4.5 the average ease of using the hand gesture features was 4.7. Overall, subject rated the comfort of wearing the HoloLens highly.

CONCLUSION: This study shows that the HoloLens can make accurate and reproducible measurements in plastic surgery. Furthermore, our survey demonstrated the accessibility and comfort of the technology for surgeons using the device. Additional studies are underway to further define applications of this technology in plastic surgery.

A Benchtop Culture System for Growing Vascularized Tissues in Vitro

Presenter: John P. Morgan, PhD
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INTRODUCTION: Tissue engineering seeks to develop physiologically appropriate tissues to restore, maintain or improve function in clinical contexts, provide platforms to study basic biological processes and screen drug candidates/delivery strategies. It aims to reduce use of patient tissue and associated morbidity at donor sites; improve economics and efficacy of drug development/screening and replace animal testing with human tissues. The overall field has suffered from the lack of a complete toolset to control physical and biological parameters of these complex cultures and make them compatible with microsurgery. We have pioneered approaches to form microvascular networks within 3-D tissue scaffolds.¹

We present an autonomous tissue cartridge (ATC) for recapitulating the microvasculature in vitro which solves these problems threefold: 1) Precise flow control within vessels, perfusing microvascular networks with nanoliter-precision control. 2) Hardware enabling fluidic, thermal and atmospheric control of cultures in a compact, portable and versatile benchtop platform. Importantly, it eliminates conventional incubators and provides live fluorescence imaging 3) Scaffolding that enables microsurgical anastomosis of cellularized vessels within 3-D matrices in animal models. Experimental results of the effect of hemodynamic forces on vascular cells provide new biological insights.

METHODS: Microvessel tissues were lithographically constructed in collagen and seeded with endothelial/perivascular cells. The fully assembled microfluidic tissue culture device with enclosed microvessels was cultured in the benchtop system with live imaging for 7-14 days under pump-driven flow using a range of flow rates to achieve physiologic shear stress against the vessel walls. Cell morphology, alignment and migration were analyzed.

RESULTS: The ATC provided consistently stable environmental/temperature control throughout extended cultures. Live imaging revealed dynamic endothelia with cells migrating throughout the vessel walls, both downstream/upstream of the flow direction. Contiguous cell-cell junctions indicated confluent, healthy endothelia with intact cytoskeletons. Microvessel cross-sectional areas expanded and changed profile from original lithographically defined squares toward elliptical cross-sections with larger dimensions. Migrating cell displacement correlated positively with applied shear stress, with maximum displacement at highest shear 2.5 Pa. Similarly, cells elongated/aligned in the direction of flow; net alignment increased with the magnitude of shear.

CONCLUSION: This breakthrough sets the stage for clinical translation of pre-vascularized tissues, provides new insights into relationships between hemodynamic forces and cell morphology/dynamics, and advances studies of mechano-biology seeking to identify molecular mechanisms by which cells sense shear stress.

Reference Citation:
1. Morgan, J. P. et al. Formation of microvascular networks in vitro. Nat Protoc 8, 1820–1836, doi:nprot.2013.110 [pii] 10.1038/nprot.2013.110 (2013).

AESTHETIC SESSION 3

A Systematic Review and Variance Analysis: Does Plane of Dissection Affect Nerve Injury Complication Rates in Various Rhytidectomy Techniques?

Presenter: Dhivya Srinivasa, MD
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INTRODUCTION: Numerous facelift techniques are employed across aesthetic surgeons, but all can be categorized according to the specific plane(s) of dissection. Regardless of the technique, nerve injuries are ubiquitously feared complications. The dissection plane has been implicated in the rates of nerve injuries, but little consensus exists on the exact relationship. Our aim was to perform a systematic review of the literature to evaluate nerve injuries across varying Rhytidectomy methods.

METHODS: The PubMed, MEDLINE (Ovid 1950 to present), and CENTRAL databases were queried using keywords (facelift, rhytidectomy, plexopathy, neuropathy, complication(s), and nerve injury) from 1950 to October 2016. The search generated 788 manuscripts. We included all original manuscripts published in 1990 or later. We excluded manuscripts with a study population less than 20, combination procedures, less than six month follow up, exclusively secondary procedures, and those lacking specification of Rhytidectomy method. The total number of facelifts as well as total numbers of motor deficits were manually extracted. We performed an analysis of variance (single factor-ANOVA) to assess for a difference in motor nerve injury incidence across our three cohorts: sub-SMAS, deep plane, and subperiosteal rhytidectomy. “Superficial” facelifts were excluded in our analysis since the term was not used uniformly.

RESULTS: After manual review of 788 abstracts, a total of 26 manuscripts met our criteria, 25 of which were retrospective and one was prospective in design. We found no previous randomized controlled trials or multivariate analyses. The included manuscripts were published from 1990 to 2015, study population ranging from 25 to 3570 patients, and follow up ranging from 6 months to 8 years. ANOVA analysis (of variance) revealed a statistically significant difference between the three cohorts with respect to incidence of motor nerve injury (p=0.0019) with an alpha of 0.05.

CONCLUSION: The incidence of motor neuropraxia in rhytidectomy surgery is related to the plane of dissection. Our inclusion criteria were specific, in order to extract the highest quality manuscripts and avoid confounding variables such as simultaneous procedures, revision surgery, and obsolete data. Given the logistic difficulties in higher quality studies in aesthetic surgery, we offer the first pooled data analysis in our systematic review and variance analysis of nerve injuries in facelift surgery.

The Frequency of Periorbital Asymmetry

Presenter: Ji Son, MD
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INTRODUCTION: Facial asymmetry is ubiquitous. Patients are likely to discern asymmetry after blepharoplasty, particularly due to procedures that remove excess skin and soft tissue. The purpose of the study was to assess asymmetries in eyebrows and eyelids in patients considering cosmetic surgery.

METHODS: Seventy-five patients being evaluated for various cosmetic procedures were included in the study. Standard pre-operative photographs were obtained and calibrated. Various eyelid (palpebral fissure, palpebral height, palpebral inclination, pupil to midline of the face, pupil to medial canthus, pupil to lateral canthus, medial limbus to medial canthus, lateral limbus to lateral canthus, marginal reflex distance 1, marginal reflex distance 2, lid margin to the supratarsal crease, orbital fissure to upper / lower lids at various points) and eyebrow (nasal eyebrow, medial eyebrow, lateral eyebrow) measurements were obtained, and the right eyelid / eyebrow measurements were compared to the left eyelid / eyebrow measurements.

RESULTS: Mean age was 36. Most prominent asymmetric eyelid measurements were pupil to midline of the face (mean difference 1.51 mm), medial canthus to the medial limbus (mean difference 1.18 mm). Most prominent asymmetric eyebrow measurement was lateral eyebrow (mean difference 1.19 mm). Ninety percent had asymmetry difference of 1 mm or more.

CONCLUSION: Pre-existing asymmetry is very common and if this is detected and brought to the patients’ attention it is the patients’ flaw. Otherwise it will be attributed to the surgery.