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OPTIMISING THE SUCCESSFUL OUTCOMES OF REVERSE SURAL ARTERY FLAP FOR LOWEREXTREMITY AND FOOT RECONSTRUCTION IN ELDERLY PATIENTS

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ABSTRACT

OBJECTIVE

Soft tissue defects of the distal lower extremity and foot present major challenges in reconstruction. In elderly patients with co morbidities ,the reverse sural artery flap is a versatile tool in reconstruction of lower extremity and foot defect as they are poor candidates of free microsurgical flap. This study was conducted to assess the versatility of the flap to cover defects in varying sites of the distal leg and foot and also its efficacy to serve as an alternative option for free microsurgical flap in the elderly patients (>60yrs).

MATERIALS AND METHODS

All patients above 50 years of age who presented with lower extremity and foot defects underwent Reversal Sural Artery flap from January 2021 to January 2022 were included in this study. 19 patients were included in this study. The etiology of the defects were trauma, electrical burns injury and infection. The flaps were raised as pedicled, islanded and adipofascial flaps. Donor site was covered using split skin grafting in all cases. The patients were followed up for a minimum of 6 months.

RESULTS

The mean age of the patients were 62.5 years. 15 male and 4 female patients were included. Size of the defects were minimum of 4x3 cm and maximum of 10x5 cm. 10 patients had diabetes mellitus and 5 patients had hypertension and 3 patients had both diabetes and hypertension and 1 patient had associated head injury. 4 patients had pre-operative flap delay followed by flap inset 7 days later. Pedicled RSA flap was done in 15 patients, adipofascial flap cover was done in 2 patients and islanded flap cover was done in 2 patients. Venous congestion present in most of the cases in early postoperative period. Flap settled uneventfully in 17 patients. 2 patients had distal flap necrosis for about 2 cm which was managed by debridement and advancement after which flaps settled well. All donor sites graft settled well.

CONCLUSION

The reverse sural artery flap is a reliable alternative for free microsurgical flap cover for reconstruction of lower extremity and foot defects in elderly patients who are poor candidates for free microsurgical flap cover, with less operative time, easy learning curve, fewer complications and high success rates.

KEY WORDS – RSA, REVERSE SURAL ARTERY , ELDERLY, LOWER EXTREMITY

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INTRODUCTION

Skin defects over the ankle , heel and foot areas are always a challenge to the reconstructive surgeon as they are susceptible to trauma , pressure, chronic ulcers and penetrating injuries. The possibility for coverage of such defects are few. The flap chosen should be easy to execute quickly with minimal discomfort to the patient and should provide durable coverage of the defect

The sural flap has gained popularity by proving its validity for reconstruction of defects around the ankle and foot. First described by **A.C. MASQUELET**. Its main advantages are extensive mobility and versatility , without sacrificing important arteries. Also this flap has a short learning curve.

ANATOMY- The sural artery issues from the popliteal artery. It joins the sural nerve coursing between the two heads of gastrocnemius and follows the lateral edge of the Achilles tendon. The sural artery is intimately connected with the sural nerve and plays an important role in supplying the skin of the lower and middle posterior leg. It terminates with the lateral supramalleolar branch of the fibular artery and posterior tibial artery. A pair of concomitant veins travel with the sural artery. The vascularisation of the nerve is ensured by the sural artery in the proximal 1/3rd of the leg and by an arterial fascial plexus issuing from the perforators of the fibular artery.

A large perforator is located approximately 5cm proximal to the lateral malleolus.

The flap includes the superficial, deep fascia, sural nerve, lesser saphenous vein, and sural artery.

The lesser saphenous vein is generally used to determine the axis of

the pedicle. The pivot point of the pedicle is the main perforator, located 5 cm proximal to the lateral malleolus, as it is the most reliable. The skin island is designed on the posterior aspect of the calf at the junction of the two heads of the gastrocnemius. The pivot point of the pedicle and the source supplying the flap is the most reliable perforator. The pedicle is a strip of adipofascial tissue, including subdermal tissue, lesser saphenous vein, sural nerve, and deep fascia. The ratio of length to width of the pedicle is approximately 4:1.

The conventional reverse sural flaps are limited to the middle 1/3rd and falls short of the critical area to be covered, with limitation being the location of the flap. Extending the flap territory proximally into the upper 1/3rd of the leg would improve the reach of the flap. Literature describing this is very limited and our study focuses on determining the reliability of the extended reverse sural artery flap in elderly population.

AIMS AND OBJECTIVE

To establish the reliability of this flap and methods by which we can optimise the extended sural artery flap in the target population being the elderly aged >60yrs.

MATERIALS AND METHODS

This is a prospective cohort study conducted in the department of plastic and reconstructive surgery, Stanley medical college and hospital, Chennai.

Study period – january 2021- January 2022.

Total number of cases – 19

Inclusion criteria –

Patients above the age of 60yrs

Defects involving lower third leg , ankle and foot

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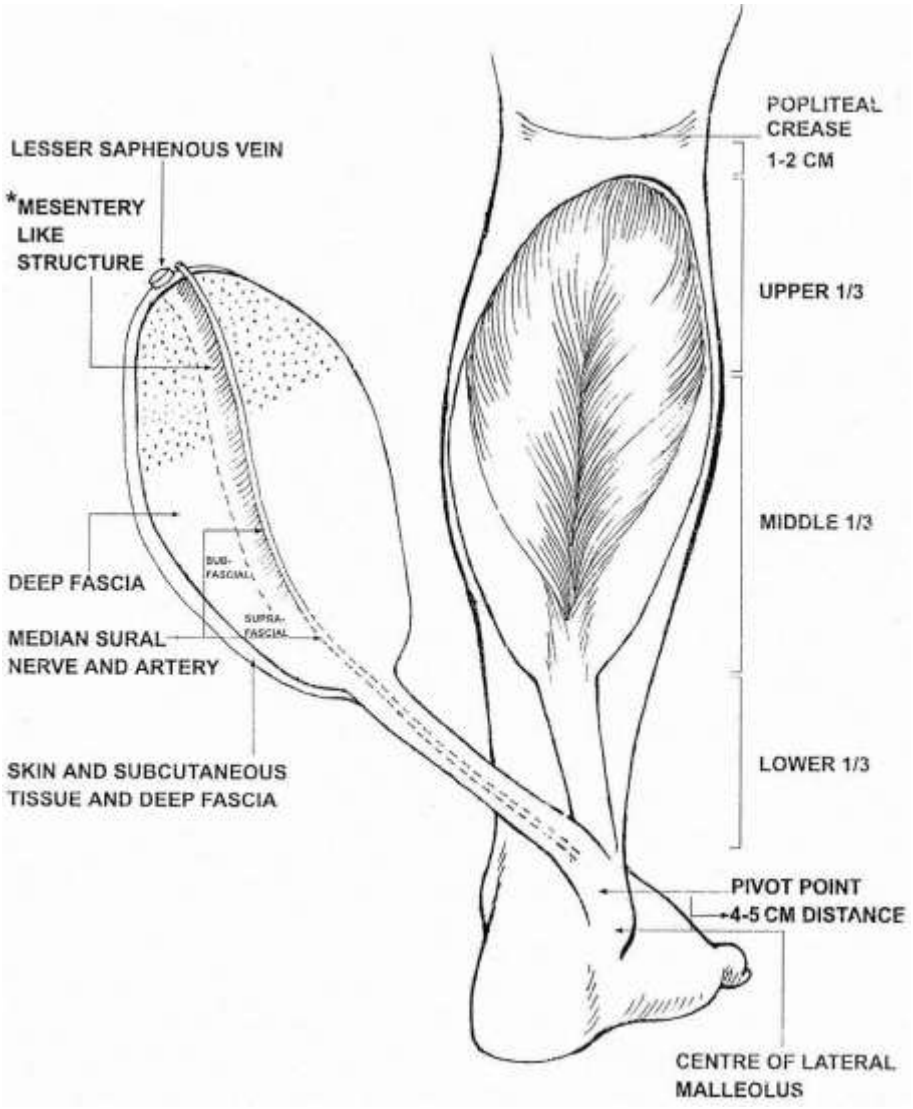
Exclusion criteria-

Patients under 60 years
Cases which were previously operated
Previous flap failure cases
Patients not willing to partake in the study.

All cases were operated by a team of surgeons including the senior author from the institute. Preoperative evaluation – local part X ray, arterial and venous doppler study, cardiac evaluation, pre-anesthetic work up. Hand held doppler done to locate perforators. Pre operative vascular basis of flap markings done in standing or supine position. The flaps were raised as *pedicled, islanded and adipo-fascial flaps.* Donor site was covered with *split skin grafting* in all cases.
Patients were optimized in terms of blood sugar control and control of hypertension prior to surgical exposure.
Flap markings and operative steps are described



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STEPS IN RAISING AN EXTENDED FLAP –

2 staged procedure where the proximal limit of the flap is raised in the 1st stage and the left in place. The second stage is done 5-7 days later where the rest of the flap is raised upto pivot point and inset to the defect.

Single stage – here a cuff of gastrocnemius is included along with the proximal 1/3rd portion of the flap which is raised 3-4 cm proximal to the proximal – middle third junction of the leg. Donor sites were covered with split thickness skin graft. Post-operatively treated with intravenous fluids, antibiotics, glycemic control maintained, limb elevation advised.

The patients were followed up for a minimum of 6 months and assessed for flap viability and survival.

RESULTS

- Mean age - 62.5 years.
- 15 male; 4 female
- Size of the defects were minimum of 4*3 cm and maximum of 10*5 cm.
- 10 patients had diabetes mellitus and 5 patients had hypertension and 1 patient had associated head injury.
- Defects – over tendoachilles region – 10, lateral malleolar – 3, medial malleolar -2, lower 3rd leg – 4
- 4 patients underwent pre operative flap delay followed by flap inset 7 days later.
- Pedicled flap was done in 15 patients and adipofascial flap was done in 2 patients and islanded flap cover was done in 2 patients.
- Venous congestion was present in most of the cases in early post operative period. Flap settled uneventfully in 17 patients.
- 2 patients had distal flap necrosis for about 2 cm which was managed by debridement and advancement, after which flaps settled well.
- All donor sites graft settled well.

DISCUSSION

Donski and Fogdestam – first to describe flap based on superficial sural artery. Based on their study distally based sural flap has been successfully constructed. *VASCULAR BASIS*- Superficial sural artery, perforators from peroneal artery and posterior tibial artery, neurocutaneous perforators from vasa nervosum of sural nerve. *Masquelet et al* – concept of neuroskin island flap – sural cutaneous branches anastomosis with the septocutaneous branches arising from main vessel. *Chang Keng et al* modification – wider pedicle without passing through subcutaneous tunnel reduces flap congestion. *Ulrich Kneser* – delayed sural flaps when the defect is large *Shao Liang Chen et al* – included midline cuff of gastrocnemius muscle.

Our observations- Flap survival was improved by

- ***Flap delay*** in case of large defects.
- ***Adipofascial flap modification*** by sparing skin island.
- Addition of ***muscle cuff*** to pedicled reverse sural artery flap in case of large defects.

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Figure 1 post traumatic defect of weight bearing heel

Figure 2 extended flap raised with cuff of gastrocnemius muscle

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Figure 3 outcome at 3 months post-op

CONCLUSION

- Extended reverse sural artery flaps are a versatile choice of reconstruction of reconstruction in the elderly
- It replaces microsurgical reconstruction in most cases of heel and foot defects with advantage of not sacrificing the major artery.
- Faster learning curve and less cumbersome compared to microsurgical free flaps.
- Safety and reliability of the flap even in the elderly population, with adequate optimisation of the patient
- Flap delay is a safer option to increase the reliability of extended flaps

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