8.00-9.10 SESSION 6 – MICROSURGERY & ALLOTRANSPLANTATION

8.00 NOVEL PERFUSION DIAGNOSTICS IN RECONSTRUCTIVE SURGERY: TOWARDS PREDICTION OF FREE FLAP FAILURE

Sanne JANSEN, Daniel-Martijn DE BRUIN, Suzanne GISBERTZ, Ton VAN LEEUWEN, Simon STRACKEE
Amsterdam, The Netherlands

INTRODUCTION: Free flap necrosis has a frequent occurrence and results in high morbidity, however there is still no quantitative method to image and measure perfusion during the operation. Optical techniques could be the answer to this problem. These techniques image perfusion directly during surgery and give a high-resolution and high-contrast image comparable to microscopy. In this study we test the feasibility, validity and reproducibility of four optical techniques: Optical Coherence Tomography (OCT), Side-stream Darkfield Microscopy (SDF), Laser Speckle Contrast Imaging (LSCI) and Fluorescence Imaging (FI).

MATERIALS AND METHODS: During free flap surgery OCT (10x10mm) and SDF (1x0.65mm) images were obtained from proximal to distal of the supplying artery. Widefield LSCI (15x20cm) images and FI (10x10cm) movies, using indocyanine green (ICG) as fluorophore, were made of the free flap. Perfusion parameters (blood flow velocity, vessel density, flux and influx of ICG) were compared statistically between the four different area’s with a paired t-test. Techniques were previously validated in terms of velocity and vessel diameter in a microvascular tissue phantom with full blood of a healthy volunteer.

RESULTS: OCT, LSCI and FI were feasible to image perfusion during surgery. OCT produced 8 3D-images of 10x10x3mm, showing tissue layers and blood vessels in a high-resolution. SDF was not feasible to show perfusion. LSCI produced 10 color-coded images with a significant difference in flux (perfusion units) between the distal (tip) and proximal part of the free flap (p=0.01). FI produced a movie in which influx of ICG was visible and significantly different between the distal and proximal part of the free flap (p<0.001).

CONCLUSIONS: OCT, LSCI and FI are feasible to image perfusion during surgery. Quantitative parameters (velocity, vessel density, flux and perfusion influx) were obtained with these techniques. Future prospective studies are necessary to determine threshold values of these quantitative parameters to predict free flap failure.

8.10 BIPEDICLE FLAP FOR UNILATERAL AUTOLOGOUS BREAST RECONSTRUCTION REVISITED: EVOLUTION AND OPTIMIZATION OF FLAP DESIGN OVER 15 YEARS

Edward CHANG, Steven KRONOWITZ
Houston, USA

INTRODUCTION: In thin patients or when significant amount of skin is needed, the entire abdomen may be necessary to reconstruct a single breast. Here, we present our 15-year experience in bipedicle flap evolution and optimization of flap design.

MATERIALS AND METHODS: Retrospective review of all bipedicle flaps performed from 2000–2014.

RESULTS: Overall, 57 patients (mean age: 49 years, mean BMI 26.2kg/m2) underwent a bipedicle flap reconstruction of a unilateral mastectomy defect. Twelve patients had a history of smoking, 29 patients had prior radiation, and 21 patients underwent immediate reconstruction. The indications for a bipedicle flap include prior midline laparotomy (n=16), need for skin coverage (n=10), need for soft tissue volume (n=22), and poor perfusion cross the midline (n=9). Eleven bipedicle flaps were performed with a pedicle TRAM coupled to a free TRAM (n=4), MSTRAM (n=4) and DIEP (n=3), and all were performed from 2000–2007. The thoracodorsal vessels (n=8) were used more frequently earlier in the study period with the internal mammary vessels (IMV), while the remaining patients used the antegrade/
retrograde IMV except one patient who used the IMV and an IMV perforator. Over the time period, there was an increasing use of perforator DIEP and SIEA flaps as well as the use of the IMV as recipients. Complications included delayed wound healing (n=5), abdominal bulge (n=2), cellulitis (n=3), seroma (n=2), and fat necrosis (n=3). There was one partial flap loss where the SIEA portion of the bipedicle flap was lost.

CONCLUSIONS: Bipedicle flaps can be performed as two free flaps safely and reliably. Use of DIEP flaps maximizes pedicle length and the IMV can be used reliably in an antegrade and retrograde fashion to perfuse both components of the bipedicle flap.

8.20 CIRCUMFLEX SCAPULAR ARTERY VASCULARIZED SCAPULAR CHIMERIC FLAPS: A NEW EXPERIMENTAL FLAP MODEL

Arzu AKCAL, Tahsin GORGULU, Seckin Aydin SAVAS, Ibrahim BASSORGUN

Antalya, Turkey

INTRODUCTION: Experimental in vivo models still mean important tool for biomedical research. The aim of study is to introduce a novel circumflex scapular artery myocutaneous/vascularized scapular chimeric flap model in rat and demonstrated a optimal skin flap dimensions.

MATERIALS AND METHODS: An 8x4 cm rectangular skin flap based on circumflex scapular artery flap were harvested and the mean percentages of surviving flap area and necrotic area are calculated. Using the flap dimensions determined in Part I, a 4x3 cm quadrangular skin is marked over the scapula and the serratus anterior muscle and partial scapular bone were included in chimeric flap model.

RESULTS: Microangiographic and histologic studies revealed the vascularity of the skin island, identified the branches of circumflex scapular artery to bone and muscle.

CONCLUSIONS: The circumflex scapular artery myocutaneous/vascularized partial scapular chimeric flap may be considered as branch based chimeric flap and it can be good flap model because of its simplicity, reliability, and consistent vascularity. Also this flap has potential applications in the study of chimeric flap hemodynamics.

8.30 SUBNORMOTHERMIC MACHINE PERFUSION (SNMP) WITH A NOVEL HEMOGLOBIN-BASED OXYGEN CARRIER (HBOC) SOLUTION FOR EX VIVO PRESERVATION IN VASCULARIZED COMPOSITE ALLOTRANSPLANTATION (VCA)

Riccardo SCHWEIZER, Sinan OKSUZ, Barak BANAN, Vijay GORANTLA, Paulo FONTES

Zurich, Switzerland

INTRODUCTION: Improved preservation techniques could reduce ischemia-reperfusion injuries (IRI), ameliorate the immunological outcome and allow improved matching and allocation of VCA grafts across wider distances. A novel SNMP system was evaluated for ex vivo preservation of VCA.

MATERIALS AND METHODS: Swine vertical rectus abdominis muscle (VRAM) flaps were preserved for 14h with cold static preservation at 4°C (CSP; n=8) and SNMP at 21°C using HBOC (n=8). Technical feasibility studies of ex vivo SNMP where followed by in vivo studies in heterotopic cervical VRAM allotransplantation followed for 7 days under triple immunosuppression. In addition to recipient’s clinical, histopathological and serum myoglobin monitoring, inflammatory markers and metabolomic analyses were performed on perfusates/tissues.

RESULTS: SNMP provided low pressures (50–55 mmHg), low flows (25–60 ml/min) and full oxygenation (FiO2=60% at 400 ml/min) to flaps. SNMP stabilized perfusate’s pH (7.55. 7.6) while keeping lactate levels under 4 mmol/L. Inflammatory cytokine profiles showed no significant difference between the groups ex vivo. Muscle fiber disruption and necrosis were significantly reduced in the SNMP group. Early contraction bands were followed by moderate to severe IRI in the CSP flaps in vivo. Myoglobin blood levels were significantly higher in CSP flap recipients. Metabolites involved in pentose (nucleic acid