**Affiliation: Cooper Medical School of Rowan University, Camden, NJ**

**BACKGROUND:** Free flaps are routinely used in complex tissue reconstruction due to their functionality and reliability. Postoperative monitoring remains a challenge despite the current available modalities. Clinical examination remains the gold standard, with color being the most sensitive marker of flap compromise. Assessment of flap color is more challenging in Fitzpatrick V–VI skin types, masking visual signs of ischemia or congestion. A Forward-Looking Infrared (FLIR) ONE smartphone based thermal imaging camera can be used to detect differences in flap temperature from the surrounding native tissue and could be used to identify early flap compromise. This simple technology used with a smartphone may be a useful method to assess postoperative flap perfusion.

**METHODS:** Institutional review board approval was obtained for postoperative flap monitoring using FLIR technology for patients undergoing complex reconstruction with a free anterolateral thigh (ALT) flap. The FLIR camera is a simple attachment that plugs into iPhone models 7–12 and takes thermal pictures with temperature readings by a spot pyrometer using their App. Preoperatively the FLIR camera spot pyrometer measured baseline temperature by ALT flap location. Temperature recordings of the flap and the surrounding native tissue were taken immediately postoperatively and then at regular intervals in addition to our standard free flap monitoring protocol. This protocol was utilized for one patient in this report who underwent a free ALT flap to scalp after sarcoma resection and Fitzpatrick skin type VI.

**RESULTS:** FLIR thermography measured the preoperative central flap temperature at 32.6°C. Immediately postoperatively the flap temperature was 33.9°C, and the surrounding native skin was 35.8°C. Sixteen hours postoperatively the central portion of the flap was found to be 28.0°C, 8.4°C cooler than the surrounding native skin, suggesting flap ischemia. Clinical examination of the flap showed edema and return of dark blood on scratch test but no frank discoloration. Handheld Doppler signal showed arterial signal but no venous signal. The patient was taken immediately for operative exploration, which showed a 30 cm³ hematoma compressing the vascular pedicle. Following evacuation, the central flap’s temperature was 35.6°C. The patient was discharged on POD 7 and still has a complete reconstruction.

**CONCLUSIONS:** FLIR ONE was helpful in detecting flap congestion and ultimately flap salvage. Prompt operative evacuation of the hematoma prevented flap loss and associated morbidity to the patient. This patient case highlights the inherent challenges in evaluating skin paddles of Fitzpatrick V–VI skin types and depicts the utility of a low-cost thermography camera that can aid in identifying a threatened flap. The user-friendly, non-contact nature of FLIR ONE adds a useful and objective datapoint in postoperative free flap monitoring that can improve patient outcomes when combined with conventional monitoring techniques in all patients, particularly those with difficult flaps to monitor. Our team hopes to continue studying thermal camera temperature differences in postoperative free flap monitoring to service our patients and provide insight into this technology’s utility for reconstructive plastic surgery.

**Adipose-derived Stem Cell Secretome and Its Potential Role in the Treatment of Androgenetic Alopecia**

**Presenter: Katarina Andjelkov, MD, PhD**

**Co-Author: Aleksandra Korac, PhD**

**Affiliation: University of Belgrade, Belgrade, Serbia**

**INTRODUCTION:** The secretory properties of white adipocytes are thought to contribute to the association between hair folliculogenesis and hair growth. We investigated the quantitative and qualitative secretome profiling of adipose derived stem cells from different zones of hair growth in patients with androgenetic alopecia.

**METHODS:** We included six male patients, candidates for follicular unit extraction hair transplantation, all in the early stage of androgenetic alopecia. One millimeter punch samples of adipose tissue located beneath hair follicles of three scalp areas (alopecia, border-line and normal hair growth) and one periumbilical sample from each patient were enzymatically digested, centrifuged, washed, and cell pellets were ceded and maintained in culture medium until reached monolayer. Conditioned media samples were thawed and analyzed with 41plex kit. Results were registered by Luminex platform and calculated with xPonent software.

**RESULTS:** We analyzed the levels of 35 signaling proteins. The levels of Inteleukin-6, Vascular Endothelial Growth Factor, Endothelial Growth Factor, and Eotaxin were significantly higher in the alopecia zone in comparison with the periumbilical and occipital. The similar trend was found for Monocyte Chemotactic Protein-3, Interferon gamma-inducible Protein-10, and Macrophage Inflammatory Protein-1 alpha.
On the other side, Monocyte Chemoattractant Protein-1 level was the lowest in alopecia comparing with other zones. Other examined proteins did not show changes.

CONCLUSIONS: The observed differences in these signaling molecules’ expression could contribute for both achieving therapeutic goals for hair loss conditions and shading more lights on the androgenetic alopecia etiology but also highlight the need to investigate adipose derived stem cells secretory proteome in all other conditions linked to hair loss.

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Improving Fat Graft Retention with Micro/Nanobubbles in Vivo

Presenter: Daniel Zaki, MS

Co-Authors: Lohrasb R. Sayadi, MD, Faris Halaseh, BS, Jordan Tang, BS, Mary E. Ziegler, MD, PhD, Nawal Khan, MD, Alan D. Widgerow, MBBSH, MMed, FCS, FACS

Affiliation: University of California, Irvine; Center for Tissue Engineering, Orange, CA

PURPOSE: Fat grafting is one of the most popular procedures in plastic and reconstructive surgery. However, retention rates of transplanted fat remain variable, often rendering unpredictable outcomes in the long term. Inadequate tissue oxygenation during the transplant process is thought to play a major role in this variability. To that end, we sought to examine the implementation of oxygenated micro/nanobubbles (MNBs) during transplantation of lipoaspirate as a means of maintaining adequate tissue oxygenation and improving graft survival. MNBs are small gas bubbles (<100 µm) that are stable for hours and can be saturated with high amounts of oxygen. Furthermore, their negative charge and irregular surface characteristics make them an ideal agent for separation and decontamination of charged particulate matter. We hypothesize that MNBs will enhance lipoaspirate survival and establish themselves as an important adjunctive step to be incorporated into current fat grafting techniques.

METHODS: Twelve 6-week-old Fox Chase SCID beige mice were used as hosts for transplanted human lipoaspirate. Lipoaspirate samples harvested from healthy human donors were washed with either an oxygenated MNB or saline solution prior to injection into the dorsum of the mice. To assess graft viability, explants were harvested at 4-, 8-, and 12-week intervals. Following harvest, grafts were weighed, and volumes were obtained using gas pycnometry. Immunohistochemistry was completed utilizing antibodies directed toward CD31, Perilipin, and CA-9 as surrogates for angiogenesis, adipogenesis, and hypoxia, respectively. Quantitative analysis of IHC images was performed via ImageJ.

RESULTS: The grafts that were washed in the MNB solution were significantly greater by mass as early as 4 weeks (P < 0.01). Likewise, an analysis of variance (ANOVA) showed that MNB-washed explants had greater volumes across all time points (P < 0.05). While CD31 staining showed that vessel density was equivocal at each interval between experimental and control groups, perilipin staining showed significantly greater intensity in the MNB group at both 4 and 8 weeks. Moreover, CA-9 staining intensity in the MNB group was notably lower by 12 weeks compared with that in the control group.

CONCLUSIONS: The utilization of MNBs, as a source of oxygen, in the wash step prior to transplant may be beneficial for improving graft survival. MNB-washed grafts displayed greater volumes and masses over 12 weeks compared with their control-group saline-washed counterpart. Furthermore, as evidenced by the surrogate markers in the IHC analysis, lipoaspirate samples subjected to the MNB-wash demonstrated improved de novo adipogenesis and less hypoxia. Taken together, these preliminary data reveal promising translatable implications for oxygenated MNBs in the future of fat grafting paradigms.

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