

Refining a Multidisciplinary “Vasculo-plastic” Approach to Limb Salvage: An Institutional Review Examining 300 Lower Extremity Free Flaps

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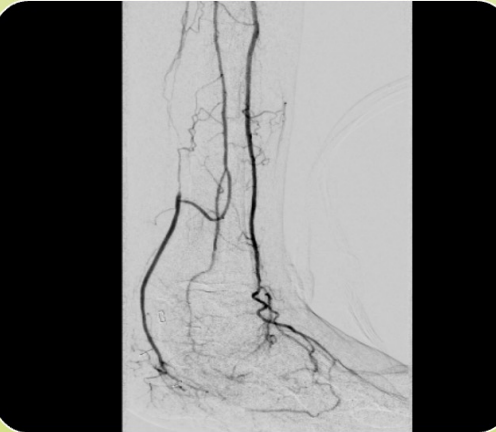


Introduction

The use of free tissue transfer (FTT) is efficacious for chronic, non-healing lower extremity (LE) wounds. The comorbidity burden of these patients often include diabetes mellitus, peripheral vascular disease, and end stage renal disease, which increases their risk of undergoing this procedure. Improvements in preoperative management, intraoperative surgical technique, and postoperative follow-up have allowed LE FTT to remain a viable reconstructive operative option despite higher risk profiles for patients. The authors present their 12-year institutional experience with 300 FTTs performed for LE limb salvage of chronic LE wounds.

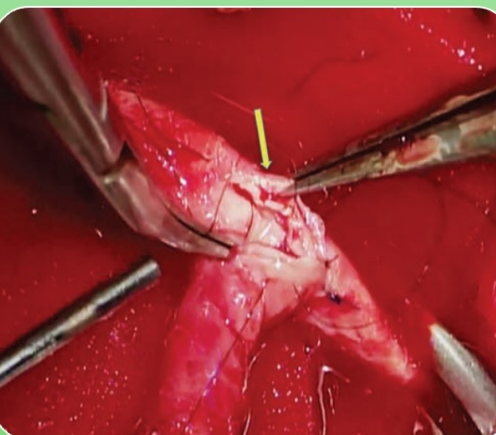
Methods

LE FTTs performed by a single surgeon from 2011 to 2023 were reviewed. Demographics, comorbidities, preoperative management, intraoperative details, flap outcomes, and complications were compared between the first 200 (Group 1, July 2011 – February 2020) and last 100 flaps (Group 2, February 2020 – January 2023) performed.



Preoperative:

- Case by case discussion with vascular surgeon to discuss patient-specific vasculopathy
- Diagnostic arterial and venous testing by angiography and duplex ultrasound (US)
- Revascularization by endovascular intervention or open bypass



Intraoperative:

- Longitudinal slit-arteriotomy with end-to-side technique
- Ethicon 7-0 Prolene (Ethicon US LLC, Cincinnati, Ohio) cardiovascular needle to penetrate calcification
- Saphenous Vein Interposition Graft, if needed
- 2 venous anastomosis choice depending on venous testing



Postoperative:

- Implantable Cook-Swartz (Cook Medical, Bloomington, ID) doppler probe for venous flow monitoring and near infrared spectroscopy ViOptix (ViOptix Inc, Newark, CA) used for postoperative monitoring
- Close monitoring and follow-up for indications of repeat angiography or revascularization
- Anticoagulation regimen established in conjunction with vascular surgery team

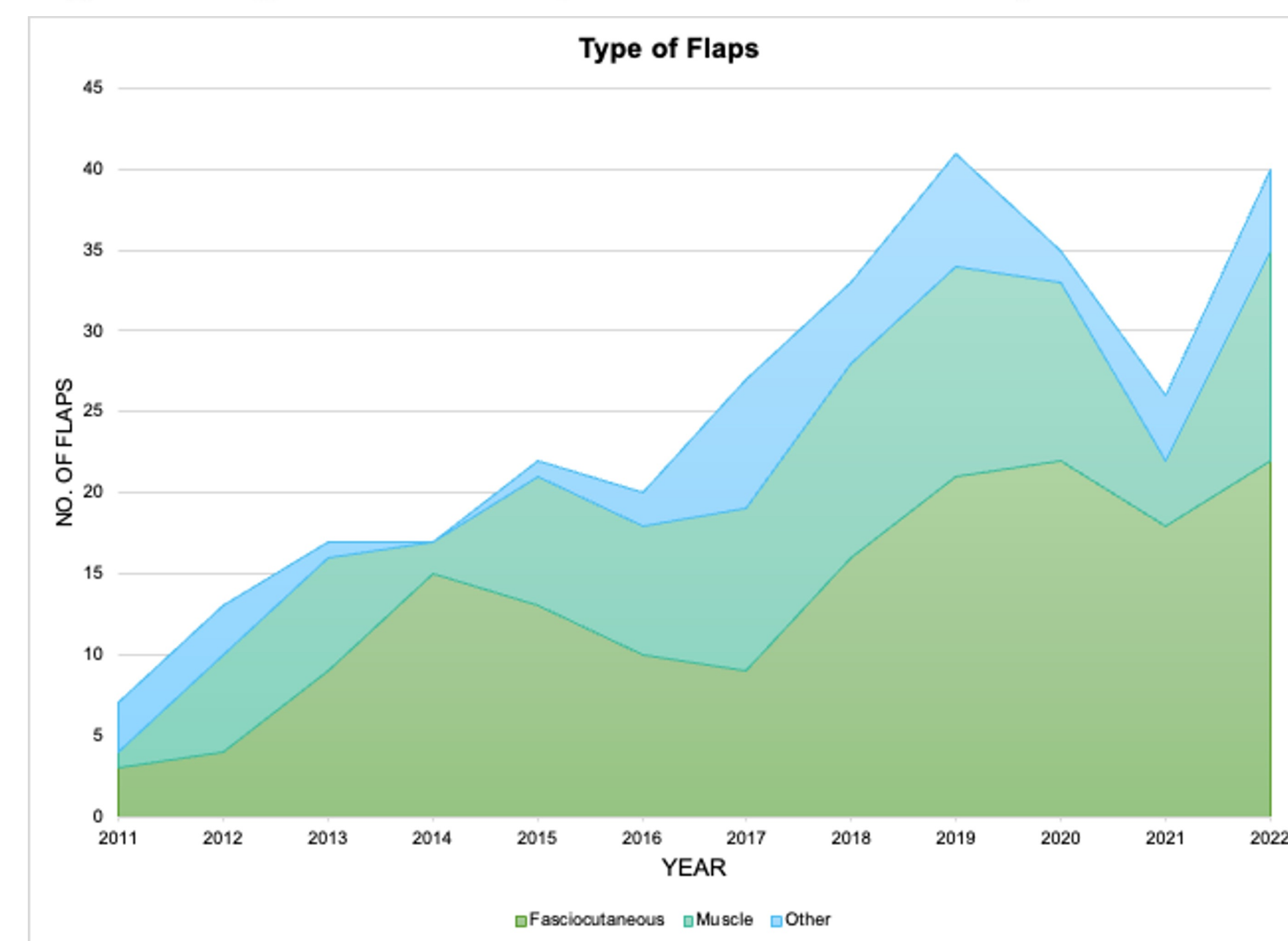
Figure 1. Vasculo-plastic approach to Limb Salvage

Results

- Compared to Group 1, **Group 2** had significantly **higher rates of:**
 - Diabetes (67.0% vs. 48.5%, p=0.002)
 - Peripheral vascular disease (56.0% vs. 24.5%, p<0.001)
 - History of venous thromboembolisms (13.0% vs. 6.0%, p=0.039)
 - Venous reflux (81.9% vs. 67.8%; p=0.028), and preoperative venous thromboses on venous testing (25.5% vs. 10.5%; p=0.003)
 - Pre-FTT endovascular interventions (23.0% vs. 16.5%, p=0.039) and vascular bypasses (4.0% vs. 0.0%, p =0.012).
- Group 2 had significantly higher rates of partial flap necrosis (7% vs. 3%; p=0.012)

	Total n = 300	Group 1 n = 200	Group 2 n = 100	p value
Free Tissue Transfer Outcomes				
Immediate Flap Success (POD 0-7)	289 (96.33)	191 (95.5)	98 (98.0)	0.347
Complications				
Takeback (POD 0-7)	18 (6)	12 (6.0)	6 (6.0)	1.000
Flap salvage*	11 (61.1)	6 (50.0)	5 (83.3)	0.316
Partial Flap Necrosis (POD 0-12)	10 (3.3)	3 (1.5)	7 (7.0)	0.012
Hematoma	16 (5.3)	11 (5.5)	5 (5.0)	0.856
Dehiscence	47 (15.7)	27 (13.5)	20 (20.0)	0.144
Infection	42 (14.0)	27 (13.5)	15 (15.0)	0.724
Long-Term Outcomes				
Postoperative ipsilateral amputation	38 (12.67)	29 (14.5)	9 (9.0)	0.177
Time to amputation (days), median (IQR)	169 (220)	180 (230.5)	129 (273)	0.697
Follow-up duration (mo), median (IQR)	15.0 (24.3)	22.5 (33.9)	7.0 (11.3)	0.000
Mortality	22 (7.4)	17 (8.5)	5 (5.0)	0.268

POD, postoperative day; *Percentages calculated from patients who had a takeback (n=18)



Of note: Data from 2011 only contains data from July-December 2011 and years 2020 and 2021 were affected by COVID-19. Data from 2023 was limited to January (n=3) and not included in the graphs

Figure 2. Use of various flap types by fasciocutaneous, muscle, or other types of free tissue flap types over time by year.



* Data from 2023 was limited to January (n=3) and not included in the graphs

Figure 3. Progression of significant comorbidities, comorbidity burden, and immediate flap success over time. Rates of DM and PVD by every two years (top). Average CCI every two years (middle). Rates of immediate flap success by year (bottom). Of note: Data from 2011 only contains data from July-December 2011 and years 2020 and 2021 were affected by COVID-19.

Discussion:

- Our study demonstrates that the post-operative success rates remained comparable between the two groups, despite a greater comorbidity profile in Group 2 patients
- Perioperative interventions to build on our vasculoplastic approach is important to follow through in the preoperative, intraoperative, and postoperative periods
- Intensive clinic follow-up, management of comorbidities, adherence to postoperative protocols, and diabetic foot care guidelines are integral to our multidisciplinary approach to complex limb salvage
- The wound center at our institution integrates several major subspecialties into a single clinic
- Limitations: single-institution retrospective study design, cohorts were divided by time periods and COVID-19 impacted several years, possible bias in more recent FTT procedures compared to earlier retrospective review

Conclusion

FTT remains efficacious for treatment of chronic LE wounds among patients affected by greater comorbidity and worse peripheral vasculature

Utility of a highly integrated, multidisciplinary vasculopathic approach to complex salvage can help achieve successful short and long-term outcomes

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