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Original Research Article

Role of large transverse fasciocutaneous cross leg flap (whole leg flap) in lower extremity salvage

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ABSTRACT

Background: Extensive soft tissue defects of leg, ankle and foot are challenge to reconstructive surgeons due to lack of local tissue. Microvascular flap coverage has become a standard line of treatment as large amount of tissue transfer is required. Large transverse fasciocutaneous cross leg flap remains an alternative for reconstruction of such extensive defects. We present our experience with this flap in 14 patients.
Methods: A total of 14 patients were operated for large transverse fasciocutaneous cross leg flap cover for defects over leg (9), ankle and foot (3) and sole (2). Age group ranged from 4 years to 50 years with 4 patients below 12 years of age. Male to female ratio was 5:2. Flaps were divided at 3weeks and final inset was done.
Results: 11 patients had complete flap survival. Two patients had marginal necrosis and one patient had superficial necrosis of proximal flap margin after flap division. One patient with partial skin graft loss at donor area required secondary skin grafting at the time of flap division. Average hospital stay was 34.5 days (range 10 - 50 days). The donor limb had no joint stiffness related to immobilisation and cosmetic outcome of flap and donor area was satisfactory.
Conclusions: large transverse fasciocutaneous cross leg flap is safe, technically easy and is associated with minimal donor site morbidity. It offers the possibility of limb salvage in difficult situations.

Keywords: Cross leg flap, Leg defects, Transverse fasciocutaneous flap, Whole leg flap

INTRODUCTION

The management of extensive large soft tissue defects in leg and foot in a traumatic lower extremity remain challenge to reconstructive surgeon due to poor availability of local tissue. In present scenario, free flaps are the first choice for soft tissue coverage in such patients. However, in some situations, free flap is not always possible due to non-availability of recipient vessels or absence of infrastructure or expertise for such supramajor surgeries. In such cases, cross leg flap still remains the best choice for limb salvage. Cross leg flap was first described by Hamilton in 1854.[1] Over a period of time many refinements have been described to improve the results of this flap.

Commonly, proximally or distally based longitudinal fasciocutaneous cross leg flaps are used in lower limb reconstruction based on the vascular territory of the vessels. Kohli JS et al described transversely based fasciocutaneous flap having almost whole of the skin from opposite leg based on septocutaneous perforators of posterior tibial artery encompassing a number of angiosomal territories.[2] This fasciocutaneous flap spans

over all the three compartments of leg. In this study, we present our experience with this flap in 14 patients.

METHODS

Patients operated by us at NKPSIMS and other private clinics during the period January 2013 to January 2017 were included in this study. A total of 14 patients underwent this flap procedure for defects over leg (9), foot and ankle (3) or sole (2). Male to female ratio was 5:2. Age group ranged from 4 years to 50 years with four patients with age <12 years. Early, clean cases were operated for flap transfer after initial debridement and skeletal stabilisation if required. Late, infected or wounds with gangrenous tissue were debrided sequentially till the wounds were ready for flap cover. Negative pressure wound therapy (VAC) was used in 5 cases who presented late with infected wounds and necrotic tissue. Interval between injuries to flap cover ranged from 3 days to 6 weeks.

Table 1: Master table.

Age and sex	Defect size in cm	Flap size in cm	Interval from injury to flap cover	Flap survival	Complications	Hospital stay* (days)	Follow up duration (months)
35/M	Whole tibia with fracture 22x12	25 x 17	6 week	complete	Partial graft loss donor area	40	24
45/M	Middle third leg 15 x 10	18 x 15	3 week	complete	nil	45	12
40/M	Upper third leg 14 x 10	14 x 12	4 week	Marginal necrosis	Pressure sore heel	36	6
12/F	Dorsum foot and ankle 11 x 8	15 x 12	5 days	Complete	nil	30	3
4/F	Dorsum foot 7 x 7	10 x 12	3 days	complete	nil	25	2
19/M	Sole 18 x 12	20 x 16	3 days	complete	Partial avulsion of flap resuturing	35	6
20/F	Middle third leg 15 x 10	18 x 15	4 week	complete	Nil	38	12
6/M	Mid foot amputation with sole 9 x 6	12 x 10	3 days	complete	nil	10	2
14/F	Dorsum foot and ankle 15 x 12	18 x 16	5 days	complete	nil	28	15
12/M	Middle and lower third leg 13 x 8	15 x 14	5 days	complete	nil	30	6
50/M	Middle and lower third leg 15 x 10	18 x 16	5 week	Superficial necrosis after division	Partial graft loss	50	12
55/M	Middle third leg 14 x 9	16 x 15	2 week	complete	Partial skin graft loss	45	6
32/M	Middle and lower third leg 17 x 13	20 x 17	3 week	Marginal necrosis	nil	40	8
40/M	Middle and lower third leg 20 x 12	22 x 16	1 week	complete	nil	32	2

*duration from referral to discharge from hospital

Skeletal stability was achieved in patients with fractures and exposed joints. The flap was divided after three weeks and any residual raw areas at donor site were grafted at that time. Four patients with fracture of tibia

subsequently required plating with bone grafting which was performed through incision at margin of flap after the flap was healed. Two patients required ilizarove procedure for segmental bone loss. Flaps tolerated the secondary procedures without any complications. At follow up patients were evaluated for functional and cosmetic outcome (Table 1).

Surgical technique

The wounds were sequentially debrided to make them healthy for flap cover. Skeletal stabilisation was done for fractures. VAC therapy was applied in cases where wounds were grossly infected or associated with necrotic tissue. Defect size was measured and flap planning was done in reverse. Flap was elevated under tourniquet. The incision was made lateral to anterior margin of tibia over the anterior compartment of leg. Width of flap can be taken from just below the head of fibula to 2-3 cm above lateral maleolus depending on the width of the flap required. After incising the deep fascia the flap was raised towards the lateral side in subfascial plane.

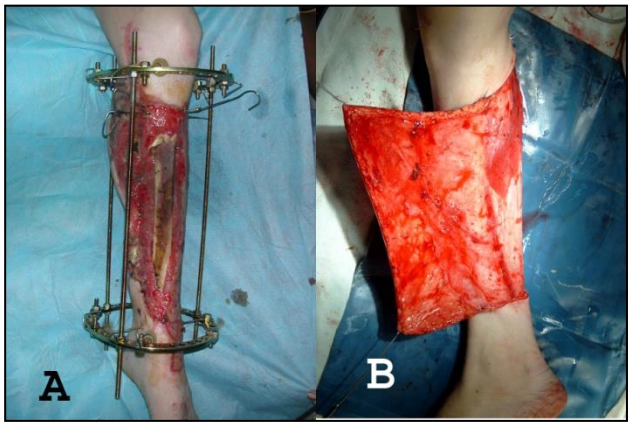

Figure 1: A) Preoperative leg defect; B) Flap harvested.

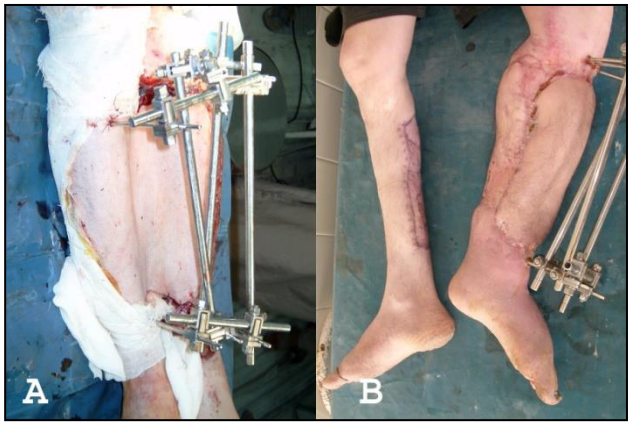

Figure 2: A) Flap sutured to defect and skin grafting over donor site; B) Early postoperative.

Continuing towards midline posteriorly, part of anterior and posterior peroneal septa were included so as to ensure the maximum number of anastomotic channels.[2] Flap was elevated till 2-3 cm before the medial border of tibia preserving the septocutaneous perforators of posterior tibial artery coursing between flexor digitorum longus and soleus to reach the deep fascia. The flap was sutured to the defect in opposite leg or foot. Raw areas, if any, in the injured limb were skin grafted. Donor area of flap was covered with skin graft. The limbs were immobilised at knee and foot/ankle using bulky padding and bandage. Some patients needed plaster of paris cast around knee for immobilization. The flap was divided after three weeks and any residual raw areas at donor site of flap were grafted at that time.

Figure 3: Post-operative result (2 years follow up).

RESULTS

A total of 14 patients underwent cross leg flap cover. The regions were leg defect with exposed tibia in 9, ankle and dorsum foot in 3 and sole in 2 patients. Six patients with clean wounds underwent early flap surgery within 5 days of injury.

The other 8 patients were operated after the interval of 1 week to 6 weeks because of either late referral or patient requiring multiple debridements for wound preparation. Negative pressure wound therapy (VAC) was used in 5 patients which ranged from 5 to 12 days. Average operating time for first stage of surgery (flap elevation and transfer to defect) was 1 hour 30 min and for second stage (flap division and final inset) was one hour. Average hospital stay from referral to discharge after flap division was 34.5 days (range 10 to 50 days). The flap was completely viable in 11 patients. Two patients had marginal necrosis while one patient had superficial epidermal necrosis. Necrosis occurred at proximal margin of flap after flap division. None of the patients had necrosis of distal margin of flap. One patient with sole reconstruction had partial avulsion of flap on 5th post-operative day which needed re-suturing of flap. Partial graft loss was noticed in 3 patients of whom only one patient required re-grafting at the time of flap division. One patient with leg defect developed pressure sore over posterior aspect of heel which healed spontaneously.

Cosmetic outcome was satisfactory in all patients. Donor area of skin graft healed well in all the patients. There was no knee or ankle joint stiffness related to immobilisation required for flap inset.

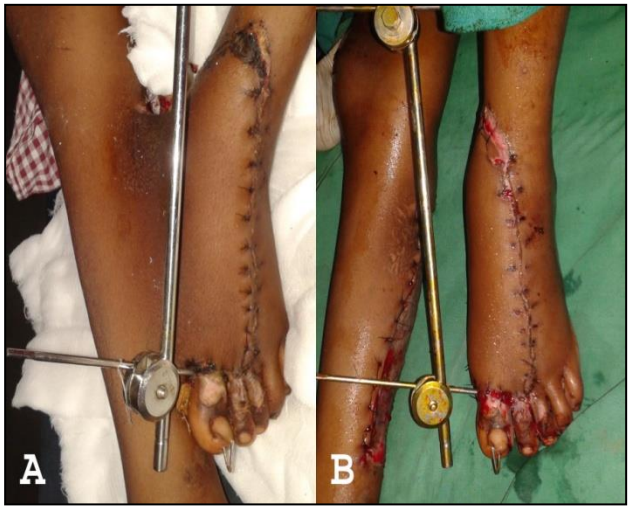

Figure 4: A) Cross leg flap for dorsum foot and ankle defect; B) Post flap division.

Figure 5: Post-operative result (15 months follow up).

Figure 6: A) preoperative leg defect; B) cross leg flap over defect.

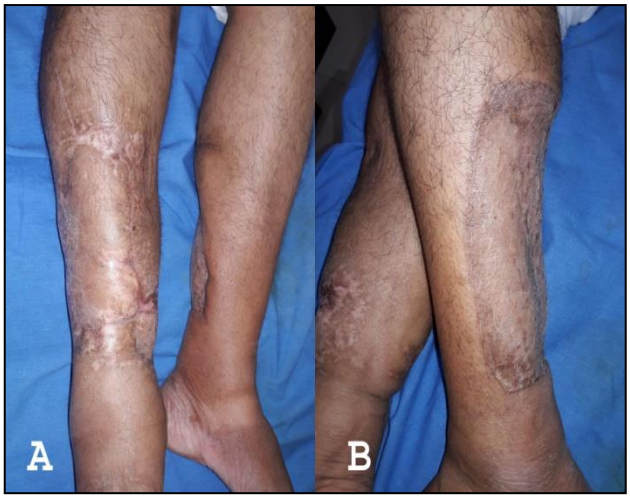

Figure 7: Post-operative 12 months (a) healed flap (b) healed donor area of flap.

DISCUSSION

Though microsurgical flap reconstruction has become well established modality for extensive soft tissue reconstruction in leg and foot region, cross leg flap still has its role in limb salvage in special situations. Cross leg flap was first described by Hamilton in 1854. Stark (1950) standardized the procedure and summarized its usefulness for lower extremities trauma.[1]

During last two decades, microvascular reconstruction for extensive lower limb injuries has become gold standard. However, free flaps cannot be used in patients with multiple level fractures and multiple vessel injury. Poor general condition of patient not permitting long duration surgery is another contraindication for microvascular surgery. Relative contraindications for free flap include electrical burns, delayed referral and post radiotherapy.[3] Microvascular surgery is technically difficult in paediatric patients. In these situations, large transverse fasciocutaneous cross leg flaps remain a good alternative for reconstruction and salvage of limb. Long operative hours, donor site morbidity and secondary surgery for debulking specially around ankle and heel are additional disadvantages with free tissue transfer.[4]

Fasciocutaneous flaps of the leg have been based on the vascular territories of one of the vessels and are usually oriented longitudinally. The whole leg flap is a transversely oriented flap based on the series of fasciocutaneous perforators of posterior tibial artery emerging on medial side of tibia between flexor digitorum superficialis and soleus muscle. Kohli JS et al stated that there is free connection between the capillary networks of extensor, peroneal and flexor compartments of leg due to interlinking of fascial perforators. Therefore, they advised that division of intermuscular septa during raising the flap must be as low as possible so that this link is not disturbed.[2]

In present study, average operating time for first stage of surgery (flap elevation and transfer to defect) was 1 hour 30 min and for second stage (flap division and final inset) was one hour. There was no major flap loss. Average hospital stay from referral to discharge after flap division was 34.5 days (range 10 to 50 days). Mohamed Shoeb, in their series of 135 cross leg flaps, reported no major flap loss. There was marginal necrosis in 4, superficial necrosis in 2 and flap dehiscence in 4 patients.[3] Bhattacharya and Reddy reported 12 cases using cross leg flaps for wound coverage and marginal necrosis within 2 cm occurred in two patients and no flap loss.[5] Lixuan Lu et al, in their series of 56 patients with cross leg flaps, reported flap loss in 2 patients (3.3%).[6] Both the patients were having history of diabetes and heavy smoking. Mean hospital stay in their series was 20±6.2 days (range 11 to 39 days). For microvascular coverage in lower limb, Serafin et al reported average operating time 8 hours and average hospital stay 36.2 days.[7] Wells et al reported that type III B tibial fractures carried a significantly higher risk of free flap failure than the other types of fracture, and stable, long term coverage of free flaps was achieved only in 78% patients.[8] Various centres report 90 - 92 % success rate for free flaps with higher failure rates in lower limb reconstruction.[9]

Cross leg flaps remain a useful tool for the reconstruction of difficult wounds of lower limb and offer possibility of salvaging of otherwise non reconstructable limbs.[10] Cross leg flap function as a nutrient flap for distal limb even though the pedicle has been divided.[11] The advantages of this flap are ease of dissection, versatility, shorter operating time, minimal donor site morbidity and replacement of like tissue with little or no need for revision.[12] It is easy to execute in paediatric patients where microvascular surgery is technically difficult. Thus, the medially based whole leg fasciocutaneous flap is really useful for large defects of the leg, dorsum of foot, ankle and sole; especially if microvascular facilities are not available or patient does not have suitable recipient vessels. The presence of broad base and long pedicle takes away most of the disadvantages of cross leg flap.[2] The donor leg has no long-term disability related to graft take or joint stiffness related to immobilisation.

CONCLUSION

Extensive soft tissue injury associated with fractures of lower extremity is common in clinical practice. Local flap reconstruction is not possible in view of extensive soft tissue loss and free flap may be difficult due to presence of vascular injury or non-availability of microvascular expertise. Large transverse fasciocutaneous leg flap remains a safe and reliable alternative for reconstruction of large leg, ankle and foot defects and salvage of limb. It is also a backup procedure in case microvascular flap fails. There is no long-term morbidity in the donor limb.

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