There was a difference between right and left nerve position lateral to midline at point #3 (p=0.008). Female gender (p=0.014) and BMI < 29 (p<0.001) were associated with a more superficial GON position.

CONCLUSION: The treatment of migraines requires a multidisciplinary, collaborative approach. The GON can be found approximately 20 mm deep to the skin where it exits the semispinalis muscle, an important consideration when performing targeted injection, diagnostic nerve blocks, and/or migraine surgery. Nerve position may be affected by BMI and gender, which should be considered prior to injection and/or dissection. When performing bilateral interventions, nerve position may differ between sides, particularly with respect to lateral distance from midline. Differences in this study compared to previous cadaver studies may reflect the inclusion of live subjects in prone position compared to cadaver specimens.

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Craniofacial Surgical Planning with Augmented Reality: Accuracy of Linear 3D Cephalometric Measurements on 3D Holograms

Presenter: Kihyun Cho, MD, MSc

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INTRODUCTION: Conventional craniofacial surgical planning software lacks intuitive operator interaction and 3D navigation. Recently available augmented reality (AR) headsets have the potential for detailed 3D holographic projections of virtual 3D models, intuitive interaction and navigation, and accurate measurements.

OBJECTIVE: To evaluate the accuracy of linear measurements performed on HoloLens (Microsoft, Seattle, Wash.) in comparison with digital microcaliper towards assessing potential use for surgical planning.

METHODS: Seven adult dry human skulls were selected based on stable occlusion. Stereolithography files were generated from CT imaging data acquired with a default imaging protocol, loaded onto HoloLens. Two researchers performed two repeated linear measurements on 1) skulls with digital microcaliper as an anatomic physical measurement (gold standard) and 2) holograms by selecting two surface points. A subset of measurements that could be measured with digital microcaliper was used. We defined the limits of an agreement as 95% and the agreement between two methods was evaluated using the Bland and Altman analysis.

RESULTS: All HoloLens measurements were completed by easily “gazing” and navigating through complex 3D structures augmented to the virtual operating room. There was no significant bias between two methods used and 95% of the values were within the limits of the agreement.

CONCLUSION: Our results indicate that HoloLens has significant potential for surgical planning including sufficient accuracy for linear measurements. Future studies will include curvilinear measurements, formal usability evaluation and augmentation of 3D holographic planning results for intraoperative use.

Prospective Quality of Life Outcomes after Facial Feminization Surgery

Presenter: Thomas Satterwhite, MD;

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**INTRODUCTION:** Recent estimates suggest there are at least 25 million transgender people worldwide. Up to 0.9% of the US population is thought to express some form of gender dysphoria. Medical and surgical gender-confirmation has been proven to have a substantial impact on transgender patients’ physiologic and psychosocial outcomes along with improved quality of life. Yet, little is known about the quality of life outcomes after facial feminization surgery (FFS). The purpose of this study was to examine the quality of life outcomes after FFS.

**METHODS:** A multi-center prospective cohort study was implemented and enrolled patients over the age of 18 from two institutions who were planning to undergo FFS. Subjects were asked to complete a previously validated instrument for assessment of quality of life outcomes after FFS and have clinical photographs at pre-determined intervals: pre-operatively, 1 week to 1 month post-operatively, and greater than 6 months post-operatively. An FFS outcome score was calculated at each interval with a range from 0 – 100, and photos were analyzed through facial analysis. Patient demographic data was obtained. Non-parametric unpaired Mann-Whitney test was used for statistical analysis.

**RESULTS:** Fifteen patients have been enrolled with an average age was 34.5 years and less than a third of patients had a smoking history. All subjects had begun medical transition with hormone therapy while 50% had previous gender-confirming surgery and 15.4% had previous FFS. Most patients had begun their transition over one year ago. The mean pre-operative FFS outcome score was 48.3±15.4 which improved to 86.9±13.2 at < 1 month post-operatively \((p=0.0002 \text{ vs pre-op})\) then 89.8±8.7 at > 6 months post-operatively \((p=0.0004 \text{ vs pre-op}; p=0.66 \text{ vs 1 month})\). Subjects reported being very satisfied \((\text{mean = 3.7±0.5})\) with the outcomes of their FFS on a four-point Likert scale \((0=\text{least satisfied}, 4=\text{most satisfied})\) at > 6 months post-operatively. Facial analysis showed substantial changes in facial properties.

**CONCLUSION:** FFS has a significant positive impact on transgender patient quality of life with minimal complications. More patients are continually being enrolled in this study, but these preliminary results and previous research points to the medical necessity of FFS for transgender patients.

**Applying State of the Art 3D Technology in the Separation of Conjoined Twins**

**Presenter:** Hayeem Rudy, BA

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**INTRODUCTION:** The successful separation and reconstruction of craniopagus twins is a technically demanding procedure that necessitates comprehensive and precise pre-operative planning. The three key challenges include (1) separating complex vascular anatomy without precipitating hemodynamic collapse (2) dividing shared brain matter without compromising critical tissue, and (3) reconstructing the dura, bony skull and soft tissue scalp using limited autologous materials. Virtual surgical planning (VSP) combines 3D-modeling and simulation software for the purpose of precisely planning such complex surgeries. Customized guides and jigs can be designed during the digital planning sessions based on high-fidelity anatomical models. These tools can then be 3D-printed, sterilized, and applied to the patient in the operating room to facilitate the precise translation of virtual plans into reality. Our goal was to utilize this technology in the separation and reconstruction of craniopagus twins.

**METHODS:** The twins underwent initial CT and MRI angiography and venography prior to any surgery to evaluate their arterial and venous anatomy as well as the brains. 3D photographs (Canfield Vectra H1) of the twins were also taken. Repeat imaging was performed subsequent to each of the first three stages of surgery. Based on these data, our team used VSP and 3D-printing to design and 3D print (1) osteotomy guides that minimized surgical risk by avoiding underlying vasculature and which generated portions of cortical bone that could be optimally repurposed for skull reconstruction and (2) age