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Original Research Paper

Plastic Surgery

RESURFACING OF ANKLE DEFECTS USING LOCO REGIONAL FLAPS; A PROSPECTIVE, OBSERVATIONAL STUDY

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ABSTRACT Acute and chronic wounds around ankle region are encountered quite frequently and mostly result from trauma, although malignancy and burn injury contribute to the number of cases considerably. These defects pose a unique challenge to the reconstructive surgeon because of paucity of local tissue and exposure of vital structures like tendons, bones and nerves. Although microvascular free flaps are ideal for such defects, they are technically demanding, time consuming, has a steep learning curve and costly. For this reason, the loco regional flaps still hold relevance in the armamentarium of a reconstructive surgeon.

In the present study we have looked into different loco regional flaps to cover such defects and observe their outcomes in terms of feasibility, complication rate, operating time and hospital stay.

We found the distally based sural artery flap to be a versatile, reliable, fast and easy alternative to cover such defects despite some acceptable shortcomings.

KEYWORDS : Lower limb, reconstructive surgery, flap, ankle defect

INTRODUCTION:

Skin and soft tissue defects around ankle region are encountered quite frequently and the majority of the cases results from trauma, tumor ablation and post burn defects. The involvement of multiple structures from bone, muscle, vessel, nerve to skin makes it difficult to achieve the goals of reconstruction where restoration of limb function, coverage for vital structures and satisfactory appearance is achieved. Reconstruction of the lower extremity requires the knowledge of all plastic surgical tools, such as skin grafting, local flaps, perforator flaps, muscle flaps, microvascular free flaps, and arterial, nerve, and bone repair.[1,2,3]

In the recent years, the management of lower extremity has evolved with numerous new techniques and innovations and thus extremities are salvaged as to being amputated in the past. Introduction of new ideas and methods for coverage like perforator flaps, propeller flaps, negative pressure wound therapy and increased knowledge for anatomy has led to successful management of lower extremity soft tissue and bone defects[10,11,12, 18,19]. Because of paucity of local skin & soft tissue and relatively poor vascular status of skin in this region, microvascular free flaps are considered ideal for coverage of such defects. However, this option may not be suitable in all the cases for various reasons like lack of experience in microvascular free flaps and logistics for microvascular free flaps may not be available at all the centres. Moreover, in some cases patients' medical condition may not permit such long operating hours and suitable recipient vessel may not be available in crush injuries. Recently, a good number of studies have shown promising results with some newer pedicle and perforator artery based flaps.[13,14,15]

In the present study we have looked into different loco regional flaps to cover such defects and observe their outcomes.

MATERIALS AND METHODS:

This prospective observational study was conducted in Plastic Surgery OPD and Plastic Surgery operating room, Medical College &Hospital, Kolkata, West Bengal, from January, 2016 to September, 2017 including 39 patients with ankle defect, who gave consent to be included in the study. Those patients having Peripheral vascular diseases, Varicose vein, Diabetes Mellitus and were older than 70 years of age were excluded. Consecutive sampling of all patients was done.

After inclusion, Plain radiographs of the ankle joint was done to rule out any skeletal defect. Resurfacing was planned according to the standard treatment protocol of the institution from the following options:

1. Reverse sural flap[4,5,6,16]: based on sural artery.
2. Lateral supramaleolar flap[17]: Based on arterial arcade of the ankle.
3. Posterior tibial artery perforator flap[7,8]: based on Posterior tibial artery perforators.
4. Medialis pedis skin flap: based on medial planter artery
5. Peroneal artery perforator flap[9]: based on peroneal artery perforators skin grafting was done as an adjunct wherever applicable. The choice of flap depended upon the site & size of the defect, availability and quality of the donor tissue and reach of the flap to cover the defect. However, there was no strict limitation of their use. A routine hand held ultra sound Doppler was used in all the cases to ensure the patency of the artery.

Patients were operated under general or regional anesthesia as per institutional protocol. Donor sites were closed primarily in cases of small defect and skin grafting was done in cases of large defect.

Post-operative flap monitoring were done by periodical clinical assessment and with the help of hand held Doppler, every 2 hours for the first 48 hours and then 6 hourly for next 3 days with preparation for possible secondary intervention as required.

Follow-up for early and late wound complications of both the flap and the donor site were noted. The follow-up schedule was bi-weekly for first 1 month then 2 monthly visits and then after 3 months.

Data was analyzed with appropriate/standard statistical methods.

Results and discussion

A total of 39 patients were included in the study. The defects resulted from trauma in 3/4th cases, others comprised of tumor and burn contracture release. Maximum number of cases had defects on the anterior aspect of ankle (41%), followed by posterior (28%) (Table 1). Most number of defects was covered with reverse sural flap followed by posterior tibial artery

perforator flap (Table 2). It was found that reverse sural flap was chosen for most of the anterior defects, whereas posterior defects were covered mostly with reverse sural flap and posterior tibial artery perforator flap for five cases each. Most of the lateral defects were covered with peroneal artery perforator flap (Table 3). Interestingly, the reverse sural flap was the only flap to cover defects of all four locations. Among the pedicled flaps the reverse sural flap took least operating time (mean= 135.83 min). Out of the 18 cases of reverse sural flap, 14 survived, either completely or managed by some minor procedures e.g. debridement & re-inset or secondary closure under local anaesthesia, but did not require a second flap surgery or grafting. Four cases showed necrosis of significant part of flap requiring a second surgery. Five out of 9 cases of Posterior tibial artery perforator flap survived (55.55%) where it was 50% in case of Peroneal artery perforator flap (3 out of 6 cases). Survival of square flaps and Medialis pedis flap were 100% each, but the number of cases for these two flaps seems to be too less (2 &1 respectively) to draw any conclusion. Since the reverse sural flap has been done in majority of cases and there are some other flaps which are too few in number to draw any conclusion of statistical significance, we have compared the outcome between the reverse sural flap and all other flaps combined. The reverse sural flap had survival rate of 77.78 % compared to all other flaps combined (57.14%) with p value of 0.000016 and the result is significant at $p < 0.01$ (Table 4). The mean post-operative hospital stay for reverse sural flaps was the lowest (11.72 days) (Table 5).

Table 1: Distribution of patients according to location of defects

Location	Number of cases	Percentage (%)
Anterior	16	41
Posterior	11	28
Medial	5	13
Lateral	7	18

Table 2: Distribution of patients according to flap used for coverage

Name	Number	Percentage (%)
Reverse Sural flap	18	46
Posterior tibial artery perforator flap	9	23
Peroneal artery perforator flap	6	15
Lateral Supramalleolar flap	3	8
Square flap	2	5
Medialis pedis flap	1	3

Table 3: Distribution of flaps according to location of defects

	Anterior	Posterior	Lateral	Medial
Reverse sural	10	5	1	2
PTAPF	2	5	0	2
PAPF	1	1	4	0
LSF	1	0	2	0
Square flap	2	0	0	0
Medialis pedis flap	0	0	0	1

Table 4: Comparison of flap survival between reverse sural and other flaps

Flap	Total	Survived	Percentage (%)
Reverse sural	18	14	77.78
Others	21	12	57.14

Table 5: Comparison of operating time between reverse sural and other flaps

Flap	Reverse sural	others
Operative time (min)	135.83	178.11
Mean hospital stay (days)	11.72	16.71

Figure 1: Post traumatic defect

Figure 2: Reverse sural flap elevated

Figure 3: flap inset

Figure 4: 3 months follow up

CONCLUSION:

The distally based Sural artery flap or reverse sural flap is a versatile, reliable and easy to perform flap that can be utilized to cover defects almost all around the ankle. The learning curve is short and no sophisticated instrument or set up is necessary. It has a low complication rate and operating time is reasonably short. The shortcomings include venous congestion, sensory loss over sural nerve territory and cosmetic deformity in some cases.

However, it can be very useful in situations where a microvascular free flap is not technically feasible, or the patient's condition doesn't permit prolonged surgery or the surgeon is not well conversant with such procedure.

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