autologous reconstruction as compared with tissue expander reconstruction (4.5 percent versus 2.1 percent; p<0.001). There were significantly more debridements performed in cases where ICG was used (5.6 percent versus 3.2 percent; p<0.001). Use of ICG added a mean charge of $9,080 per reconstruction ($79,242 vs. $70,162; p<0.001); however, it also resulted in a decreased LOS (2.37 days versus 2.47 days; p<0.001).

CONCLUSION: The use of Indocyanine Green angiography in breast reconstruction has increased in recent years and is associated with higher debridement rates. Significant hospital, patient and ethnic disparities exist in Indocyanine Green angiography use. Although length of stay was significantly reduced statistically, it bears minimal clinical significance and clinicians may utilize this information regarding resource utilization in the setting of Indocyanine Green angiography use versus need for future additional unplanned procedures, given the significant increase in charges.

Development of a Breast Reconstruction Training Environment

Presenter: Alex Viezel-Mathieu, MD, CM
Co-Authors: Roy Kazan, MD; Shantale Cyr, PhD; Thomas Hemmerling, MD, MSc, DEAA; Mirko Gilardino, MD, MSc, FRCS, FACS
Affiliation: McGill University Health Center, Montreal, QC

INTRODUCTION: Breast reconstruction following mastectomy remains an essential component of the holistic approach to treating women affected with breast cancer. The training of plastic surgery residents in this domain can prove to be a challenging task due to limited access to non-patient models. Advanced and increased simulation-based training is one way to teach residents necessary skills, improve outcome of surgery and create a dynamic teaching environment. Moreover, the introduction of the competency based training programs has raised the need for simulators as objective assessment tools in order to gauge residents’ performance and assess for acquisition of competence.

METHODS: A modified Delphi technique was used to survey plastics surgeons with an expertise in breast reconstruction from 6 university centers with plastic surgery residency programs. A list of the most challenging steps in teaching alloplastic breast reconstruction was obtained. Using various commercially available silicon materials, a benchtop post-mastectomy breast reconstruction simulator was created by casting and molding techniques. The model was built in order to accommodate both sub-pectoral and pre-pectoral implant based reconstructions. Senior plastic surgeons with an expertise in breast reconstruction were recruited and asked to perform a sub-pectoral, implant based breast reconstruction on the simulator. Following the procedure, participants were asked to complete a 22-point questionnaire using a 5-point Likert scale to grade the simulator on its physical attributes, realism of experience, realism of material and overall experience.

RESULTS: Nine relevant anatomical components were successfully included in the simulator, notably, rib cage, intercostal muscles, pectoralis minor muscles, dissectible pectoralis major muscle, acellular dermal matrix sheet and a three-layer skin envelope. A pneumothorax indicator was also incorporated. The simulator was designed to be completely reusable with no disposable components necessary for each use. Face and content validation results based on the evaluations performed by expert plastic surgeons showed excellent results among parameters evaluated, with an overall mean score of 4.52 on 5 (90.4%).

CONCLUSION: Given the realism offered by the simulator as well as its reusability, this project has the potential to revolutionize the way in which breast reconstruction is taught and mastered by plastic surgery residents with the ultimate goal to improve patient outcomes and ensure patient safety.

3D Domestic Printer Use in Rhinoplasty

Presenter: Denis souto Valente, MD, PhD
Co-Authors: Niveo Steffen, MD; Sibelie S. Valente, MSc
Affiliation: Pontifical University Catholic Rio Grande do Sul, Porto Alegre

INTRODUCTION: Systematic nasal analysis is critical to establish the goals of rhinoplasty, and there are numerous methods that plastic surgeons adopt
in their practices to help patients understand what their surgical result following rhinoplasty may look like. The development of polymer filaments, laser, and computer-aided design has permitted the creation of three-dimensional (3D) scanning and printing technology. Most recently, 3D domestic scanning and printing has become available. This new technology allows the surgeon and the patient to view a sculpture of the nose. The labored mould can be palpated, rotated and viewed from many angles, this technology goes beyond a simple 3D-shaded visualization on a flat monitor.

PURPOSE: This study was aimed to describe an objective method of domestic 3D scan and print of the patient’s actual anatomy to use as an intraoperative aid.

METHODS: Patients undergoing rhinoplasty had preoperative facial scan taken. The reference model was then cropped, trimmed and solidified using a 3D software on the patient scan. The file was then transferred to a 3D printer in order to create a statue of the nose with Polylactic Acid filament prior to the surgery. This sculpture is taken to sterilization, then it can be used trans-operatively in order to help surgeon to compare the obtained results following his maneuvers, to check his adherence to the surgical plan and to improve his surgical decision-making.

RESULTS: The creation of a three-dimensional nose sculpture were performed in twenty patients. All of them were caucasian, the average age was 41 years old, and 85% were female. 75% of the cases were primary rhinoplasty.

No patients in this study developed infection post-operatively, and there were no major complications (eg, necrosis).

CONCLUSION: The application of 3D printing of the patient’s actual anatomy to use as an intraoperative aid proves to pose a positive effect on the treatment of aesthetic nose disorders, whereas prospective controlled study with larger samples is needed to explore and elucidate the efficacy of this technology.

Validation of Vectra 3D Imaging for Quantitative Volumetric Measurement of Upper Extremity Lymphedema

Presenter: Mark J. Landau, PhD

Co-Authors: Jennifer S. Kim, B.A; Daniel J. Gould, MD; PhD, Ketan M. Patel, MD
Affiliation: Keck School of Medicine of USC, Los Angeles, CA

INTRODUCTION: Secondary lymphedema of the upper limb is a common sequela following lymphadenectomy during oncologic surgery. The gold standard for evaluating treatment outcomes in upper limb lymphedema is limb volume measurement, with tape measurement being the method most commonly used. However, current techniques lack sensitivity to localized changes. In this study, the Vectra 3D imaging system was utilized to accurately and precisely obtain volume measurements of the upper limb in patients with lymphedema.

METHODS: A feasibility study was performed in 11 patients with lymphedema and 22 upper extremities; 24 arms were evaluated in total. Three-dimensional images were taken of the upper extremities and Vectra 3D software was used to calculate the volume of the hand, forearm, and upper arm. These measurements were compared to traditional circumference (tape) and water displacement measurements.

RESULTS: The twenty-four arm volumes ranged from 1517 to 4050 cc. The Vectra 3D provided precise and accurate volume measurements (average standard deviation ±1.0% of total volume). Measurements of the forearm and upper arm correlated with circumference measurements (R² = 0.991) and were in good agreement, with the mean difference between measurement techniques being 2.8±2.0%. Three-dimensional measurements of hand, forearm, and upper arm correlated with water measurements (R²= 0.990) and had a mean difference between measurement techniques of 2.6±2.1%.

CONCLUSION: The Vectra 3D system provides precise and accurate data comparable to the most commonly used technique to estimate limb volume (tape measurement) and gold-standard water volume measurement. Three-dimensional imaging also offers several advantages, including time efficiency and obtaining localized measurements with high spatial resolution.

Automated Identification of Severity Level of Unilateral Cleft Lip Using Facial Dysmorphology Novel Analysis