial sutures were qualitatively assessed using micro–computed tomographic (uCT) scanning at 42 days postoperatively.

RESULTS: Treatment with 0.4mg/mL rhBMP-2 resulted in significant growth changes and fusion of the coronal sutures bilaterally, anterior sagittal suture, and frontonasal suture by cephalometric analyses at 42 days postoperatively ($p<0.05$). Growth changes appeared greatest in the nasal region and less in the bicoronal and anterior sagittal regions. No significant differences in cranial growth were noted with use of 100-ug/mL biopatterned rhBMP-2 when compared to the empty defect group. Qualitative uCT analysis revealed comparable bony defect healing between rhBMP-2 groups. Application of high-dose, 0.4mg/mL rhBMP-2 resulted in pansynostosis upon uCT analysis, further verifying cranial growth restriction. Low-dose, 100-ug/mL biopatterned rhBMP-2 consistently regenerated bone within the surgical defect margin without evidence of extra-sutural invasion.

CONCLUSIONS: Use of rhBMP-2 results in unwanted craniofacial changes in a dose-dependent manner. Local effects of high dose rhBMP-2 include pansynostosis and growth restriction that may limit its potential translation into the clinical setting. However, low dose biopatterned rhBMP-2 regenerates bone within a target defect without causing these undesirable side effects. This low-dose, spatially controlled methodology of growth factor delivery may improve the clinical efficacy of current off-label use of rhBMP-2 in the immature craniofacial skeleton.

## 117 THE ROLE OF TGF-ALPHA IN THE WOUND HEALING CAPACITY OF CELLS DERIVED FROM HUMANS WITH CLEFT LIP/AND PALATE

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BACKGROUND & PURPOSE: A fraction of patients with cleft lip and/or palate (CLP) are subject to excessive scarring after primary surgery, which later impedes maxillary growth and dento-alveolar development. Since certain genes are involved in both, craniofacial morphogenesis and wound regeneration, we hypothesize that a primary genetic defect causing CLP could later in life affect wound repair. Our aim is therefore to find a functional link between CLP and wound healing in humans, and in the far future, to contribute in identifying patients at risk.

METHODS & DESCRIPTION: In vitro wound healing assays were performed with primary dermal fibroblasts isolated from excess lip tissue of 16 CLP patients. Human foreskin fibroblasts from 9 individuals (6 healthy, 3 phimosis) were used as control strains. Fibroblast monolayers were grown to confluency on culture dishes and scratch wounds 1mm in width were applied; wound closure was monitored morphometrically over time. Statistical significances were determined by Kruskal-Wallis fallowed by a pairwise Wilcoxon rank sum test. The expression of genes involved in CLP and wound repair was determined by qRT-PCR. Based on the results obtained, effects of TGF-α, anti-TGF-α, and TGF-α inhibitors were tested in wounding assays in vitro.

RESULTS: The mean ranks of wound closure rate in vitro showed highly significant differences between individual fibroblast strains ($P<2.2x10-16$). After performing an unbiased multiple comparisons test, cells from different individuals could be divided into three migratory groups, namely “fast” (5 CLP, 3 phimosis), “intermediate” (10 CLP, 3 healthy foreskins) and “slow” (1 CLP, 3 healthy foreskins). These phenotypes were stable when assays were repeated with different cell passages from the same patients. Compared to “intermediate” and “slow” migratory groups, TGFA mRNA was significantly (> 2-fold) up-regulated in the “fast” migratory group. The addition of antibody to TGF-α or a specific inhibitor of its receptor reduced the wound closure rate of the “fast” group. Conversely, exogenous TGF-α accelerated wound closure by CLP-derived fibroblasts from the “intermediate” group.

CONCLUSIONS: Of the CLP-derived fibroblast strains, about one third exhibited significantly faster wound closure in vitro. Increased cell migration correlated with higher expression levels of TGFA. This growth factor is known to regulate wound repair by affecting cell migration and proliferation. Interestingly, non-syndromic CLP has been linked to TGFA polymorphisms. A causal relationship between cell migration and scarring still needs to be established.

## 118 THE OPTIMAL RHBMP2 DOSE NECESSARY TO AUGMENT HEALING OF A MURINE CRANIAL DEFECT UTILIZING A NOVEL FIBRIN HYDROGEL SCAFFOLD

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BACKGROUND & PURPOSE: Although tremendous advancements in surgical reconstruction of large craniofacial defects have been made, a large proportion of patient outcomes remain unfavorable. Patients with combat and civilian trauma, craniectomy for various intracranial pathologies and large en-bloc tumor resections are often left with few, if any, reliable and successful reconstructive options. Technical challenges that exist in the reconstruction of larger and more complex craniofacial defects differ vastly from those of smaller defects, as their incidence of infection, soft tissue erosion, extrusion, and migration increase significantly. This study aims to further delineate the role of recombinant human bone morphogenetic protein-2 (rhBMP2) by determining the dose required for maximal bone regeneration when delivered in a novel fibrin hydrogel scaffold.

METHODS & DESCRIPTION: Utilizing a murine model, C57BL/6 (n=70) mice received two identical 5mm full-thickness craniectomy defects (61.6 $mm^2$) using a standardized micro-drill core bit. The mice were divided into 7 groups consisting of: craniectomy without treatment (Group 1, n=10, negative control), craniectomy with hydrogel only (Group 2, n=10), craniectomy, hydrogel and 2μg rhBMP2 (Group 3, n=10), craniectomy, hydrogel and 3μg rhBMP2 (Group 4, n=10), craniectomy, hydrogel and 4μg rhBMP2 (Group 5, n=10), craniectomy, hydrogel and 5μg rhBMP2 (Group 6, n=10), and craniectomy, hydrogel and 7.5μg rhBMP2 (Group 7, n=10). Mice underwent CT imaging at 2 and 8 weeks to assess volumetric calvarial bone regeneration.

RESULTS: The mice in Group 1 who received craniectomy without treatment and those in Group 2 who received craniectomy with hydrogel only, showed no appreciable healing at 2 or 8 week intervals ($p<0.05$). Our preliminary data suggests a dose response curve for Groups 3-5, whereby statistically significant stepwise increases in bone regeneration occur as the dose of rhBMP2 increases from 2μg to 4μg ($P<0.05$); however no appreciable increase in bone regeneration occurs at rhBMP2 doses >4μg (Groups 6 and 7). The optimal dose of rhBMP2 to heal a 61.6 mm2 defect in our study appears to consistently augment bone regeneration with >50% healing observed at 8 weeks ($p<0.05$).

CONCLUSIONS: Current surgical reconstruction of large craniofacial defects remains challenging and associated with a high incidence of significant complications. Numerous publications exist that delineate the role of specific biologic products intended to aide in the process of bone regeneration for the reconstruction of these defects, and among these is rhBMP2. The optimal dosing of rhBMP2 when delivered in a novel hydrogel scaffold for a murine cranial defect, as outlined here, will facilitate further evaluation of rhBMP2 when used alone or in combination with other biologic products to reconstruct large craniofacial defects.

## 119 OPTIMIZING COLLAGEN SCAFFOLDS FOR BONE ENGINEERING: EFFECTS OF CROSSLINKING AND MINERAL CONTENT ON STRUCTURAL CONTRACTION AND OSTEOGENESIS

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BACKGROUND & PURPOSE: Osseous defects of the craniofacial skeleton occur frequently in congenital, post-traumatic, and post-oncologic deformities. The field of scaffold-based bone engineering emerged to address the limitations of using autologous bone for reconstruction of such circumstances. In this work, we evaluate two modifications of three-dimensional collagen-glycosaminoglycan scaffolds in an effort to optimize structural integrity and osteogenic induction.

METHODS & DESCRIPTION: Human mesenchymal stem cells (hMSCs) were cultured in osteogenic media on non-mineralized (C-GAG) and nanoparticulate mineralized (MC-GAG) type I collagen-glycosaminoglycan scaffolds in the absence and presence of crosslinking. At 1, 7 and 14 days, mRNA expression was analyzed using quantitative real-time RT-PCR for osteocalcin (OCN) and bone sialoprotein (BSP). Structural contraction was measured by the ability of the scaffolds to maintain their original dimensions. Mineralization was detected by micro-computed tomographic (micro-CT) imaging at 8 weeks. Statistical analyses were performed with Student’s t-test.

RESULTS: Nanoparticulate mineralization of collagen-GAG scaffolds (MC-GAG) increased expression of both OCN and BSP. Crosslinking of both C-GAG and MC-GAG resulted in modestly decreased osteogenic gene expression, however, structural contraction was significantly decreased after crosslinking. hMSC-directed mineralization, detected by micro-CT, was increased in nanoparticulate mineralized scaffolds, although the density of mineralization was decreased in the presence of crosslinking.

CONCLUSIONS: Optimization of scaffold material is an essential component of moving towards clinically-translatable engineered bone. Our current study demonstrates that the combination of nanoparticulate mineralization and chemical crosslinking of collagen-GAG scaffolds generates a highly osteogenic and structurally stable scaffold.

## 120 EVALUATION OF ADIPOSE-DERIVED STEM CELL OSTEOGENIC POTENTIAL AND CRANIAL BONE REMODELING IN A MURINE MODEL OF CROUZON SYNDROME

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BACKGROUND & PURPOSE: Crouzon syndrome is a common craniosynostosis condition, resulting from a mutation of the fibroblast growth factor receptor 2 (FGFR2) gene. It presents with a variety of craniofacial defects, including maxillary hypoplasia, ocular proptosis, hypertelorism, etc., caused by increased osteogenesis. Studies focused on developing therapies to treat craniosynostosis by preventing premature suture closing have been performed using various animal models. The FGFR2C342Y/+ mouse is well-established as a clinically-relevant model for Crouzon syndrome, however, its efficacy as a model to study novel therapeutic treatments for craniosynostosis has not been established. Therefore, we evaluated the osteogenic potential of adipose-derived stem cells (ADSCs) from FGFR2C342Y/+ mice in vitro and performed an in vivo bone remodeling study to assess cranial defect healing in Crouzon mice to determine if osteogenesis is enhanced in comparison to wild-type (WT) mice.

METHODS & DESCRIPTION: ADSCs were isolated from adipose tissue samples from Crouzon mice and WT control mice and cultured in control medium. At confluence, experimental cells were treated with osteogenic medium containing ascorbic acid, dexamethasone, and β-glycerophosphate, and controls were maintained in control medium. Osteogenic differentiation was assessed after 7, 14, and 21 days with a quantitative assay for alkaline phosphatase (ALP), Alizarin Red S (ARS) staining for mineral, and gene expression analysis for osteogenic-specific markers (ALP, Runx-2, OPN, Col1a). To evaluate bone healing in vivo, critical size defects were created in the right

parietal bone of WT and Crouzon mice using an Electric Pen Drive System (Synthes) fitted with a 3.75-mm burr. Bone regeneration was assessed after 8 and 16 weeks using micro-CT and histological stains (H&E, toluidine blue, von Kossa) to assess tissue composition and bone mineralization.

RESULTS: ALP in Crouzon mouse ADSCs was significantly higher than the WT cells at Day 7, 14, and 21 (n=3, p<0.05), however, ARS staining showed, no difference in mineral. Gene expression analysis showed no difference in Col1a or Runx-2 expression in WT or Crouzon cells, however, there was significantly more ALP and OPN expressed by Crouzon cells at Day 7 (n=3; p<0.05). After 8 and 16 weeks post-op, no significant qualitative differences in bone architecture, bone mineralization, or osteoblast activity were observed between WT and Crouzon mice, however, fusion of cranial sutures was observed in reconstructions of Crouzon skulls.

CONCLUSIONS: Our data suggests that Crouzon ADSCs may undergo increased osteogenic differentiation, as compared to WT ADSCs in vitro. Qualitatively, the fusion of cranial sutures in the in vivo model suggests that bone healing is enhanced in Crouzon mice when defect healing occurs; this finding must be confirmed with quantitative measurements of bone growth. Outcomes of this work are the first steps towards developing a clinically-translatable therapeutic strategy for patients with Crouzon syndrome.

## 121 THE STATE OF OUTCOMES RESEARCH IN NON-SYNDROMIC CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW OF THE LITERATURE OVER 20 YEARS

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BACKGROUND & PURPOSE: In the current era of result-driven health care, the careful evaluation of surgical outcomes must become an integrated part of patient care. The goal of this systematic review was to examine the state of outcomes reporting in the non-syndromic craniosynostosis literature in order to identify strategies for improvement.

METHODS & DESCRIPTION: A rigorous systematic review was conducted of all English articles evaluating outcomes in non-syndromic craniosynostosis published between 1993 and 2013. Pre-determined inclusion and exclusion criteria were applied and bibliographies were cross-referenced to minimize omission. Each article was analyzed for study design characteristics, population specifics, level of evidence grading, and outcomes metrics employed. Each member of a four-person research team independently reviewed all articles. Discrepancies were reviewed and resolved until a consensus was reached.

RESULTS: From January 1993 to October 2013, 840 articles were identified. A total of 132 articles met the inclusion criteria and were included for the review. Over the study period, there was a significant trend toward increasing annual rate of publications (R2=0.65). 85.6% of the publications were retrospective series, and 6% were prospective. 3.7% of studies were multicenter. 91.6% and 88.6% of the studies evaluated were graded with the lowest evidence scores in the ASPS and Oxford scales, respectively. 32.5% of outcomes studies (n=43) did not include a length of follow up. Of those that did, the average was 46.5 months (SD=36). Mean number of patients evaluated per study was 68 (SD=63.5). Outcomes measures varied significantly between publications. Only 15.1% (n=20) of studies used a validated outcomes measure, and all of these assessed neurodevelopment with established scales. In contrast, 45.4% (n=60) of studies employed ad hoc measures for analysis. 16.6% of studies (n=22) considered a patient- or family-reported outcomes mechanism. Aesthetic results were evaluated in some form by 44.5% of studies (n=59), and 35.6% of these used the Whitaker scale. However, 22% did not state any criteria for assessment. Other common outcome measures employed included: perioperative outcomes, 49.2% (n=65); complications, 40.9% (n=54); cephalic index, 26.5% (n=35); quantitative imaging analysis, 25% (n=33); and photographic analysis, 9% (n=12). Only 2.3% (n=3) of articles included a cost analysis.

CONCLUSIONS: The majority of the current literature on this topic remains classified as low level of evidence, stressing the need for more rigorously designed research. This review revealed the large variation in outcome measures used for non-syndromic craniosynostosis, making it difficult to combine evidence. This calls for a more consistent approach to outcomes reporting in the field. There is a need for validated outcome measures, and the Whitaker classification could be a good candidate for validation based on its clarity and wide use by craniofacial surgeons.

## 122 A PRELIMINARY REPORT ON THE USE OF POST-OPERATIVE STANDARDIZED OUTCOME TRACKING FOR INFANTS WITH SINGLE SUTURE CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Significant variability exists in the treatment of single suture craniosynostosis (SSC) amongst centers and within the same team. This variability may lead to inefficiency, waste and can compromise patient care. In 2012, the Craniofacial Center at Seattle Children's Hospital instituted a standardized pathway for the treatment of SSC. This pathway includes standardized order sets and checklists for outpatient visits, inpatient labs, tests, medications and nursing orders. Through a series of safety checklists, the providers can monitor outcome parameters in real time. The pathway includes 120 orders and 6 checklists for the following 6 phases of care: diagnostic, pre-surgical, immediate preoperative, immediate post-operative, transfer from PICU to the surgical unit, and discharge. We present our early experience using this system and focus on the outcomes documented in the immediate post-operative checklist.

METHODS & DESCRIPTION: For the purposed of this analysis we included patients with SSC who met criterion for the pathway and had a post-operative checklist completed by their provider. Patients with associated syndromes, multi-suture synostosis, previous cranioplasty or other major medical conditions were excluded from the pathway. Data were collected prospectively in each patient's electronic medical record upon completion of the operation based upon consensus of the surgical and anesthesia team. Tableau™ software was used to generate descriptive statistics from the checklists.

RESULTS: During this 2 year span, 138 (60%) of the 231 patients treated for craniosynostosis were placed on at least one of the six phases of the pathway. Six had lambdoid (4%), 27 had metopic (20%), 23 had unicoronal (17%), 75 had sagittal (54%), and 7 (5%) were "other". Of these, 99 patients had the post-operative checklist completed. Intraoperatively, sinus tear = 0, air emboli = 1 (without clinical changes), dura tear = 11, endotracheal malposition = 3, hypothermia = 5, and 1 patient required administration of a vasopressor intra-operatively. All open procedures involved blood transfusion and 85% received transexamic acid. 87% received less than 2 units of prbc, 80% received less than 2 u FFP and no patients received platelets. No patients were discharged with a hematocrit less than 18. 1.8% returned to the emergency room within 30 days and 0.9% were re-admitted within 30 days.

CONCLUSIONS: Standard work protocols provide a mechanism to follow an established pathway for patients with SSC treated at our institution, and to create a baseline from which we can monitor change. We believe that this standardization improves safety and provides a mechanism to track outcome measures which allow us to monitor our care in real time. We hope these measures will serve as benchmarks to compare alterations in care within our center and amongst craniofacial centers. We continue to work towards developing further evidence for components of the pathway, and identify barriers to pathway use.

## 123 A TREATMENT PROTOCOL FOR ATYPICAL PRESENTING SAGITTAL CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Sagittal craniosynostosis is the most prevalent single-suture craniosynostosis and is typically diagnosed and treated within the first year of life. Herein the authors highlight their experience with a challenging and previously unreported patient population: those with phenotypically mild, missed, or late-presenting sagittal craniosynostosis.

METHODS & DESCRIPTION: A retrospective chart review was conducted for all cases of sagittal craniosynostosis in our institution's Cleft-Craniofacial Center Database presenting between August 2013 and August 2014. Patients older than 1 year of age with isolated sagittal craniosynostosis were selected to highlight our experience since standardizing our treatment protocol over the past year. Our protocol takes into account the increased challenges of cranial vault surgery in older children. All children are evaluated by craniofacial

surgery, neurosurgery, and ophthalmology who perform dilated fundus examinations and visual evoked potential (VEP) testing. Socially significant head shape abnormalities are assessed and addressed surgically. Additionally, those with clear signs/symptoms of intracranial hypertension (ICH) are offered surgery. Those patients with mild head shape abnormities, signs of ICH that may be explained by other causes, and/or inconclusive ophthalmologic evaluations are scheduled for intracranial pressure monitoring in order to determine need for cranial vault surgery. All patients who do not undergo surgery are followed closely with serial ophthalmologic evaluations at least every 6 months.

RESULTS: Twenty-six patients were identified who met inclusion criteria. Of these, only two patients had clear scaphocephaly and proceeded directly to cranial vault remodeling. Six patients presented either with mild scaphocephaly, demonstrating some degree of saddle deformity; with symptoms concerning for ICH such as headache, developmental delay, or behavioral issues; or with abnormal VEP testing without papilledema on dilated fundus examination. These patients were admitted for intracranial pressure monitoring, of which two were found to be elevated (33 percent) and therefore underwent cranial vault remodeling. The other eighteen patients presented with isolated sagittal craniosynostosis in the setting of a completely normal head shape or a lack of any signs/symptoms concerning for ICH. These patients continue to undergo serial ophthalmologic evaluation with normal optic disc appearance and VEPs to date.

CONCLUSIONS: The optimal treatment of patients presenting with atypical sagittal craniosynostosis is not well defined. A new treatment protocol based upon the authors' experience with this cohort of patients is therefore described.

## 124 IMPLEMENTATION OF TRANEXAMIC ACID TO REDUCE BLOOD LOSS DURING CRANIAL VAULT REMODELING FOR CRANIOSYNOSTOSIS AT A SINGLE INSTITUTION

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BACKGROUND & PURPOSE: Pediatric cranial vault remodeling for repair of craniosynostosis is associated with significant blood loss and need for blood transfusion. To reduce these events, our institution began using tranexamic acid (TXA) peri-operatively in 2012. We sought to quantify the impact TXA has had on reducing blood loss and the transfusion of all blood product components.

METHODS & DESCRIPTION: With institutional review board approval, a retrospective study from 2006 to 2013 was performed for all patients undergoing surgical correction of craniosynostosis at our institution. All available records were reviewed, and patient data were collected from the time of preoperative evaluation until discharge. We focused our review on patients with non-syndromic single-suture synostosis, before and after the implementation of TXA into our program.

RESULTS: We identified a total of 220 patients with craniosynostosis, of which 176 had non-syndromic single-suture disease. Of these 177, a total of 49 received TXA. A single surgical team performed all operations. Median age at time of surgery was 9.1 months (IQR of 5.9-10.4 months). The TXA group had a significant reduction in estimated blood loss (29 vs. 37 ml/kg $p<0.01$), cell saver volume (6ml/kg vs. 10 ml/kg $p<0.01$), red cell transfusion volume (33 vs. 42 ml/kg $p<0.01$), and exposure to plasma transfusion (2% vs. 27% $p<0.01$). Reduction in platelet transfusion did not reach significance (2% vs. 9% $p=0.18$). Even with reduced red cell transfusion, the TXA-treated patients exhibited similar post-operative hematocrits (30.1 vs. 30.8 $p=0.10$) to those not treated with TXA. We found that length of stay was reduced with the use of TXA (4 days IQR 3-4 vs. 4 days IQR 4-5, $p<0.01$), as was output from surgically placed drains (177 vs. 328 ml $p<0.01$). We found no difference in mortality or post-operative complications between groups.

CONCLUSIONS: The introduction of TXA for non-syndromic single-suture synostosis repair at our institution resulted in significant reductions in blood loss and need for blood product transfusion for cranial vault remodeling. Postoperative hematocrits remained similar even with the reduced blood transfusion volumes. In addition, TXA use nearly eliminated the need for plasma transfusion, and is associated with a shorter hospital stay. No difference in postoperative complications was observed. Our data provides further support for the continued use of TXA in our program and its wider acceptance for pediatric cranial vault remodeling.

## 125 A NEW OSTEOGENIC AGENT, OXYSTEROL, INDUCES BONE REPAIR IN RABBIT CRANIOFACIAL DEFECT

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BACKGROUND & PURPOSE: The repair of complex craniofacial defects poses significant reconstructive challenges. Current methods employing autologous bone grafts or alloplastic implants are fraught with complications. Tissue engineering approaches using bone morphogenetic proteins (BMPs) are associated with adverse side effects and exorbitant costs. Here we investigate a novel molecule with significant osteogenic potential. We examined the impact of Oxy133, a novel oxysterol analogue, on in vitro and in vivo osteogenic differentiation of rabbit bone marrow stromal cells (BMSCs).

METHODS & DESCRIPTION: Rabbit BMSCs were isolated, cultured, and treated with control media or varying concentrations of Oxy133 or BMP-2. In vitro osteogenic differentiation was assessed via alkaline phosphatase (ALP) assay, quantitative real-time PCR of osteogenic genes, and mineralization assays. In vivo activity was measured by healing of critical-sized rabbit calvarial defects that were treated with collagen sponge/inert control vehicle, collagen sponge/Oxy133, collagen sponge/BMP-2, or no treatment. The calvarium was harvested after seven weeks for histologic and radiographic analysis.

RESULTS: Rabbit BMSCs treated with Oxy133 demonstrated increased ALP activity, up- regulation of osteogenic gene expression, and increased mineralization of cultures compared to controls. Oxy133-treated cells demonstrated osteogenic differentiation with an efficacy similar to that of cells treated with BMP-2 in vitro. Similar to animals treated with BMP-2, critical-sized rabbit calvarial defects showed complete bone regeneration when treated with collagen sponges combined with Oxy133.

CONCLUSIONS: Oxy133 induces osteogenic differentiation in rabbit BMSCs as effectively as BMP-2 in both in vitro and in vivo models. Oxysterols may therefore represent a viable alternative to BMP-2 in bone tissue engineering paradigms. Its application to the design of a clinically viable, safe, and cost effective bone graft substitute warrants further study.

## 126 DYNAMIC SKELETAL CHANGES OF AN OSTEOMYOCUTANEOUS FACIAL ALLOGRAFT FIVE YEARS FOLLOWING TRANSPLANTATION

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BACKGROUND & PURPOSE: More than 30 face transplantations have been performed worldwide, most including part of the facial skeletal framework. The aim of this study was to evaluate if the skeletal component of a facial allograft undergoes changes following transplantation under the modified circulatory pattern and effects of the immunosuppressive regimen.

METHODS & DESCRIPTION: Pre and postoperative CT scans of the facial bones, CT angiogram (CTA) of the neck vessels and bone mineral densitometry (BMD) were evaluated. The pre and postoperative CT images were overlapped to assess skeletal changes and the changes were expressed both in a numeric and color-coded scale (Medical Modeling 3D Systems). The values of the serum calcium, phosphate, vitamin D, alkaline Phosphatase, thyroid and parathyroid hormones, TSH, FHS, LH, estradiol, total protein and albumin, serum creatinine and creatine clearance were reviewed.

RESULTS: At 5 years follow up the patient was 51 year-old, clinically asymptomatic and presented good stability of the Le Fort III skeletal component of the facial allograft. Five years CT images revealed fibrous union of all of skeletal fixation sites except the right zygomatic arch. There was increased bone resorption at the osteotomy sites, left infraorbital rim and left maxillary buttress and anterior maxilla. Patchy areas of bone deposition were detected at the level of septum and alveolar bones. CTA showed segmental absence at the origin of the left external carotid artery, good opacification of the rest of the external carotid arteries and its branches likely due to retrograde flow and attenuated origin of the left lingual artery with good distal opacification. BMD evidenced osteopenia of the spine. The patient presented mild hypoalbuminemia (3.4 g/dL) and perimenopausal hormonal levels. All of the remaining laboratory values were within normal limits.

CONCLUSIONS: This is the longest follow-up reported for a facial allograft with an important bony component. Despite the patient presented multiple risk factors for bone resorption, facial allograft osteopenia was only discovered at the level of the left infraorbital rim and anterior maxilla. These findings could

be explained with the occlusion of the left external carotid system and retrograde revascularization. Bilateral arterial repair is recommended in the event of full-face allotransplantation in order to maximize the normal physiology of the skeletal component of the allograft.

## 127 THE EFFECT OF CLEFT PALATE AND REPAIR ON GROWTH: A COMPARISON OF AMERICAN CHILDREN AND INTERNATIONAL ADOPTEES

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BACKGROUND & PURPOSE: Patterns of growth in children with a cleft palate have not been well delineated in the literature. This study describes the effect of plate repair on weight, length and head circumference in non-syndromic children at a major American cleft center.

METHODS & DESCRIPTION: A chart review was performed to identify all patients who underwent palate repair between 2010 and 2013. Syndromic patients, secondary repairs, and submucous cleft palate were excluded. Patients were categorized as internationally adopted or domestic. Growth measurements were abstracted from the electronic medical record up to April 2013. Length, weight, and head circumference were converted to z-scores for age according to World Health Organization's (WHO) standards. Three time periods were identified: birth, pre-cleft palate repair and post- repair (up to 2 years post-surgery). A growth model was fit to standardized anthropometric data, with time as a discrete variable and a random effect at the patient level. For each measure, contrasts were calculated between each of the three time periods separately for adoptees and domestic children. P-values were not adjusted for multiple comparisons.

RESULTS: We obtained 633 lengths, 720 weights, and 291 head circumferences from 22 international adoptees and 107 domestic children (47% female). Adoptees were significantly older at surgery, mean age 24.0 months, than the domestic children, 10.8 months ($p < 0.001$). At birth, z-scores for weight in both groups were negative (below average anthropometrics). The z-scores for weight declined from birth to pre-repair among both domestic children and adoptees ($p < 0.001$, and $p = 0.079$, respectively), and rebounded significantly after repair ($p < 0.001$ domestic, $p = 0.001$ adoptees). Length z-scores also declined significantly in both groups from birth to pre-repair, and increased pre- to post-repair (p-values all $< 0.05$). In both groups, head circumference declined from birth to pre-repair ($p<0.05$). Head circumference post-repair increased significantly in the domestic group ($p < 0.001$), but not in the adoptees ($p = 0.449$), whose mean z-score remained more than one standard deviation below normal.

CONCLUSIONS: Growth measurements in children with cleft palate are below average at birth. Growth measures decline further before palate repair, and for both domestic and adoptee children weight and length measure recover following palate repair. Interestingly, this occurs despite the difference in timing of repair. Head circumference is the one measure for which adoptees to do not catch up. These findings may have implications on the quality of pre-repair nutrition programs for cleft palate patients. The failure of normalization of head circumference in adoptees is also concerning for the potential downstream cognitive effects. Both of these issues warrant further study.

## 128 PERIOPERATIVE COMPLICATIONS IN POSTERIOR PHARYNGEAL FLAP SURGERY: REVIEW OF THE NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM PEDIATRIC (NSQIP-PEDS) DATABASE

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BACKGROUND & PURPOSE: Posterior pharyngeal flap (PPF) surgery has a long track record of success in the treatment of velopharyngeal incompetence (VPI). This study aims to identify risk factors for complications from and readmission after PPF using the American College of Surgeons National Surgical Quality Improvement Program Pediatric (NSQIP-Peds) database.

METHODS & DESCRIPTION: Patients who underwent posterior pharyngeal flap surgery (CPT codes 42225 or 42226) as their primary procedure were selected from the 2012 NSQIP-Peds program update file. Patient characteristics, comorbidities, and complication/readmission data were compiled. Fisher's exact, chi-squared, and rank-sum tests were used to evaluate and compare risk factors.

RESULTS: 225 patients met the inclusion criteria for this study. Of those, 5.3% (12) had peri-operative complications. The most common complications were pulmonary in nature (6, 50%) including respiratory failure requiring mechanical ventilation (4, 33%) and post-operative pneumonia (2, 17%). Underlying asthma ($p=0.024$) or any cardiac risk factor ($p=0.047$) conveyed significant risk for complication. Other risk factors including esophageal varices ($p=0.089$), chromosomal congenital malformations ($p=0.079$), ASA class 3 ($p=0.073$), and neuromuscular disorders ($p=0.127$) showed a trend toward associated complication. Four patients (1.8%) required readmission, at a mean interval of 8.8 days after the original procedure. Three patients (1.4%) required reoperation, at a mean interval of 9.8 days after the original procedure. 79 patients (35%) were discharged postoperatively on an outpatient basis, and this subgroup only included one patient (8%) with a complication ($p = 0.038$), which may suggest that surgeons are use good judgment in admitting patients with risk factors for complication to enable observation.

CONCLUSIONS: The 2012 NSQIP-Peds provides a reliable cross-sectional view of complications associated with posterior pharyngeal flap surgery across institutions. This study suggest that peri-operative complications surface at a low rate following pharyngeal flap surgery. Respiratory complications are the most common, and additional attention should be paid to those patients with asthma, cardiac risk factors, esophageal varices, chromosomal abnormalities, an ASA class of 3, and neuromuscular disorders. Future work will focus on increasing enrollment to gain deeper insight into risk factors as well as development of risk-reduction strategies.

## 129 ACELLULAR DERMAL MATRIX IN PRIMARY PALATOPLASTY: IMPLICATIONS FOR SPEECH

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BACKGROUND & PURPOSE: Palatoplasty is performed to correct velopharyngeal incompetence (VPI). Post-operative palatal fistulas are to be avoided, as these recalcitrant lesions can lead to the regurgitation of fluid and food and independently cause VPI. Post-operative fistula formation is prevented by a tension-free watertight closure. Employing acellular dermal matrix (ADM) in difficult primary palatoplasties has minimized post-operative fistula rates in our previously reported experience. We hypothesize that the incorporation of ADM into primary Furlow palatoplasty does not adversely affect postoperative speech.

METHODS & DESCRIPTION: A retrospective review of consecutive patients undergoing primary Furlow palatoplasty with or without ADM at a major academic cleft-craniofacial center over a decade (from 2004 - 2013) by a single surgeon was performed. Children with syndromic diagnoses and those unable to cooperate with speech evaluation were excluded. Veau type, demographics, and post-operative speech results [quantified by Pittsburgh Weighted Speech Score (PWSS)] were recorded. The ADM and non-ADM groups were compared with regards to PWSS and frequency of secondary speech surgery. Statistical analysis was performed using SPSS Statistics 22.0 (IBM). Power analysis demonstrated sufficient sample size to demonstrate significant differences if present.

RESULTS: Inclusion criteria were met by 112 patients (ADM n = 50, non-ADM n = 62). Average follow-up was 5.0 years. ADM use did not differ significantly by gender (Pearson X2 $p>0.05$). Patients with more severe Veau diagnoses were significantly more likely to be treated with ADM (Pearson X2 $p<0.001$). ADM was utilized in 0% patients with Veau class 1, 35% patients with Veau class 2, 39% patients with Veau class 3, and 88% patients with Veau class 4. There was no significant correlation between ADM use and subsequent secondary speech surgery: 4.8% patients in the non-ADM group versus 12% patients in the ADM group (Fisher's Exact Test $p>0.05$). Similarly, there was no significant correlation between ADM use and mean post-operative PWSS: 3.5 in the non-ADM group and 4.8 in the ADM group (Mann-Whitney U Test $p>0.05$).

CONCLUSIONS: ADM facilitates effective palatal closure in difficult primary palatoplasties and, as we have previously shown, prevents postoperative fistulas. It would not, however, be acceptable to undermine the primary goal of palatoplasty (normalized speech) to avoid another complication (post-operative fistula). ADM does not appear to adversely affect speech outcomes in primary Furlow palatoplasty. Concerns for possible speech disturbance should not deter one from using ADM to augment potentially tenuous primary Furlow palatoplasties.

## 130 VARIATION IN THE BURDEN OF SECONDARY PALATE SURGERY ACROSS US CLEFT CENTERS

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BACKGROUND & PURPOSE: The burden of care for children with cleft lip and palate extends beyond primary lip and palate surgery to potentially include multiple secondary procedures. We previously demonstrated a 5.9-fold difference in the burden of secondary surgery among four centers participating in Americleft. It is unknown whether this variation in burden of secondary palate surgery exists among other treatment centers in the US.

METHODS & DESCRIPTION: The patient's burden of secondary palate surgery was evaluated for children treated at 44 US children's hospitals using prospectively collected administrative data in the Pediatric Health Information System (PHIS). Children with non-syndromic cleft lip and palate were included if they underwent cleft palate repair prior to two years of age between 1998 and 2013. To account for variable follow-up, outcome was defined as duration of survival without secondary palate surgery. Survival without secondary palate surgery was compared between hospitals using a Cox proportional hazards model that adjusted for gender, race, and socioeconomic status. Inter-hospital comparisons were restricted to hospitals treating at least 175 subjects during the study period. This ensured a power of 0.8 to detect a 50% difference in survival without secondary palate surgery with a type I error rate of 0.05 (adjusted for pairwise comparisons between hospitals).

RESULTS: Survival without secondary palate surgery was evaluated for 4939 children. Children underwent primary palate repair at a median age of 11 months (range, 1-24 months). Overall median survival without secondary palate surgery was 8.2 years (95% CI, 8.0-9.5). Survival was significantly different between hospitals ($p<0.0001$, log-rank test), with median survival ranging from 2.9 to 10.7 years. Between-hospital differences remained significant after adjusting for patient characteristics, including gender, race, and socioeconomic status ($p<0.0001$). The hospital-specific hazard ratio for secondary palate surgery ranged as high as 9.0 (95% CI, 5.6-14.4) compared to the best performing hospital.

CONCLUSIONS: Survival without secondary palate surgery was significantly different between US children's hospitals. Identifying best practices at high-performing centers could lead to substantial reductions in the burden of care for children with cleft lip and palate.

## 131 PATIENTS WITH CLEFTS WHO UNDERGO SLEEP STUDIES AFTER SURGERY DO NOT SHOW SIGNIFICANTLY IMPROVED SLEEP PARAMETERS AFTER ADENOTONSILLECTOMY

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BACKGROUND & PURPOSE: The most common etiology for pediatric obstructive sleep apnea (OSA) is tonsillar or adenoidal hypertrophy. Children with cleft-craniofacial conditions have additional factors that lead to OSA, such as scarring and volume of the velopharyngeal complex. Our goal was to examine these patients who had postoperative polysomnograms (PSG), and compare adenotonsillectomy (AT) procedures versus non-AT procedures, in terms of their PSG measurements. Our hypothesis was that children with AT procedures would have better PSG outcomes than non-AT procedures.

METHODS & DESCRIPTION: After IRB approval, a retrospective review of records from 2009-2014 was conducted. Patients with PSGs were included for analysis including demographics, cleft type, syndromes, types of surgery, and PSG outcome measures. Data was analyzed per procedure, with postoperative PSGs (before the next surgery if there was an additional surgery), and preoperative PSG if one existed. Continuous outcomes were compared with Mann Whitney U-tests, and categorical by chi-square or Fisher exact tests.

RESULTS: 92 patients had a postoperative PSG after surgery, for a total of 115 postoperative PSGs. Of these postoperative PSGs, the procedure distribution was tonsillectomy (T) 5, adenoidectomy (A) 5, adenotonsillectomy (AT) 19. Postoperative OSA as defined by apnea-hypopnea index (AHI)1 > 1: T 4/5 (80%), A 4/5 (80%), AT 18/19 (95%), P=0.4644. Total AHI means of T 11.0, A 13.6, AT 16.4, P=0.4130. Obstructive AHI means of: T 11.4, A 12.5, AT 16.6, P=0.3677. Arousal index means: T 17.2, A 16.0, AT 14.2, P=0.7449. We then compared change between preoperative and postoperative PSGs. 30 patient procedures were associated with pre- and post- operative PSGs. 17 procedures were T, A or AT (TAAT), versus 13 non-TAAT procedures. Changes were measured as post-PSG minus pre-PSG. AHI change was: TAAT -0.35, non-TAAT -9.64, P=0.1736. Obstructive AHI change was [page 6]: TAAT 0.62, non-TAAT -9.7, P=0.1185. Arousal index change: TAAT -1.49, non-TAAT -6.24, P=0.4397.

CONCLUSIONS: Tonsillectomy, adenoidectomy, and adenotonsillectomy procedures, hypothesized to improve airway patency in patients with cleft palates, were not associated with significant improvement in OSA when compared to other cleft procedures. This result may be the result of heterogeneity of the procedures, or being underpowered, or indication bias from patients who received sleep studies were more likely symptomatic. We tentatively caution that tonsillectomy, adenoidectomy, and adenotonsillectomy may not have a strong an effect as we would expect, and in that scenario, teams may want to avoid adenoidectomy to avoid its risks of velopharyngeal insufficiency.

## 132 SLEEP DISORDERED BREATHING IN PATIENTS WITH CLEFT PALATE; DO HOME OXIMETRY SLEEP STUDIES HAVE A CLINICAL UTILITY?

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BACKGROUND & PURPOSE: Sleep Disordered Breathing (SDB) is known to affect syndromic (e.g. PRS) patients with cleft plate. The guidelines in the United Kingdom suggest early sleep investigations at 4 weeks of age should be performed. There is a need to better understand the range of SDB in all patients with cleft palates +- lips. Our aim was to elucidate the degree of SDB in pre- and post-operative patients with cleft palate +- lip, evaluate any differences between patients that are syndromic or non-syndromic, and also to assess the clinical utility of sleep studies in these cohorts.

METHODS & DESCRIPTION: We conducted a prospective observational study of SDB patterns in consecutive patients referred to our Regional Cleft Surgery Service between 2010 and 2014. All patients were offered pre- and post-operative home oximetry sleep studies. Sleep studies were reported using the American Academy of Sleep Medicine scoring guidelines. A total of 104 patients were studied. They were stratified into isolated cleft palate, isolated cleft palate and lip, and cleft palate +- lip with an associated syndrome. Further subgroup analysis looked at pre- vs post-operative sleep studies; early (< 6 weeks) vs late sleep studies; and the correlation of the use of airway adjuncts post operatively with pre-operative sleep study results.

RESULTS: All groups demonstrated some degree of SDB. This was significantly worse in those studied at a younger age and those with associated syndromes. Pre- and post-operative studies demonstrate improvements in SDB in all groups but not normalisation of SDB in infants with cleft palate. Those with associated syndromes were more likely to require pre-operative airway adjuncts. The use of pre-operative sleep studies as a guide to the requirement of post-operative naso-pharyngeal airway adjuncts decreased the emergency placement of airway adjuncts after surgery.

CONCLUSIONS: Transient hypoxias during sleep are a normal part of infant development but are worse in patients with a cleft palate, and especially in those with an associated syndrome. We have demonstrated that SDB improves both with maturity and, to a lesser extent, with palatal surgery. We now use the results of pre-operative sleep studies to guide our decision making regarding intra-operative placement of naso-pharyngeal airway adjuncts. We also present a pragmatic algorithm for the investigation/management of SDB in cleft children that avoids unnecessary resource burden as well as minimising clinician and parental anxiety.

## 133 INCIDENCE AND SEVERITY OF OBSTRUCTIVE SLEEP APNEA IN ONE THOUSAND TWENTY CHILDREN WITH CLEFT-CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Children with cleft or craniofacial conditions have multiple etiologies for obstructive sleep apnea (OSA). Our aim was to characterize the degree and severity of our patients, by analyzing our patients with cleft-craniofacial conditions who had polysomnogram (PSG) during their course of care.

METHODS & DESCRIPTION: After IRB approval, a retrospective review of records from 2009-2014 was conducted. Patients with PSGs were included for analysis including demographics, cleft type, syndromes, types of surgery, and PSG outcome measures. Data was analyzed on patient and PSG level with univariate descriptive statistics.

RESULTS: Of 1,020 cleft patient records examined, 92 patients (51.1% male) had clinical symptoms warranting 115 postoperative PSGs. Of those PSGs 105/115 (91.3%) had OSA as defined by obstructive apnea-hypopnea index (OAHI) > 1.0. This was further broken down into multiple OSA grades: grade 0 (OAHI ≤ 1) 10/115 (8.7%); grade 1 (OAHI >1, <5) 46/115 (40.0%); grade II (OAHI ≥5, <10) 30/115 (26.1%); grade III (OAHI ≥10, <15) 9/115 (7.8%); grade IV (OAHI ≥15, <20) 4/115 (2.5%); grade V (OAHI ≥20, <25) 6/115 (5.2%); grade VI (OAHI ≥25, <30) 4/115 (3.5%); and grade VII (OAHI ≥ 30) 6/115 (5.2%). The incidence of syndromic association was 27/92 (29.4%). Incidence of Pierre Robin sequence was 18/92 (19.6%). The average age at PSG was 6.28 years (standard deviation 4.67). The surgery directly preceding each PSG was reviewed (n=115). A postoperative median time delay of 11.47 months (IQR: 6.2 - 32.2) was observed. The following procedures were performed: primary palatoplasty 11.3% (13/115), secondary speech surgery 31.3% (36/115), tonsillectomy and/or adenoidectomy 25.2% (29/115), takedown procedures 2.6% (3/115), and other procedures 40.0% (46/115).

CONCLUSIONS: Obstructive sleep apnea is a common finding in our patient population, with an incidence approaching 10%, compared to the published rate of 1-5% in the general pediatric population. The majority of these patients (38%) present with an OAHI between 1 and 5. Future analyses will include subgroup analyses by diagnosis and surgery. Signs and symptoms of sleep apnea should be elicited and further evaluated in children with cleft-craniofacial conditions.

## 134 DEVELOPMENT AND VALIDATION OF COMPUTER-BASED 3D ANALYSIS OF SYMMETRY BEFORE AND AFTER CLEFT LIP REPAIR

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BACKGROUND & PURPOSE: Evidence-based cleft lip repair requires objective measurement of 3D nasolabial form however current methods of analysis are limited or cumbersome. The purpose of this project was to develop and validate automated quantitative measures of 3D nasolabial symmetry for infants with cleft lip. Aim 1 compares 5 methods of defining the mid-facial reference plane of the face across which symmetry can be measured. Aim 2 utilizes the best computer-based mid-facial reference plane, determined in part 1, to quantify symmetry before and after primary cleft lip repair.

METHODS & DESCRIPTION: Aim 1: The mid-facial reference plane was determined on 50 subjects (35 with UCL±P, 10 BCL±P, and 5 normal controls) using two manual methods (direct placement and landmark) and 3 automated computer-based methods ("mirror", "deformation", and "learned"). Six raters (3 cleft surgeons, 3 craniofacial researchers) assessed the precision of each reference plane in a blind and randomized manner using 3D meshes that could be rotated synchronously. For each subject, raters ranked which method they thought performed best and rated how well each method approximated the mid-facial reference plane according to a 7-point reference scale. Rater reliability was assessed by Pearson correlation and differences in rankings and ratings were analyzed using ANOVA. Aim 2: Computer-based measures of symmetry were applied to 35 subjects with UCL±P before and after primary repair and to 20 age-matched normal controls. The correlation of symmetry scores to subjective rankings of cleft severity was determined using linear regression analysis. Symmetry scores were compared before and after surgery and to normal controls.

RESULTS: Part 1: Manual methods of defining the mid-facial reference plane received better rankings and ratings than the automated methods. This difference was statistically significant for all automated methods except for the "deformed" method, which performed the best amongst the automated methods. The average correlation coefficient amongst raters was 0.4, however it rose to 0.7 and 0.9 when the angular difference between planes was greater than 6 and 8 degrees respectively. Part 2: Pre-operative symmetry scores correlated highly with subjective ratings of cleft severity (0.72) and columellar angle (0.71). Differences between pre- and post-operative symmetry scores were large for severe clefts and small for less severe clefts. Post-operative symmetry scores were similar to those for normal controls.

CONCLUSIONS: Processing of 3D images of infants with cleft lip can be automated. The "deformation" method of defining a mid-facial reference plane to measure facial symmetry performed best and was on par with human methods. Subsequent quantification of facial symmetry using the mid-facial reference plane correlated with cleft severity and the pre vs. post-operative state. These methods may be used as objective measures of change produced from treatment of cleft lip.

## 135 DEFINING NORMAL: QUANTIFYING CRANIAL ASYMMETRY IN THE PEDIATRIC POPULATION

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BACKGROUND & PURPOSE: Patients with deformed skulls often undergo cranial reconstructive surgery to improve head shape. However, defining a normal human head shape can be controversial. By far, most of the quantification of cranial asymmetry is done with simple caliper anthropometric measurements or 2D photography describing the overall contour. In this study, we used 3D non-radiologic images to assess the cranial asymmetry of normal healthy children to provide a reference point to craniofacial surgeons.

METHODS & DESCRIPTION: Stereophotogrammetic images (3dMD, Georgia, USA) of normal healthy children (n=30) with no known cranial abnormality were recruited at well-child visits following IRB approval. The children ages ranged from 0 to 16 years old (median 8 years). A symmetric 3D scan with left and right point correspondences was used as a template to calculate the asymmetry in the 3D subject data. The template was registered and scaled to each individual scan using 25 manually placed landmarks. An additional 40 pseudolandmarks were automatically placed on the head surface and the template scan was deformed to each subject's 3D surface scan using a thin-plate spline algorithm and iterative closest point matching. A distance map was generated between the cranial surface and the center of the head (midpoint of the left and right tragus points), which in turn was used to calculate the cranial asymmetry for each subject. Group characteristics were calculated.

RESULTS: The mean cranial asymmetry was 1.52 ± 0.7% ranging from 0.6% to 3.5%. The mean asymmetry was similar between younger children (<10 years, n=18) and older children (≥10 years, n=12), 1.53 ± 0.74% and 1.50 ± 0.72%, respectively. In addition, similar asymmetry values were observed in African American (n=13) and Caucasian (n=16) children, 1.49 ± 0.73% and 1.54 ± 0.76%, respectively.

CONCLUSIONS: This study shows the feasibility of quantifying normal cranial asymmetry using 3D surface scans. We are currently expanding our study utilizing over 1000 normal subject scans in our Craniobank repository and we plan to share these results gathered from this work in this presentation. An understanding of the "normal" distribution of asymmetry is an important prerequisite in considering interventions and diagnosis of patients presenting with concern about asymmetry.

## 136 CONTRIBUTIONS OF THE MUSCULUS UVULAE TO VELOPHARYNGEAL CLOSURE QUANTIFIED WITH A 3D MULTI-MUSCLE COMPUTATIONAL MODEL

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BACKGROUND & PURPOSE: The levator veli palatini (LVP) muscle has been examined in vivo using MRI in infants, children, and adults. However, few studies have examined the musculus uvulae (MU) shape and movement changes in vivo. Research has questioned even the existence of the MU in individuals born with cleft palate. As a result, little consideration is given to its surgical reconstruction (Huang et al. 1997). A greater understanding of the mechanics of the MU will provide insight into importance of surgical procedures to modify the nasal velar surface to reconstruct and/or compensate for this midline muscular absence. The purpose of this study was to quantify the contributions of the MU to velopharyngeal (VP) closure in a computational model.

METHODS & DESCRIPTION: We created a novel 3D finite element model of the VP mechanism from MRI scans of a 20 year old Japanese male subject with normal VP anatomy. The model components included the soft palate, the posterior pharyngeal wall, the LVP, and the MU. Simulations were based on the muscle and soft tissue mechanical properties from the literature (Inouye et al. 2014, Blemker et al. 2005, Huang 1995). We simulated three scenarios: i) MU and LVP activated simultaneously (i.e., as found in Kuehn et al. 1988) and equally, ii) LVP activated in isolation in the absence of the MU, and iii) MU activated in isolation.

RESULTS: We found from scenarios (i) and (ii) that contraction of the MU in the model reduced the muscle activation required for VP closure by 10%. The tip-to-tip length of the MU decreased by 5% upon VP closure in (i) while the same portion of tissue increased in length by 5% upon VP closure in (ii), showing that the MU shortens during VP closure and therefore acts to shorten and thicken the muscle and the surrounding velar tissue. In (iii), activation of the MU with the LVP at rest decreased the VP distance by extending the posterior portion of the velum towards the posterior pharyngeal wall. Furthermore, contraction of the MU in (iii) increased the velar thickness and decreased the tip-to-tip length of the MU.

CONCLUSIONS: This study provides novel insights into the role of the MU in VP closure. A properly functioning MU, as shown by this study, a) decreases the VP distance, b) decreases the activation required for VP closure, and c) increases thickness at the velar knee. These effects result from the MU contracting the velar nasal surface, thereby extending the posterior velar segment and thickening the velar knee. These results indicate that cleft patients without the MU or without a properly reconstructed MU are predisposed to hypernasality since the function of the MU is intimately involved in VP closure. More complex models including additional velopharyngeal muscles will provide further insight into the contributions of other muscle functions in normal and cleft populations.

## 137 DIAGNOSTIC YIELD OF SKULL RADIOGRAPHS IN DIFFERENTIATING SYNOSTOTIC AND NON-SYNOSTOTIC PLAGIOCEPHALY

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BACKGROUND & PURPOSE: Differentiating synostotic and non-synostotic plagiocephaly can be challenging, and some providers routinely obtain skull radiographs when evaluating an infant who presents with plagiocephaly. While it is a common practice to obtain skull radiographs as a diagnostic adjunct to differentiate the types of plagiocephaly, obtaining skull radiographs is controversial because the diagnostic yield has not been studied, and there is concern for radiation exposure and cost.

METHODS & DESCRIPTION: After obtaining IRB approval, a retrospective review of all patients who were referred to the University of Texas Southwestern School of Medicine, Children's Medical Center (Dallas, TX) between the years of 2010 to 2012 with a diagnosis of plagiocephaly was undertaken. Patient demographics, perinatal data, physical exam findings, skull radiographic findings in radiologist reports, and CT findings were collected, and descriptive statistics were calculated.

RESULTS: Electronic medical records of 1429 patients with a diagnosis of plagiocephaly were reviewed. 6 of 1429 patients obtained CT after initial evaluation without prior conventional skull radiographs, and within this group 3 patients (50%) had true synostosis. 1218 of 1429 patients obtained skull radiographs after initial exam, and 23% had abnormal radiographic findings. 28 of 1218 had findings concerning for synostosis, and 16 of 28 patients obtained CT. Of these 16, 3 patients (0.13% of those obtained skull radiographs) had radiographic diagnosis of synostosis from CT.

CONCLUSIONS: There is a low diagnostic yield in ordering routine skull radiographs to differentiate between synostotic and non-synostotic plagiocephaly in patients with a plagiocephaly. A discussion of the costs in terms of radiation risk, economic burden, and diagnostic information gleaned from skull radiographs will be undertaken in presenting these data.

## 138 PRENATAL DIAGNOSIS OF CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Craniosynostosis, the premature fusion of the cranial sutures, can result in cranial deformity, and increased intracranial pressure. Craniosynostosis is rarely diagnosed in-utero, but rather postnatally by way of clinical exam and radiographic findings. Prenatal diagnosis could allow for improved parental counseling and timely intervention. Prenatal ultrasound has become increasingly powerful, and is routinely able to diagnose cleft lip and palate and other developmental anomalies. Our goal is to determine if prenatal ultrasound can be used to diagnose craniosynostosis, by quantitatively comparing calvarial dimensions of fetuses with known craniosynostosis, to age-matched controls.

METHODS & DESCRIPTION: After institutional IRB approval, we retrospectively analyzed prenatal ultrasounds of infants with a known postnatal diagnosis of craniosynostosis. Cross sectional images at the plane used to measure biparietal diameter (BPD) were selected and cranial shape for each subject was parameterized with a radial spoke model using ImageJ (http://rsbweb.nih.gov/ij/index.html). Control images were selected to within 1 day of gestational age. Shape analysis was performed on age matched pairs, and by using leave-one-out validation to determine if the patients with synostosis could be discriminated from their age matched controls. Cranial indices were calculated for cases of sagittal synostosis and their age matched controls. Additionally, two independent craniofacial surgeons made diagnoses on the blinded images to compare visual inspection alone to the mathematical shape analysis.

RESULTS: We obtained the prenatal ultrasounds of 22 patients postnatally diagnosed with craniosynostosis and compared them to 22 age matched controls. The most common diagnosis was sagittal synostosis (11), followed by metopic synostosis (6). The average gestational age of both controls and synostotic patients was 26 weeks and 6.8 days. The controls and synostosis cases segregated into statistically different populations by their shape profiles (P=0.0004). Using leave-one-out validation the shape analysis correctly classified images as normals vs. synostotic cases 85.9% of the time. Cephalic index was a poor indicator of sagittal synostosis (45% sensitivity). Visual inspection alone demonstrated only a fair level of accuracy (40- 50% agreement) in identifying cases of synostosis (kappa 0.09-0.23).

CONCLUSIONS: Cases of synostosis can be identified on prenatal ultrasound with good sensitivity. Formal shape analysis is more accurate at identifying synostosis than cephalic index or visual inspection. We hope that further refinements in the shape analysis will improve diagnostic accuracy, and help elucidate at what point in gestation cranial shape becomes identifiably abnormal.

## 139 THE ROLE OF PREOPERATIVE IMAGING IN THE OPERATIVE PLANNING AND DETECTION OF INTRACRANIAL ABNORMALITIES IN SINGLE SUTURE LAMBDOID CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: The use of imaging with concomitant clinical examination has traditionally served as the cornerstone for the diagnosis and treatment of craniosynostosis. The necessity of imaging to ensure a proper diagnosis and to guide patient management in children with isolated single suture, non-syndromic craniosynostosis, however, has recently become a subject of controversy because of the potential deleterious effect of radiation in early childhood. Unfortunately, the role that imaging can play in operative planning has been largely ignored in this debate. The purpose of the current study is to evaluate the impact of preoperative imaging in patients who have undergone operative intervention for lambdoid craniosynostosis to delineate how imaging can affect intraoperative and postoperative management.

METHODS & DESCRIPTION: A retrospective single center review of all patients who underwent total cranial vault remodeling for lambdoid craniosynostosis between January 2006 and 2014 was conducted after IRB approval. Data was collected on patient demographics, age at CT scan, age at surgery, results of the radiologic evaluation, operative technique, and modification of the diagnosis following the radiologic studies. Radiological examinations were interpreted by a pediatric neuroradiologist and reviewed by the surgical team. Findings related to genetic, ophthalmological and neuropsychiatric evaluations were recorded. Additional MR and CSF flow studies were ordered at the discretion of the attending neurosurgeon. The primary outcome of interest was a documented change in intraoperative or postoperative management based on imaging results.

RESULTS: A total of eleven patients were diagnosed with lambdoid synostosis. There were 8 males and 3 females in this group. Average age at CT scan was 9 months (range 1-24 months), and average age at surgery was 16.9 months (range 10 – 29 months). Of these patients, 81.8 % were found to have abnormalities on imaging studies important to operative planning. The most common anomalies were Chiari I malformation (45%) and venous anomalies of the posterior cranial fossa (36%). Thus, preoperative imaging studies led to an alteration in the overall management in 9 (81.8%) patients. Closer follow-up was required for six patients (54%). Suboccipital decompression for Chiari malformation was required in four patients (36%). Anatomically important findings requiring meticulous dissection; including hypoplastic transverse sinus, sigmoid sinus and/or internal jugular vein anomalies, were found in four patients (36%). In addition, diagnosis was changed to lambdoid synostosis in 2

patients (18%) who were initially diagnosed with positional plagiocephaly.

CONCLUSIONS: We propose that preoperative imaging is necessary in the setting of lambdoid synostosis to both aid in diagnosis and to assist in pre-operative planning, given its association with additional anomalies and conditions that modify operative technique and postoperative follow-up.

## 140 OPTICAL COHERENCE TOMOGRAPHY: AN OBJECTIVE MODALITY FOR DETECTING PAPILLEDEMA IN CRANIOSYNOSTOSIS PATIENTS WITH SUSPECTED INTRACRANIAL HYPERTENSION

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BACKGROUND & PURPOSE: Craniosynostosis may pose risk of neurocognitive impairment, particularly for patients with elevated intracranial pressure. Conventional detection of intracranial hypertension is either highly invasive or more commonly done indirectly via fundoscopy to detect papilledema, which is subjective, lacks sensitivity, and may be a late finding. Optical coherence tomography (OCT) is a noninvasive, precise ultrasonogram that has been used extensively in the adult literature to detect elevated intracranial pressure by objectively mapping and measuring thickness of the retina and optic disc. We aim to determine whether OCT can be reliably used to measure retinal thickness of infants with craniosynostosis, and whether findings correlate with clinical indications of papilledema and intracranial hypertension.

METHODS & DESCRIPTION: Patients diagnosed with craniosynostosis who were deemed candidates for cranial vault remodeling at a tertiary craniofacial center were included in the study. After induction of general anesthesia, a portable OCT device was used in the operating room to image bilateral fundi, both to measure retinal and optic nerve thickness and perform 3-dimensional mapping. When indicated by the neurosurgical service, patients also underwent direct intracranial pressure measurement. Patient characteristics, clinical findings, and ophthalmologic evaluations were reviewed.

RESULTS: Ten retinas in five patients with craniosynostosis (two each with metopic and unicoronal, one with sagittal synostosis) underwent OCT prior to cranial vault remodeling. Mean length of procedure was 30 minutes ± 5 minutes. Six retinas (three patients) were found to have normal optic nerve thickness and surface characteristics. Two patients (four retinas) revealed abnormally thickened optic discs bilaterally. One of these patients did not exhibit papilledema on preoperative fundoscopic exam. The other patient, who experienced headaches preoperatively, demonstrated severe optic disc swelling on OCT, and intracranial pressure was elevated (26 mmHg) on opening but decreased to nearly normal (12 mmHg) after frontal bone removal. Radiographic findings including thumbprinting of the cranial bone were further suggestive of intracranial hypertension in both patients.

CONCLUSIONS: Optical coherence tomography is a feasible modality for objectively measuring retinal thickness in infants with craniosynostosis. Two patients were found to demonstrate thickness consistent with papilledema, which corroborated clinical suspicion of intracranial hypertension, although papilledema could only be detected preoperatively on fundoscopy in one of them. With further enrollment, we hope to validate OCT as a non-invasive modality to detect elevated intracranial pressure in infants with craniosynostosis.

## 141 RELATIONSHIP BETWEEN RECEPTIVE LANGUAGE AND TEACHER AND PARENT REPORTS OF ATTENTION PROBLEMS IN CHILDREN WITH OROFACIAL CLEFTS

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BACKGROUND & PURPOSE: Children with orofacial clefts (OFC) have increased rates of learning and language disorders compared to the general population. There has been concern that these deficits are sometimes misdiagnosed as attention deficit hyperactivity disorder (ADHD), and as a result, children are not receiving the correct intervention services. This study aims to investigate the relationship between receptive language deficits and teacher and parent report of attention problems.

METHODS & DESCRIPTION: The sample included 109 children (Male=58; CL0=13, CPO=18, CLP=78) ages 4-8 years (M=6.6 yrs, SD=1.5). Hearing was screened prior to assessment. Receptive language skills were assessed using the Clinical Evaluation of Language Functioning-Preschool 2 (CELF-P2) for the 4 year old children and CELF-4 for children 5 and up. The Attention Problems syndrome scale and Diagnostic and Statistical Manual-Oriented (DSM)-ADH Problems scale from the age appropriate Child Behavior Checklist (CBCL) were used to assess parent report of attention problems. The same scales were used from the age appropriate Caregiver or Teacher Report Form (TRF) to assess teacher report of attention and DSM-ADH problems. Raw scores were converted to z-scores, using age and sex adjusted norms for parent and teacher measures. Regression analyses with robust standard error were used to measure the association between child receptive language and attention problems, while controlling for parent SES and child age.

RESULTS: Mean scores (SD) on the Attention Problems scale were 55.38 (6.76) for parent report and 56.06 (8.78) for teacher report. On the DSM-ADH Problems scale, they were 54.63 (6.74) and 56.85 (10.41); 18.5% scored above the clinical cutoff (T = 65) on each scale based on parent or teacher report. In the teacher report model, poorer receptive language scores were significantly associated with increased attention problems (Beta = -.361, p = .025) and ADHD behaviors (Beta = -.336, p = .028), over and above age and SES. In the parent report model, receptive language scores were not significantly associated with parent reports of attention problems or DSM-ADH behaviors.

CONCLUSIONS: Teachers tend to report more attention problems in children with OFC who had poorer receptive language skills regardless of age and SES. This suggests either co-occurrence of language and attentional problems, or that receptive language delays are sometimes misinterpreted as inattention in the classroom setting. When attentional problems are suspected in this population, screening for language delay may facilitate more appropriate early intervention.

## 142 INTERNATIONALLY ADOPTED CHILDREN WITH CLEFT LIP AND PALATE: IMPLICATIONS FOR SOCIAL WORK

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BACKGROUND & PURPOSE: Internationally adopted patients with cleft lip and palate (CLP) face complex psychosocial challenges as they overcome language and cultural barriers while adjusting to their new family life. In addition, these patients differ from their non-adopted counterparts in both the timing of their presentation and the variable treatment backgrounds in their native countries. There is a paucity of literature on whether these families require additional resources from the interdisciplinary cleft lip and palate team. The purpose of this study is to describe the characteristics of adopted children with CLP and to compare the need for social work intervention between adopted and non-adopted children with CLP.

METHODS & DESCRIPTION: This retrospective comparative outcome study evaluated the timing of surgery of 38 matched pairs of adopted and non-adopted children with CLP who were born between August 1993 and November 2012. The sample breakdown by diagnosis was as follows: unilateral CLP (71.1%), bilateral CLP (10.5%), unilateral cleft lip (5.3%), and isolated cleft palate (13.2%). There were 21(55.3%) females and 17(44.7%) males. The majority of those adopted come from China (97.4%). The mean age at the time of adoption was 25.8 + 10.6 months. Descriptive statistics and the Wilcoxon Signed Rank Tests were used to describe the characteristics of the adopted children compared to the control group.

RESULTS: At the time of adoption 12.9% of the children had an unrepaired cleft lip and 77.1% had an unrepaired cleft palate. Six children required cleft lip revisions. Children who were adopted were statistically significantly older than those who were not adopted at the time of cleft lip and/or cleft palate repair ($z = -2.94$ and $-2.20$, $p<0.05$). Timing of cleft lip repair was performed an average of 3.37 + 1.65 months post adoption. Cleft palate repair was conducted at an average of 4.43 + 1.50 months post adoption. Twenty-two (57.9%) of the adopted children had medical comorbidities compared to 5.3% in the non-adopted group. Sixteen (42.1%) of the children who were adopted were referred to social work for psychosocial intervention. Although the rate of referral to social work did not differ between groups, the reasons for referral were different. In addition to general referrals to address socio-emotional coping, the referrals to social work in the adopted group were for behavioral, psychiatric and academic concerns that arose less frequently in the non-adopted group.

CONCLUSIONS: Adopted children with CLP require the same inter-professional resources as their non-adopted peers; however, their psychosocial needs are unique compared to their non-adopted peers.

# Abstracts

## 143 EXAMINING SOCIAL AND COMMUNICATIVE FUNCTIONING IN CHILDREN WITH VELOPHARYNGEAL INSUFFICIENCY

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BACKGROUND & PURPOSE: While the physical difficulties associated with velopharyngeal insufficiency (VPI) have received primary attention both in research and intervention, at present, a comprehensive understanding of the social and communicative functioning of these individuals is limited. Research on children with VPI suggests that multiple components of social competence may be affected in some children with VPI. Furthermore, in contrast to the literature describing speech and voice impairments, comprehensive study of broader communication impairments have not been studied extensively in children with VPI. Decrements in communicative functioning clearly have the potential to affect the child's social competence. As a result, social interaction may be affected with varied levels of decrements in communication skills. The present study explored the social and communicative functioning of children with VPI.

METHODS & DESCRIPTION: 20 children with VPI (7-14 years), and 20 typically developing children matched for age and gender participated in this study. Parents of children completed the Social Competence (SC) scale of the Home and Community Social Behavior Scales (HCSBS), a 32-item measure used to assess social-behavioral characteristics of children. Further, parents of children in the VPI group also completed the Children's Communication Checklist – Second Edition (CCC-2), a 70-item instrument evaluating children's broad communicative abilities. The experimental questions posed were: 1) Do children with VPI experience less social competence than controls?, 2) Do children with VPI experience decrements in communication skills compared with normative scores?, and 3) Does a relationship exist between SC total scores and CCC-2 scores in children with VPI?

RESULTS: On average, children with VPI scored significantly lower on social competence than typically developing children. In addition, parents of children in the VPI group also reported more difficulties in communication skills when compared to norm-referenced data of children in the same age group. Finally, a moderate to strong correlation was observed between social competence and communication skills in children with VPI.

CONCLUSIONS: According to parent report, children with VPI experience more decrements in social competence compared with typically developing children. These limitations in social competence are likely associated with their overall communicative functioning. As such, the present data allow for an enhanced understanding of limitations in social and communicative participation in children with VPI.

## 144 BODY IMAGE, QUALITY OF LIFE, AND SOCIAL STIGMATIZATION IN ADOLESCENTS WITH AND WITHOUT CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Body image is a multidimensional construct which is relevant to understanding quality of life and psychosocial functioning among youth with and without chronic health conditions. Body image dimensions include appearance investment (importance of appearance to self-worth), body image disturbance (appearance-related distress and impairment in functioning), and appearance evaluations (satisfaction with bodily features). Adolescents with craniofacial conditions often have physical and functional differences and are vulnerable to stigmatization and teasing, all of which are known risk factors for body image disturbances. However, few studies have examined body image and psychosocial functioning among youth with and without craniofacial conditions. The purpose of this study was: 1) to examine and compare body image dimensions in youth with and without craniofacial conditions; 2) to assess relationships between body image, quality of life, and social stigmatization in both groups.

METHODS & DESCRIPTION: In this NIH-funded, cross-sectional study, 70 adolescents (mean age: 15.6 years; 44% female) with visible craniofacial conditions and a matched sample of 42 adolescents (mean age: 15.8 years, 48% female) without craniofacial conditions completed reliable and valid measures that assessed body image disturbance; appearance evaluation and investment; satisfaction with facial appearance; perceived stigmatization; and quality of life. Youth with craniofacial conditions also completed the Youth Quality of Life Instrument-Facial Differences Module (YQOL-FD) which assesses domains of quality of life related to having a facial difference including stigma, negative self-image, positive consequences, negative consequences, and coping.

RESULTS: Similar levels of body image disturbance and satisfaction with facial and overall appearance were found in both groups. Adolescents with craniofacial conditions were significantly ($p < 0.01$) more likely to report facial appearance concerns and were significantly ($p < 0.001$) less invested in appearance compared to non-affected adolescents. In both groups, higher levels of body image disturbance were significantly ($p <0.01$) associated with lower quality of life and greater perceived stigmatization. Among youth with craniofacial conditions, greater body image disturbance and appearance investment were significantly ($p < 0.01$) associated with greater perceptions of negative consequences related to having a facial difference, more negative self-image, and greater perceptions of stigma.

CONCLUSIONS: Body image dimensions are related to quality of life and stigmatization in adolescents with and without craniofacial conditions. Appearance investment may play a role in promoting or protecting against body image and related psychosocial problems. High levels of appearance investment, negative evaluations of facial appearance, and social stigmatization appear to be important areas to assess and target for intervention.

## 145 FACING DIFFERENCES: AN ANALYSIS OF MEDIA REPRESENTATION OF FACIAL DIFFERENCE

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BACKGROUND & PURPOSE: In this day and age, North American society is heavily influenced by advertisements, movies, television shows, and literature. As such, exploring the media's representation of facial difference (FD) is an important topic to address, as it is necessary to understand what (if any) impact and influence the media has historically had on people with facial differences. This research sought to examine how individuals who identify as having a FD view current representations of facial difference in mainstream media and what they understand to be the impacts of such on their own lives.

METHODS & DESCRIPTION: This research called upon Critical Disability Theory, in an effort to de-bunk longstanding beliefs that suggest facial differences are a "problem" with the individuals who identify as having a FD, but instead, to suggest the problems lie in broader social attitudes and beliefs that create and maintain stigma. Participants were gathered through snowball sampling, (with assistance from Aboutface International) as well as from media posts and a newsletter article about the research. A focus group with five participants occurred over a four-hour span in one day, and discussed 12 media stills (images) where facial difference was represented. The qualitative research methods of Photo Voice and Photo Elicitation were used together in order to elicit participants' feelings, concerns, and to promote dialogue on the topic. In addition, participants were given power through their own use of visual imagery and language; doing so was a means for participants to challenge existing visual representations in mainstream media. Rather than calling on the historically-valued quantitative research methods that are often used in the medical world, it was important to this research to gather first-hand, descriptive stories from participants so that participants could share their experiences of the effects of media representation of FD.

RESULTS: After the focus group transcription was completed (by an outside transcriber), the transcripts were studied using open coding to generate categories and themes present in the data. Looking through each sentence allowed for the identification of major ideas brought up by participants. Macro and micro conditions were accounted for when seeking explanations for participant's statements. The focus group revealed many important issues pertaining to the topic of FD, including society's notion of beauty; how individuals with a FD understand themselves in Western culture; and to what extent the media is responsible in shaping and promoting one's understanding of "normal". To provide validity to the methodologies used, participants were asked to provide feedback on the images created by the focus group to ensure they felt the images created represented what the group intended.

CONCLUSIONS: This research has identified the need for more attention to be paid to how FD is represented in the media as Western society tends to portray FD inaccurately and inappropriately, with damaging results.

## 146 "MY KID IS AN HONOR STUDENT": PARENTS PERCEPTIONS OF ACADEMIC ABILITY IN THEIR CHILDREN WITH ISOLATED NON SYNDROMIC CLEFTS

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BACKGROUND & PURPOSE: Children with clefts may experience learning problems and delays in academic achievement. Parental perception of childhood academic ability may influence a child's mastery of academic skills and overall self-esteem. This study examined parental perception of educational performance among children with an isolated non syndromic cleft compared to children without a known structural birth defect.

METHODS & DESCRIPTION: We identified a cohort of 695 children with an orofacial cleft and 6,822 children without a known structural birth defect from the North Carolina Birth Defects registry and Birth Certificates, respectively, who were born between 1997-2003. Cleft cases were confirmed by a geneticist based on medical chart reviews. We mailed a parent/caregiver survey to all families of children with a cleft and a random sample of 1201 unaffected families to obtain information regarding parent perception of school achievement as well as child development. We calculated frequency distributions and chi square statistics to describe differences in parental perception of educational performance between children with and without an isolated cleft.

RESULTS: Thirty two percent of families of children with a cleft and 27% of children without a known structural birth defect responded. Among the respondents,176 children had an isolated non syndromic cleft and 333 did not have a known structural birth defect. Parents of children with an isolated cleft were 62% more likely (Cleft: 23.86% vs No Birth Defect: 14.71%; p=0.02) to perceive their child's current academic achievement in reading as lower than others, compared to unaffected families. Yet, parents' perception of their child's effort in school was similar. Although few parents of a child with a cleft perceived their child's intelligence as less than others (10.23%), they were approximately five times (Cleft:10.23% vs No Birth Defect:2.10%;p=<0.0001) more likely to feel their child was less intelligent compared to parents of children without a structural birth defect.

CONCLUSIONS: Parents of children with an isolated cleft are more likely to perceive their child as being less intelligent and as having difficulty in reading compared to parents of children without a known structural birth defect. Ongoing work will determine whether parental perception of educational performance among children with a cleft is a valid measure of the child's actual academic performance.

## 147 QUALITY OF CARE BY CRANIOFACIAL TEAM – PARENTS PERCEPTION

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BACKGROUND & PURPOSE: The primary objective of this study was to examine the quality of care offered by craniofacial teams and whether parents perceived better outcomes if the care was delivered by interdisciplinary teams.

METHODS & DESCRIPTION: We identified a cohort of 685 children born with a cleft in NC between 1997 and 2003 from the NC Birth Defects Monitoring Program. We mailed surveys assessing educational outcomes, psychosocial development, and cost/quality of healthcare to all families of children with a cleft. Among the surveys mailed, 222 families responded. Parents or legal guardians answered questions regarding the quality of care provided by Craniofacial Teams in NC on a scale from 1- "poor" to 5 – "excellent". Parents reported the quality of care received from the following group of professionals: a) physicians and surgeons; b) dentists and orthodontists; c) speech therapists; d) audiologists; e) geneticist/genetic counselor; f) mental health workers; g) clinic staff; h) hospital nursing staff around time of surgery. In addition they reported their experiences regarding how well physicians/surgeons and the craniofacial teams communicated regarding their child's condition. For each discipline, we calculated percentage of families reporting each level (1 – poor, 2 – fair, 3 – good, 4 – very good and 5 – excellent) of satisfaction in quality of care on the 1-5 Likert scale:

RESULTS: Across all group of professionals participating in team care, at least 65% of families reported very good or excellent quality of care. Families reported the greatest satisfaction (90% very good/excellent) from the team of physicians/surgeons and the hospital nursing staff at the time of surgery. Families were least satisfied with care from audiologists (65% very good/excellent) and geneticists/genetic counseling (67% very good/excellent). Overall, the majority of participating families reported that physicians/surgeons and the cleft/craniofacial team as whole did a very good/excellent job of communicating about their child's condition and plan of care.

CONCLUSIONS: Most of the parents of children with a cleft appear to perceive the quality of care provided by Craniofacial teams as "very good" or "excellent". However, areas such as geneticist/genetic counseling and audiology presented lower percentage of "excellent" scores when compared to other areas. Further analyses will determine whether parental perception of quality of care will reflect the outcomes achieved by interdisciplinary teams.

## 148 ROBIN SEQUENCE WITHOUT CLEFT PALATE: GENETIC DIAGNOSES AND MANAGEMENT IMPLICATIONS

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BACKGROUND & PURPOSE: In 1923 Pierre Robin published his experience with patients with the triad of micrognathia, glossoptosis and obstructive apnea. Since his initial study, several studies have been published about treatment and outcomes of patients with Robin sequence (RS). Over the years, there has been a great deal of controversy regarding diagnosis of RS and many investigators have limited it to include only those patients with cleft palate. However, as with Robin's first patients we have found that patients without cleft palate make up a significant number of RS patient, and moreover, mosthave underlying syndromes.

METHODS & DESCRIPTION: Hospital charts of patients with RS who were born between 2002 and 2014 were analyzed. Ascertainment criteria included those patients listed in the Craniofacial Center database as having RS as well as a search of all hospital admissions of patients who had diagnoses of RS, had polysomnograms and were evaluated by a clinical geneticist. Data were abstracted from patient charts and entered into a secure database and analyzed for presence or absence of cleft palate, genetic diagnoses, airway management, and feeding management.

RESULTS: A total of 144 patients were identified. Of these, 36 (25%) had RS without cleft palate, 5 with isolated non-syndromic RS (14%) and 31 (86%) had underlying syndromes. Of the syndromic patients, there was no single disorder or group of disorders which was significantly represented. The most common single syndrome was Treacher Collins syndrome (3 patients), followed by Stickler syndrome (2) and deletion 22q11.2 syndrome (2). The most common diagnostic group was the arthrogryposes, seen in 4 patients followed by chromosomal anomalies in 3 patients. With regard to airway management, 3 patients with isolated RS were managed with supplemental oxygen and one patient required mandibular distraction osteogenesis (MDO). Three of the isolated RS patients fed orally while one required a gastrostomy. Of the 31 syndromic RS patients, 12 were treated with MDO, 12 required tracheostomies, 3 required oxygen only, two were treated with positioning. One patient died prior to intervention. Gastrostomies were required in 15 syndromic patients, 10 of these also had tracheostomies. Three (8%) of the patients died, all of whom were syndromic with serious multiple anomaly disorders.

CONCLUSIONS: Many patients with RS will not have a cleft palate. Most of these patients will have underlying syndromes, underscoring the need for genetics evaluations for all patients with RS. Patients with syndromic RS are more likely to require more aggressive airway and feeding management. It is of concern that so few patients with RS without cleft palate in this study had non-syndromic RS, raising the issue that infants born with RS may not be appropriately diagnosed despite having feeding problems and obstructive apnea.

## 149 22Q11.2 DELETION SYNDROME: OBJECTIVE ASSESSMENT OF A NEWLY IDENTIFIED FACIAL PHENOTYPE

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BACKGROUND & PURPOSE: Patients with 22q11.2 Deletion syndrome are diagnosed through a variety of methods from chromosome analysis to clinical characteristics. Each genetic syndrome is unique and related to specific alterations in DNA. Clinically, these patients present with a myriad of phenotypes although the expression of the 22q11.2 deletion syndrome is highly variable. Facial anomalies are often the first phenotype that is recognized because they are so visible and well documented. The Craniofacial Team at Connecticut Children's Medical Center has subjective, anecdotal, clinical evidence of a previously unidentified facial phenotype in the 22q11.2 Deletion population. In approximately 80% of the CCMC Craniofacial caseload, patients with 22q11.2 syndrome are identified as having a prominent vein at

the dorsal, nasofrontal angle (DNfAV). The purpose of this study was twofold; first to determine the incidence of the presence of the DNfAV within our 22q11.2 deletion clinical population and secondly to determine the reliability of various clinical providers to identify the DNfAV within our 22q11.2 deletion clinical population.

METHODS & DESCRIPTION: A retrospective chart review of all current patients of the Connecticut Children's Medical Center Craniofacial Team diagnosed with 22q11.2 deletion syndrome through genetic testing was analyzed. Patient photographs were viewed identified as either presenting with the DNfAV or not. Three independent raters scored the pictures as either a 1 (having the DNfAV) or 0 (not having the DNfAV). Photographs with an overall percent agreement of >90% were positively identified as having the DNfAV. Patient photographs were then grouped into 2 categories. Category 1 included photographs that were positively identified as having the DNfAV and Category 2 were photographs that were not identified as having the DNfAV. These photographs were randomly presented to 2 groups of raters. Group 1 were recruited from the Craniofacial Team and were identified as experienced raters. Group 2 were recruited from other medical professionals (Maternal Fetal Medicine, Nursing, Speech Pathology, ENT, NICU) not associated with the craniofacial team. Statistical analysis was used to determine percent agreement between and within raters.

RESULTS: There was an 81% (44 subjects) positive identification of the prominent DNfAV from the sample of 54 clinical patients. In the second perceptual task the expert group reported the highest rate of a positive DNfAV (78%) while the novice group reported a positive DNfAV in 65% of the subjects.

CONCLUSIONS: The prominent DNfAV is an easily recognizable feature in 81% of our 22q11.2 Deletion Syndrome clinical population. Adding this phenotype to the list of recognizable facial features may aid in diagnosing the syndrome earlier in the course of intervention.

## *150 THE PERPLEXING PREVALENCE OF FAMILIAL NESTED 22Q11.2 DELETIONS

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BACKGROUND & PURPOSE: Most patients with 22q11.2DS have a de novo 3 Mb A-D deletion including loss of the important developmental gene TBX1 as well as diagnostic FISH probes located within the A-B region. In contrast patients with atypical nested deletions, B-D and C-D, do not include loss of TBX1, would have been missed by FISH alone and are frequently inherited. Here we report the perplexing prevalence of familial nested deletions as well as associated phenotypes including those presenting in Cleft Palate Clinics.

METHODS & DESCRIPTION: 571 patients with 22q11.2DS (50%) had deletion sizing by enhanced FISH, CGH, GWAS, or MLPA. Phenotypes were catalogued prospectively under an IRB approved study.

RESULTS: 499/571 patients (87%) had typical A-D deletions; 13% had atypical deletions including 19 probands with nested B-D deletions. Both parents were available for study in 15/19 families, of whom 9/15 (60%) had an affected parent. In addition we ascertained a sibling with a B-D deletion, 3 patients and 1 parent with C-D deletions. Anomalies typically associated with A-D deletions were also identified in patients with B-D deletions despite the presence of TBX1 including: VPI/SMCP (38%); congenital heart disease (31%); chronic infection (46%); hypocalcemia/growth hormone deficiency (24%); GERD (36%); CNS anomalies (38%); eye findings (19%); scoliosis/camptodactyly (19%); developmental delay/learning differences (61%). One patient with a B-D deletion had polymicrogyria associated with CEDNIK syndrome as a result of a SNAP29 mutation on the remaining allele (JMedGenet, 2013). The 3 patients with C-D deletions had typical features despite the presence of TBX1 including: high palate/hypernasal speech; congenital heart disease; GERD; chronic otitis media; scoliosis, strabismus; genitourinary anomalies; and developmental delay. 3/9 parents with B-D deletions demonstrated clinically significant findings (developmental delay/ADHD; short stature/growth hormone deficiency) and the parent with a C-D deletion has a Master's Degree in Education despite severe learning deficits in math. Importantly, dysmorphic features were overlapping but variabl

CONCLUSIONS: A-D 22q11.2 deletions are generally de novo whereas nested deletions are frequently familial and dysmorphic features often associated with A-D deletions may be lacking perhaps due to a milder overall phenotype, the lack of involvement of TBX1 or the effect of modifier genes. Nonetheless, the observation is critical in identifying these patients; providing appropriate genetic counseling; and in better understanding the importance of developmental genes beyond TBX1, such as CRKL1 and SNAP29, to explain the clinical overlap with perplexing intergenerational variability. Further, based on this data, we urge practitioners to consider the possibility of a nested 22q11.2 deletion to explain craniofacial features typically associated with the standard deletion which will require testing beyond FISH such as MLPA or SNP microarray and to perform parental studies in all cases.

**Disclosure:** Other – Honorarium – I am a speaker for Natera.

## 151 HARDIKAR SYNDROME, A RARE SYNDROME OF CLEFT LIP/PALATE, AND UROGENITAL ABNORMALITIES, MAY RESULT FROM VARIANTS IN MYELIN GENE REGULATORY FACTOR

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BACKGROUND & PURPOSE: Hardikar syndrome (OMIM # 612726) is among the 70 named syndromes involving CL/P in which a molecular cause has not been found. It is a rare syndrome, and is associated with multiple congenital anomalies including cleft lip and palate, patchy pigmentary retinopathy, and obstructive liver disease. The clinical manifestations in Hardikar syndrome can be quite severe with patients often requiring liver transplantation in childhood secondary to their obstructive liver disease. There have not been any familial cases reported, so it is thought to be due to either de novo dominantly acting mutations or autosomal recessive mutations.

METHODS & DESCRIPTION: We performed research whole exome sequencing on a patient with clinically-diagnosed Hardikar Syndrome and her unaffected parents. Results were validated using Sanger sequencing in the proband and her parents.

RESULTS: By using whole exome sequencing of an isolated proband we were able to identify variant NM_013279.2:c.2237C>T:p.P746L in myelin gene regulatory factor (MYRF), now a candidate gene for this syndrome. This variant in MYRF was the only one that remained as a pathogenic candidate after our variant analysis, and was Sanger-sequencing confirmed to be de novo in the patient.

CONCLUSIONS: MYRF is known to be a transcription factor. Current research has focused on its role in the formation of myelin, but it is also expressed elsewhere, such as the developing face and liver/pancreas. Despite this expression pattern, its role outside the nervous system has never been explored, making it a prime target for discovery. The variant is not in a known functional domain, but the protein structure has not been well-categorized yet. We are awaiting results in three additional patients with Hardikar Syndrome to see if they have variants in MYRF as well. If this gene is confirmed as a pathologic variant in a clinical laboratory it would immediately allow other children suspected of having the disorder to have a molecularly-confirmed diagnosis, and would allow for effective counseling and prenatal options (such as preimplantation diagnosis) for families at risk. This discovery also provides a framework for future work in the field of molecular pathogenesis of cleft lip/palate, which affects about 1/700 children.

## 152 CLINICAL GENETICS EVALUATION ESSENTIAL IN MULTI-DISCIPLINARY CLEFT CLINIC

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BACKGROUND & PURPOSE: Genetic medicine professionals are trained to elicit and combine family history with medical history and dysmorphisms to recognize that a specific collection of developmental anomalies are caused by a common genetic or environmental insult; a syndrome. Without genetic medicine expertise in the multi-disciplinary cleft clinic, opportunities are missed to provide accurate recurrence risk counseling and direct patient care for every patient and their family.

METHODS & DESCRIPTION: With IRB approval, a retrospective analysis of all patients seen by genetic medicine professionals over a 2 year period in a multi-disciplinary cleft clinic was completed. The study parameters include demographics, presenting syndromic diagnosis vs. diagnostic category after clinical evaluation vs. final diagnosis after recommended tests and studies. A comprehensive genetic evaluation includes a 3 generation pedigree, medical history including co-morbid conditions and teratogen exposure, and physical exam.

RESULTS: There were 650 clinical visits to the multi-disciplinary cleft clinic over 2 years. Genetic medicine professionals evaluated 293 unique patients for 327 encounters. 82 (25.1%) were new to cleft clinic and 94 of 293 (28.8%) had a

prior outside clinical genetic evaluation. 49 (16.7%) patients presented with a clinical (n=31) or cytomolecular (n=18) cleft syndrome diagnosis. After genetics evaluation, 150 (51.2%) patients were classified as syndromic/likely syndromic; 41.3% had CP alone, 36.0% CL/P, 6.7% CL and 16.0% with other orofacial clefting. For those completing the recommended single gene/chromosomal studies, 14 new cytomolecular syndromic diagnoses were made and 45 patients were reassigned to non-syndromic. The final diagnostic category distribution of our 293 cleft patients after genetic evaluation was 119 with syndromic/likely syndromic diagnosis (40.6%; 32 cytomolecular, 87 clinical) and 174 (59.4%) non-syndromic. Though the completed tests and studies had high diagnostic yield with many significant abnormalities (echocardiogram (28.6%), ophthalmology exam (43.5%), brain MRI (50.0%), SNP array (43.3%) single gene (50.0%)), over half of the recommended tests and studies were not completed.

CONCLUSIONS: Orofacial clefting (i.e. CP, CL/P, CP, other) is a major congenital anomaly, collectively affecting at least 1 in 500 livebirths. Over 50% of our cleft clinic population had more than one additional abnormality (e.g. second major congenital anomaly, cognitive impairment, failure to thrive, characteristic facial dysmorphism) which warranted laboratory studies and tests to identify a unifying syndromic diagnosis. Following these evaluations, 40.6% were determined to have a syndromic or likely syndromic diagnosis, of which 26.9% were confirmed at a cytomolecular level. Patients with orofacial clefting are best served in a multi-disciplinary setting where they can access many specialists and genetic medicine professionals can draw from these specialists to work toward a cohesive diagnosis.

## 153 PERFORMANCE OF WHOLE EXOME SEQUENCING FOR CHILDREN WITH CRANIOFACIAL DISORDERS

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BACKGROUND & PURPOSE: A search of Online Mendelian Inheritance in Man generates 708 disorders in which cleft lip or cleft palate is a feature. In addition, other craniofacial abnormalities are described in 365 entries. The genetic etiology remains elusive for many of these disorders. We report how whole exome sequencing has enabled us to detect putatively functional genetic variants in a subset of children with craniofacial disorders.

METHODS & DESCRIPTION: An expert panel of genetics specialists selected patients with rare disorders to be studied based on applications submitted by clinicians. For each family unit, whole exome sequencing was performed on DNA from the participant identified with a suspected genetic disorder and appropriate biologic family members. Various analysis strategies were applied based on the number and relationship of affected family members or known genetic heterogeneity for a particular disorder. Up to 12 months of sequencing and analysis was conducted before the expert panel determined if the result should be communicated to parents as positive, negative or uncertain.

RESULTS: Six of twenty-four enrolled families had one or more individuals with a rare or unique craniofacial disorder. Suspected pathogenic variants in novel genes were identified in four families with craniofacial disorders. Collaboration with other centers has since confirmed the role of two of the six variant novel genes in distinct rare craniofacial disorders: severe mandibulofacial dysostosis syndrome with limb abnormalities and severe auriculocondylar syndrome with alopecia. Functional studies and recruitment of unrelated individuals with carefully defined phenotypes are underway to validate the role of a variant novel gene for autosomal dominant omodysplasia and a variant novel gene for a unique autosomal dominant disorder with cleft lip and cleft palate, heart defect and skeletal abnormalities. Results were reported as negative for two families: a four generation family with cleft lip, cleft palate and a family with a child who has developmental delay and multiple malformations including Robin sequence, cleft palate and metopic craniosynostosis.

CONCLUSIONS: As new genetic diagnostic technologies are developed we will be able to diagnose most rare genetic disorders. Whole exome sequencing is one such technology to help identify the genetic causes of rare craniofacial disorders. It has become evident that future such discoveries will require the collaborative efforts of clinical and basic research scientists to validate these discoveries.

## 154 DIAGNOSTIC EXOME SEQUENCING FOR CRANIOFACIAL ANOMALIES: THE NIJMEGEN EXPERIENCE

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BACKGROUND & PURPOSE: Whole exome sequencing (WES) is a successful genomewide approach to identify genetic causes of heterogeneous diseases. The Radboud University Medical Center was among the first to implement two-step exome sequencing in clinical genetic diagnostics. We show the first results of WES for craniofacial anomalies. The heterogeneity of these disorders makes WES a very suitable method for diagnostic genetic testing.

METHODS & DESCRIPTION: Seventeen patients with craniofacial anomalies, consisting of familial or syndromic cleft lip and/or palate, oligodontia and craniosynostosis were investigated by WES. WES was performed on an Illumina HiSeq2000TM platform after enrichment with the Agilent SureSelect XT Human All Exon 50 Mb kit. After read alignment with Burrows-Wheeler Transform and variant calling with Genome Analysis Toolkit the annotation was done by the Department of Human Genetics of the Radboud UMC using an in-house developed pipeline. A two-step analysis was used in which a craniofacial gene panel containing 72 genes was analysed first before opening the whole exome. The 72 genes were selected based on the Online Mendelian Inheritance in Man database (www.omim.org) and recent publications. Variants were confirmed with Sanger sequencing.

RESULTS: By the first step analyses, a genetic diagnosis was made in 3/17 patients (18%). A heterozygous mutation in COL11A2 causing Stickler syndrome was identified in a patient with familial Pierre Robin sequence. In two siblings with oligodontia a homozygous WNT10A mutation was identified. In the remaining patients where no causal mutation was identified analysis of the whole exome is now ongoing, except for one patient who did not consent for this.

CONCLUSIONS: The first results of the WES craniofacial gene panel based on a small patient cohort are promising. These suggest a diagnostic yield of 18% in the first analysis, but further cases are needed to estimate a firm percentage. Moreover, the second step analyses are ongoing and may lead to novel or only recently identified candidate genes that were not yet included in the selected gene panel. Having a genetic diagnosis allows an updated approach and management of the disorder and adequate genetic counselling. Moreover, understanding the molecular background of these disorders will pave the the way to explore possibilities for preventive strategies and for development of therapeutic measures. We recommend that diagnostic WES should be offered to patients with syndromic or familial forms of orofacial clefting.

## 155 CLARIFYING THE RELATIONSHIP BETWEEN THE DIFFERENT FEATURES OF THE OMENS+ CLASSIFICATION IN CRANIOFACIAL MICROSOMIA

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BACKGROUND & PURPOSE: The OMENS+ classification is a commonly used tool to describe the phenotypically diverse craniofacial features of Craniofacial Microsomia (CFM). The purpose of this study is to evaluate associations between the individual components of the OMENS+ criteria.

METHODS & DESCRIPTION: An IRB-approved retrospective chart review was performed for patients who presented with a diagnosis of unilateral or bilateral CFM to the Craniofacial Clinic from January 1990 to December 2012. Demographic, diagnosis, classification, treatment, and radiographic data were abstracted for all patients who met inclusion criteria. Associations between the different features of the OMENS + classification were evaluated using the Spearman's Rank test and a Logistic Regression Model.

RESULTS: 255 patients with CFM were evaluated and treated during the study period. 105 patients met inclusion criteria. There were 61 males and 44 females. 81 patients (77.1%) had unilateral microsomia and 24 patients (22.9%) had bilateral microsomia. 28 patients (26.7%) had macrostomia. Correlations were all significantly interrelated (p=0.000-0.018) between the degree of orbital, mandibular and soft tissue deformities. Moreover, the severity of ear deformity and facial nerve involvement were also significantly correlated (p = 0.008). Between these two groupings there was a significant correlation between soft tissue deficiency and nerve involvement (p=0.010). Macrostomia was associated with the individual components of the group orbit (p=0.008), mandible (p=0.000) and soft tissue (p=0.005).

CONCLUSIONS: This analysis demonstrates that the association between structures using the OMENS+ classification may be caused by their branchial arch origin. Structures mainly developed from the first branchial arch (orbit, mandible and soft tissue) are associated in degree of severity, as are the structures mainly derived from the second branchial arch (facial nerve and ear).

## 156 SURGICAL INTERVENTION IN CRANIOFACIAL MICROSOMIA: THE EXPERIENCE OF 4 CRANIOFACIAL CENTERS WITHIN THE FACIAL NETWORK

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BACKGROUND & PURPOSE: Craniofacial Microsomia (CFM) is the second most prevalent condition treated within craniofacial teams and its complexity requires multidisciplinary care. Coordination of this care with the patient's growth and development is paramount. Yet, disagreement exists regarding timing and type of procedures offered. We sought to quantify the surgical experience of patients with CFM amongst various centers.

METHODS & DESCRIPTION: The Facial Asymmetry Collaborative for Interdisciplinary Assessment and Learning (FACIAL) is a multicenter research network whose aim is to improve care for patients with CFM. Participating teams include Seattle Children's (SCH), Children's Hospital of Philadelphia (CHOP), Children's Hospital of Los Angeles (CHLA), and University of North Carolina, Chapel Hill (UNC). Patients diagnosed with CFM at these centers were entered into the FACIAL network. Photographic and chart review confirmed the diagnosis. Surgical interventions and age of surgery were assessed by chart review and parent recall. Surgeries were grouped into the following categories: Airway, Dental, External Ear, Middle Ear, Eye, Facial Palsy, Orofacial cleft, Facial Skeleton, Soft Tissue and Other. Comparisons were made amongst centers and between patients of differing phenotypes.

RESULTS: 100 patients were enrolled (CHLA-20, CHOP-12, SCH-56, UNC-12). Of these, 21 had not undergone surgery. The other 79 underwent a total of 280 procedures related to CFM (avg = 3.5 per patient) in the following categories; Airway:23, Dental:15, External Ear: 96, Middle Ear:27, Eye:21, Facial nerve:2, Orofacial cleft: 16, Facial Skeletal: 18, Soft Tissue: 17, Other: 45. The number of operative anesthetics per year of life ranged from 0.26 to 0.76. Kids with microtia along with asymmetry (+/- other features of CFM) had the highest average number of surgeries at 0.47/year, and those with isolated microtia (without atresia) had the lowest average number of surgeries/yr (0.21), this low number is likely influenced by the fact that 25% of kids with isolated microtia had no history of surgeries. The average number of surgeries per year was generally lower among older kids, suggesting that there is an early, intense period where many procedures are done.

CONCLUSIONS: Patients with CFM undergo numerous surgeries during childhood, most frequently pertaining to ear and airway followed by facial skeletal and soft tissue. Other surgeries are also frequently performed in this cohort, illuminating the need for multidisciplinary care for these patients.

## 157 CONGENITAL AND ACQUIRED MANDIBULAR ASYMMETRY: MAPPING GROWTH IN THREE DIMENSIONS

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BACKGROUND & PURPOSE: Disordered craniofacial development frequently results in definitive facial asymmetries that can significantly impact an individual's social and functional well-being. The mandible plays a prominent role in defining facial symmetry, and as an active region of growth, commonly acquires asymmetric features. Additionally, syndromic mandibular asymmetry characterizes craniofacial microsomia (CFM), the second most prevalent congenital craniofacial anomaly (1:3,000 to 1:5,000 live births) following cleft lip and palate. The unpredictable nature of asymmetric mandibular growth, often occurring in three planes of space, presents a significant obstacle to surgical treatment planning. We hypothesize that asymmetric rates and trajectories of mandibular growth occur in the context of syndromic and acquired facial asymmetries.

METHODS & DESCRIPTION: To test this hypothesis, a novel spherical harmonic-based shape correspondence algorithm (SPHARM) was applied to quantify and characterize longitudinal growth changes in the mandible in three groups of adolescent-age patients. The first group (n=9) had a diagnosis of Pruzansky Type I or II craniofacial microsomia. The second group (n=10) consisted of individuals with severely asymmetric, non-syndromic dentofacial deformity requiring surgical intervention. A control group (n=10) of gender, age, and skeletal growth stage matched symmetric patients were selected for comparison. Growth of the mandible was measured in each individual using two serial cone beam computed tomographic (CBCT) time-points obtained prior to surgical intervention, at T0=12.4±0.4ys and T1=14.5±0.5ys respectively. Longitudinal mandibular volumes were aligned using an automated, voxel-based regional registration at the mandibular symphysis. Directional symmetry and growth of the mandibular surface were quantified using SPHARM.

RESULTS: Mandibular shape and symmetry displayed distinct signatures in the three groups (ANOVA; p=0.03), with the greatest degree of asymmetry present in regions of the condyle and ramus. In particular, the condyle or proximal ramus on the dysplastic side in the CFM group was more lateraly and posteriorly oriented relative to the contralateral side. In contrast, the non-syndromic group had little detectable transverse asymmetry, characterized instead by differences in length and height of the condyle and ramus. Growth of the dysplastic condyle/proximal ramus in the CFM group paralleled the overall ramus orientation, in a lateral and posterior direction. The dentofacial deformity group had a relatively greater and more vertically oriented condylar growth vector on the hyperplastic side. The condylar growth rate was significantly less on the dysplastic side in Type II CFM cases (t-test; p=0.008).

CONCLUSIONS: Congenital anomalies of the craniofacial skeleton can impede the coordination of jaw growth, often producing progressive facial asymmetries. In these cases, quantification of asymmetric growth of the mandible can greatly improve planning of treatment approaches.

## 158 DISTINGUISHING GOLDENHAR SYNDROME FROM CRANIOFACIAL MICROSOMIA

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BACKGROUND & PURPOSE: Goldenhar syndrome is characterized by the typical features of craniofacial microsomia (CFM) with the addition of epibulbar dermoids and vertebral anomalies. This study aims to examine the objective differences between patients carrying a diagnosis of Goldenhar syndrome to those diagnosed with CFM.

METHODS & DESCRIPTION: An IRB-approved retrospective chart review was performed on all patients who presented with a diagnosis of CFM or Goldenhar syndrome to the Craniofacial Clinic from January 1990 to December 2012. Demographic, diagnosis, OMENS+ classification, accompanying diagnoses, and radiographic data were collected. For subjective analysis, subgroups were designed based on the diagnosis Goldenhar syndrome or CFM per history. For objective analysis, subgroups were designed based on the presence of epibulbar dermoids and/or vertebral anomalies. The cohorts were compared with respect to associated medical abnormalities and severity of CFM features.

RESULTS: 138 patients met inclusion criteria. Epibulbar dermoids and vertebral anomalies were seen in 17% and 34% of the patients, respectively. Only ten patients (7.2%) had epibulbar both dermoids and vertebral anomalies. The subjective "Goldenhar" group (N= 44, 32%) was found to have a higher percentage of bilaterally affected patients (p=0.001), a more severe mandibular deformity (p=<0.001), a more severe soft tissue deformity (p=0.01) and a higher incidence of macrostomia (p=0.003). In the objective subgroup analysis, the only significant difference was found in the degree of soft tissue deficiency (p=0.049).

CONCLUSIONS: The diagnostic criteria of Goldenhar syndrome remain unclear, thereby making clinical use of the term "Goldenhar" inconsequential. Goldenhar syndrome is over diagnosed subjectively in those patients who show more severe CFM features.

## 159 PREVALENCE OF RENAL AND CERVICAL VERTEBRAL ANOMALIES IN PATIENTS WITH ISOLATED MICROTIA

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BACKGROUND & PURPOSE: The objective of this study is to determine whether patients with isolated microtia have an increased prevalence of renal and/or cervical vertebral anomalies. Microtia is a congenital anomaly of the auricle that can range in severity from a mild structural abnormality to complete absence of the auricle and external auditory canal. Microtia can occur as an isolated anomaly or as part of a spectrum of anomalies or syndrome (20-60%). Controversy exists whether patients with isolated microtia (not associated with other craniofacial anomalies or syndromes) have Oculoauriculovertebral Spectrum. Patients with microtia may have congenital

structural renal and/or cervical vertebral anomalies. Although there is little consensus regarding optimal screening evaluations in patients with microtia, it has been recommended that patients with microtia undergo routine renal ultrasound and cervical spine x-rays. Studies have shown an increased prevalence of structural renal anomalies in patients with microtia associated with other craniofacial anomalies or syndromes. However, studies have also shown no increased risk for structural renal anomalies in patients with minor anomalies of the auricle such as pre-auricular skin tags and sinuses. What is not clear is whether there is increased risk for renal and/or vertebral anomalies in patients with isolated microtia, which represent 40-80% of all patients with microtia.

METHODS & DESCRIPTION: A retrospective medical record review of all patients diagnosed with microtia, aural atresia, and/or Oculoauriculvertebral Spectrum has been performed at two institutions over a 10 year period. The study is currently in progress at two additional institutions. Patients with other craniofacial anomalies or syndromes were excluded. The following was determined: the number of patients with isolated microtia that underwent a renal ultrasound and/or cervical spine x-rays; the results of those studies; and further evaluation and/or treatment for abnormalities found.

RESULTS: To date, a total of 434 patients with isolated microtia and/or atresia were identified. 102 (24%) underwent renal ultrasound (age at ultrasound ranged from 1 day to 17 years, median 1 year). No patients had any structural renal anomalies. 2 patients with right microtia had minimal left renal pelviectasis, both of which resolved with no further treatment. 70 patients (16%) underwent cervical spine x-rays (age at x-ray ranged from 1 day to 41 years, median 2 years), none of which showed any abnormalities. 250 patients (58%) had unilateral right microtia; 127 (29%) had unilateral left microtia; 44 (10%) had bilateral microtia; 257 (59%) had unilateral right atresia; 131 (30%) had unilateral left atresia; 35 (8%) had bilateral atresia.

CONCLUSIONS: Based on data obtained to date, there is no increased prevalence of renal and/or cervical vertebral anomalies in patients with isolated microtia and/or atresia. Therefore, these patients do not require routine screening renal ultrasound or cervical spine x-rays.

## 160 BREATHING, MACROGLOSSIA AND TONGUE REDUCTION IN INDIVIDUALS WITH BECKWITH-WIEDEMANN SYNDROME

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BACKGROUND & PURPOSE: The impact of the macroglossia of Beckwith-Wiedemann syndrome (BWS) upon perinatal breathing and the effect of surgical tongue reduction (TR) upon the breathing of individuals with BWS has only been reported anecdotally or in very small series. The purpose of this study is to retrospectively review a large series of individuals with BWS who underwent TR by one surgeon using one technique to determine: 1. The incidence of perinatal upper airway issues in individuals who eventually had a diagnosis of BWS; 2. The effect of surgical lingual reduction for BWS macroglossia upon breathing.

METHODS & DESCRIPTION: A retrospective chart review was conducted of 315 individuals with the diagnosis of BWS who underwent an initial TR by one surgeon using one technique. The following breathing data was collected: perinatal respiratory history, preTR sleep study results, perioperative TR respiratory status, and postTR sleep study results and breathing status. Additional possible variables abstracted included: gestational age, age at TR, degree of macroglossia, presence of cleft palate and length of follow-up.

RESULTS: Perinatal breathing issues were recorded for 18% of the BWS individuals who had TR. Of these 56 individuals, 24 required intubation with mechanical ventilation, 10 had CPAP, 5 had supplemental oxygen, 5 prone positioning and 4 other interventions (including 2 tracheotomies) to manage breathing issue while an additional 8 had “apnea” without therapeutic intervention. While the mean gestational age for the entire population was 35 weeks and for the subgroup with perinatal breathing issues was 34 weeks, the range of gestational age was the same for both groups (28-40 weeks). PreTR sleep study data was present for 20 individuals: obstructive sleep apnea (OSA) was documented in 15 of these (“severe” = 3, “moderately severe” = 3, “mild” = 4, not graded = 5) while 5 had no OSA. Perioperative respiratory morbidity occurred in 4% of individuals following TR: reintubation following perioperative extubation = 5 (4 were successfully extubated, 1 required tracheotomy), management of respiratory distress without reintubation = 8. Of the 13 individuals with periTR respiratory issues, only 5 had a history of perinatal breathing issues. PostTR sleep studies were infrequent (2% of the entire reviewed population) and only 2 of the 5 had a preTR sleep study. Of the 2 individuals with both pre and postTR sleep studies, both still had OSA but it was diminished postTR. Of the 3 individuals with a preTR sleep study and only clinical follow-up, OSA was resolved for 1, improved for 1 and for 1 worse after palatoplasty but then improved with T&A.

CONCLUSIONS: Neonates with BWS usually do not have perinatal breathing problems. Perioperative respiratory problems following anterior/perimeter”W”lingual reduction are infrequent and do not seem related to perinatal breathing issues. Of those BWS individuals with preTR documented OSA or clinical sleep issues, breathing is usually improved following lingual reduction.

## 161 DEVELOPMENT OF A ROBOTIC APPROACH TO CLEFT PALATE REPAIR. PHASE 1: CREATION AND VALIDATION OF A CLEFT PALATE SIMULATOR

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BACKGROUND & PURPOSE:Cleft palate surgery is a challenging procedure due to the limited access of working in a small cavity, poor visualization, the fragility of the tissues, and the difficulty of simultaneous access between the surgeon and assistant. Robotic surgery offers the advantage of increased access, improved visualization and enhanced precision and is therefore ideally suited for application within the pediatric oral cavity. The first phase of developing a pediatric robot to perform a cleft palate repair is to create and validate a high fidelity cleft palate simulator to test the robot. In addition, a highly realistic simulator can be used as an effective training tool.

METHODS & DESCRIPTION: An infant computed tomography (CT) scan was utilized in conjunction with computer editing software to 3D print a cleft palate and molds of the oral cavity. An anatomical mold of the tensor veli palatini, levator veli palatini, palatopharyngeus, uvulus and palatoglossus muscles was created using computer animation software. The oral cavity, muscle complex and overlying mucosa were then casted with silicone. The oral cavity was then placed over the palate-muscle-mucosa unit and was made detachable to allow complete visualization of the palate-muscle anatomy. A cleft palate repair was performed on the simulator by two surgeons for validation. The simulator was tested by twelve PGY3 to PGY5 residents and was assessed as a training tool.

RESULTS: A highly realistic cleft palate model developed from a CT has been developed that simulates operating in the oral cavity and performing a cleft palate repair. The two surgeons were successful in performing a cleft palate repair on the simulator. The surgical steps included incising and elevating the mucosa off the underlying hard palate and musculature, releasing the musculature from the palate and suturing the muscles and mucosa back together. In addition, the residents successfully performed each step of the procedure and the detachable oral cavity allowed complete visualization of the origin and insertion of the palatal musculature as well as their complex orientations and relationships with respect to each other.

CONCLUSIONS: We have successfully developed and validated a high fidelity cleft palate simulator that provides the most realistic environment to practice performing a cleft palate repair. In addition, the accurate representation of the anatomy allows better understanding of the palatal musculature. The next phases of this project include developing the robotic surgical system followed by testing the robot on the cleft palate simulator followed by further testing on an animal model.

## 162 A CRANIOMETRIC ANALYSIS OF BILATERAL ENDOSCOPIC SUTURECTOMY AND HELMET THERAPY FOR MANAGEMENT OF BILATERAL CORONAL CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Treatment paradigms for both single suture craniosynostosis and bilateral coronal craniosynostosis have been significantly altered during recent years. Early endoscopic suture release and postoperative helmeting have demonstrated comparable results to open cranial remodeling while decreasing anesthesia time, morbidity, and hospital length of stay. Posterior distraction recently has been employed to delay the need for frontal advancement in bilateral coronal cases and to halt progressive turricephaly. Our group has begun to employ bilateral coronal suturectomy with helmet

therapy in these cases. Here we report a craniometric evaluation of our surgical outcomes.

METHODS & DESCRIPTION: An IRB approved, single-institution, retrospective chart review was performed of all children presenting with bicoronal synostosis. Patient who underwent bilateral coronal endoscopic suturectomy with helmet therapy were included if they had both preop CT imaging and a postop CT performed at least 6 months after surgery. Craniometric measurements were taken on sagittal and axial views. Measurements included: anterior cranial base length (ACBL; sella-nasion), anterior bossing angle (sella-nasion-anterior frontal bone), cranial length, and cranial width. Additionally, cranial heights were measured with a line perpendicular to ACBL axis at nasion (anterior), sella (middle), and basion (posterior). The cranial heights were reported as absolute values and as a ratio normalized to ACBL (cranial height/ABCL).

RESULTS: A total of 19 children were treated with bilateral coronal suturectomy. 10 patients had both pre- and postop CT studies for evaluation. Postop CT studies were performed 16.9 (6.5-26.6) months after surgery on average. Average anterior cranial lengths increased significantly from 35.3mm to 42.5mm (p=0.005). Cephalic indices also significantly improved from 91.1 to 85.9 (p=0.01). Anterior cranial height remained stable from 66mm preop to 67.4mm postop (p=0.80). Middle and posterior height did increase (83.5 to 96.9; p=0.005) (94.6 to 120.6; p=0.005). When expressed relative to ACBL as a ratio, the anterior and middle cranial height improved (1.89 to 1.59, and 2.38 to 2.29). Anterior bossing improved from 112.8 to 105.4 without significance (p=0.075).

CONCLUSIONS: Early endoscopic suturectomy with postoperative helmet therapy is a rational alternative to posterior distraction in ameliorating the deformity of bilateral coronal craniosynostosis, and preventing/diminishing turricephaly. This methods seems more physiologic as it addresses the region of active pathology and as previously reported, can be achieved with comparable morbidity.

## 163 COMPARISON OF CRANIAL ANTHROPOMETRIC MEASUREMENTS USING HAND CALIPER VERSUS LASER SCANNER TO DIAGNOSE SEVERITY AND ASSESS CHANGE IN PATIENTS WITH DEFORMATIONAL PLAGIOCEPHALY

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BACKGROUND & PURPOSE: Deformational plagiocephaly (DP) occurs in 16-19% in infants. Current literature states that a confounding factor for diagnosis and decision making for treatment of DP is the lack of a proven viable measurement tool to quantify severity and change in DP. Several papers have debated the utility of the hand caliper as a practical tool for diagnosis and decision-making in determining which patients should be referred for helmet therapy (HT). Cranial anthropometric measurements made by a single nurse practitioner (NP) using hand caliper (HC) at a major children's hospital plagiocephaly clinic and a single orthotic company using laser scanner (LS) seemed to be closely correlated.

METHODS & DESCRIPTION: A retrospective review of all DP patients who underwent HT between January 2013 and July 2014 was performed. Data collected included race, gender, age at time of identification and presentation to the clinic, side of DP, dates of 1st and 2nd visits to medical facility, cranial index (CI), oblique diagonal difference (ODD), and head circumference at 1st and 2nd visits, presence of congenital muscular torticollis (CMT), physical therapy use (PT), and daycare use. The use of HC to measure CI and ODD was used to determine qualification for HT. Once eligible for HT, patients were sent to an orthotic company and LS is used to measure CI and ODD. Analysis was done to compare HC and LS measurements of ODD and CI.

RESULTS: Forty patients were identified that met inclusion criteria, 26 males and 14 females. 38 infants were Caucasian. The average age of identification of DP by the family was 2.2 months of age. Average age of presentation to the DP clinic was 5.7 months. 22 infants were para #1. 9 patients went to daycare. 22 patients had right-sided DP, 8 left-sided, and 10 bilateral. 36 infants had CMT (23 left, 12 right). 18 infants had already started PT by their first medical visit. HC measurements were obtained for CI and ODD at the time of the initial visit by a single NP and at approximately 3 months after beginning HT. LS measurements of CI and ODD were obtained within 3 weeks of the medical visit and approximately 3 months after beginning HT. Analysis of the measurements using the HC and LS showed that there were no significant differences between the HC and LS measurements (p=0.687, 0.266, 0.134 for OFC, CI, and ODD respectively, p<0.05 significance).

CONCLUSIONS: We have identified a cohort of infants with DP who underwent HC and LS measurements for CI and ODD which were closely correlated. Based on these findings, HC is an effective tool to evaluate the severity of DP, determine appropriate referral to an orthotic company for HT, and assess for change after HT. This correlation is important since it is very rare to have a medical facility with access to LS since the cost is quite prohibitive. Therefore, it is important to recognize this close correlation of cranial anthropometric measurements in an effort to accurately diagnose the severity of DP and to treat and refer appropriately.

## 164 SLIDING TEMPORALIS MYOPLASTY FOR SINGLE STAGE SMILE RECONSTRUCTION IN 15 CONSECUTIVE PATIENTS WITH FACIAL PARALYSIS

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BACKGROUND & PURPOSE: The gold standard for dynamic smile reconstruction in facial paralysis is microsurgical free tissue transfer. Often, this approach may require additional surgery to correct secondary deformities such as excessive cheek bulk, asymmetric vector of oral commissure excursion, and asymmetric nasolabial fold production. These complaints are made frequently by patients considered to have successful outcomes. In addition, in the setting of bilateral facial nerve palsy, unilateral surgery is practiced more routinely than simultaneous bilateral reconstruction. Postoperative ICU admission is common, with hospital stays typically between 5 and 7 days. Prolonged operative times, longer hospital stays, and longer time to animation are associated with free flap options. Sliding temporalis myoplasty (STM) can provide one-stage dynamic smile reconstruction with equivalent results to free tissue transfer and with fewer secondary deformities.

METHODS & DESCRIPTION: From 2012 to 2014, 19 sliding temporalis myoplasties were performed in 15 patients for smile reconstruction. A retrospective chart review was carried out to determine diagnosis, laterality, and ancillary procedures performed. Patient and operative variables collected included age, sex, operative times, hospital length of stay, and perioperative complications (blood loss requiring a transfusion, infection, hematoma, seroma, unplanned return to the operating room).

RESULTS: A total of 15 consecutive patients with facial paralysis were included. Simultaneous bilateral reconstruction occurred in 4 patients, and 11 underwent unilateral procedures. Diagnoses included 5 patients with Mobius syndrome, 5 with posterior cranial fossa tumors, 2 post-traumatic, 2 idiopathic, and 1 with hemifacial microsomia. All patients underwent single-stage unilateral or bilateral STM. Excluding one adult patient (age 68 years), average patient age was 10.1 years. Average operative time was 378 minutes (581 minutes for bilateral STM and 304 for unilateral STM). Average length of stay was 3.2 days (4.25 days for bilateral STM, 2.8 for unilateral STM). No patients required postoperative intensive care unit admission. Eight patients required minor revisions of the tendon insertion site. Two patients required blood transfusion during the perioperative period. Two patients developed a postoperative infection requiring incision and drainage. All patients demonstrated smile excursion.

CONCLUSIONS: These initial results indicate that the sliding temporalis myoplasty is a safe, viable alternative to free tissue transfer for dynamic smile reconstruction in patients with facial paralysis. Benefits to this procedure include limited donor site morbidity and immediate, predictable improvements in facial appearance. Shorter operative times, avoidance of ICU stays, and shorter hospital overall stays contribute to improved financial efficiency. Long-term functional and aesthetic outcomes are necessary to critically evaluate STM as a viable alternative for smile reconstruction.

## 165 LONG TERM GROWTH OUTCOMES OF PATIENTS WITH PIERRE ROBIN SEQUENCE WHO UNDERWENT INFANT MANDIBULAR DISTRACTION OSTEOGENESIS

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BACKGROUND & PURPOSE: Pierre Robin originally described the correlation between micrognathia and neonatal airway obstruction, which causes obstructive sleep apnea and is a significant cause of morbidity in infants. Patients with severe micrognathia are treated with mandibular distraction osteogenesis (MDO) to lengthen the mandible. The purpose of this study was to analyze the long-term growth outcomes of early intervention with MDO in patients with Pierre Robin Sequence (PRS) and compare them against non-distracted patients with PRS.

METHODS & DESCRIPTION: Radiographs from twelve patients diagnosed with Pierre-Robin sequence and obstructive sleep apnea who underwent MDO during infancy were analyzed using cephalometric measures and compared against non-distracted Pierre Robin patients described in the literature. All

landmarks were digitized using Dolphin imaging software.

RESULTS: The mean age was 94.5 months (27-183 months). The mean follow up period for the PRS treated with MDO group was 85.3 months (25-124 months). Distracted patients differed from historical non-distracted PRS controls in the following measure: sagittal maxillary/mandibular relationship (ANB), gonial angle (Ar-Go-Me), mandibular body length (Go-Gn), ramus height (Ar-Go), and chin prominence (SN-Pg). Specifically, ANB was 5.2 degrees in untreated patients and 3.13 degrees in treated patient (*p=0.021). The gonial angle was 133.7 in untreated patient and 141.98 in treated patient (*p=0.001). Mandibular body length was 48.8 mm in untreated patients and 62.4 mm in treated patients (*p=0.002). Conversely, ramus height was 42.0 mm in untreated patients and 31.02 mm in treated patients (*p=0.001). Chin prominence was 41.1 degrees in untreated patients and 47.49 degrees in treated patient (*p=0.01).

CONCLUSIONS: The anterior posterior sagittal relationship of the maxilla to the mandible following MDO was maintained. Differential mandibular ramus/length proportions were significant between the two groups suggesting that the lengthening of the mandibular body during MDO leads to a compensatory lack of growth in ramus height, this may contribute to the increased gonial angle. An increased gonial angle indicates a change in the growth vector of the mandible, which at this age is not readily apparent in the soft tissue profile, but may become more apparent as further growth of the mandible is expressed. The increased chin prominence may also become more apparent with growth. Further 10-15 year follow up of these patients is needed.

## 166 INCIDENCE OF AMBLYOPIA AND ITS RISK FACTORS IN CHILDREN WITH ISOLATED METOPIC CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Ophthalmic abnormalities in children with syndromic craniosynostosis have been reported previously, and referral of these children to a pediatric ophthalmologist is recommended. However, the need for referral of a child with nonsyndromic synostosis to a pediatric ophthalmologist is not as clear. The aim of this study is to report the incidence of amblyopia and its risk factors in children with isolated metopic craniosynostosis (IMC).

METHODS & DESCRIPTION: An IRB approved, retrospective review was performed on 91 children diagnosed with isolated metopic craniosynostosis. Ophthalmologic records were reviewed for diagnoses of amblyopia, strabismus, and refractive error.

RESULTS: Of the 91 children, 8 (8.8 %) had amblyopia, 8 (8.8%) had strabismus, 19 (20.9%) had astigmatism, 5 had myopia (5.5%), 5 had hyperopia (5.5%), and 5 had anisometropia (5.5%). The incidence of amblyopia and its risk factors found in our study are higher than the rate found in the normal pediatric population.

CONCLUSIONS: In our patient population, children with isolated metopic craniosynostosis demonstrate an increased rate of amblyopia and its risk factors. Amblyopia is best treated early in life for a successful outcome. A referral to a pediatric ophthalmologist for a formal eye exam and potential treatment is therefore recommended for children with isolated metopic craniosynostosis.

## 167 MANDIBULAR DISTRACTION OSTEOGENESIS IN THE VERY SMALL WITH ROBIN SEQUENCE: IS IT SAFE?

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BACKGROUND & PURPOSE: Various studies evaluated the efficacy of mandibular distraction osteogenesis (MDO) for the treatment of upper airway obstruction in Robin sequence (RS), and have reported the complications associated with this treatment modality in a heterogenous population. The aim of this study is to evaluate efficacy and complications associated with MDO performed in neonates < 4kg.

METHODS & DESCRIPTION: A 10-year retrospective review of all neonates with RS treated with MDO was performed. Patients < 4kg at the time of distraction were included. A control group of all RS patients > 4kg undergoing mandibular distraction during the same time period was used for comparison. Variables included associated medical comorbidities, improvement in apnea/hypopnea index (AHI), need for tracheostomy, repeat distraction, and complications.

RESULTS: Ninety-five patients underwent MDO during the study period and 67 patients met inclusion criteria. The remaining 27 patients were > 4kg and used as a control group. Mean age and weight at time of distraction were 22 days (range 5 to 97 days) and 3.19kg (range 2.00 to 3.99). The mean age and weight for the control group was 2 years 9 months and 12kg. Low birth weight (<2500g), intrauterine growth restriction, and prematurity were present in 26.4%, 26.0%, and 25.0% of the patients < 4kg respectively. There was not a significant difference in success of MDO to treat airway obstruction in the < 4kg group vs. the control group (97% vs. 88.9%; p = 0.1407). Success was defined as either decannulation of tracheostomy, avoidance of tracheostomy, or significant improvement of obstructive sleep apnea symptoms. The number of patients < 4kg with 1 or more complications was 10 (14.9%). Within the < 4kg group, major complications were present in 1 patient (1.5%), moderate complications in 4 patients (6.0%), and minor complications in 9 patients (13.4%). The only major complication in the patients < 4kg was a fibrous non-union (1.5%). Moderate complications were device malfunction (3.0%) and SSI requiring return to the operating room (3.0%). Minor complications were SSI managed with oral antibiotics (9.0%), ventilator-associated pneumonia (1.5%), hematoma (1.5%) and transient facial nerve palsy (1.5%). The most common complication was SSI (11.9%), of which 25% were successfully treated by oral antibiotics alone. There was not a significant difference in complication rate between the patients < 4kg and the control group (14.9% vs. 22.2%; p = 0.3829). The rates of repeat distraction were similar between the < 4kg group and the control group (6.3% and 14.8%; p = 0.2206). The mean age at repeat distraction was 2.3 years in the < 4kg group and 9.2 years in the control group (p = 0.1213). The mean follow up was 2.9 years in patients < 4kg and 3.3 years in the control group (p = 0.6286).

CONCLUSIONS: MDO is a safe and effective treatment modality for neonates with RS, <4kg and severe airway obstruction. The efficacy and complication profiles are not significantly different from patients >4kg.

## 168 TREATMENT CENTER FACTORS ASSOCIATED WITH SECONDARY PALATE SURGERY

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BACKGROUND & PURPOSE: Secondary palate surgery is a source of substantial morbidity to patients. This includes surgery to close palatal fistulas or correct velopharyngeal insufficiency. Previous research demonstrated a 4-fold variation in secondary palate surgery between cleft centers, with prevalence of secondary palate surgery ranging from 9 to 42%. Factors leading to this variation across treatment centers remain unclear.

METHODS & DESCRIPTION: The patient's burden of secondary palate surgery was evaluated for children treated at 44 US children's hospitals using prospectively collected administrative data in the Pediatric Health Information System (PHIS). Children with non-syndromic cleft lip and palate were included if they underwent cleft palate repair prior to two years of age between 1998 and 2013. To account for variable follow-up, outcome was defined as duration of survival without secondary palate surgery. The association of pre-specified treatment center factors with secondary palate surgery was tested using a multivariate Cox proportional hazards model. The model adjusted for differences in patient characteristics between centers, including gender, race, and socioeconomic status.

RESULTS: Survival without secondary palate surgery was evaluated for 4939 children with cleft lip and palate. Patients were predominately male (n=3144, 63.7%) and Caucasian (n=3355, 67.9%). Median survival without secondary palate surgery was 8.2 years (95% CI, 8.0-9.5). Age at primary repair was associated with secondary palate surgery (p<0.001). Children who underwent palate repair before 9 months of age were at increased risk of secondary palate surgery compared to children undergoing repair at 15-24 months of age (Hazard ratio 2.4, 95% CI 2.0-2.9). Risk of secondary palate surgery was not significantly different for children undergoing repair at 9-15 months of age, compared to repair at 15-24 months of age (HR 1.1, 95% CI 0.9-1.3). The number of palate repairs performed at the treating hospital each year was associated with secondary palate surgery (p<0.001). Compared to low-volume hospitals (<20 repairs/yr), survival without secondary palate surgery was significantly lower at high-volume hospitals (>50 repairs/yr) (HR 1.4, 95% CI 1.1-1.7, p<0.001). There was no difference in survival without secondary palate surgery between low- and medium-volume hospitals (20-50 repairs/yr) (HR 1.2, 95% CI 1.0-1.4, p=0.10). Length of stay after primary repair was also associated with secondary palate surgery (p<0.001), with children hospitalized for two or more nights after the primary repair having a lower risk of secondary palate surgery compared to those hospitalized only one night (HR 0.7, 95% CI 0.6-0.8, p<0.001).

CONCLUSIONS: There are specific treatment center factors associated with secondary palate surgery. These factors include age at primary palate repair, the number of palate repairs performed at the treating hospital each year, and length of stay after primary repair.

## 169 A COMPARISON OF THE NEED FOR SPEECH THERAPY FOLLOWING TWO PALATAL REPAIR TECHNIQUES

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BACKGROUND & PURPOSE: Speech problems in individuals with cleft palate deformities are a common occurrence, and reconstruction of the levator musculature (intravelar veloplasty) at the time of cleft palate repair has been suggested to be important in long-term speech outcomes. Nevertheless, the association between the type of cleft palate repair and the need for speech therapy remains unclear. In this study, we explore the indications for speech therapy among patients with cleft palate and also compare the need for postoperative speech therapy between two palatoplasty techniques.

METHODS & DESCRIPTION: A retrospective chart review was performed for patients with cleft palate who underwent either primary Kriens intravelar veloplasty (KR) or overlapping intravelar veloplasty (OV) before 18 months of age. All subjects underwent surgery between 2003-2012 and completed a follow-up visit at approximately three years of age. Only patients with nonsyndromic cleft palate, Pierre Robin sequence, or van der Woude syndrome were evaluated. Data obtained included documentation of ongoing or recommended speech therapy at age 3 years and reasons for speech therapy as noted by speech-language pathologists. Maladaptive articulation patterns, hypernasality secondary to velopharyngeal dysfunction, limited consonant repertoire, and limited oral opening were categorized as cleft-related reasons for speech therapy. Preoperative pure tone average (KR n=47; OV n=16) and the number of ear tubes placed by age 3 years (KR n=60; OV n=10) were also obtained, when recorded, to assess hearing loss.

RESULTS: All of the KR procedures (n=99) were performed by a single surgeon, while all of the OV procedures (n=30) were performed by the senior author (ASW). The mean age at surgery (13.3±1.4 months; $p$=0.259) and age at 3-year follow-up (KR=3.0 years; OV=2.8 years; $p$=0.087) were equivalent between the two procedures. At 3 years of age, 36.7% of OV patients required speech therapy compared to 64.6% of KR patients ($p$=0.008). For patients requiring speech therapy for cleft-related reasons, a significant difference was also found between the two groups (OV=23.3%; KR=49.5%; $p$=0.009). For patients requiring speech therapy for non-cleft related reasons, the difference between OV (30.0%) and KR (33.3%) patients was not significant ($p$=0.742). No significant difference was found in preoperative pure tone average (overall mean=29.2 dB; $p$=0.616) or in sets of ear tubes placed (overall mean=1.4 sets; $p$=0.669) between the two groups.

CONCLUSIONS: At three years of age, patients who received overlapping intravelar veloplasty were less likely to need speech therapy compared to patients who received Kriens intravelar veloplasty. Hearing loss did not appear to influence the difference found in need for speech therapy between the two surgical techniques.

## 170 SYSTEMATIC REVIEW OF STUDIES COMPARING PRIMARY PALATOPLASTY WITH FURLOW VERSUS NON-FURLOW TECHNIQUES VIA PERCEPTUAL SPEECH OUTCOMES

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BACKGROUND & PURPOSE: Orofacial clefts, including clefts that involve the soft palate, are the most common birth defect in the USA. The most important morbidity of cleft palate is hypernasal speech due to insufficiency of the velopharyngeal sphincter. Proper alignment of the levator veli palatini is essential to the function of the velopharyngeal sphincter. Two popular techniques, intravelar veloplasty (IVV) and Furlow double-opposing Z-plasty, have been developed to restore velopharyngeal competence. However, there is still ongoing debate on the success rate of primary palatoplasty between these two techniques. Our study is a review of the literature comparing speech outcomes of Furlow and IVV for primary palatoplasty.

METHODS & DESCRIPTION: Searches were conducted on June 23, 2014 on the following databases: PubMed, Ovid MEDLINE, Scopus, CINAHL plus, and CENTRAL. Search terms used were: "Furlow" and "cleft palate surgery". Duplicates, case reports, series with less than five subjects, and literature reviews were eliminated. Only studies that contained both Furlow and IVV perceptual speech outcome data were included. Studies that included submucous cleft palate or patients with syndromes were excluded. Pooled analysis was performed with available data.

RESULTS: After duplicates were removed, 121 full-text articles were examined, yielding 4 articles that met our inclusion criteria. In all four studies, Furlow had superior speech outcomes to IVV. However, only 2 studies found a statistically significant difference. 2 studies provided enough data to undergo a pooled analysis using hypernasality scores, which are graded on a 0 (normal) to 3 (severe) scale. This yielded Furlow n = 83 and IVV n = 149. 1 of these papers provided the data for each patient, which breaks down as follows: Furlow was 0 (20/20), and IVV was 0 (131/139), 1 (6/139), and 2 (2/139). The other study only provides means and standard deviations (SD), which were Furlow mean 0.32 (SD 0.74, n=63) and IVV mean 1.15 (SD 1.27, n=20). The means were combined using n, and the SD were combined using the equation for pooled variance, which demonstrated Furlow mean 0.243 (SD 0.647) and IVV mean 0.208 (SD 0.529). A Welch's t-test shows P=0.6746.

CONCLUSIONS: Furlow palatoplasty had superior results to IVV in all studies included in this review, suggesting that Furlow palatoplasty may overall have superior velopharyngeal outcomes than IVV. However, our pooled analysis with available data did not show a statistical difference between Furlow and IVV perceptual speech outcomes. Possible confounding factors include the heterogeneity of the studies reviewed, publication bias, and the inter-rater reliability of perceptual speech assessments. We are looking at papers with Furlow-only or IVV-only data, but those will have even more random effects between groups than the papers selected here where both groups are compared by their respective authors.

## 171 LONG-TERM SPEECH OUTCOME IN ADULTS WITH COMPLETE UNILATERAL CLEFT LIP AND PALATE AFTER TWO-STAGE PALATE CLOSURE

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BACKGROUND & PURPOSE: The timing of soft and hard palate closure remains an ongoing discussion in cleft care. To date, only a few studies have evaluated long-term speech results after two-stage closure. In two-stage palate closure the soft palate is closed at an early age and the hard palate is closed secondarily. Theoretically, early soft palate closure allows for adequate speech development, while the delayed hard palate closure limits the amount of maxillary outgrowth restriction. For this reason, a tertiary center in the Netherlands has been performing the two-stage repair of cleft lip and palate for more than 30 years. Purpose: To evaluate the speech and the amount of speech enhancing interventions in patients with an isolated unilateral complete cleft lip and palate after a two-stage palatoplasty performed in the 1980s and 1990s.

METHODS & DESCRIPTION: Retrospective analysis of patients of 17 years and older with an isolated complete unilateral cleft lip and palate treated with a two-stage palatoplasty. All patients where operated in the same cleft palate centre by one surgeon. Patients where invited for a final speech analysis. Medical history was obtained from the medical files and speech was assessed by the speech pathologist at follow-up. In each patient, nasometry and mirror tests were performed and intelligibility and hypernasality was assessed.

RESULTS: Seventy-eight patients met our inclusion criteria, from these patients 52 presented at follow-up (67%). Hard and soft palate closure was performed at a median age of 33 months and 5 months respectively. In 42% of the patients a pharyngoplasty was performed. On a 5-point intelligibility scale, 85% scored 1 or 2, meaning speech was intelligible, possibly with minimal speech pathology. A history of speech enhancing surgery or fistulas did not influence intelligibility or hypernasality scores significantly. Patients that received a pharyngoplasty scored significantly better on the mirror test.

CONCLUSIONS: Present study describes a unique patient group after two-stage palatoplasty in which hard palate closure was performed at a median age of approximately 3 years old. Acceptable long-term speech results regarding intelligibility and hypernasality were found. Speech enhancing surgery was needed in 42% of the patients. Once pharyngoplasty is performed, intelligibility and hypernasality scores were comparable to the patients without speech enhancing surgery.

## 172 INFLUENCE OF INTRAORAL AIR PRESSURE AND AUDITORY FEEDBACK ON VELOPHARYNGEAL CLOSURE DURING NORMAL, WHISPERED, PANTOMIME, AND ELECTROLARYNX SPEECH

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BACKGROUND & PURPOSE: This study addressed the role of the velopharyngeal mechanism as an important articulator for speech, allowing energy through the nasal cavity during nasal speech sounds and obstructing the nasal cavity during oral speech sounds. Closure of the velopharyngeal mechanism may be influenced by intraoral air pressure sensation and by auditory feedback during speech. These influences were studied by monitoring velopharyngeal movements as speakers produced utterances under varying conditions of auditory and intraoral pressure feedback.

METHODS & DESCRIPTION: Velopharyngeal opening and closing gestures were measured using an endoscopic light source and phototransducer assembly, which sensed the amount of light passing through the velopharyngeal port during speech. Four male and three female subjects produced three sentences containing either high intraoral pressure sounds, low intraoral pressure sounds, or nasal speech sounds. Each of the sentences was produced 6 times normally, whispered, pantomimed (no auditory or air pressure feedback), and using an electrolarynx (no air pressure feedback). Average percent velopharyngeal closure was calculated for each utterance produced by each subject. Similarly, variability of velopharyngeal closing gestures were calculated using the spatiotemporal index.

RESULTS: Average percent velopharyngeal closure was greatest in normal and whispered conditions for all sentences where both intraoral pressures and auditory feedback were present, while variability of closure across repeated productions was greatest in the pantomime condition. Intermediate degrees on closure were observed in the electrolarynx condition which involved auditory feedback but no pressure feedback. The lowest percent velopharyngeal closure levels were observed in the pantomime condition (No auditory or air pressure feedback).

CONCLUSIONS: While removing oral pressure and auditory feedback had a significant negative influence on velar movement control the influence of oral pressure was greatest, highlighting the importance of air pressure sensation to velar control. Observation of variations in closure level in the pantomime condition albeit greatly reduced in overall magnitude could be interpreted to represent differences between central and peripheral control of velopharyngeal closing gestures.

## 173 PROGRESSIVE TIGHTENING OF THE LEVATOR VELI PALATINI MUSCLE IMPROVES VELOPHARYNGEAL DYSFUNCTION IN PRIMARY PALATOPLASTY

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BACKGROUND & PURPOSE: Impaired speech resonance from velopharyngeal dysfunction (VPD) is one of the major morbidities associated with cleft palate. It has been suggested that management of the levator veli palatini muscle with an intravelar veloplasty (IVV) may improve speech resonance outcomes. Two popular techniques for repair of the levator musculature include reapproximation of the palatine musculature, as advocated by Kriens, and Radical-IVV with separate dissection and reapproximation of the levator at the midline. The senior author (ASW) has introduced a more aggressive procedure where the levator is significantly overlapped upon itself and the muscle is maximally tightened. The purpose of this study is to compare speech resonance results from 4 separate levator management protocols: 1) No-IVV, 2) Kriens-IVV, 3) Radical-IVV, and 4) Overlapping-IVV.

METHODS & DESCRIPTION: A retrospective chart review was conducted on 252 patients with documented speech follow-up at a minimum of 3 years of age after undergoing primary palatoplasty. Veau classification was used to categorize cleft severity. Two speech pathologists evaluated postoperative velopharyngeal function based on speech resonance, nasal emission, turbulence and grimacing in the context of appropriate articulations once individuals reached 3 years of age. Patients were then assigned a score on a 4-point scale (0 = normal resonance, no nasal emission, turbulence or grimacing; 1 = occasional slight hypernasality, nasal emission, turbulence, grimacing – no further assessment warranted; 2 = mild hypernasality, intermittent nasal turbulence, grimacing – velopharyngeal imaging recommended; 3 = severe hypernasality – surgical intervention recommended). Patients scoring either "0" or "1" are considered to have a desirable outcome, whereas "2" or "3" are undesirable outcomes. Fisher's exact test was used to compare outcomes.

RESULTS: A single surgeon performed all the Non-IVV (n=92), Kriens-IVV (n=103) and Radical-IVV (n=31) procedures while the senior author performed the Overlapping-IVV procedure (n=26). The cleft severity proportions were equivalent across the four procedures ($p = 0.28$). Postoperatively, patients who underwent Overlapping-IVV demonstrated significantly better velopharyngeal function on the four point scale compared to Non-IVV, Kriens-IVV, and Radical-IVV ($p < 0.001$ for all comparisons). Upon further stratification into desirable versus undesirable outcomes, patients who underwent Overlapping-IVV performed better than Non-IVV, Kriens-IVV, and Radical-IVV ($p < 0.001$ for all comparisons). None of the Overlapping-IVV patients required further velopharyngeal imaging or secondary surgery.

CONCLUSIONS: This study demonstrates that speech resonance outcomes are improved and the need for secondary VPD management is reduced when the levator veli palatini is formally dissected out and reconstructed. Results were best when the muscle was maximally overlapped during primary palatoplasty.

## 174 COMPARING SURGICAL AND NON-SURGICAL MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION IN PEDIATRIC PATIENTS WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: Management of velopharyngeal dysfunction (VPD) in patients with 22q11.2 DS is controversial and often more difficult than in their non syndromic counterparts. To evaluate the outcomes of nonsurgical management of VPD through traditional speech therapy focusing on misarticulation in patients with 22q11.2 DS and compare this with traditional surgical management. The purpose of this study is to evaluate the role of speech therapy with and without surgical management for VPD and to determine how and to what extent surgical management affects speech intelligibility.

METHODS & DESCRIPTION: A retrospective chart review was conducted on 14 patients with 22q11.2 Deletion Syndrome confirmed through FISH analysis. Patient demographics, surgical history, and speech therapy history were recorded from patient charts. Additionally, pre and posttreatment nasendoscopy scores, Goldman Fristoe (GF) articulation test results, and perceptual assessment of nasality scores were recorded. Following treatment, posttreatment evaluations were completed at 3 months, 6 months, and 9 months thereafter. Patients with VPD secondary to an unrepaired overt or submucosal cleft palate, patients surgically repaired at an outside institution, patients with incomplete data, and patients with a negative fluorescence in situ hybridization (FISH) study for 22q11.2 deletion were excluded from the study.

RESULTS: Velopharyngeal dysfunction (VPD) was present in all patients and confirmed by direct visualization with nasendoscopy and by perceptual assessment of nasality. The average age at diagnosis was 3.6 years (range 2 days – 7.9 years). Nine patients (64.3%) were treated with speech therapy and surgically and five (35.7%) were treated solely with speech therapy. There were no significant pretreatment differences between the two groups. In the surgically managed group, the mean pretreatment Goldman-Fristoe (GF) standard score was 79.6. The mean posttreatment standard score was 90.4 (change=10.9, $p<0.01$). The mean percentile rank was 6.8 before treatment and 11.2 after treatment (change=4.4, $p=0.02$). In the nonsurgically managed group, the mean pretreatment GF standard score was 72.2 and after treatment was 94.4 (change=22.0, $p=0.04$). The mean percentile score before treatment was 6.2 and posttreatment was 22.2 (change=16, $p>0.05$). When comparing the degree of improvement after treatment, there was not a statistically significant difference between the two groups although each group improved. In the surgically managed group, the mean size of the velopharyngeal gap before treatment was 0.64% after treatment was 0.04% (change = 0.6, $p<0.01$). In the surgically managed group, the mean nasality score before treatment was 4.7, indicating moderate/severe nasality. After treatment, the mean score was 1.3 indicating normal nasality (change=3.3, $p<0.01$).

CONCLUSIONS: Patients with 22q11 DS and VPD benefit from both speech therapy and surgical correction however surgical correction improves resonance but may not improve articulation.

## 175 POST-PALATOPLASTY PAIN PROTOCOL: A PILOT STUDY

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BACKGROUND & PURPOSE: Pediatric primary palatoplasty is associated with significant pain post-operatively that can lead to delay in return to routine function. Pain management requires a comprehensive approach to address patient and families' needs and concerns. We worked with nursing staff, nurse educator, and pain/anesthesia and surgeon teams to develop a post-palatoplasty pain protocol. We wished to

METHODS & DESCRIPTION: Prior to any protocol, pain management consisted of "as needed" medications: oral, oral acetaminophen q4hrs, oxycodone q4hrs and IV morphine q1-2 hrs. A new pain-management protocol consisted of fixed IV acetaminophen q6hrs overnight, then switching to "as needed" oral Tylenol in the morning. "As needed" oral oxycodone was changed to q3hrs and IV morphine was the same as before. With IRB approval, we performed a retrospective review of a single surgeon experience from 2012-2104. We identified 84 consecutive patients who underwent palatoplasty before and after institution of the pain protocol in 2013.

RESULTS: 43 patients underwent operations prior to instituting a pain protocol and 41 underwent operations afterwards. There were similarities between the pre and post-protocol groups in average age (14.1 vs 12.5 months), length of stay (25.75 vs 25.68 hrs), and total oxycodone dosing (0.78 vs 0.78mg/kg). We noted a downward trend in average pain scores (4.35 vs 3.89) and total morphine dosing (0.34 vs 0.27mg/kg) but both were not statistically different (*p=0.1379 and p=0.2793 respectively). However, total Tylenol dosing (81.4 vs 63.2 mg/kg) was significantly decreased after instituting the pain protocol (*p=0.0014).

CONCLUSIONS: In this pilot study of post-operative palatoplasty patients, we identified a downward trend in overall pain scores and total morphine use. Interestingly, we saw a significant decrease in overall acetaminophen use. This is likely attributed to the scheduled IV acetaminophen dosing of the pain protocol. A multidisciplinary approach to post-operative pain management in this subset of patients is showed a promising downward trend in overall pain scores and medication usage.

## 176 RECOVERY TIME AND COMPLICATIONS AFTER ILIAC CREST BONE GRAFT HARVEST FOR ALVEOLAR CLEFT BONE GRAFTING

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BACKGROUND & PURPOSE: Use of the iliac crest for secondary bone grafting of alveolar clefts has been criticized for unacceptable donor site morbidity and a long recovery, leading surgeons to investigate alternatives. However, this perception does not coincide with our experience. The purpose of this study is to review our outcomes and patients' experiences with open iliac crest bone harvest for alveolar bone grafting, and to compare the complication rates and recovery times to the literature.

METHODS & DESCRIPTION: A retrospective chart review was performed to determine recovery time, complications, and outcomes for all patients who had secondary bone grafting from the iliac crest for alveolar cleft closure. A questionnaire was administered to patients who underwent the surgery within the previous 3 years to determine subjective recollections of the recovery experience. In addition, a literature search was performed in order to compare similar approaches as well as alternative techniques.

RESULTS: Seventy patients met inclusion criteria for the chart review and 20 questionnaires were completed. Inpatient stays averaged 26 hours, with 92% of patients being discharged the day after surgery. There were no major donor site complications. Minor complications included 2 patients with superficial infections which resolved with oral antibiotics, and 2 with ongoing but non-limiting discomfort at the donor site scar. Fifty-eight percent of patients had only mild and well-controlled post-operative pain. Our most recent patients required minimal narcotic analgesics (0.4 mg/kg of codeine equivalents), with only 1 patient of 25 requiring intravenous breakthrough analgesia. Eighty percent of questionnaire respondents recalled limping for less than a week, and 95% of patients were back to full activity within 1 month of surgery. The complication profile and recovery times of patients with open iliac crest bone harvest compared favorably to those of other donor sites and were comparable to minimally invasive approaches.

CONCLUSIONS: Open iliac crest bone graft harvest for repair of alveolar clefts is a well-tolerated procedure, with acceptable recovery times, and with a favorable complication profile. The procedure should continue to be considered the optimal donor site in this patient population.

## 177 PATIENT PERCEPTIONS OF PERIOPERATIVE CARE FOLLOWING ILIAC BONE GRAFTING SURGERY: A SURVEY BASED STUDY OF PATIENTS TREATED IN A LARGE ACADEMIC MEDICAL CENTER

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BACKGROUND & PURPOSE: An understanding of patient perception and experience is of paramount importance in quality improvement initiatives. Large academic institutions are often the center of team based cleft care. Given the abundance of resources these institutions often provide the optimal environment for treating complex care issues; however, they often suffer from depersonalization and inconsistency given numerous providers with varied training and experience. Here we survey patients undergoing iliac bone grafting at our institution to appreciate patient and parent perspective on perioperative care.

METHODS & DESCRIPTION: All patients undergoing iliac bone grafting from January 1, 2011 until present were identified. Using RedCap (cite) a total of 72 patients completed the electronic survey providing information regarding pain scores at the donor and recipient sites, narcotic requirement and duration, hospital days, lost school days. On a scale from 1 to 5, with 5 being the optimal response patients rated their satisfaction with preparation for surgery and recovery experience.

RESULTS: According to surveyed patients: mean hospital stay was 1.2 days with 75% of patients staying a day or less in the hospital after surgery. 67% of patients required oral narcotic medication for an average of 3 days post discharge. 51% of patients reported the iliac crest donor site to be more painful that the recipient site (19%) with an average pain score of 5.2 out of 10. 95% of patients were comfortable with their child's discharge from the hospital. 57% of patients were out of school for more than 5 days. 7% of patients reported significant nausea, 5% reported vomiting after discharge, and 11% reported prolonged difficulties with oral intake. 7% identified difficulties with their oral splint. On the 1 to 5 scale for satisfaction with outcomes, patients responded accordingly. With respect to their surgery overall, 45% scored a 5, 24% scored a 4, and 17% scored a 3. With respect to their overall recovery, 51% scored a 5, 26.4% scored a 4, 20 % scored a 3, and 1.2% scored a 2. Regarding utility of perioperative counseling, 52.8% scored a 5, 34.7% scored a 4, 6.9% scored a 3, 14% scored a 2 and 1.4%scored a 1. With parent comfort with discharge, 58.3 percent scored a 5, 30.6% scored a 4, and 11.1 % scored a 3. With respect to coordination of care in the hospital, 55.6% scored a 5, 29.2% scored a 4, 13.9% scored a 3, and 1.4% scored a 1. When asked about financial stress associated with the procedure and hospitalization, 47% reported a 5 (no stress), 23.6% reported a 4, 27.8% reported a 3, and 1.4% reported a 2.

CONCLUSIONS: Here we provide a clear, concise survey-based summary of patient experience following iliac bone grafting. This data can be used to better counsel patients on expectations for their perioperative experience. Using this data, academic centers can identify areas for quality improvement. Resulting changes at our institution have included the implementation of a universal protocol amongst the entire cleft care team.

## 178 EARLY SURGICAL COMPLICATIONS AFTER PRIMARY LIP REPAIR- A REPORT OF 3108 CONSECUTIVE PATIENTS

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BACKGROUND & PURPOSE: Conflicting data is found in the literature regarding the definition and incidence of surgical complications following primary cleft lip repair. The purpose of this study is to analyze short term surgical complications after primary cleft lip repair at a high volume cleft center in a developing region.

METHODS & DESCRIPTION: 3108 consecutive primary cleft lip repairs with 2062 follow-ups were reviewed retrospectively through medical records. Documented complications in terms of dehiscence, necrosis, infection and suture granuloma were compiled. Logistic regression was used with dehiscence (yes/no) or infection (yes/no) as binary dependent variables. Age, cleft type and surgeon (visiting/long term) were used as covariates.

RESULTS: Patients were aged 3 months – 75 years at the time of surgery with a mean age of 7 years. Among the 2062 patients that returned for early

follow-up, 90 (4.4%) had one or more complications. Dehiscence (3.2%) and infection (1.1%) were the most common type of complications. Bilateral clefts, complete clefts, and visiting surgeons were significantly associated with wound dehiscence, and complete clefts were associated with wound infection according to the logistic regression analysis. 6.9% of patients with bilateral complete clefts suffered from some degree of wound dehiscence.

CONCLUSIONS: The overall complication rate of 4.4% compares well with data from centers in developed regions, and demonstrates that quality outcomes can be achieved in challenging settings and without presurgical molding. The most common complication was minor skin dehiscence and this complication was significantly associated with bilateral complete clefts. The risk of dehiscence is, however, reduced when these cases are assigned to surgeons with experience with these types of clefts. We also found that the incidence of wound infection can be kept relatively low, even without the use of postoperative antibiotics. Instead we recommend educating patients in simple routines of hygiene and wound care before discharge.

## 179 CLEFT PALATE REPAIR: HOSPITAL LENGTH OF STAY

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BACKGROUND & PURPOSE: In the US, cleft palate repair typically occurs during the first 9-18 months of life and almost always involves hospital admission to monitor the child's recovery. There has been a recent insurance-related push to decrease in-hospital time for children after surgery including those cleft-related. Some procedures have been targeted as appropriate for ≤23 hour stays. In our practice, patients having cleft palate repair usually do not meet criteria for discharge until at least 24-48 hours post-op. Pain control, respiratory status, and oral hydration issues can make the post-operative course unpredictable. Understanding the factors associated with decreased hospital length of stay (LOS) could help define strategies for decreasing hospital stay for all patients.

METHODS & DESCRIPTION: This is a retrospective single-surgeon review of 70 consecutive primary palate repairs. Discharge criteria for all included 1) no significant bleeding/drainage, 2) pain control via oral medicine, and 3) intake of maintenance fluid requirements. Demographic and peri-operative information related to palate repair were reviewed. Hospital LOS was determined in relation to different perioperative factors such as the use and timing of narcotics, steroids, surgery length, and surgical method.

RESULTS: Multiple cleft types were represented: Veau I+II = 29, Veau III = 19, Veau IV = 13, and submucous cleft palate (SMCP) = 9. Post-operative LOS ranged from 18-72 hours. 81.4% of all patients required 24+ hours of hospitalization before meeting discharge criteria. 25.7% required 48+ hours. Patients with SMCP were much older at the time of surgery, on average 4.75 years compared with the other cleft types: Veau I+II 12.4 months, Veau III: 14.8 months, and Veau IV: 20.6 months. 3 of the 70 patients had g-tubes and went home in <24 hours. 3 other patients had to be re-intubated and required ICU admission. Excluding these outliers, the SMCP group averaged a 6 hour shorter LOS at 32 hours compared with the others at 38 hours. There was an inverse relation between cleft type and shorter LOS: Veau IV: 35.2 hours, Veau III: 37.9 hours, and Veau I+II: 39.3 hours. There was no obvious correlation with dosing of intra-operative steroids or fentanyl in relation to LOS. Patients who received intra-operative morphine, however, stayed an average 40.6 hours compared with 36.7 hours for those who did not. Those receiving morphine also had longer PACU stays and longer average time until first PO intake. There was no overall association, though, between first oral intake and LOS.

CONCLUSIONS: The data suggests SMCP and Veau IV clefts may be anticipated to require shorter LOS than Veau I, II, and III clefts. Intra-operative morphine, compared with fentanyl, may slow recovery but the reasons for this disparity are not clear. It is clear the majority of cleft palate repairs require more than a 23 hour admission before achieving adequate pain relief and oral intake. This should discourage attempts at shortening pre-admission plans for these procedures.

## 180 FACTORS AFFECTING DURATION OF ADMISSION AFTER PRIMARY PALATOPLASTY

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BACKGROUND & PURPOSE: Most infants may be safely discharged from the hospital within 24 hours of primary palatoplasty. However, some require hospital admission longer than 24 hours, typically due to poor oral intake, poor pain control, or other factors. The aim of this study was to determine the factors that contribute to delay in discharge of children following cleft palate repair.

METHODS & DESCRIPTION: A retrospective review was performed of patients aged two years and younger who underwent primary cleft palate repair between January 2010 and December 2013 at a single center. Patients undergoing secondary palate repair were excluded from analysis. A variety of relevant demographic and clinical variables were examined, comparing those infants discharged within 24 hours to those that required longer hospital stays. The data were analyzed using Chi-squared analysis, with a p-value at 0.05.

RESULTS: A total of 104 children met the inclusion criteria, 46 (44.2 %) male and 58 (55.8 %) female. Mean age at palatoplasty was 13.1 ± 3.5 months. Mean duration of anesthesia was 119.6 ± 31.5 minutes. Thirty six (34.6%) of the patients required hospitalization for more than 24 hours following surgery; the remainder (65.4%) were discharged within 24 hours. Increased duration of anesthesia (p=0.12), decreased narcotic use (p=0.09), and decreased oral intake (p=0.07) were observed among the children with a prolonged hospital stay; however, these differences only approached statistical significance. Of the four adopted children in the study, three had a prolonged hospital stay. Factors including syndromic diagnosis or multiple congenital anomalies, Pierre Robin sequence, prematurity, sex, race, cleft type, surgeon, volume of blood loss, use of local anesthetics (lidocaine versus bupivicaine), and repair technique did not influence the duration of admission. Age at palatoplasty was the only factor that significantly affected length of stay, with children discharged within 24 hours (mean age, 12.6 ± 3.0 months) being younger than those requiring a longer hospital stay (mean age 14.1 ± 4.1 months; p=0.05).

CONCLUSIONS: These data demonstrate that age at primary palatoplasty may significantly influence length of stay after surgery, with older children requiring longer hospitalization. The duration of anesthesia, post-operative narcotic administration, oral intake, and adoption status may be additional factors that influence the timing of hospital discharge.

## 181 IMPROVING CONSISTENCY OF CARE AND TIMELY DISCHARGE FOR PATIENTS UNDERGOING CLEFT REPAIR OR ILIAC BONE GRAFTING

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BACKGROUND & PURPOSE: The consistency of post-operative discharge instructions is critical for the provision of quality care as well as timely hospital discharge following cleft lip, palate, and alveolar bone grafting surgery. The complexity of efficient patient preparation for discharge with the added challenge of numerous providers of varied experience and training often encountered in a large academic hospital setting, can result in fragmented and delayed discharge practices. Not only can this impact patient safety and patient satisfaction, but it also can incur additional medical costs. In this quality improvement initiative, we reviewed parent-initiated post-operative phone call frequency and content to identify practice inconsistencies and deficiencies. We then used this data to develop strategic interventions to maintain consistency in post-operative care, and timely, efficient discharge.

METHODS & DESCRIPTION: All phone calls initiated post-operatively by parents after cleft lip, cleft palate and alveolar bone grafting surgery were reviewed for a 60 day period and collated according to operative procedure, reason for call, and attending surgeon. Surgeon consensus was queried and achieved targeting diet, pain control, oral care, criteria for discharge, and timing of post-operative follow up. Web-based patient family education documents were revised to reflect this standardized protocol for post-operative care by procedure Post-operative and discharge instructions were also formatted in a pre-populated order set in the Electronic Medical Record and reviewed with each resident physician prior to commencement of the specialty rotation. Teaching sessions by a practice specialty nurse at the time of the pre-operative visit were initiated, and educational sessions were provided to the inpatient nursing team. Inpatient visits on the first post-operative day were conducted by the specialty nurse to reinforce the bedside teaching by floor nurses and assess readiness for discharge. Patient initiated phone calls were again audited following the implementation of this standardized protocol and teaching initiative and compared to the pre-implementation calls.

RESULTS: A significant reduction in the number of post operative calls was noted for patients who underwent cleft palate repair (p=0.036) and alveolar bone grafting surgery (p= 0.003), while no significant change was seen in the number of calls for patients after cleft lip repair did not reach statistical significance (p=0.540).

CONCLUSIONS: This quality improvement initiative consisted of the development of a universal post-operative care protocol following cleft lip,

palate, and alveolar bone grafting surgery, as well as regular teaching for the family, resident trainees, and in-patient care teams to accomplish consistent implementation of this protocol. We noted a significant reduction in the number of parent–initiated post-operative calls, potentially reflecting improvements in communication and impacting patient outcomes.

## 182 SCALABLE, SUSTAINABLE COST-EFFECTIVE SURGICAL CARE: A MODEL FOR SAFETY AND QUALITY IN THE DEVELOPING WORLD

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BACKGROUND & PURPOSE: With an estimated backlog of 4,000,000 patients worldwide, cleft lip and cleft palate remain a stark example of the global burden of surgical disease. The need for a new paradigm in has been increasingly recognized to exponentially expand care while emphasizing safety and quality. This presentation examines the evolution of a specialty cleft surgery center in Northeast India as an innovative model for cleft care in the developing world.

METHODS & DESCRIPTION: This specialty center is the result of a unique public-private partnership between government, charity, and the corporate sector to create a center of excellence in cleft care for an underserved region. A state-of-the-art surgical facility and a needs-based approach were implemented to assemble infrastructure, teams, and systems capable of providing world-class care to the most needy of patients. The project utilized a diagonal model of surgical care delivery, with vertical inputs of mission-based care transitioning to investments in infrastructure and human capital to create a sustainable, local care delivery system. Progress was meticulously documented to evaluate performance and provide transparency to all stakeholders.

RESULTS: The center is open year round to offer full-time services and follow-up care. Along with complete surgical services, offerings include speech therapy, child life counseling, dental care, otolaryngology, orthodontics, and nutrition services for the cleft patients under one roof. Over the first 2.5 years of service (May 2011–November 2013), the center made significant advances in numerous areas, providing free operations to 7,034 patients. Results show enhanced safety, outcomes, and multidisciplinary services while dramatically decreasing costs and increasing investments in the local community. The center has become a regional referral cleft center, and governments of surrounding states have contracted the GCCCC to provide care for their citizens with cleft lip and cleft palate. Additional regional and global impact is anticipated through continued investments into education and training, comprehensive services, and research and outcomes.

CONCLUSIONS: This model utilizes a high-volume, subspecialized institution to provide scalable, sustainable, and cost effective surgical care to a highly vulnerable patient population. The success of this public private partnership demonstrates the value of this model of surgical care in the developing world, and offers a blueprint for reproduction. Our experience has been consistent with previous studies demonstrating a positive volume-outcomes relationship, and provides evidence for the value of the specialty surgical hospital for improved surgical care in the developing world.

## *183 GLOBAL ONLINE TRAINING FOR CLEFT CARE – ANALYSIS OF INTERNATIONAL UTILIZATION

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BACKGROUND & PURPOSE: We have produced a freely available, web-based, multimedia surgical simulator in partnership with Smile Train which demonstrates the cardinal procedures in primary cleft surgery. This tool is intended to help surgeons in developing countries care for their local cleft populations. Limitations of Internet access and local technology may hinder use in the developing world. We report on the international utilization of the world's first internet-based cleft simulator.

METHODS & DESCRIPTION: The Smile Train Virtual Surgery Simulator contains an internal tracking system which records the unique Internet Protocol (IP) addresses all users. Using these IP addresses, each country accessing the Simulator was identified over a one year period. All users accessing the Simulator for less than 5 minutes were eliminated. The countries were analyzed based upon economic factors such as Gross Domestic Product (GDP) and per capita income (PCI) as well as health metrics such as health expenditures and underweight children.

RESULTS: There were 849 novel users of the Simulator from 78 countries were recorded over the one-year study period. Those countries represent 6.28 billion persons or 88.5% of the global population. Of the countries utilizing the simulator 54 were classified as developing economies, representing 5.3 billion people. The developing countries average GDP was $467.4 ± 147 billion and PCI was $8,281 ± 815. The poorest developing countries accessing the Simulator in terms of PCI were Congo ($400), Ethiopia ($1,200), and Nepal ($1,300). In terms of percent population living below the poverty line, the poorest countries accessing the simulator were Haiti (80%) Congo (71%) and Nigeria (70%). In developing countries, the health expenditures as a percentage of GDP averaged 6.1%. The nations with the lowest healthcare expenditures as a percentage of GDP were Myanmar 2%, Pakistan 2.2%, and Indonesia 2.6%. Penetration into advanced economies was also extensive including 24 countries representing 979 million people and an aggregate GDP of $40.98 Trillion. In the United States the simulator was used in 40 states from both academic and community Internet service providers. Surprisingly, the simulator was used in 21 countries with active armed conflicts and 28 where the US State Department advises against travel including Ukraine, Egypt, Yemen, Iraq and Nigeria.

CONCLUSIONS: The presented internet-based surgical simulator is accessible globally and has quickly gained use in 78 countries representing 88% of the global population including 5.3 billion of the worlds developing population. Over 2/3rds of the countries accessing the simulator are developing nations and include regions experiencing severe poverty. Projects directed towards international education of cleft care in the developing world should strongly consider the use of web-based digital technology as a means to immediately access and educate caregivers, particularly in countries with significant economic and political constraints.

**Disclosure:** Receipt of Intellectual Property Rights/Patent Holder **-** Aaron Oilker holds the intellectual property rights for the biodigital surgery simulator.

## 184 EVALUATION OF SURGICAL OUTCOMES IN CRANIOSYNOSTOSIS RECONSTRUCTION WITH A NOVEL OBJECTIVE AUTOMATIC COMPUTATIONAL FRAMEWORK

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BACKGROUND & PURPOSE: In the past, surgical outcomes in craniosynostosis have been evaluated by qualitative analysis (Whitaker scale), direct and indirect anthropometry, cephalometrics, and CT craniometric analysis. Qualitative analysis is limited by low inter- and intra-observer concordance. The main failure of any linear, vector, or angular CT craniometric analysis is the inability of any specific index or set of indices to meaningfully or accurately characterize three-dimensional cranial shape. The purpose of this study is to develop a new objective computational stereophotogrammetric framework to analyze cranial shape in craniosynostosis patients.

METHODS & DESCRIPTION: We set out to develop and implement a novel automatic computational framework that would accurately register and capture differences in three-dimensional morphology between two cranial forms. This framework is applied to three-dimensional meshes derived from 3dMD images acquired on patients with synostosis at multiple time points across the course of surgical treatment.

RESULTS: Decimation algorithm is applied to three-dimensional triangle meshes derived from 3dMD images. Automatic mesh-pair registration utilizing coherent point drift registration algorithm registers a set (pre-operative vs. post-operative) of images to each other. Local features are compared utilizing principal, mean, and Gaussian three-dimensional curvatures at each related vertex pair on pre-operative and post-operative surface meshes. Normal vectors, changed surface areas, lines of curvature, and geodesics are utilized to derive region-specific indices that capture three-dimensional cranial morphology. Finally, the differences are visualized utilizing false color and color histograms. The computational framework for each type of single-suture craniosynostosis has been validated.

CONCLUSIONS: This novel quantitative framework is a robust computational system within which surgical outcomes in synostosis could be accurately and meaningfully evaluated. Objective comparison between different techniques, timing of intervention, and surgical approaches is now possible.

## 185 IMPROVED CLEFT LIP OUTCOMES AT A SURGERY SPECIALTY CENTER IN THE DEVELOPING WORLD

**Carolina Restrepo** (1), Alex Campbell (1), Björn Schönmeyr (2), Gaurav Deshpande (3), Hiteswar Sarma (4). (1) Operation Smile, Virginia Beach, VA, (2) Skane University Hospital, Malmo, Skåne County, (3) Guwahati Comprehensive Cleft Care Center, Guwahati, Assam, (4) Guwahati Comprehensive Cleft Care Centre, Guwahati, Assam

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BACKGROUND & PURPOSE: A surgery specialty center for cleft lip and cleft palate was developed as an innovative model for sustainable cleft care in underserved Northeast India. Two large missions held in just prior to the opening of the permanent center and the presence of permanent team members in the region allowed for improved follow up data collection and a unique insight into the progression of care and outcomes. This manuscript details the evolution of cleft lip outcomes over 3419 consecutive patients during the process of transition from mission-based care to full time center-based care.

METHODS & DESCRIPTION: Included in this retrospective cohort study are 3419 patients who received repair of primary and secondary cleft lip deformities at a single site. The study examined early complications in three groups of patients undergoing primary cleft lip repair. The first group included 298 consecutive cleft lip repairs completed on a mission in December 2010 and a second group included 356 consecutive cleft lip repairs completed on a mission in February of 2011. A third cohort of 2765 consecutive patients received lip repair during the time period from May 2011 to February 2014 at the specialty cleft center, a modern facility staffed by a permanent team providing full time multidisciplinary care. A retrospective analysis was performed to determine the complication rates in all three cohorts.

RESULTS: Out of the 298 cleft lip patients from the first mission, 220 (74%) returned for follow-up, and 29 (13.2%) experienced post operative complications including dehiscence and would infection. Of the 356 operated in the second mission, 252 (71%) returned for follow-up, and 17 (6.7%) experienced post operative complications. At the center, 2,765 patients received surgical repair of cleft lip deformities during the study period, 1817 (66%) returned for follow-up, and 72 (4.0%) experienced post operative complications. This represents a 70% risk reduction un complications from the first mission to current care at the center.

CONCLUSIONS: Our evolution from mission-based care to center-based care resulted in markedly improved outcomes after primary and secondary cleft lip repair, and a 70% relative risk reduction in complications. Our findings are consistent with much of the published literature regarding the volume-outcome relationship for conditions with complex surgical intervention and those requiring comprehensive multidisciplinary care. Regional referral centers been suggested by numerous authorities as the optimal approach to cleft care in wealthy nations, and this center exemplifies that this can be a successful model in developing regions as well.

## 186 ANTIBIOTIC USE IN PRIMARY PALATOPLASTY: A SURVEY OF PRACTICE PATTERNS, ASSESSMENT OF EFFICACY, AND PROPOSED GUIDELINES FOR USE

**S. Alex Rottgers** (1), Liliana Camison (2), Rick Mai (2), Sameer Shakir (3), Lorelei Grunwaldt (4), Andrew Nowalk (2), Megan Natali (2), Joseph Losee (4). (1) Boston Children's Hospital Department of Plastic and Oral Surgery, Harvard University Medical School, Boston, MA, (2) Children's Hospital of Pittsburgh, Pittsburgh, PA, (3) University of Pittsburgh, Pittsburgh, PA, (4) University of Pittsburgh Medical Center, Pittsburgh, PA

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BACKGROUND & PURPOSE: Healthcare today demands judicious use of resources, a focus on patient safety, and evidence-based practice. The literature does not provide guidelines for antibiotic use in primary palatoplasty. This study group sought to ascertain the current practice patterns, review a large, single-surgeon experience, and propose guidelines for the thoughtful use of antibiotics in primary palatoplasty.

METHODS & DESCRIPTION: A six-question survey was emailed to all surgeon members of the ACPA. A retrospective study was conducted of the senior author's consecutive 10-year (2004-2014) series of primary palatoplasties. Patients were divided into two groups. Group 1: received no antibiotics during their preop or postop course. Group 2: received preop and/or postop antibiotics. The study group compared the rates of palatal infections, delayed healing, and palatal fistula formation in primary palatoplasties between groups.

RESULTS: Survey: 312 of the 1115 surgeon members of the ACPA (28%) responded to the survey. 85% of respondents administer prophylactic antibiotics. 26% use a single preoperative dose. 23% give up to 24 hours of postoperative therapy; 12% use 25-72 hours; 16% use 4-5 days; 12% use 6-10 days of postop antibiotics. The antibiotic given for prophylaxis was penicillin for 5% of surgeons, a first generation cephalosporin for 64%, ampicillian/sulbactam for 13%, and clindamycin for 8%. 89% of surgeons give prophylactic antibiotics for revision palatoplasty procedures. Case Series: 311 patients were reviewed; and, 173 patients received antibiotics and 138 did not. Delayed healing and fistula rates did not differ between groups: 13.3% vs 10.9% (p=0.71) and 2.3% vs 1.4% (p=0.47) respectively. One Group 2 patient received no preop antibiotic, and developed an early postop, persistent Group A, beta-hemolytic streptococcal bacteremia requiring antibiotic treatment. After review by our infectious disease colleagues, the case did not meet the CDC definition of a surgical site infection, but the patient subsequently developed a palatal fistula on follow-up.

CONCLUSIONS: There is no consensus amongst practitioners regarding the appropriate use of antibiotics (agent or duration) in primary palatoplasty. Our data supports a clinician's choice to forego prophylactic antibiotic use; however, given the significance of postop palatal fistulae, and our single case of postoperative streptococcal bacteremia, the study group recommends a single preop dose of ampicilian/sulbactam. The current evidence cannot justify the use of protracted postoperative antibiotic regimens.

## 187 ROLE OF ANTIMICROBIALS IN CLEFT PALATE SURGERY: PROSPECTIVE, DOUBLE BLIND, RANDOMIZED, PLACEBO-CONTROLLED CLINICAL STUDY

María Aznar (1), Björn Schönmeyr (2), Gaston Echaniz (3), Lismore Nebeker (3), Lisa Wendby (3), **Alex Campbell** (3). (1) Hospital Universitari Vall d'Hebron, Barcelona, Catalonia, (2) Skane University Hospital, Malmo, Skåne County, (3) Operation Smile, Virginia Beach, VA

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BACKGROUND & PURPOSE: This study is a prospective, double blind, randomized, placebo-controlled trial composed of 518 consecutive patients who underwent primary cleft palate repair at a single institution. Patients were 1-43 years at the time of surgery with a median of 9 years. The patients were randomly divided into two groups. One group received a 5-day regimen of oral Amoxycillin (50 mg/kg) postoperately and the other group received placebo medication. Both groups received a single dose of Cefuroxime (30 mg/kg) perioperatively prior to incision. Both patients and providers were blinded to the randomization during the trial. Patients were followed postoperatively for early complications, in terms of infection and wound breakdown, as well as for late complications in terms of palatal fistulas.

METHODS & DESCRIPTION: The incidence of early complications was 13.8% among the patients in the placebo group and in 8.7 % of the patients in the antibiotic group (p=0.175). Late complications in terms of fistulas were noted in 17.1% of the patients in the placebo group and in 10.7% of the patients in the treatment group (p=0.085). Logistic regression analysis identified visiting surgeons as the only covariate related with early complications (OR 3.71, p<0.001). However, the use of placebo, female gender and complete clefts were observed as factors associated with the incidence of late complications (fistulas) (OR 2.09, p=0.037; OR 2.04, p=0.047, OR 3.31, p=0.004 respectively).

RESULTS: The incidence of early complications was 13.8% among the patients in the placebo group and in 8.7 % of the patients in the antibiotic group (p=0.175). Late complications in terms of fistulas were noted in 17.1% of the patients in the placebo group and in 10.7% of the patients in the treatment group (p=0.085). Logistic regression analysis identified visiting surgeons as the only covariate related with early complications (OR 3.71, p<0.001). However, the use of placebo, female gender and complete clefts were observed as factors associated with the incidence of late complications (fistulas) (OR 2.09, p=0.037; OR 2.04, p=0.047, OR 3.31, p=0.004 respectively).

CONCLUSIONS: Our results indicate that postoperative antibiotic prophylaxis, to some extent can reduce the incidence of fistulas after primary cleft palate repair.

## 188 ADULT CLEFT LIP REPAIR UNDER LOCAL ANAESTHESIA: THE GHANA EXPERIENCE

**Solomon Obiri-Yeboah** (1), Alexander Oti Acheampong (2), Samuel Ansah (2), Peter Ray (3), John Grant (3), Peter Donkor (1). (1) Komfo Anokye Teaching Hospital, Kumasi, Ghana, (2) Komfo Anokye Teaching Hospital, Kumasi, Ashanti Region, (3) University of Alabama, Birmingham, Birmingham, AL

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BACKGROUND & PURPOSE: Unlike developed countries where adult primary cleft lip and palate are nearly nonexistent, developing countries still have a backlog of adults with unrepaired cleft lip and palate. Developing countries

experience significant challenges in terms of general anesthesia cost, time, and available providers. The design and use of a safe, effective, and inexpensive local anesthetic protocol for the repair of cleft lip is an important component of a cleft practice in a developing country. This review captures our approach in our center located in Ghana.

METHODS & DESCRIPTION: A retrospective review of non-pediatric primary and secondary cleft lip repair was performed. Patients, who underwent repair using only local anaesthesia between 2012 and April, 2014 were included. This technique was used on adolescents and adults aged 13 and above with microform, unilateral or bilateral cleft lip. Patients were further screened for the ability to understand and tolerate local anaesthesia. Infraorbital nerve blocks were used in the majority of cases with bilateral blocks used in those with complete clefts. Informed consent was obtained from both patients and their guardians. Patients who were not medically fit or were deemed at screening to be unable to tolerate the procedure while awake were excluded. Demographic information and outcome data were collected including average time in the operating room, surgical time, and day of discharge.

RESULTS: We identified thirty three adolescents and adults comprised of eighteen females and fifteen males. Twenty six of the patients presented with unilateral cleft lip of which only three were complete; two bilateral cleft lip and five were lip revisions. The lowest age was Thirteen years (two patients) and the highest age was Sixty-Six years (one patient). The mean weight was 54kg. The mean anaesthetic time including waiting time was 12.94 minutes and mean operation time was 56.52 minutes. The majority of the patients were discharged the same day except for five who needed to stay overnight because of distance from their home. There were no reported early postoperative complications and wound healing was uneventful for all the patients.

CONCLUSIONS: Cleft lip repair in adults under local anaesthesia is safe, effective and inexpensive. A modification in technique with minimal dissection and efficiency is essential in such cases.

## 189 AN INTRODUCTION TO THE CARE OF THE CHILD WITH A CLEFT: THE FIRST YEAR OF LIFE

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BACKGROUND & PURPOSE: Children born with cleft lip and/or palate receive optimal care when they are assessed and treated by a multidisciplinary team of providers. Disciplines often involved in the care of children with clefts include: nursing, plastic surgery, genetics, pediatrics, pulmonology, otolaryngology, audiology, speech language pathology, dentistry, orthodontics, nutrition, psychology, and social work. There are many challenges in the first year of life, including possible feeding and breathing issues, frequent appointments, and multiple surgeries. Families' understanding and ability to follow through with treatment plans can be influenced by cultural and socioeconomic factors. The first year of life is a critical time for team members to coordinate medical and surgical care, provide cleft education, address genetic concerns, and assist with support and coping skills.

METHODS & DESCRIPTION: A multidisciplinary panel of experts will describe the role each discipline plays in the care of children and families affected by clefting. We will introduce family centered multidisciplinary team care for the child who was diagnosed prenatally or neonatally with a cleft, with an emphasis on the role of nursing and care coordination. ACPA Standards for Cleft Palate and Craniofacial Teams will be incorporated across disciplines. Common psychosocial issues and corresponding interventions will be discussed. Information about the delivery of culturally competent care to diverse families and socioeconomic groups will be addressed.

## 190 DEVELOPING ALGORITHMS FOR TRAINING AND INDEPENDENCE IN CLEFT CARE IN THE DEVELOPING WORLD: AN OASIS IN THE SAND

**John van Aalst** (1), Omri Emodi (2), Rushdi Amr (3), Christopher Gordon (4), Ann Schwentker (5), Haitham El-Hady Babiker (1). (1) Cincinnati Children's Hospital, Cincinnati, OH, (2) Rambam Medical Center, Haifa, Israel, (3) Hebron, Private Practice, Hebron, Palestine, (4) Cincinnati Children's Hospital Medical Center, Cincinnati, OH, (5) Cincinnati Children's Medical Center, Cincinnati, OH

Contact Email: john.vanaalst@cchmc.org

BACKGROUND & PURPOSE: The developed world sends volunteer surgical teams to the developing world at an astonishing rate. At a quick glance, the two largest cleft organizations report 220,000 free surgical procedures completed while working in over 60 countries (Operation Smile) and completion of over a million surgeries in 87 countries (SmileTrain). In addition, Resurge works in 13 countries; Transforming Faces (Canada) works in 8 countries. The US has at least 22 listed organizations involved in international cleft care; the UK 4, Canada 3, Australia 3, with an additional 13 countries having at least a single organization devoted to providing free cleft care. In reality, this list is considerably longer; scores of smaller organizations perform cleft care around the world, but without a definitive, comprehensive list of their existence. The emphasis for many of these organizations—though possibly unintentional—is simply the number of trips taken and the surgeries completed. There is often little discussion about metrics for training local practitioners, creating independent local cleft organizations, and clearly defining exit strategies for the parent organization. At a time when the word "sustainable" is used by nearly everyone in international health care, do we truly understand how to build sustainable surgical (or team-based) cleft programs in the developing world?

METHODS & DESCRIPTION: The panelists for this discussion bring together cleft care expertise in Africa, the Middle East, and Latin America, and will attempt to provide answers regarding the following questions: How to: Identify local professionals with a commitment to cleft care? Define sustainability, from the visitor's or host's perspective? Establish metrics for training local professionals? Create a surgical program (or any another discipline) supplemented with telesurgery, video and teleconferencing, workshops and conferences. Determine benchmarks for completion of training? Establish an independent local/national cleft organization? Leave gracefully by developing an exit strategy? In summary, the panel will define a training algorithm for surgical work overseas (with metrics for completion of training), demonstrate the value of creating a national cleft organization in each country where outreach work is performed, and examine the benefit of an exit strategy.

## 292 VALUATION OF DIRECT SURGICAL REMODELING OF FRONTAL BOSSING IN PATIENTS WITH SAGITTAL SYNOSTOSIS

**Debra Yen** (1), Gary Skolnick (2), Dennis Nguyen (1), Sybill Naidoo (3), Kamlesh Patel (4), Matthew Smyth (5), Alex Kane (6), Albert Woo (5). (1) Washington University School of Medicine, St. Louis, MO, (2) Washington University School of Medicine, Saint Louis, MO, (3) Washington University School of Medicine, St Louis, MO, (4) Washington University in St. Louis, St. Louis, MO, (5) Washington University in St. Louis School of Medicine, Saint Louis, MO, (6) University of Texas Southwestern Medical Center, Dallas, TX

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BACKGROUND & PURPOSE: The need for surgical correction of frontal bossing in patients with sagittal synostosis is currently debated. We retrospectively analyzed frontal bossing in patients with isolated, nonsyndromic sagittal synostosis who underwent calvarial remodeling with and without frontal craniotomy. These groups were compared against each other and control subjects.

METHODS & DESCRIPTION: We analyzed computed tomography (CT) scans of patients with sagittal synostosis < 9 months of age (6.2±1.6 months) who underwent modified-pi procedure either with frontal craniotomy (FC, n=16) or without frontal craniotomy (NFC, n=10). Only patients treated between 2003-2013 with both preoperative and one-year postoperative CT scans were included. Non-synostotic age-matched control scans were also analyzed. Cephalic index (CI) and three previously validated measures of frontal bossing (bossing angle, horizontal bossing ratio, and vertical bossing ratio) were obtained. Additionally, three-dimensional photographs of ten FC patients were evaluated for frontal bossing between 1-8 years postoperatively.

RESULTS: Preoperatively, no significant differences were found between the two groups ($0.064<p<0.940$). Both groups showed greater scaphocephaly and frontal bossing compared to controls ($p<0.001$). One-year postoperatively, all measures improved but remained significantly different than normal values except: CI of NFC patients ($p=0.296$); bossing angle ($p=0.068$) and horizontal bossing ratio ($p=0.129$) of FC patients. Compared to NFC patients, horizontal bossing ratio was significantly improved in FC patients ($p=0.017$, mean difference of 0.047). No other statistically significant differences were found between the two techniques ($0.127<p<0.637$). In our long-term study of FC patients up to 9 years of age (n=10), we analyzed forehead inclination as our measure of frontal bossing in three-dimensional photographs. A linear regression analysis showed a significant reduction in forehead inclination with age, decreasing 1.3±0.4 degrees per year ($p=0.021$). Forehead inclination for controls did not change significantly with age ($p=0.558$).

CONCLUSIONS: At one-year following modified-pi procedure, FC patients approached normalization of their forehead morphology to a greater extent than NFC patients. However, neither group completely normalized during this time period. Frontal bossing in FC patients continued to decrease with age, which reveals the postoperative dynamic nature of frontal bone morphology during childhood for these patients.

## 308 ASCFS LINTON A. WHITAKER LECTURE: CRANIOSYNOSTOSIS

**Jeffrey Fearon** (1). (1) The Craniofacial Center, Dallas, TX

Contact Email: cranio700@gmail.com

BACKGROUND & PURPOSE: The American Society of Craniofacial Surgery Foundation is pleased to sponsor the third Linton A. Whitaker Lecture. The Lecture recognizes Dr. Whitaker's years of service to the specialty of craniofacial surgery and his mentorship and education of a generation of plastic surgeons.

METHODS & DESCRIPTION: Dr. Fearon will review the etiology, functional implications, historical and current treatments of craniosynostosis. He will also address the outcomes of treatment.

## *309 TIMING OF THE SURGICAL MANAGEMENT OF NON-SYNDROMIC CRANIOSYNOSTOSIS

**Joseph Losee** (1), John Persing (2), Jeffrey Fearon (3), Jesse Taylor (4), Jack Yu (5), Richard Hopper (6), Mark Urata (7). (1) University of Pittsburgh Medical Center, Pittsburgh, PA, (2) Yale, New Haven, CT, (3) The Craniofacial center, dallas, TX, (4) The Children's Hospital of Philadelphia and Perelman School of Medicine, Philadelphia, PA, (5) Georgia Regents University, Augusta, GA, (6) Seattle Children's Hospital, Seattle, WA, (7) Children's Hospital, Los Angeles, Los Angeles, CA

Contact Email: Joseph.Losee@chp.edu

BACKGROUND & PURPOSE:The ASCFS Panel on Saturday morning will focus on the timing of the surgical management of non-syndromic craniosynostosis.

METHODS & DESCRIPTION: Panelists will review the current research and provide recommendations for early surgery, late surgery, alternative options, and will present the current evidence available. Invited discussants will summarize the presentations and ensure lively discussion with the audience.

**Disclosure:** Royalty - J.Persing: Royalty, co-editor Book - Plastic Surgery.

## 310 KEYNOTE: THE BIRTH, DEVELOPMENT AND FUTURE PROSPECTS FOR CRANIOFACIAL BIOLOGY

**Harold Slavkin** (1). (1) University of Southern California School of Dentistry, Los Angeles, CA

Contact Email: slavkin@usc.edu

BACKGROUND & PURPOSE: Throughout the genesis of the human face, facial expressions and the various sensory functions performed within the craniofacial-oral-dental complex - - -vision, hearing, speech, taste, chewing and touch - - - have created awe and wonder, pain and suffering, and the advent of remarkable health care for craniofacial birth defects as well as acquired craniofacial malformations resulting from trauma, burns, infections and head and neck cancers. Understanding craniofacial diseases and disorders has been punctuated by protein-calorie malnutrition, vitamin deficiencies, drug-induced birth defects (teratology), a number of wars that engendered profound advances in craniofacial imaging, surgery, and biomaterials based upon biomimetics, along with physical and behavioral rehabilitation, resulting in improvements for the diagnosis, treatment and clinical outcomes of "broken faces." More recently, investments in fundamental biomedical research - - - human genetics and developmental and molecular craniofacial biology—- have changed the landscape and now suggest therapeutic strategies for a number of craniofacial skeletal and soft tissue malformations. Enter regenerative medicine and dentistry, personalized medicine and dentistry, and precision health care.

METHODS & DESCRIPTION: This presentation will provide an assessment and celebration of our past, present and future prospects for craniofacial biology and the human condition. Where did we come from? Who are we? Where are we going? This keynote address will conclude with basic, translational and clinical biological and behavioral research priorities related to craniofacial birth defects and craniofacial acquired malformations. The genesis of craniofacial and the story of the human face have important implications for both research, health professional education, and trans-professional, patient-centered, outcomes-based, comprehensive, quality and cost-effective health care for all people.

## 312 LONG TERM OUTCOMES OF CRANIOFACIAL MICROSOMIA TREATMENT: MANDIBULAR RECONSTRUCTION

**Rachel Mandelbaum** (1), Deborah Martins (1), Emily Dubina (1), Sarah Park (2), James Bradley (1), Justine Lee (2). (1) David Geffen School of Medicine at UCLA, Los Angeles, CA, (2) David Geffen School of Medicine, UCLA, Los Angeles, CA

Contact Email: rachelsmandelbaum@gmail.com

BACKGROUND & PURPOSE: Craniofacial microsomia is a rare congenital anomaly characterized by mandibular hypoplasia, microtia/atresia, facial nerve weakness, and soft tissue deficiencies. Due to the wide phenotypic spectrum seen, treatment plans are highly individualized and have historically been difficult to evaluate, leaving significant knowledge gaps about the optimal timing of treatment and surgical approach.

METHODS & DESCRIPTION: Retrospective review of patients with a diagnosis of craniofacial microsomia treated at the UCLA Craniofacial Clinic (n=151) between 2008-2014. Patients >14 years of age at the time of study initiation were included (n=42). Characteristics of the mandibular deformity, operative strategies, and complications were reviewed and analyzed.

RESULTS: The average age of the 42 patients included was 18.3 years (range 15-25). 35 patients (83.3%) had mandibular malformations, of which 22.9% were affected bilaterally, 40.0% were affected on the right, and 37.1% were affected on the left. In terms of severity of mandibular hypoplasia, 58.1% were classified as Pruzansky grade I, 20.9% Pruzansky IIA, 7.0% Pruzansky IIB, and 14.0% Pruzansky III. Facial nerve dysfunction was normal to mild in greater than 80%. Airway compromise was present as obstructive sleep apnea in 25.7%, necessitating tracheostomy or distraction in 22.9%. 14 patients (40.0%) underwent 58 orthognathic surgeries, with an average of 4.14 surgeries (range 1-7) per patient. 13 patients underwent mandibular distraction, the initial procedure performed in 64%. 8 patients underwent bilateral sagittal split osteotomy, 7 of which were performed following distraction, indicating a more severe presentation. In addition, 3 patients underwent rib graft, 3 patients underwent osseous genioplasty, and 3 patients underwent Le Fort I to correct maxillary defects. 64.3% of patients who received mandibular reconstruction concurrently underwent surgery for microtia/atresia. Patients began surgical intervention at an average age of 9.9 years. In a linear regression model, age, higher Pruzansky score, airway compromise, or simultaneous microtia reconstruction were not predictors of increased number of mandibular surgeries in the treatment regimen to achieve desired outcome or of surgery failure and the need for repeat operations. Facial nerve involvement was significantly associated with a greater number of surgeries performed.

CONCLUSIONS: In conclusion, facial nerve involvement was the only factor associated with greater number of surgeries required. Both the number of surgeries performed in the course of treatment and surgery failure requiring a repeat procedure were not associated with age, more severe presentation, airway compromise, or ear involvement. Patients with severe abnormalities or airway compromise did not begin treatment at a significantly younger age than those with milder presentations. Treatment failure was mainly dependent on external factors. The ideal age at which to begin mandible reconstruction requires further investigation.

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2015 ANNUAL MEETiNG

# Commercial Exhibitors

*As of March 24, 2015, the following companies/organizations had registered to exhibit at our annual meeting. Those companies that are deserving of special recognition for providing educational support for this meeting have their listings bolded. Please take time to visit the exhibitors and thank them for their interest in participating in our meeting.*

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3dMD provides high-precision 3D and 4D (60 fps) facial and head surface imaging systems with sophisticated 3D software for measurement, evaluation, planning, and outcomes assessment.

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The Cleft Palate-Craniofacial Journal is an interdisciplinary international journal dedicated to current research on etiology, prevention, diagnosis, and treatment of craniofacial anomalies.

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# Commercial Exhibitors



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www.southmedic.com
Southmedic is a Canadian owned medical manufacturer of DynaCleft and Nasal Elevator products used in the pre-surgical treatment of cleft palate patients.

Disclaimer: While the above information is believed to be accurate, neither ACPA, CPF nor the National Office staff accept responsibility for any errors or omissions. ACPA and CPF do not endorse any product or service with respect to the above listed exhibitors.

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www.acpa-cpf.org
Standards of care. Latest science. International journal, annual meeting and multidisciplinary networking. Membership in ACPA is essential to researchers and professionals dedicated to the care of persons with cleft palate and craniofacial anomalies.

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1504 E. Franklin Street, Suite 102
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www.cleftline.org
Serving patients and families affected by cleft and craniofacial conditions since 1973 with connections to local teams and resources, feeding and counseling support, research funding, college scholarships, and more.

### 13th International Congress Chennai, India

The 13th International Congress of Cleft Lip and Palate and Related Craniofacial Anomalies will be held on February 8-11, 2017, at the Radisson Blu Resort, Temple Bay, Mahabalipuram (Mamallapuram) near Chennai, India. Early bird registration discount is available until Jan 31, 2016. The Congress website is now open: https://cleft2017.org/

**The American Cleft Palate-Craniofacial Association extends a Special Thank You to:**
KLS Martin Group, Jacksonville, FL • 3D Systems-Medical Modeling Inc, Golden, CO
Mohammad Mazaheri, MDD, MSc, Lancaster, PA •OsteoMed, Addison, TX • Stryker, Portage, MI
**for their support at this year's meeting.**

# Summary of Events

**PLEASE NOTE:** Rooms are subject to change at the hotel's discretion.
Please check at the registration desk or listen for announcements of room changes.

| SUNDAY, APRIL 19<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 4:00PM-7:00PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |

| MONDAY, APRIL 20<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 7:30AM-5:30PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |
| **9:00AM-5:30PM** | **Pre-Con Symposium: What Is The 'Ideal' Treatment Outcome For A Child With A Cleft?** | **Celebrity E-H** |
| 10:30AM-11:00AM | Symposium Coffee Break | Celebrity Foyer |
| 12:30PM-2:00PM | Lunch Break (On Your Own) | |
| 3:30PM-4:00PM | Symposium Coffee Break | Celebrity Foyer |

| TUESDAY, APRIL 21<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 7:30AM-7:30PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |
| **8:00AM-11:30AM** | **Pre-Con Symposium: What Is The 'Ideal' Treatment Outcome For A Child With A Cleft?** | **Celebrity E-H** |
| **8:00AM-12:00PM** | **ACPA Primer on Team Care** | **Celebrity D** |
| 10:00AM-10:30AM | Symposium Coffee Break | Celebrity Foyer |
| 12:30PM-2:00PM | Lunch Break (On Your Own) | |
| 12:00PM-1:00PM | ACPA Primer on Team Care Lunch (Optional) | Celebrity D |
| 12:00PM-1:30PM | ACPA/CPF Committee Chairs Meeting/Luncheon (Open to 2015 and 2016 ACPA/CPF Chairs) | Rancho-Mirage |
| 3:00PM-5:00PM | Exhibit Move-In | Celebrity Foyer |
| | **ACPA and CPF Committee Meetings** | |
| 1:00PM-6:00PM | Americleft - Surgeons | Polo |
| 1:30PM-2:30PM | Journal Advisory | Oasis 5 |
| 1:30PM-2:30PM | Americleft - All | Oasis 4 |
| 1:30PM-2:30PM | ACPA Organizational Alliances | Oasis 6 |
| 1:30PM-2:30PM | ACPA Honors & Awards | Oasis 7 |
| 1:30PM-3:30PM | CPF Research Grants | Oasis 1 |
| 1:30PM-3:30PM | CPF Publications | Oasis 2 |
| 2:30PM-4:00PM | ACPA Membership | Oasis 4 |
| 2:30PM-4:00PM | Americleft - Psych | Oasis 6 |
| 2:30PM-4:30PM | Parameters | Oasis 7 |
| 2:30PM-4:30PM | Americleft - Ortho | Oasis 5 |
| 3:30PM-4:00PM | CPF DPMF | Oasis 1 |
| **4:30PM-5:00PM** | **Committee Coffee Break** | Oasis Foyer |
| | **ACPA and CPF Committee Meetings (Cont.)** | |
| 5:00PM-6:00PM | Ethics | Oasis 7 |
| 5:00PM-6:30PM | CPF Scholarship | Oasis 1 |
| 5:00PM-6:30PM | Education | Oasis 2 |
| 5:00PM-6:30PM | International Outreach | Oasis 4 |
| 5:00PM-6:30PM | ACPA Data Standards | Oasis 6 |
| 5:30PM-6:30PM | Archives | Oasis 5 |
| 5:00PM-6:00PM | ACPA New Member Orientation | Rancho-Mirage |
| **6:30PM-8:30PM** | **Presidents' Welcoming Reception** | Masters Plaza |
| | Cash Bar/Hors d'oeuvres | *(outdoor event)* |

# Summary of Events

| WEDNESDAY, APRIL 22<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 6:30AM-6:30PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |
| 7:00AM-8:00AM | Eye Openers – Group I | |
| | Course 1 (Journal Manuscript) | Mirage |
| | Course 2 (Commission on Approval of Teams) | Oasis 4 |
| | Course 3 (VPD: Speech Assessment & Management) | Oasis 1-3 |
| | Course 4 (Americleft Project) | Oasis 5-7 |
| 7:30AM-8:20AM | Past Presidents' Breakfast | Polo |
| | Open only to past and present ACPA/CPF Presidents | |
| 7:00AM-5:00PM | Exhibits | Celebrity Foyer |
| 7:00AM-1:00PM | Poster Session A | Celebrity Patio |
| 8:30AM-9:00AM | Opening Ceremony | Celebrity |
| 9:00AM-10:00AM | Keynote Session: Harold Slavkin, DDS | Celebrity |
| 10:00AM-10:30AM | Exhibits, Coffee Break | Celebrity Foyer |
| | Poster Session A | Celebrity Patio |
| 10:30AM-12:30PM | General Session I: The Best of the Oasis – The Leading Edge of Cleft and Craniofacial Care | Celebrity |
| 12:30PM-2:00PM | Lunch Break (On Your Own) | |
| | 2016 Program Committee Luncheon/Meeting | Oasis 3 |
| | Ethics Roundtable Discussion/Optional Lunch | Rancho-Mirage |
| | Commission on Approval of Teams Luncheon/Meeting | Oasis 2 |
| 1:30PM-6:30PM | Poster Session B | Celebrity Patio |
| 2:00PM-3:00PM | General Session II: Team Care Panel | Celebrity |
| 3:00PM-6:30PM | Cleft Palate Craniofacial Journal (CPCJ) Editorial Bd Meeting | Polo |
| 3:15PM-4:45PM | Discipline Forums | |
| | Genetics/Pediatrics | Oasis 1 |
| | Mental Health | Oasis 7 |
| | Nursing/Coordination & Speech/Audiology | Rancho-Mirage |
| | Oral-Maxillofacial Surgery | Oasis 2 |
| | Orthodontics/Prosthodontics | Oasis 4 |
| | Otolaryngology | Oasis 3 |
| | Pediatric Dentistry | Oasis 5 |
| | Plastic Surgery | Ambassador Foyer |
| | Research | Oasis 6 |
| 5:00PM-6:45PM | Ideas & Innovations (*formerly Show & Tell*) | Celebrity |
| 6:45PM-8:15PM | Americleft Speech Meet & Greet | Rancho-Mirage |

| THURSDAY, APRIL 23<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 6:30AM-6:00PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners OFC |
| 7:00AM-8:00AM | Eye Openers – Group II | |
| | Course 5 ( Withdrawn ns Relevant to Children w/Cleft) | Oasis 4 |
| | Course 6 (Speech Therapy Techniques for Compensatory Articulation) | Oasis 1-2 |
| | Course 7 (Feeding Problems & Solutions In Babies W/Cleft) | Rancho |
| | Course 8 (Anatomy of the Unilateral Cleft Lip Nasal Deformity) | Polo |
| | Course 9 (Making The Most Of Prenatal Counseling Opportunities) | Oasis 5-7 |
| | Course 10 (How To Use Buccal Myomucosal Flaps) | Mirage |
| | Course 10 (Preparing Your Patient For Jaw Surgery) | Celebrity A |
| 7:00AM-5:00PM | Exhibits | Celebrity Foyer |
| 7:00AM-6:00:PM | Poster Session C | Celebrity Patio |
| 8:00AM-10:00AM | Junior Investigator Session | Celebrity D-E |
| 10:00AM-10:30AM | Junior Investigator Award Panel Meeting | Moroccan Boardroom |

# Summary of Events

| THURSDAY, APRIL 23 — (CONTINUED) | | |
|---|---|---|
| 10:00AM-10:30AM | Exhibits, Coffee Break | Celebrity Foyer |
| | Poster Session C | Celebrity Patio |
| 10:30AM-11:45AM | General Session III: Cleft & Craniofacial Care Outcomes | Celebrity D-E |
| **12:00PM-2:00PM** | **ACPA/CPF Annual Awards Luncheon** | **Ambassador Ballroom** |
| 2:30PM-4:00PM | Study Sessions – Group I | |
| | Course A (Americleft Listener Ratings Protocol For SLPs) | Oasis 5-7 |
| | Course B (Management And Surveillance Protocols For Complex CF) | Polo |
| | Course C (Narrative Video Therapy For Children & Adults) | Oasis 3 |
| | Course D (Academic and Clinical Training Guidelines for Team SLP) | Oasis 1-2 |
| | Course E (Practical Guidelines for Managing Patients W/ 22Q) | Celebrity B |
| | Course F (Assessing Non-Adherence & Abuse In The CF Population) | Rancho |
| | Course G (Making Sense of Nasal Air Emission) | Mirage |
| | Course H (Endoscopic Craniosynostosis Surgery) | Celebrity A |
| | Course I (Cleft Orthognathic Surgery) | Oasis 4 |
| | Course J (The Furlow Palatoplasty: Optimizing Outcomes) | Celebrity C |
| 4:00PM-4:30PM | Exhibits, Coffee Break | Celebrity Foyer |
| | Poster Session C | Celebrity Patio |
| 4:30PM-6:00PM | Study Sessions – Group II | |
| | Course K (Speech Outcome Data: Techniques For Data Collection) | Oasis 3 |
| | Course L (Neonatal Mandibular Distraction Treatment Strategies) | Celebrity C |
| | Course M (Surgical Management of VPD In 22Q for Surgeon & SLP) | Oasis 1-2 |
| | Course N (Nasoalveolar Molding and Columella Elongation) | Oasis 5-7 |
| | Course O (Nasopharyngoscopy: Successful Methods for Pre-K Kids) | Rancho |
| | Course P ("Hands On" 3-D Ear Framework Carving Workshop) | Oasis 3 |
| | Course Q (Feeding & Swallowing Concerns In The Child with Cleft) | Celebrity B |
| | Course R (Dento-Skeletal Reconstruction Of Patient W/Facial Cleft) | Mirage |
| | Course S (Patient Treatment Burnout For Individuals With Cleft) | Polo |
| | Course T (Cleft Care For Internationally Adopted Children) | Celebrity A |
| 6:00PM-7:30PM | INTL2017 Congress Task Force Meeting | Moroccan Boardroom |
| 6:00PM-7:30PM | CPF Donor Reception (by invitation only) | Hospitality 517 |

| FRIDAY, APRIL 24<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 7:00AM-5:30PM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |
| 7:00AM-8:00AM | ASCFS Breakfast | Oasis Den |
| 8:00AM-12:30PM | Poster Session D | Celebrity Patio |
| 7:00AM-3:30PM | Exhibits | Celebrity Foyer |
| 8:00AM-9:00AM | Concurrent Session A: Quality of Life & Health Services | Celebrity F-H |
| | Concurrent Session B: Speech-Language Pathology | Celebrity E |
| | Concurrent Session C: ASCFS Linton A. Whitaker Lecture: *Craniosynostosis* | Celebrity D |
| 9:00AM-10:00AM | **ACPA Annual Business Meeting (Members Only)** | Celebrity D |
| 10:00AM-10:30AM | Exhibits, Coffee Break | Celebrity Foyer |
| | Poster Session D | Celebrity Patio |
| 10:30AM-12:00PM | Concurrent Specialty Sessions (Group 1) | |
| | Concurrent 1 (ASCFS 1) | Celebrity D |
| | Concurrent 2 (Cleft Lip And Palate Surgery) | Celebrity E |
| | Concurrent 3 (Speech) | Oasis 1-4 |
| | Concurrent 4 (Ortho/Dental) | Celebrity F-H |
| | Concurrent 5 (Basic Research) | Celebrity A-C |

# Summary of Events

| FRIDAY, APRIL 24 — (CONTINUED) | | |
|---|---|---|
| 12:00PM-1:30PM | Lunch (On Your Own) | |
| | ASCFS Luncheon/Business Meeting | Rancho |
| 12:00PM-3:00PM | ACPA Council Meeting/Luncheon | Polo |
| 1:00PM- 5:00PM | Poster Session E | Celebrity Patio |
| 1:30PM-3:00PM | Concurrent Specialty Sessions (Group 2) | |
| | Concurrent 6 (ASCFS 2) | Celebrity D |
| | Concurrent 7 (Cleft Lip And Palate Surgery 2) | Celebrity E |
| | Concurrent 8 (Advances In Bioimaging) | Oasis 1-4 |
| | Concurrent 9 (Psychosocial) | Celebrity F-H |
| | Concurrent 10 (Genetics) | Celebrity A-C |
| 3:00PM-3:30PM | Exhibits, Coffee Break | Celebrity Foyer |
| | Poster Session E | Celebrity Patio |
| 3:30PM-5:00PM | Concurrent Specialty Sessions (Group 3) | |
| | Concurrent 11 (Mandible Microsomia) | Celebrity D |
| | Concurrent 12 (Cleft Lip And Palate Surgery 3) | Celebrity E |
| | Concurrent 13 (Speech Surgery) | Oasis 1-4 |
| | Concurrent 14 (Hospital Management) | Celebrity F-H |
| | Concurrent 15 (Outcomes & International Issues) | Celebrity A-C |
| **6:30PM-10:30PM** | **ACPA's 72nd Annual Gala – A Night At The Oasis** | **Masters Plaza (*Outdoor Event*)** |

| SATURDAY, APRIL 28<br>TIME | FUNCTION | ROOM |
|---|---|---|
| 7:30AM-10:00AM | Registration | Celebrity Foyer |
| | Speaker Ready Room | Celebrity Planners Ofc |
| 7:30AM-8:30AM | Concurrent Session D: First Year Care (Panel) | Celebrity A-C |
| 8:30AM-9:30AM | Concurrent Session E: Cleft Care In The Developing World (Panel) | Celebrity E |
| 7:30AM-9:30AM | Concurrent Session F: ASCFS | Celebrity D |
| | Timing Of The Surgical Management Of Non-Syndromic Craniosynostosis | |
| 11:30AM-6:00PM | Americleft Speech | Oasis 1 |
| 10:00AM | Meeting Adjourns | |