reconstruction. During the operation, arterial thrombosis was observed 3 times in the microvascular anastomotic site. Intraoperative examination showed AT activity decrease (37 %) and AT transfusion was performed. Fourth arterial anastomosis was performed after AT transfusion and no further thrombosis was observed. Intraoperative bleeding volume was 1480ml and operation time was 18 hours 20 minutes.

RESULTS: Thrombosis was not observed in any of three patients intraoperatively after the transfusion or postoperatively and no other complications were observed.

DISCUSSION: AT deficiency was thought to be a main reason for the thromboses observed during the operation in all three cases. AT is synthesized in the liver and inhibits thrombus formation. It accounts for about 80 % of the thrombin inactivation in the blood, and is greatly related to the balance of the coagulation-fibrinolytic system. Various factors are thought to explain the decrease of AT activity observed in the cases presented; including hereditary AT deficiency, severe intraoperative blood loss, highly invasive operation, malnutrition and impaired liver function. It is necessary to consider AT deficiency in case repeated thrombosis developed intraoperatively.

Fasciocutaneous Free Flaps in Extremity Reconstruction: Safety of Re-Elevation

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PURPOSE: Free flap-based extremity reconstruction in the settings of chronic osteomyelitis and acute traumatic wounds can be a complex, multi-staged process that requires elevation of the free flap at each stage. Use of fasciocutaneous flaps is a safe and effect option in this situation, and may actually be preferable to muscle or musculocutaneous flaps despite traditional recommendations. Here the authors present their experience in utilizing fasciocutaneous flaps for reconstruction of the lower extremity in the settings of chronic osteomyelitis and acute traumatic wounds.

METHODS: A retrospective review of a single-center's experience with lower extremity fasciocutaneous free flap reconstruction in the setting of chronic osteomyelitis and acute traumatic wounds was performed. Patients were identified from the senior surgeon's prospective database. Osteomyelitis was diagnosed with tissue culture as well as corresponding radiographic changes. Charts were reviewed for relevant risk factors, operative details, and outcomes.

RESULTS: Twenty-one patients underwent reconstruction with free anterolateral thigh fasciocutaneous flaps. Of the fourteen trauma patients, there were seven Gustilo IIIB lower extremity injuries, three open hand or wrist fractures, two degloving injuries of the foot, one crush injury to the foot, and one traumatic hand amputation. Of the seven chronic osteomyelitis patients, the original mechanism of injury leading to chronic osteomyelitis was traumatic bony fracture in five patients and neoplasm excision in two patients. Mean patient age in our series was 44.3 (7 to 80) years. Mean BMI at time of reconstruction was 27.8 kg/m² (21.5 to 36.5 kg/m²). The average defect size was 270 cm² (32 cm² to 525 cm²). The average length of hospital stay was 32 days. Patients required a mean of 3.7 debridements prior to flap reconstruction and a mean of 6.9 surgeries to complete the reconstructive process. The average time from initial debridement to flap was 15.5 days; mean time from flap to final surgery was 122 days. Mean follow-up time period was 10 months. There were two urgent returns to the operating room with two flap losses. Nine flaps were re-elevated 13 times (1 to 4 re-elevations per flap) for flap debulking, draining wound, antibiotic spacer replacement or removal, bone grafting, and ligament or tendon reconstruction; there were no major complications following flap re-elevation.

CONCLUSION: Use of fasciocutaneous flaps in lower extremity reconstruction in the settings of chronic osteomyelitis and acute traumatic wounds appears to be safe and effective, even when the flap is subsequently re-elevated during revision surgery. Fasciocutaneous flaps allow for soft tissue coverage and the potential for protective sensation. Despite operating on a Western population with an overweight BMI, it was possible to utilize fasciocutaneous flaps for reconstruction. The optimal time from the initial injury to flap reconstruction may actually be longer than once thought.

Revisiting the Reverse Sural Artery Flap in Lower Extremity Reconstruction: A Systematic Review and Pooled Analysis
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**PURPOSE:** Reconstruction of the distal lower extremity (LE) is challenging due to limited local flap options and poor blood supply. The reverse sural artery flap (RSAF) is a popular salvage option for patients who are not ideal candidates for free tissue transfer. However, high rates of partial flap necrosis and venous congestion have been reported. This is the first systematic review on RSAF and pooled analysis of surgical characteristics, risk factors, and outcomes.  

**METHODS:** A systematic literature review was conducted according to PRISMA guidelines. Three electronic databases (PubMed, MEDLINE Ovid, and Cochrane Library) were queried. All patients who underwent reconstruction with the RSAF with reported outcomes were included. No study was excluded based on surgical technique. Pediatric cases (≤18 years) and those in which individual outcomes were not reported were excluded from pooled analysis. Categorical data were analyzed with Fischer’s exact or Chi-square test, and continuous variables were analyzed via ROC curve. A p-value of <0.05 was considered statistically significant.  

**RESULTS:** A total of 68 studies encompassing 1,525 flaps published between 1997–2018 were included in this systematic review. All studies were case series (Level IV evidence), and the majority (77.9%) were not U.S.-based. Twenty-five studies (36.8%) reported on surgical technique modifications. Eleven studies (118 flaps) reported on delayed reconstruction.  

Forty-three studies (479 patients, 481 flaps) were analyzed. The majority of patients were male (70.3%), and average age was 46.9±16.7 years old. Rates of smoking, diabetes mellitus (DM), and peripheral vascular disease (PVD) were 34.6%, 35.4%, and 12.3% respectively. Defect etiologies were largely traumatic (60.4%). The most common defect location was the heel (40.8%). Flap modifications were reported in 123 (25.6%) flaps. The most common modification was adipofascial extension (20.3%). Overall, the partial and total flap loss rates were 15.4% and 3.1%, respectively. Partial flap loss was significantly increased in smokers (28.9% versus 12.2% in non-smokers, p=0.0195). Technical modifications decreased the odds of partial necrosis by almost 3-fold compared to traditional RSAF reconstruction (7.2% versus 17.9%, OR=2.8 [1.4–5.8], p=0.0035). Patient age, DM, and PVD were not significantly associated with flap loss.  

**CONCLUSION:** Despite its reliance on a healthy vascular supply, the RSAF remains a safe salvage option for LE defects in patients with co-morbidities such as DM or PVD, but should be utilized with caution in smokers. Furthermore, employing technical modifications to minimize pedicle compression significantly reduces rates of partial necrosis.  

**Targeted Muscle Reinnervation Successfully Treats Neuroma Pain and Phantoms in Major Limb Amputees: A Randomized Clinical Trial**  

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**BACKGROUND:** A majority of amputees suffer from pain isolated to the residual limb or pain perceived in the missing limb, known as phantom limb pain. End-neuromas are the leading cause of residual limb pain while the etiology of phantom limb pain is much more complex and less well understood. There are over 150 surgical treatments for end-neuromas in the literature, highlighting the fact that no single treatment consistently works. Targeted Muscle Reinnervation (TMR) is a surgical procedure first developed to provide intuitive prosthesis control by transferring cut nerve endings to otherwise redundant motor nerves. It was incidentally found that patients undergoing TMR also