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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
had improvement in residual limb and phantom limb pain post-operatively. The objective of this randomized clinical trial is to compare TMR as a treatment option for amputee-related pain to the current standard of care for end-neuromas, which entails neurectomy and muscle-burying.

METHODS: A total of 28 major limb amputees suffering from neuroma-related pain were randomized to either standard therapy (14 patients, 15 limbs) or Targeted Muscle Reinnervation (14 patients, 15 limbs) across two sites. Three standard therapy patients converted to TMR one year after their initial intervention and were included in the TMR cohort as well, leaving a total of 18 limbs in final analysis. Pre-operative and post-operative pain outcomes were assessed using an eleven-point Numerical Rating Scale.

RESULTS: With an average follow up of almost 18 months, patients undergoing TMR had a significant reduction in both phantom limb and residual limb scores compared to pre-operative values. Specifically, average phantom pain levels decreased from 5.7 (0–10 scale) pre-operatively to 1.8 post-operatively, and average residual limb pain decreased from 6.7 pre-operatively to 3.4 post-operatively (all p<0.05). Standard treatment failed to yield any significant improvement in phantom pain (3.9 pre-operative vs 4.3 post-operative) with only minimal improvement in residual limb pain values (6.9 pre-operatively versus 5.7 post-operatively, p>0.05). The percentage of patients who had no phantom pain (NRS score of zero) increased from 16.7% to 50% in the TMR cohort. There were few individuals free from residual limb pain before or after surgery in either intervention arm. The percentage of individuals dealing with mild pain (NRS score 1–3) increased from 0% to 66.7% in the TMR cohort. Conversely, the number of individuals suffering from severe phantom limb or severe residual limb pain (NRS 7–10) increased in the standard treatment arm post-operatively. The trial was ultimately stopped in light of the noted failures and lack of overall improvement seen in the standard arm.

CONCLUSION: Results from this randomized clinical trial reveal that Targeted Muscle Reinnervation provides profound long-term improvement in phantom limb pain and residual limb pain in major limb amputees. TMR should be the treatment of choice for chronic pain in amputees as the results from standard therapy were disappointing for patient outcomes.

Central Artery Perforator Propeller Flap for the Reconstruction of Nasal and Medial Canthal Tissue Defects

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INTRODUCTION: Non-melanoma skin cancer is the most common type of skin cancer of the nose and medial canthal region, which is caused by chronic sun exposure. The main goals for reconstruction of these areas are to provide color and texture match and to minimize donor-area morbidity. As the glabellar region has a rich vascular network, it is highly suitable for perforator flaps. Therefore, we designed a perforator propeller flap based on the central artery.

PATIENTS AND METHODS: This prospective clinical study included 34 patients (14 females and 20 males) who had undergone surgery between January 2014 and March 2017. The median age of the patients was 60 (range: 19–88 years). All patients were followed up for at least 6 months.

RESULTS: The pathological diagnoses were basal cell carcinoma (n=19) and squamous cell carcinoma (n=12). Two of the defects were after trauma. The median follow-up was nine months (ranged:6-32months). The size of the defects ranged from 2 x 2 to 4 x 5 cm, and that of the flaps ranged from 2 x 3.5 to 5x10 cm. We did not observe any major complications requiring surgery, such as total flap loss, hematoma, or dog-ear deformity. Venous congestion was observed in five patients, two of whom showed partial flap loss. Partial flap loss in largest flap (5 x 10cm) due to lack of arterial inflow into the tip of the flap. Although all of them healed without any intervention, only one required partial suture removal. None of the patients underwent secondary surgery for aesthetic reasons.

DISCUSSION: The forehead flap is a safe and reliable option for the reconstruction of any skin component of the nose and medial canthal region. The disadvantages of the conventional forehead flap are as follows: need for at least one more surgery for pedicle separation, eyebrow deformity, vertical forehead scar, hair transfer to the reconstructed area, bulged-out appearance of the flap in comparison with the recipient area, and frequent occurrence of hypesthesia over the superior forehead (as the supratrochlear nerve is included in the flap). None of our patients experienced hypesthesia on the forehead and...