**Presenter:** Caroline Yao, MD

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**INTRODUCTION:** The current classification system for bilateral cleft lip merely quantifies clefts as complete versus incomplete, providing insufficient prognostic information. By objectively exploring the spectrum of this disease in different ethnicities, we aimed to identify predictive measurements of pre-operative and post-operative severity.

**METHODS:** Pre- and post-operative anthropometric measurements and standardized medical photographs were collected of patients with bilateral cleft lip during medical missions conducted by Operation Smile in Bolivia, Madagascar, Morocco and Vietnam. Ratios of nostril width, cleft width and lip transverse length, as well as measurements of philtral height and the columellar-philtral angle, were calculated and compared pre- and postoperatively. Two experienced cleft surgeons and two non-medical lay persons subjectively ranked both pre- and postoperative medical photographs based on perceived severity. Using these rankings, we assessed which facial ratios were most predictive of ranking scores.

**RESULTS:** Of the 33 analyzed patients all main facial ratios significantly improved: nostril width from 0.93±0.13 to 0.74±0.12 (p<0.001), cleft width from 0.74±0.23 to 0.23±0.08 (p<0.001), lip transverse length from 0.76±0.12 to 1.33±0.15 (p<0.001), philtral height from 7.04±2.06 mm to 8.09±2.02 mm (p=0.009) and columellar-philtral angle from 54±26 degrees to 93±17 degrees (p<0.001). Ratios did not differ significantly among different countries. Significant positive correlations were found pre- and post-operatively between lay persons (Pearson r=0.786 (p<0.001) and 0.819 (p<0.001)), between surgeons (Pearson r=0.773 (p<0.001) and 0.669 (p<0.001)) and between both groups (Pearson r=0.901 (p<0.001) and 0.752 (p<0.001)). Stepwise regression showed that cleft width and nostril width were the strongest predictors of preoperative rank scores (p<0.001, p=0.010)). Postoperatively, lip transverse height was notably predictive of post-operative severity (p= 0.067).

**CONCLUSION:** Similar morphologies were observed across different ethnicities for bilateral cleft lip patients, suggesting that setting universal markers of severity is reasonable. This pilot demonstrates that cleft width and nostril width were most predictive of overall perceived cleft severity for both surgeons and laypersons. Although post-operative predictors were harder to establish, we believe this can be attributed to our small sample size and highlights the necessity of further outcome data collection. Our current study presents easily identifiable landmarks on the cleft face to showcase the spectrum of disease morphology before surgery and the variability in outcomes after surgical repair.

**Acute Ear Burns: An Algorithm for Treatment**

**Presenter:** Maureen Beederman, MD

**Co-Authors:** Laura S. Humphries, MD; Essie Kueberuwa Yates, MD; Lawrence J. Gottlieb, MD, FACS

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**INTRODUCTION:** The exposed position of the external ear on the head, as well as its structure, makes it uniquely susceptible to thermal burns. The goals of treatment of the burned ear are to prevent chondritis, maintain form and function and salvage auricular structure. We propose a classification system and management algorithm for ear burns to better treat these injuries.

**METHODS:** A retrospective chart review was performed on patients who were seen and diagnosed with ear burns at The University of Chicago Medical Center (UCMC) from 2007–2013. Charts were reviewed and searched for key phrases, including “ear” “burn” “chondritis” “cartilage” and “sulfamylon”. Microbiology and pathology data were examined for details regarding infections and chondritis. Patients with ear burns were initially managed similarly with topical sulfamylon, removal of pillows to prevent direct pressure on ears, hydrotherapy, and bedside debridement. They then progressed down the algorithm taking...
into account the depth of burn and amount of exposed cartilage.

**RESULTS:** From 2007–2013, 109 patients with at least 1 ear burn were treated at UCMC. Of these, 77 (70.6%) were male and 32 (29.4%) were female. Patients ranged from 5 months to 75 years old. 27 patients had operative interventions for their ear burns. All ear burns requiring operative intervention had exposed or burned cartilage. Operative intervention occurred an average of 8.8 days after admission, with a range of 1–42 days. Closure methods included complete or partial primary closure (8 patients), STSG coverage (24 patients), or a combination of these approaches. Most patients required only 1 surgery to treat their ear burns, while one patient required a total of 5 surgeries. The incidence of suppurative chondritis in our patient population was 0.

**CONCLUSION:** Although chondritis is a serious complication of ear burns, our protocol has effectively eliminated chondritis in patients with ear burns admitted to UCMC. Ear burns were classified by depth of injury, presence of viable perichondrium, amount of exposed cartilage, and presence of burned cartilage. Our approach to ear burns involves minimizing pressure to the ear, wound care involving sulfamylon, hydrotherapy treatment for nonoperative debridement and early operative intervention for burns with exposed/burned cartilage, with coverage methods that range from primary closure to local flap closure, depending on the amount of cartilage exposed.

**Autologous Human Auricular Chondrocytes: What Are the “Rights” of Passage?**

**Presenter:** Jaime L. Bernstein, BS  
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**INTRODUCTION:** There has been an increasing interest in cartilage engineering given the significant shortcomings associated with current autologous reconstructive options for auricular deformities. A major obstacle in the engineering of human auricular scaffolds is the availability of a sufficient number of autologous human chondrocytes. A clinically obtainable amount of auricular tissue (i.e. 1 gram) only yields approximately 10 million cells, where 25 times this amount is needed for the fabrication of a full-scale pediatric ear. It is known that repeated passaging of chondrocytes leads to de-differentiation and loss of the chondrogenic potential. However, little to no data exists regarding the ideal number of times that human auricular chondrocytes can be passaged in a manner that both maximizes the cellular expansion while minimizing dedifferentiation.

**METHODS:** Human auricular chondrocytes (HAuCs) were isolated from discarded otoplasty specimens. The HAuCs were then expanded and cells from passage 3, 4, and 5 were encapsulated into type I collagen 8mm diameter disc hydrogels with a cell density of 25 million cells/mL. The constructs were then implanted subcutaneously in the dorsa of nude mice, and harvested after 1 and 3 months for analysis.

**RESULTS:** Constructs containing passage 3, 4, and 5 chondrocytes all maintained cylindrical geometry. After 3 months, passage 3 and 4 discs on average contracted 24.22% and 25.00%, respectively. Interestingly, passage 5 discs on average contracted only 19.97%, which was significantly less. Regardless of the passage number of the chondrocytes, all constructs developed a white cartilage like appearance and had flexibility similar to native human auricular cartilage. Histologic and biomechanical analyses are pending.

**CONCLUSION:** With the analysis performed thus far, there appears to be no difference in the chondrogenic capacity between auricular chondrocytes expanded out to passage 3, 4, or 5. In fact, passage 5 constructs experienced significantly less contraction that passage 3 and 4. Future work will consist of further analyzing the biochemical, histological, and mechanical properties of the cartilage produced from the various passages. These data indicate that later passaged human auricular chondrocytes have the potential to be used for cartilage engineering and help us to overcome the current cell-sourcing barrier we face.