

Fasciocutaneous flaps in reconstruction of lower extremity: our experience

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Abstract

Objectives: The restoration of an intact covering is the primary surgical requisite following trauma of the lower extremity because deep healing can be no better than the surface covering. The present article is about our experience of lower limb reconstruction using fasciocutaneous flaps. **Methods:** 20 fasciocutaneous flaps in 15 males and 5 females were used for the wound / defect of lower limbs following trauma. **Results:** Fasciocutaneous flaps provided stable wound cover in 20 patients for leg wound/defect. 2 patients developed wound infection, 2 developed partial graft loss and 1 patient had partial flap necrosis. **Conclusion:** In the armamentarium of lower limb reconstruction fasciocutaneous flaps remains one of the useful methods of skin cover for leg wound/defects.

Key Words: Fasciocutaneous flap, lower limb reconstruction, leg defect/wound.

Lower limb trauma predominantly involves skin, muscle and bone. Infection doesn't loom large as hazard if the skin is not involved, but it has to be added to the list of possible complications when there is a break in the skin barrier, and this can be particularly serious when a fracture is part of injury. It is for this reason that the effective provision of skin cover becomes a matter of urgency, though its provision has to be coordinated with the management of the other damaged structures, each of which carries its own imperative. Before contemplating the use of fasciocutaneous flap, it would be essential to gauge the damage to the overall vascularity of the skin, which it is proposed to use as the flap¹.

The aim of the present study is to highlight the role of fasciocutaneous flap in the reconstructive armamentarium of lower limb wounds/defects.

Materials and methods

A total of 20 patients admitted during the period of sept' 2001 to May' 2004 with lower limb defect/wound with exposed bone (tibia/fibula) and/or fracture site (Type IIIb), following trauma were selected for the study. The study was conducted in the dept of Plastic Surgery, PGI, Chandigarh, India and Nepalgunj Medical College Teaching Hospital Kohalpur, Banke, Nepal.

Before embarking onto the procedure patients were carefully examined clinically. Basic investigations

(HB, TLC, DLC etc.) for fitness for surgery were done. X ray of the injured limb was done to rule out underlying fracture and osteomyelitis. Wound pus was sent for culture and sensitivity. Local and systemic antimicrobials were used according to culture and sensitivity to control the wound infection. Once the wound was free of infection, fasciocutaneous flap was planned. For planning the fasciocutaneous flap, leg defect was divided into upper 1/3, middle 1/3 & lower 1/3. Based on the septocutaneous perforator of posterior & anterior tibial artery and peroneal artery skin with fascia as fasciocutaneous flap was raised as superiorly (proximally) based, inferiorly (distally) based & transversally based fasciocutaneous flap from the same leg (ipsilateral) or from the opposite (contralateral) leg (cross leg flap). In the doubt of vascularity flap was delayed before actual raising and inseting the flap. Donor site from where the flap raised, was covered with skin graft harvested from the thigh. Graft and the limb were immobilized with Plaster of Paris Slab. Graft dressing was done on 7th post-op day and flap sutures were removed on 10th post-op day. In case of cross leg flap, flap division and inset was done on 21st day. Patients were followed up bi-weekly and all the complications were recorded.

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Results

Table 1. Distribution of cases with respect to age and sex groups

Age	Male	Female	Total	Percentage
< 20 years	2	1	3	15%
20-30 years	11	2	13	65%
>30 years	2	2	4	20%
Total	15	5	20	100%

Table2. Distribution of cases with respect to type of injury

Type of Injury	No. of patients	Percentage
Crush Injury	12	60%
Run over Injury	4	20%
Degloving Injury	2	10%
Mixed Injury	2	10%
Total	20	100%

Table 3. Distribution of cases with respect to the site of the defect/wound

Site of Defect/Wound	No. of patients	Percentage
Upper 1/3 leg	3	15%
Middle 1/3 leg	5	25%
Lower 1/3 leg	12	60%
Total	20	100%

Table 4. Distribution of cases with respect to associated fracture of Tibia/Fibula

Type of Bone Fractured	No. of patients	Percentage
Tibia Alone	3	15%
Fibula Alone	3	15%
Both Tibia & Fibula	12	60%
No fracture (Only exposed)	2	10%
Total	20	100%

Table 5. Distribution of cases with respect to size of the defect/wound

Size of the wound/defect	No. of patients	Percentage
< 5 cm	6	30%
5-10 cm	12	60%
>10 cm	2	10%
Total	20	100%

Table 6. Distribution of cases with respect to type of Fasciocutaneous Flap

Type of Flap	No. of patients	Percentage
Ipsilateral Superiorly based	3	15%
Ipsilateral Inferiorly based	13	65%
Ipsilateral Transverse based	2	10%
Contra lateral Transverse based	2	10%
Total	20	100%

Photograph – 1: Pre-operative view showing exposed bone (type-IIIb)



Photograph – 2: Pre-operative X-ray showing fracture of tibia and fibula (type-IIIb) of same patient



Photograph– 3: Intra-operative view after debridement with flap marking & planning



Photograph – 4: Post-operative view (day 15) showing transposed fasciocutaneous flap (based on perforator of posterior tibial artery) with donor area covered with SSG

Table 7. Distribution of cases with respect to complications

Complications	No. of patients	Percentage
Wound infection	2	10%
Partial Graft loss (<10%)	2	10%
Partial flap Necrosis	1	5%
Total	5	25%

In our study for upper and middle third leg defects superiorly based and for lower third leg defects inferiorly based fasciocutaneous flaps were done. Overall results were satisfactory as only one patient

developed partial flap necrosis which was managed conservatively. Other complications noted were: wound infection and partial graft loss.

Discussion

Following unique features of the lower limb makes the reconstruction different from that for upper extremity^{2, 3}

1. The lower extremity is almost always in a dependent position and more susceptible for deep vein thrombosis, venous stasis and oedema.
2. Increased incidence of peripheral vascular diseases.
3. The subcutaneous location of the tibia, the main weight bearing bone of the leg, poses unique problems in the fracture healing.

Before embarking on the actual reconstruction the defect should be assessed for soft tissue and any bony loss. The “Gustilo-Anderson: classification of open leg wounds^{4, 5} should be followed:

- Grade I - Wound less than 1cm long, no extensive soft tissue damage, and no crush injury.
- Grade II – Laceration greater than 1 cm, no extensive soft tissue damage, no flaps or skin avulsions and moderate skin crush.
- Grade III – Extensive soft tissue damage, including skin, muscle and neurovascular structure; highly contaminated. Further divided into 3 groups:

- a) Large skin laceration or avulsed skin flaps that nevertheless provide for adequate soft tissue coverage.

- b) Extensive loss of soft tissue with periosteal stripping and exposed bone; massive contamination, severe comminution and loss of bone.
- c) Open fracture associated with arterial injury requiring repair.

In our study only those patients were selected who had leg defect/wound with exposed bone and/or fracture (Type III b).

Fasciocutaneous flaps have been well investigated and tried out in the leg defect. As early as in 1901, Ponten⁷ reported the use of fasciocutaneous flaps in the lower leg. Ponten⁷ had shown that the flaps in the leg can measure 8 cm x 18 cm and can be raised in a single stage without necrosis if the deep fascia is included.

The blood supply to fasciocutaneous flaps can be from three sources⁸:

1. Musculocutaneous perforators: For example via gastrocnemius.
2. Axial vessels: Saphenous artery and superficial sural arteries.
3. Septocutaneous perforators: For each of anterior tibial, posterior tibial and Peroneal vessels.

Numerous authors^{8, 9} have attempted to study the location of septocutaneous perforators in relation to bony landmarks and leg lengths (Table 8).

Table 8. Location of septocutaneous perforators

Location of Perforator	Posterior tibial Artery Perforator (Distance from MM-Medial Malleolus)	Peroneal Artery (Distance from LM-Lateral Malleolus or FH-Fibula Head)	Anterior tibial Artery Perforator (Distance from origin of anterior tibial Artery)
N1	4.5 cm (MM)	4-10cm(LM)	2-4cm
N2	6.0cm(MM)	10-13cm(LM)	
N3	9-12cm(MM)	15-20cm(LM)	
N4	17-19cm(MM)	5-6cm(FH)	
N5	22-24cm(MM)		

Fasciocutaneous flap may be used locally in the ipsilateral limb or distally as a cross leg fasciocutaneous flap. Fasciocutaneous flap should be selected depending on the site of the leg defect:

- a) Upper third leg- Proximally (superiorly) based fasciocutaneous flaps based on the perforators of the post tibial, anterior tibial⁹ or peroneal artery.

- b) Middle third leg- Proximally (superiorly) based fasciocutaneous flaps based on the posterior tibial or Peroneal perforators or a distally (inferiorly) based fasciocutaneous flap based on the lower posterior Tibial perforator¹⁰.
- c) Lower third leg- Distally (inferiorly) based or cross leg fasciocutaneous flap may be

used based on lower perforators of the posterior tibial and Peroneal arteries^{10, 11}, reverse sural artery flap^{12, 13}, posterolateral Malleolar flap¹⁴.

In our study also, after dividing the leg defect into upper, middle & lower third, fasciocutaneous flaps were raised as superiorly (proximally) or distally (inferiorly) fasciocutaneous flap based on perforators of anterior tibial, posterior tibial artery and peroneal artery. In our study I (5%) patient had partial flap necrosis, which managed conservatively. 2(10%) patients developed wound infection and another 2(10%) patients developed partial graft loss.

Conclusion

Thus it can be concluded that in the armamentarium of lower limb reconstruction fasciocutaneous flaps remains one of the useful method of skin cover for leg wound/defects. It is worth emphasizing that these fasciocutaneous flaps are also 'superflaps' and should only be practiced by super specialist. The trainee should learn practical skills by their supervisors before attempting use of such flaps.

Acknowledgement

The authors would like to thank Mr. Gautam Verma for the computer typing, print layout etc. done for the present manuscript.

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16/11/2004

**To,
Chief Editor,
KUMJ,
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**Subject: “ORIGINAL ARTICLE: FASCIOCUTANEOUS FLAPS IN RECONSTRUCTION OF
LOWER EXTREMITY: OUR EXPERIENCE”**

Sir,

**Kindly acknowledge our revised (as per your comments in the e mail sent by you) article for the category of
'original article' for your KUMJ journal. I am sorry as desired by you (comment g) I could not get (On Line
& In our Library) Photograph of Angiotomes by Ponten. Please do the needful.**

Sincerely

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