SATURDAY EXTREMITIES

1:05 PM - 1:10 PM

RM2 Ex-Situ Normothermic Perfusion of Human Upper Extremity

Cleveland Clinic Foundation, Cleveland
Presenter: **Vahe Fahradyan, MD**
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Background: Ischemia time remains a significant limiting factor for successful extremity replantation and transplantation. Compared to the cold storage normothermic ex-situ perfusion is a novel method of a limb preservation by maintaining physiologic cellular metabolism avoiding the deleterious effects of hypoxia and cooling. The purpose of our study was to establish the efficacy of normothermic ex-situ perfusion in preserving the viability and function of human upper extremities.

Methods: Ten upper extremities were procured from brain-dead organ donors. Five limbs were perfused using an oxygenated colloid solution at 38°C containing PRBC, plasma and albumin. Five were preserved at 4°C as a control. Electrolytes were kept within physiologic range by partial perfusate exchanges. Limb viability was assessed by muscle contractility, compartment pressure, tissue oxygen saturation, creatine kinase(CK) and myoglobin concentrations, indocyanine green (ICG)angiography and thermography.

Results: Perfused arms retained physiological parameters and function up to 51hours with a final weight change of -1.26%±14.15, compartment pressure 21.2±16.39mmHg, mean muscle temperature of 35.1±0.86^{o}C, and tissue oxygen saturation 90.54%±7.98. Average values of final myoglobin and CK concentrations were 51330±31913.86ng/mL, and 34785.8±16136.54U/L. Thermography and ICG angiography depicted uniform peripheral perfusion throughout the experiment. Electrical stimulation of median, ulnar and radial nerves displayed no muscle contraction at the beginning, however, it recovered gradually and preserved until the end of perfusion.

Conclusion: Ex-situ normothermic limb perfusion shows potential in overcoming the present standard of care (cold preservation) improving ischemia time for large segments and envisioning a radical change in the management of traumatic amputations and upper extremity transplantation.

1:10 PM - 1:15 PM

RM3Improved Perfusion of the Ischemic Diabetic Foot after Reconstruction Using Free Flap

Asan Medical Center, Seoul

Presenter: **Jin Geun Kwon, MD**

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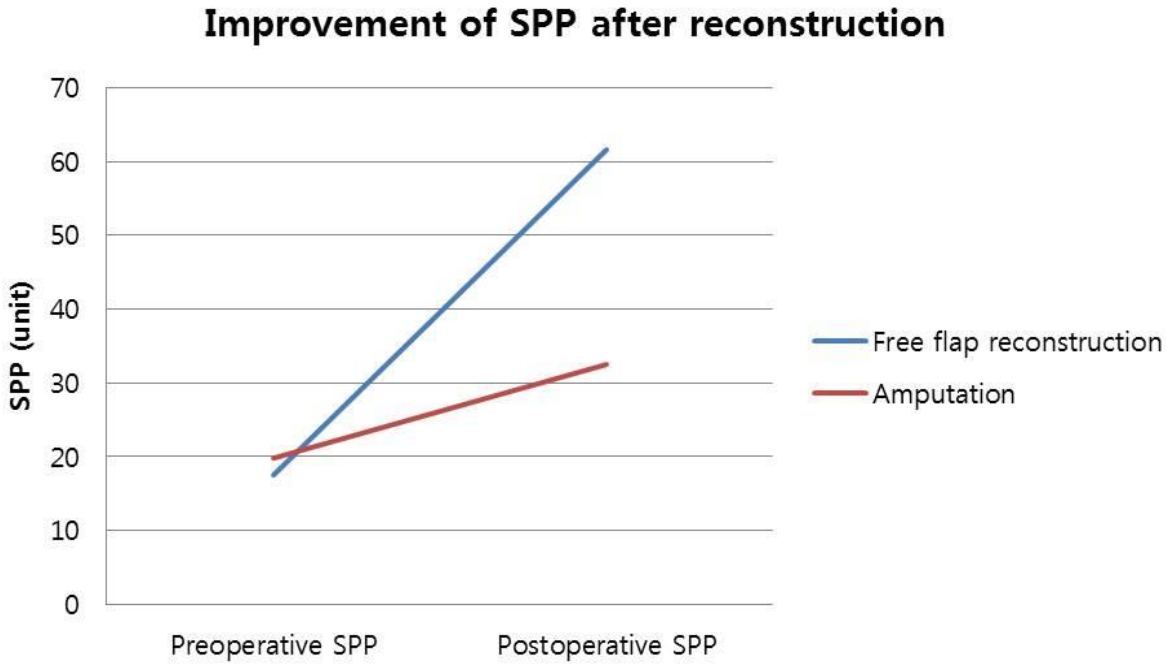
Background: Previous studies have shown that a 5-year survival rate can be improved by performing a free flap reconstruction of the diabetic foot. Conversely, more than half of patients who had amputation underwent re-amputation. The purpose of this study is to determine whether perfusion of the surrounding territory near the reconstructed flap changes after free flap reconsturction in ischemic diabetic foot patients.

Methods: This study is a retrospective analysis of 54 patients with ischemic diabetic foot from June 2015 to December 2017 at Asan Medical Center. All patients underwent angioplasties and hyperbaric oxygen to improve perfusion prior to operation. The patients were divided into 2 groups; Group 1 (n=36) who underwent free flap reconstruction (angiosome based debridement and reconstruction) salvaging the foot and Group 2 (n=18) who underwent partial foot amputation. For each foot, the skin perfusion pressure (SPP) was measured at the same point adjacent to the defect at preoperative and at postoperative 6 months. The results were compared and analyzed using independent t-test.

Results: The patient age ranged from 31 to 79 years (average- 56.6 years). In the reconstructed goup 1, various free flaps were used including anterolateral thigh (n=19), superficial circumflex iliac artery perforator (n=16), and other perforator free flaps (n=2). The preoperative SPP showed 17.58 units in the free flap reconstruction group 1 and 19.73 units in the amputation group 2 without statistical significance between the two. The postoperative SPP showed 61.62 units in the free flap reconstruction group 1 and 32.58 units in the amputation group 2 with statistical significance ($p<0.01$).

Conclusion: The increase in perfusion of the amputation group 2 is most likely from the angioplasty procedure and hyperbaric oxygen therapy that all patient goes through routinely to maximize the chance of healing. After healing, prevention of additional recurrence is very important concept in holistic management of ischemic diabetic foot.
According to our study, free flap reconstruction improves the perfusion of remnant tissue compared to the amputated group 2. There was a significant increase in perfusion of the reconstructed foot most likely from the well vascularized free flap. This approach may reduce the potential risk of further ischemia while maintaining the healing state of the foot.

Figure 1. Improvement of skin perfusion pressure (SPP)


Improvement of SPP after reconstruction
SPP (unit)
70
60
50
40
30
20
10
0
Preoperative SPP
Postoperative SPP
Free flap reconstruction
Amputation

1:20 PM - 1:25 PM

RM4 Plantar Reconstruction: Long-Term Outcomes of Free Gracilis Muscle Flaps Versus Free Fasciocutaneous Anterolateral Thigh Flaps

Klinikum Bogenhausen Academic Teaching Hospital , Munich

Presenter: **Niclas Peter Broer, MD, PhD**

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Plantar reconstruction: Long-term outcomes of free gracilis muscle flaps versus free fasciocutaneous anterolateral thigh flaps **Background:** When faced with plantar defects, reconstruction of the weight-bearing areas presents unique surgical challenges. Consequently, there exist only few donor sites which fulfill the specific anatomic requirements. While loco-regional flaps can adequately cover smaller defects, they play a limited role when faced with more extensive defects. In these cases, microvascular flap reconstruction usually becomes the next option. Several free flap modalities have been described in this respect, but there remains debate regarding the best suited flap modality. Aim of this study is to compare free muscle (gracilis-) and non-neurotized fasciocutaneous (anterolateral thigh-) flaps for plantar reconstruction in respect to long-term functional outcomes. **Methods:** Over a 7-year period (2011 – 2017), a total of 89 patients received 100 free flaps (ALT n=46; gracilis n=54) for plantar reconstruction at our institution. The data were screened for patients' demographics, as well as intra- and perioperative details. Postoperative complications were accounted for and the two groups compared accordingly. All patients were contacted and asked to participate in a follow-up examination. **Results:** Overall, there were no significant differences between the two groups of patients regarding the rate of major- (23.91% (ALT) versus 16.67% (gracilis); $p = 0.366$) and minor surgical complications (60.87% (ALT) versus 70.37% (gracilis); $p = 0.318$). However, the group of ALT flaps showed a significantly higher need for secondary surgeries (39.13 (ALT) versus 18.52% (gracilis); $p=0.022$). A total of 68 patients returned for long-term follow-up evaluation (mean: 51.2 months, range: 13 – 71, SD: 19.15 months). While the numeric rating scale evaluating pain was low in both groups, the ALT group showed significantly less pain at rest at the recipient- ($p=0.0004$) and donor ($p=0.010$) sites. The scar assessment utilizing the Vancouver scar scale (VSS) revealed significantly better results in the ALT group (mean: 1.75 (ALT) versus 5.67 (gracilis); $p < 0.001$). Additionally, the ALT group showed better depth- ($p=0.017$) and superficial ($p=0.007$) sensation. **Conclusion:** Both the free ALT- and gracilis flaps are well suited for plantar reconstruction, yielding overall similar functional outcomes. However, the ALT flap resulted in less scarring, pain, and better recovery of sensation, and thus presents our preferred reconstructive option.