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Assessing the Fisher, Millard, and Mohler Techniques of Cleft Lip Repair Surgery with Eye Tracking Technology

Presenter: Jeffrey W. Kwong, BS

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PURPOSE: Cleft lip is one of the most common congenital anomalies in the world that can have severe consequences on a child’s social, functional, and emotional development. Eye-tracking technology offers an unbiased way to evaluate how viewers perceive the aesthetic outcome of cleft lip repairs. Here, we apply eye-tracking technology to compare how viewers with varying degrees of experience in plastic surgery assess the aesthetic quality of the Fisher, Millard, and Mohler cleft lip repair techniques.

METHODS: 17 subjects with plastic surgery experience ranging from layperson to attending plastic surgeon were shown 20 images (5 controls without cleft lip and 5 each of unilateral Fisher, Millard, and Mohler repairs). Viewers were instructed to examine the images, while eye-tracking equipment was used to track viewers’ gazes and analyze the distribution of attention during the task. Subjects were then asked to evaluate the overall aesthetic quality of each image on a 1-to-10 Likert scale. Eye-tracking equipment and software from Tobii Technology (USA) was used to track raters’ gazes and analyze the number of gaze fixations and time of fixation on different areas on the displayed faces.

RESULTS: On average, subjects demonstrated the highest number of gaze fixations for Fisher repairs (18.3), followed by Millard (16.8) and Mohler (15.8) repairs. Duration of time in fixed gaze followed a similar pattern, in which subjects looked longest at Fisher repairs (6.73 sec), followed by Millard (5.33 sec) and Mohler (5.30 sec) repairs. In evaluating the aesthetic quality of the three techniques, subjects also most preferred the Fisher repair (6.9), over the Millard (5.8) or the Mohler (6.5) repairs. The repair scar was the first area to catch viewers’ attention in only 4 out of 15 repairs (2 Fisher, 1 Millard, and 1 Mohler), but the area that held the longest duration of fixation on average in 6 out of 15 repairs (3 Fisher, 1 Millard, and 2 Mohler), as well as the area that garnered the highest number of fixations in 7 out of 15 repairs (4 Fisher, 1 Millard, and 2 Mohler).

CONCLUSION: Eye tracking provides a novel and objective way to evaluate viewers’ attention and to correlate gaze data with clinical aesthetic outcomes. In comparing the three techniques, the subjects’ attention indicated that they tend to prefer the Fisher repair, with these images receiving the highest number of fixations, longest time of fixation, and highest Likert score. Interestingly, viewers seem to first fixate on the philtrum to establish a reference of normal anatomy before moving to examine the repair scars, as none of the repair techniques typically caught viewers’ initial attention. However, viewers did tend to spend more time analyzing the scar than other areas of the face in about half of all repairs after first establishing a normal reference frame. This suggests that repair scars do capture viewers’ attention but only upon a closer inspection. Ongoing work includes testing these effects on craniofacial and non-craniofacial attending surgeons and exploring the impact of bilateral repairs of each technique.

Single-Stage Primary Cleft Lip and Palate Repair: Analysis of Early Complications

Presenter: Rami S. Kantar, MD

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BACKGROUND: Simultaneous primary cleft lip and palate (PCLP) surgery is controversial in the United States. As a result, most patients are treated with a staged approach including repair of the lip first, followed by palatal repair at approximately 1 year of age. In this study, we evaluate early postoperative complications of the single-stage PCLP
repair, compared to primary cleft lip (PCL) or primary cleft palate (PCP) alone through the largest cohort study to date.

**METHODS:** The ACS NSQIP-Pediatric database was used to identify patients undergoing single-stage PCLP, PCL or PCP repairs between the years 2012 and 2015. Preoperative factors and early postoperative outcomes were compared between the three groups, as well as within the PCLP group between patients with and without complications. Univariate and multivariate regression analyses controlling for potential confounders were performed.

**RESULTS:** Review of the database identified 181 patients in the single-stage PCLP group, 1,007 in the PCP group, and 783 in the PCL group. On univariate analysis, there was a significant difference in mean age (p<0.001), weight (p<0.001), as well as distribution of gender (p<0.001), race (p=0.002), primary surgical service (p<0.001), and wound classification (p=0.01). There was no difference in the rates of early complications between the three groups. Mean operative time was significantly different between the PCLP, PCP and PCP groups respectively (159.1 ± 66.8 vs. 142.1 ± 67.2 vs. 125.1 ± 59.4, p<0.001). Regression analysis was subsequently performed to control for potential confounders. Within the PCLP group, cardiac risk factors (β = 35.19; 95% CI: 7.88–75.21; p=0.04) and complications (β = 77.31; 95% CI: 35.82–118.79; p<0.001) were significant risk factors for longer operative time. The most common surgical complication after PCLP repair was superficial incisional surgical site infection (n=3).

**CONCLUSION:** Review of a national multi-center validated pediatric surgery database shows that single-stage primary cleft lip and palate repair is not associated with increased risk of early postoperative complications as compared to primary cleft lip or palate repair alone. Future in-depth analyses of functional outcomes, craniofacial morphology, and psychosocial outcomes are warranted to understand the long-term impact of single-stage primary cleft lip and palate repair.

**Characterizing Associations between Neonatal Abstinence Syndrome and Orofacial Clefting**

**Presenter: C. Lendon Mullens, BS**

**Co-Authors: Ian L. McCulloch, BS, M Res; Kristen M. Hardy, BS; Russell E. Mathews, MSN, PNP-BC, RN; A. Corde Mason, MD**

Orofacial clefting is the most common developmental craniofacial malformation, with a prevalence of about 1 in 700(1,2). Etiologies are thought to be multifactorial.1,2 West Virginia is at the epicenter of the current opioid crisis in the United States.3 Our center has witnessed a large number of newborn infants recovering from neonatal abstinence syndrome (NAS) secondary to in-utero narcotics exposure. Within this group, orofacial clefting has been noted. We sought to characterize the prevalence and associations of orofacial clefting in infants with NAS.

This retrospective study analyzed live births at our institution from 2013–2017 to determine the prevalence of orofacial clefting in our general inborn population compared to infants born with concomitant NAS.

There were 11,599 live births in the study period, 1179 of which had documented NAS. 25 patients were born with orofacial clefting, 8 of whom were recovering from NAS. Odds ratios for NAS patients having developed orofacial clefting, isolated cleft palate, isolated cleft lip, and combined cleft lip and palate compared to the general inborn population were found to be 4.18 (p=.001), 5.92 (p=.001), 3.79 (p=.05), and 2.94 (p=.35), respectively. In comparing the orofacial clefting populations in the NAS and general inborn populations, no significant differences existed in terms of gender, race/ethnicity, birth weight, gestational age at birth, length at birth, head circumference at birth, APGAR scores, and/or newborn screen findings. Additionally, there were no significant differences between the two groups related to prenatal care, folate supplementation during the first trimester, gestational alcohol, cigarette, or marijuana exposures. The only discernable difference between the two populations were exposures to drugs of addiction. In the NAS population, where orofacial clefting was observed, all 8 newborns had documented exposure to opiates during the first trimester – 7 patients were exposed to buprenorphine and 1 patient was exposed to methadone. In the general inborn population with clefting, only 1 patient had exposure to drugs of addiction, which were Percocet and amphetamines.

Prevalence of orofacial clefting in infants with NAS in our population was significantly higher than the general population of live births. Isolated cleft palate and isolated cleft lip, specifically, were significantly more prevalent in NAS patients compared to the general population in this cohort. Interestingly, all 8 patients with orofacial clefting in the NAS...