



LATERAL SUPRAMALLEOLAR FLAP IS A RELIABLE OPTION FOR COVERAGE OF DEFECTS OVER LOWER 3RD OF LEG, DORSUM OF FOOT AND ANKLE

Plastic Surgery

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ABSTRACT

Background: The Lateral Supramalleolar flap is based on a perforating branch of the peroneal artery (emerging from about 5 cm above the tip of lateral malleolus on the antero-lateral aspect of lower leg) which pierces the interosseous membrane just proximal to the anterior tibiofibular ligament.

Methods: We harvest the Lateral Supramalleolar flap as a fasciocutaneous, peninsular flap with minimal perforator dissection. We have done 32 cases in last 5 years with excellent result with our technique.

Results: In our experience over the last 5 years we did not get a single case of total flap necrosis. In only one case we found about 2 cm necrosis of distal most margins. Conclusion: The Lateral Supramalleolar flap is useful for coverage of exposed lower 3rd of tibia, defects around ankle, exposed tendo achilles and dorsum of foot.

KEYWORDS

Lateral Supramalleolar flap, defect around ankle.

INTRODUCTION:

The lateral supramalleolar flap is a fasciocutaneous flap raised on the lateral aspect of the lower leg and is usually employed as a distally based pedicled flap.

This flap was first described by Masquelet et al in 1988 [1]. The vascular supply is provided by the anastomotic arcade of the ankle. The flap is based on the perforating branch of peroneal artery, which pierces the interosseous membrane at the distal tibio-fibular angle, just proximal to the anterior tibiofibular ligament. It anastomoses at a variable level with the anterior lateral malleolar artery arising from the anterior tibial artery, courses on the anterior tibiofibular ligament and then descends anterior to the inferior tibiofibular syndesmosis and anastomoses with the lateral tarsal artery on the lateral border of the foot (at the level of sinus tarsi)[2]. Between its emergence from the interosseous membrane and tibiofibular ligament, the perforating artery gives off one or two ascending branches[2] to the skin of the distal half of the lateral aspect of the leg, which constitutes the territory of the flap. The flap is designed in middle of the leg and the length of pedicle is about 15 cm[3]. These cutaneous branches run anteriorly to the fibula, travel in the lateral intermuscular septum between the extensor digitorum longus and peroneus brevis, and course upwards and anastomose with the vascular network which accompanies the superficial peroneal nerve. This nerve enters the subcutaneous tissue at about the junction of the middle and distal third of the leg and then divides into medial and lateral branches at the level of the ankle joint.

We hereby report our clinical experience with 32 cases of Lateral supramalleolar flap done in a tertiary care centre, and share our experience in using this flap as a fasciocutaneous pedicled flap for lower leg, ankle and foot defects.



Figure 1: Detailed anatomy of lateral supramalleolar flap. (2)

METHODS:

The present study was conducted in the Department of Plastic Surgery, Medical College, Kolkata. Retrospective data of patients operated in last three and half years (April 2015 – December 2018) with lateral supramalleolar flap for coverage of lower 3rd of leg, ankle and foot defects was collected. All patients from the age of 15- 65 years were included in this study. Informed consent and permission for usage of photographic data was obtained from all patients.

The exclusion criteria were patients age <15 and > 65 years; extensive crush injury of foot or lower 3rd of leg; patients with associated neurovascular injury to the limb.

Operative technique

The procedure is performed usually under spinal anesthesia, with the patient in supine position and a pillow or sandbag is placed under ipsilateral buttock. The limb is exsanguinated by pressure with Esmarch bandage. Then a pneumatic tourniquet is applied over mid-thigh.

The final defect size is measured after debridement of wound and the relevant landmarks are marked as follows:

1. Tip of lateral malleolus.
2. The point where peroneal artery perforator is localized.
3. The boundaries of the flap is marked by a line 0.5 cm lateral and parallel to anterior tibial crest to the posterior margin of fibula.

Preoperative Doppler of the region above the lateral malleolus is done to identify the perforator of the peroneal artery in all cases. Usually we start at a point 5cm above the lateral malleolus on the axis of the flap and proceed proximally and distally from this point to localize the perforator and planning of the flap is done in reverse, a pattern of the flap is made by using sterilized lint piece and cut, as we would cut the skin and tissue from the pivot point to the distal most edge of the flap. The width of the flap at pivot point is kept at least 3 cm. This template of planned flap is then transposed to the leg along the axis of the flap. Flap harvest is done retrogradely in a subfascial plane, preserving the paratenon, especially on the tendinous parts of EDL and peroneal muscles. The superficial peroneal nerve is cut and taken with the flap the remaining nerve is

then buried under the muscles and a flat bed is created for graft placement[4] . After flap elevation, the tourniquet is released and hemostasis is ensured. The donor site is covered with a split skin graft and flap inseting is done in a single layer with half buried sutures.

RESULTS:

In 31 flaps, wound healing was uneventful. In all cases the donor site graft take was also uneventful. In only 1 case, inseting sutures removed after 24 hours of operation due to venous congestion. In this case the flap is just placed over the wound and a loose dressing was done for 5 days. On 6th post-op day re-insetting of flap done under local anaesthesia. There was no case of complete or partial flap necrosis. We did detachment and inseting of flaps by dividing the pedicle of the flap and return of the remainder flap to original position if needed.

We did not encounter any painful neuromas as we routinely burry the cut end of superficial peroneal nerve under the surrounding muscles.

Of the 32 patients, 21 [65.6%] were male and 11 [34.4%] were female. The most common mode of injury was due to Road Traffic Accident (RTA) [25%]

The age group of patents operated was 21 years to 58 years. Most common defect which was covered was in lower third of exposed tibia in 11 patients (34.37%) followed by defect over Tendo achilles in 10 patients (31.25%) (Table 1) (Figure 2-4).



Figure 2 : Intra operative photographs of patient with soft tissue defect over tendoachilles area showing defect from lateral view, flap planning, flap inset, flap inset lateral view, donor area coverage by STSG.



Figure 3 : Upper 3 photographs post operative day 10 and lower 3 photographs are of post operative day 15 of patient in figure 2.



Figure 4 : Photographs of patient in lower third soft tissue defect with exposed tibia showing defect from medial view, defect from anterior view, flap planning, flap inset, 10 days post operative anterior view and medial view.

The largest defect which was covered was 11cm x 6 cm and smallest was 3 cm x 2 cm. All the defects were covered by lateral supramalleolar flap without need for delay of the flap.

Amongst post oncosurgical resection patients one patient had exposed tibia with tibialis anterior tendon the whole exposed tibia and majority of tibialis anterior tendon was covered by this flap and remainder area was covered by STSG received External Beam Radiotherapy (EBRT) and even after with 25 fractions of EBRT the flap tolerated EBRT well (Figure 5) intraoperative pictures of the patient and (Figure 6) post EBRT follow up.



Figure 5 : Photographs of patient with lower third leg defect post oncosurgical resection with exposed tibialis anterior tendon and tibia showing defect from medial view, from anterior view, flap planning, flap after harvest, flap in situ site, flap reach till end of defect, flap inset with partial area covered by STSG.



Figure 6 : Photographs of patient in figure 5 with result after 3 months after receiving 25 fractions of ERBT.

In 3 cases of 32 patients had post traumatic defect in lower third of leg with exposed tibia and having fracture of tibia and fibula in distal third, even with the fracture of fibula in lower segment if intact perforator was identified and this didn't have adverse effect on the flap survival.

Table 1: Distribution of recipient site for flap coverage

Area covered	No of patients	Complication
Lower third exposed tibia	11	0
Tendoachilles area	10	1
Medial malleolus	4	0
Dorsum of foot	7	0

DISCUSSION:

Patient with lower limb injury, all the option for reconstruction should be considered, the most reliable one which will provide the best functional outcome should be chosen. Various local flaps are available for leg reconstruction. Local flaps based on known perforators may be safely performed to cover the complex leg defects. Local flaps are advantageous as they offer a viable reconstructive option with shorter operative time and less complexity [5]. These flaps also provide like with like tissue reconstruction.

The lower limb is an anatomic area rich in perforators available for flap harvest. These perforators have been thoroughly mapped out with the help of extensive cadaveric dissection studies and angiographic investigations.

Within the leg, perforators originate from posterior tibial axis, anterior tibial axis and peroneal axis.

The Posterior tibial artery perforator flaps incorporates perforators arising in the intermuscular septum between the soleus and flexor digitorum longus [6].

The Peroneal artery perforator flap is comprised of perforators that emerge distally in the posterior lateral septum between the peroneus longus and soleus muscle and also the perforator (Ramus Perforans) [4] which is the vascular basis of the Lateral Supramalleolar flap that is concerned in our discussion.

Even if there is fibula fracture in distal one third the flap harvest is not difficult and this doesn't lead to any deleterious effect on eventual outcome of the surgery.

The flap is usually harvested till visualization of the first perforator arising of the peroneal axis so as to decrease time of procedure and the decreased chances of injury to the pedicle. To augment venous drainage of the flap the flap is harvested and transposed in peninsular fashion and post operative limb elevation is a routine practice. Limb immobilization is not a routine practice and the donor site is always covered by STSG with good bed contact and quilting without pressure dressing

CONCLUSION:

Lateral Supramalleolar flap is a simple and reliable fasciocutaneous flap for coverage of defects surrounding ankle, lower third leg and proximal foot. The ease of flap is due to no need for perforator level dissection like Posterior tibial artery perforator flap or subdermal dissection for Reverse sural artery flap.

The transposition of flap is easier because of relatively loose tissue surrounding the pedicle and the donor site morbidity is lesser.

We didn't encounter any donor site morbidity and the donor area is well accepted by patients.

The donor site was always covered with STSG and fixed well with quilting sutures and overlying dressing without tie over sutures and

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