

Background

Since the Reverse Sural Flap was described, it has been a work-horse for lower extremity reconstruction. However, the flap has limitations: reach, venous congestion, and the need for skin grafts to cover the donor site.² Most lower extremity defects need tissue to close the dead space.² Our new design will assist flap survival and supply more tissue with a skin paddle with the additional benefit of closing the donor site primarily. We propose a new alternative for reconstruction of lower extremity defects, the Reverse Sural Flap Supercharged with Medial Sural Artery Perforator Flap (RSMSAP).

Methods

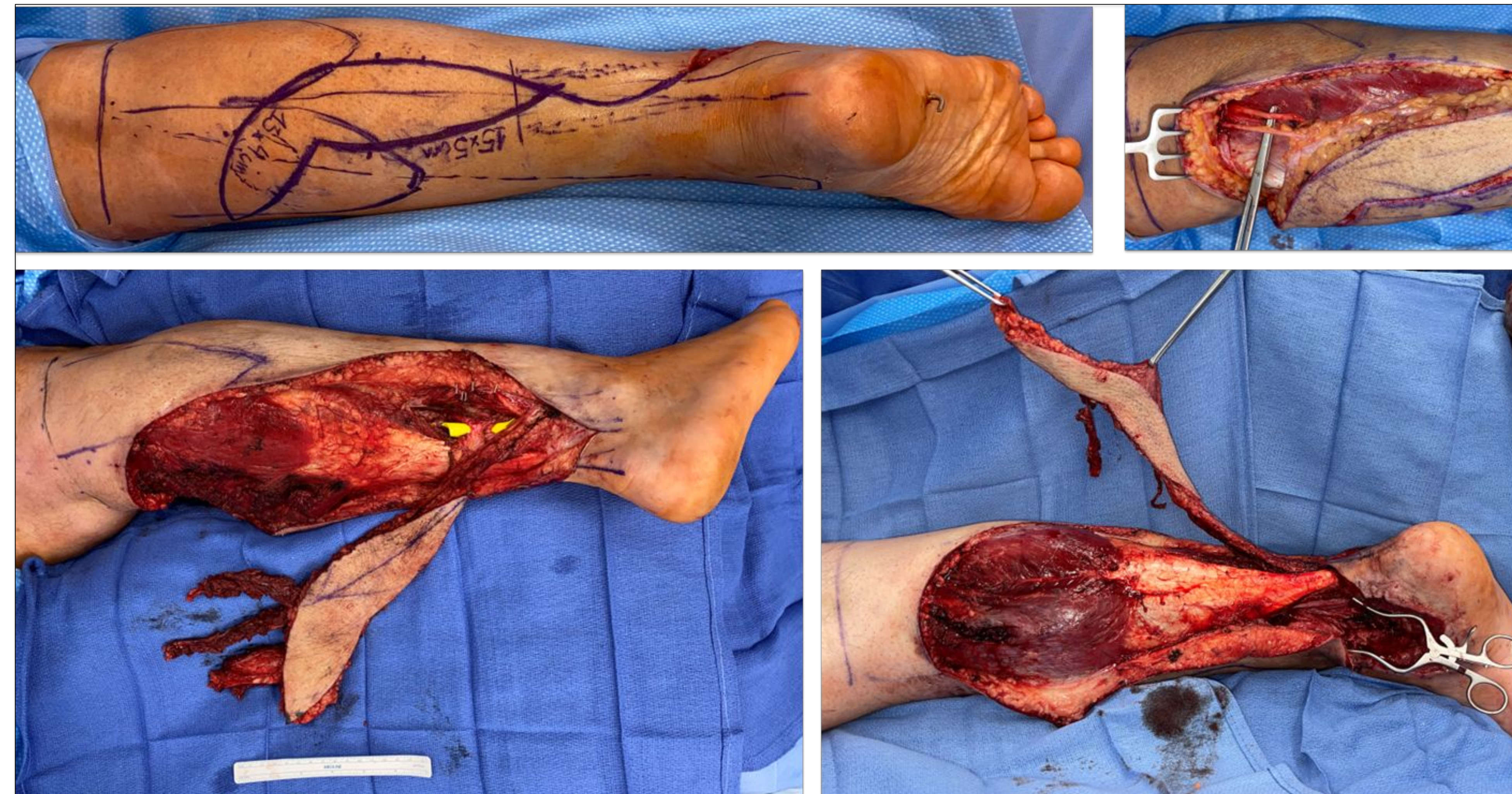
38 Cadaveric leg dissections were performed, obtaining information on fibular characteristics, perforator positions, diameters, and lengths. Our surgical cases utilized four RSAF modifications: perforator skeletonization, achilles tendon release, tunneling beneath it, and proximal peroneal artery ligation. After cadaveric surgical techniques established reproducibility, the reverse sural artery flap was clinically transitioned to 12 patients in need of fasciocutaneous +/- myocutaneous flap coverage. Diabetes Mellitus and Peripheral Vascular Disease were criteria of exclusion.

Anatomic Dissection

Cadaveric legs were dissected, 14 left and 24 right. A total of 138 perforators were identified for an average of 3.63 ± 1.04 perforators per leg. On average, terminal perforators were 10.96 ± 3.67 cm from the lateral malleolus, with arterial caliber 0.83 ± 0.34 cm and length 4.10 ± 3.42 cm. 71% of the terminal perforators were between the 60-80% portion of the fibula, which corresponds to a distance of 6.76-13.52cm from the lateral malleolus. 10.6% of terminal perforators were localized distally and 18.4% were localized more proximally. There was a significant negative correlation between total number of perforators and distance from the lateral malleolus ($r = -0.343, p = 0.035$).

Surgical case series

5 pediatric and 7 adult patients underwent lower limb reconstruction with RSAF. On average, the terminal perforator supplying the RSAF was at 71.0% of the total fibular length, or 9.31 ± 1.80 cm, from the lateral malleolus in adults and 70.6%, or 7.14 ± 1.69 cm, in children. The final pivot-points were invariably lower than the perforator location, on average 2.64cm and 3.20cm lower than the perforator position in adults and children, respectively. All patients underwent perforator skeletonization and Achilles tendon release. 4 patients also underwent tunneling under the Achilles tendon for coverage of medial foot defects and one patient underwent proximal ligation of the peroneal artery for further reach. Post-operatively, two cases had distal tip necrosis less than 10% and one case resulted in 50% superficial epidermolysis which healed with local wound care. No cases required re-operation or experienced flap failure.



CONCLUSIONS

Modifications (perforator skeletonization, achilles tendon release, tunneling beneath it, and proximal peroneal artery ligation) enhance RSAF coverage for medial and distal forefoot reconstruction. Anatomic findings demonstrate that the peroneal perforator can be higher than the recommended 5 cm pivot point superior to the lateral malleolus, underscoring modification importance. Careful implementation of these modifications boosts the RSAF suitability for lower limb defect reconstruction.

REFERENCES

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