



ROLE OF CROSS LEG FLAPS IN LEG AND FOOT RECONSTRUCTION: OUR EXPERIENCE

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ABSTRACT

Introduction: The management of compound trauma has always been challenging. Free flaps are the first choice when soft tissue cover cannot be provided by local flaps. When facilities for microsurgery are not available or certain factors preclude the microsurgical anastomosis or in cases of free flap failure, the cross leg flaps have a big role to play in lower limb reconstruction. We are presenting our retrospective study on 30 cases of distal leg and foot defects covered successfully by cross leg flaps. **Aims and objectives:** The aim of this study is to highlight the usefulness of cross leg flaps in lower limb reconstruction. **Material and methods:** A retrospective study was done on 30 patients from January 2015 to December 2021 who underwent perforator based fasciocutaneous cross leg flap for post traumatic soft tissue defects of distal leg and foot. The mechanism of injury, size and site of defect were recorded. All flaps were planned in reverse and limbs were immobilised with external fixator. Post-operative complications if any were noted. The patients were followed till the flap became stable. **Results:** The mechanism of injury was road side accident in 26 cases, machine injury in 2 cases and fall from height in 2 cases. 19 patients had soft tissue defect of distal 1/3rd of leg and 11 patients had foot defects. 26(86.67%) patients underwent distally based fasciocutaneous cross leg flap and 4(13.33%) patients underwent conventional anteromedially based fasciocutaneous flap. All flaps survived well. 2 patients had discharge and 1 had margin necrosis but were managed conservatively. **Conclusion:** The perforators based fasciocutaneous cross leg flaps provide an easy, simple, reliable and viable cover for distal leg and foot reconstruction.

KEYWORDS : Cross leg flap, leg defects, Reconstruction, Trauma

INTRODUCTION

The management of compound trauma of lower limb has always been challenging especially when the soft tissue defect cannot be managed by a local flap. The large size of the defect, unhealthy surrounding tissues, damaged perforators or the location of the defect where local flap cannot reach, necessitate the need of an alternative option. With the advancement in microsurgical techniques free flap has become the first choice for the defects not managed by local flaps. The plastic surgery department, where the facility of microsurgery does not exist, the cross leg flap is the only option. Even in a well-equipped microsurgical centre the cross leg flap is done when free flap fails or certain patient related factors preclude the use of free flap surgery. Performing microsurgery is a big challenge in less than 6 years old age group when compared with simpler cross leg flaps⁽¹⁾. Cross leg flap is an ultimate flap option when other coverage solutions fail.⁽²⁾ In spite of a relatively difficult postoperative period the cross leg flaps have always been a strong tool in the armamentarium of every plastic surgery unit with or without facilities of microsurgery.

We are presenting a retrospective analysis of 30 cross leg flaps done in cases of post traumatic soft tissue defects of distal leg and foot who were admitted in a tertiary care hospital in Punjab.

Aims and Objectives:

The aim of this study is to highlight the usefulness of cross leg flaps in lower limb reconstruction.

Material and Methods

After taking approval from the institutional ethical committee (Vide letter no GMC/IEC/22/SS/59 dated 19-03-2022), a retrospective analysis of 30 patients from a tertiary care hospital in Punjab who were operated in the department of plastic surgery for leg and foot defects from Jan 2015 to Dec 2021 was done. The record of the patients who had post traumatic soft tissue defects of the lower 1/3rd of the leg and foot or the exposed implant after undergoing open reduction and internal fixation under Orthopaedics department was

studied in detail. The mechanism of injury, site and size of the wound were recorded. The condition of the surrounding skin and nature of the exposed structures whether bone, tendons, neurovascular bundle or implant was also recorded. The patients had undergone routine investigations (CBC, RFTs, LFTs, and viral markers) which were recorded. The patients having defects restricted to lower 1/3rd of the leg and foot where ipsilateral fasciocutaneous flap coverage or skin grafting was not possible were included in the study. None of the patients included suffered from any medical problem, peripheral vascular disease or joint stiffness. All patients had been referred from orthopaedic department after initial management in the form of debridement and bone fixation. The implant where exposed was removed and the bone was stabilised with external fixator.

The type of the flap which was used from the opposite leg was either distally based retrograde fasciocutaneous flap or conventional anteromedially based cross leg flap. The pattern of cross leg flap to be used had been decided by location, size and dimensions of the defect. Operative technique used in these patients was studied. The surgery was done under spinal anaesthesia in all cases. The flaps were planned in reverse keeping in mind not only the adequate coverage of the defect but comfortable post-operative positioning of both the limbs without any tension of flap pedicle.

Distally based fasciocutaneous flaps were raised by the technique described by Bhattacharya and Reddy⁽³⁾. The anteromedially based cross leg flaps were raised by the conventional technique.⁽⁴⁾ In all the flaps the dissection was done in the subfascial plane. The distally based fasciocutaneous flaps were based on the distal perforators of the posterior Tibial artery keeping the base of flaps 8 cm above the medial malleolus. The length: breadth ratio upto 3:1 was easily achieved. In the anteromedial flaps the base was kept at least 3 cm from the medial margin of tibia. Midline of the calf was not crossed in either of the technique.

The donor area and the bridge segment were grafted with split skin graft before flap inset. The final position of limbs in

immobilisation and flap inset was confirmed. After the two limbs were immobilised with external fixator in all the patients, flap was sutured on three margins of the defect without any kinking or tension on the bridge segment.

At the end of three weeks the flaps were detached after a delay procedure on 18th day under local anaesthesia. The final flap inset was done after 72 hours under spinal anaesthesia. The bridge segment was returned back to the donor area. The sutures were removed on 10th day and all the patients were followed weekly. (Figures 1, 2, 3 & 4)

The record was maintained till the flap cover became stable. Any post-operative complication in the form of discharge, flap necrosis, graft loss and joint stiffness was recorded. The study was restricted to the outcome of cross leg flap only. The bone healing/fracture union was not the part of this study.



Figure 1. (a) A case of machine injury lower part of leg and ankle. (b) Distally based cross leg fasciocutaneous flap. Post-operative day 7 with both limbs immobilized by external fixator (c) Post- operative 4 weeks with final detachment and inset (d) Post – operative 6 weeks.



Figure 2: (a) A case of soft tissue defect foot with exposed fractured 1st metatarsal. (b) Conventional anteromedially based cross leg flap after detachment at 6 weeks.

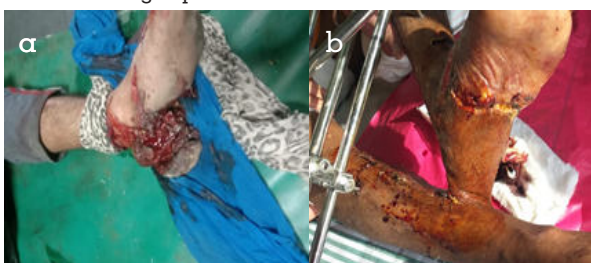


Figure 3:(a) A case of heel injury. (b) Distally based fasciocutaneous cross leg flap (after debridement) with both limbs immobilized with external fixator. Post- operative day 7. (c) Post-operative at 6 weeks.

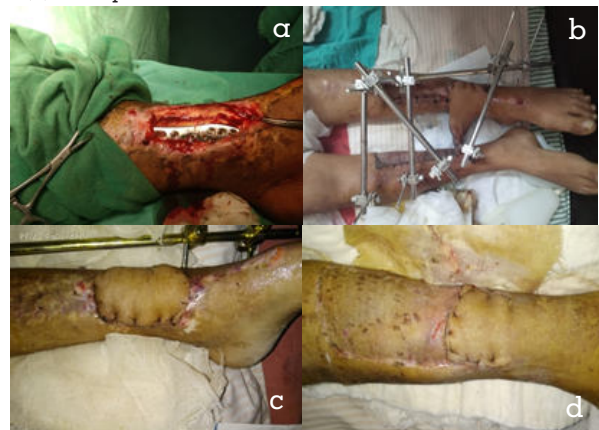


Figure 4:(a) A case of fracture both bones lower leg and exposed implant. (b) Distally based fasciocutaneous flap after implant was removed and bone stabilized with external fixator. Post- operative day 7 (c) Post- operative 4 weeks with detachment and final flap inset (d) Flap donor area.

RESULTS

Out of 30 patients, 28(93%) were males and 2(7%) were females. The age ranged from 5 to 60 years (mean 29.86 years). Mechanism of injury was road side accidents in 26 cases (86.66%) all of which were motor bike accidents, fall from height in 2 cases (6.67%) and machine injury in 2cases (6.67%) (Figure 5). 19 patients (63%) had soft tissue defect of lower 1/3rd of leg out of which the implant was exposed in 5 patients. All of these 19 patients had fracture of both bones of leg. 11 patients (37%) had defects of foot (Figure 6). 3 patients had exposed tendons of ankle and foot without fracture. The size of the defect requiring flap cover ranged from 7cm to 11 cm in length (mean 9 cm) to 4 cm to 10 in width (mean 8.3) (Figure 7). In 2 patients of foot injury the flap had to be combined with the skin graft because the defects were large involving dorsum of foot and heel. In these cases cross leg flap was done for the heel and skin grafting was done for foot dorsum. 26 (86.67%) patients underwent inferiorly based fasciocutaneous cross leg flap and 4(13.33%) patients underwent conventional anteromedially based cross leg flap (Figure 8). The operative time ranged from two hours to two and half hours with average of two hours and 15 minutes. The stay in the plastic surgery department ranged from 28 days to 32 days with an average of 30 days.

None of the patient had flap or graft loss. Marginal necrosis was seen in 1 patient and there was discharge from underneath the flap 2 patients. This was managed conservatively. All flaps survived well. All flaps healed by the end of 6 weeks and tissue cover became stable enough to undergo any orthopaedic procedure if required. Joint stiffness of the donor limb was seen in only one patient who was 60 years old but responded well to physiotherapy within 2 weeks. Pressure sore was not seen in any patient.

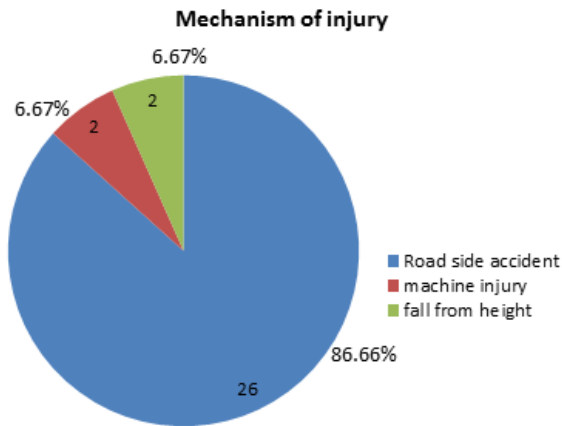


Fig 5: Distribution of patients with respect to the mechanism of injury

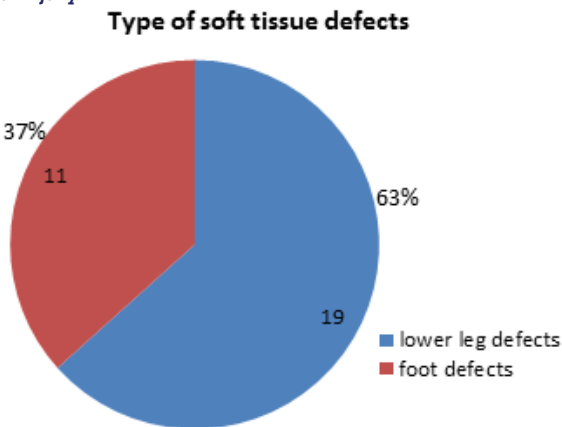


Fig 6: Distribution of patients with respect to the type of leg defects

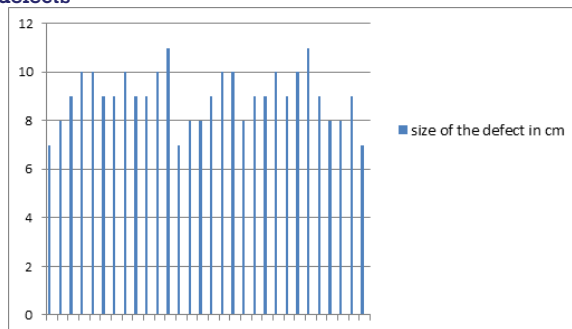


Figure 7: distribution of the patients with respect to the size of the defect

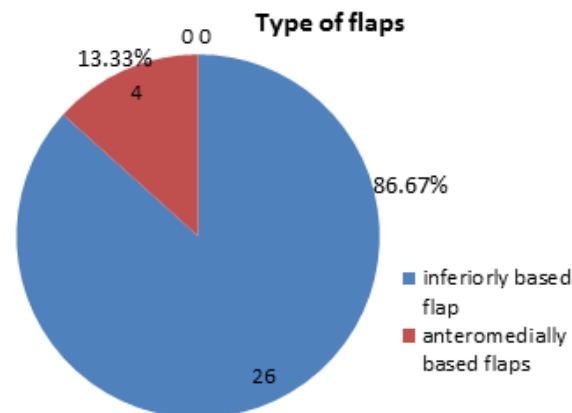


Figure 8: Distribution of patients with respect to the type of flaps

DISCUSSION

Cross leg flap was formally described in 1854 by Hamilton and has subsequently been used for the coverage of leg and foot defects in almost all possible situations.⁽⁵⁾ Before the introduction of fasciocutaneous flaps by Ponten, the cross leg flaps were mere skin flaps with limited length: breadth ratio 1:1. With inclusion of fascia, the length : breadth ratio can easily be 3:1 and by basing the flap on perforators further longer and narrower flap can be harvested making cross leg flap more versatile in its uses.⁽⁶⁾ This leads to more room between legs and avoids cross legging causing minimal discomfort to the patient.⁽³⁾ In our cases the length: breadth ratio was kept at 3:1.

We did distally based cross leg flap in 26 patients and conventional anteromedially based flap in 4 patients. The conventional cross leg flap though resulted in an uncomfortable limb position, was more suitable in these cases because of the location and dimensions of the defect. The defects where during planning it was found that length of the defect was more than the width of the distally based fasciocutaneous flaps possible to be planned, we preferred conventional cross leg flap based anteromedially. Mahajan et al in their study of 198 cases did conventional anteromedially based flap in 123 cases and the size and location being the decisive factors⁽¹⁾. We performed cross leg flap in 3 paediatric patients. In paediatric patients especially those less than 6 years, the cross leg flap is preferred even at the established microsurgery centres because of non-availability of large donor tissue for free flap.⁽¹⁾ Use of cross leg flaps in children, when indicated have been described simpler and associated with very less complications as compared to free flaps.⁽⁷⁾

We have used external fixator in order to immobilise the lower extremities. Use of external fixator has simplified immobilisation and post-operative care of patients who undergo cross leg flap.⁽⁸⁾ Use of external fixator by allowing more mobility reduces stiffness of joints and the chances of DVT.

We restricted our study to the defects of the lower 1/3rd of leg and foot utilising the calf tissue of the opposite leg basing the flaps on perforators of Posterior Tibial artery distally or anteromedially. In a person of average built the proximal calf provides up to 22x12 cm² tissue to cover large defects. The bridge segment if kept wide can be used to cover a part of the defect after detachment.⁽³⁾ The largest size of defect in our study was 11cm x10cm. The studies have shown that almost any area of leg can be covered by a cross leg flaps. They can be based on septocutaneous perforators⁽⁹⁾ and the entire leg skin can be utilized. They can be raised as a random pattern fasciocutaneous flaps⁽¹⁰⁾ distally or proximally based perforator flaps,⁽⁸⁾ perforator plus flaps,⁽¹¹⁾ myocutaneous flaps⁽¹²⁾ and sural artery flaps.⁽¹³⁾

In all of the cases almost 70% of primary inseting was achieved therefore delay was optional.⁽³⁾ In various studies the cross leg flaps have been divided without delay^(3,6and14) Lu et al in their study trained the flap and detached it after 11 days significantly decreasing the hospital stay.⁽¹⁵⁾ Mahajan et al in their series of 198 cases divided all the flaps after delay.⁽¹⁾ We had decided to be on safer side and had divided the flaps on 21st day after delay procedure. There was no major complication. Only minor complications of discharge (2 cases) and marginal necrosis (1 case) were there.

The flaps are little bulky initially but with passage of time they are settled and acceptable to the patient. There is no functional deficit of the donor area. The cross leg flaps are reliable, versatile and easy to execute, create minimum donor site morbidity and therefore have stood the test of time. Some authors have even recommended them as a first line treatment in preference to a free flap.⁽¹⁵⁾

The inconvenience and discomfort for three weeks due to limb immobilization and long hospital stay is nothing when the overall advantages are taken into consideration. All of our patients were informed and motivated before the surgery therefore they coped well with the limb immobilisation.

The value of microsurgery and free flaps cannot be underestimated and their supremacy is unchallenged in the reconstruction of complex defects of the lower limb but the facility of microsurgery is still not available in many plastic surgery units. The fascio-cutaneous perforator based cross leg flaps can be easily raised using only basic plastic surgery instruments. A larger expensive set up is not required. The combination of local flaps have been used to cover large leg defects as an alternative to free flap or cross leg flap but when the large defects involve lower 1/3rd of leg or foot even a combination of local flaps is not possible as well as all those cases of leg defects where surrounding tissues are unhealthy.⁽¹⁶⁾ Cross leg flap is the only answer for all these defects especially at the plastic surgery units having limited manpower and resources.

CONCLUSION

The perforator based fasciocutaneous cross leg flaps provide an easy, simple, reliable and viable cover for distal leg and foot reconstruction and secure an important place even in this era of microsurgery.

Conflict of interest: None

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