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"Evaluation of Soft Tissue Coverage in Lower Limb Trauma"

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ABSTRACT:
Introduction: In recent years, Road Traffic Accidents (RTAs)have gained prominence as a pressing health concern that calls for a multi-pronged response. (1)Modern trauma care has come a long way, and severe injuries to the lower extremities can often be saved. Using cutaneous, musculocutaneous, and fasciocutaneous flaps based along certain dominant vascular pedicles has permitted the direct transfer of tissue that is less reliant on the blood supply of the wound bed. In addition to improving wound covering, they increase local blood flow.(3)Covering the back of the foot, heel, and lower third of the lower leg presents unique technical challenges.
Aim: The aim of the study is to evaluate soft tissue coverage in lower limb trauma
Materials and Methods: 50 patients patients of lower limb trauma with open wounds presenting to the Surgery OPD or Casualty of Subharti Hospital, referred from medical wards of Subharti hospital OR referred from outside diagnosed as case of avulsion injury between October 2020 to September 2022 were enrolled in the study.
Results:in our study we found that most of the patients presenting with leg trauma are male of middle age group. Farmers are most commonly affected. Skin graft and fasciocutaneous flap served the purpose of reconstruction in most of the cases. Most common complication was partial flap necrosis. Comorbidities like diabetes mellitus increase the risk of complications.
Conclusion: Our study may provide useful information and current reference for clinician to understand the evaluation of soft tissue coverage in lower limb trauma
Key words: lower limb trauma, open wounds, lower extremities, flaps, skin graft.

I. INTRODUCTION:

In recent years, Road Traffic Accidents (RTAs) have gained prominence as a pressing health concern that calls for a multi-pronged response. (1) Modern trauma care has come a long way, and severe injuries to the lower extremities can often be saved. Adequate soft tissue covering, which commonly involves the use of vascularized flaps, is a crucial part of any such therapy strategy. A flap is a unit of tissue that can be moved from a donor to a recipient site while still receiving its own blood supply. They serve a variety of objectives, including cosmetic enhancement and structural repair. Using cutaneous, musculocutaneous, and fasciocutaneous flaps based along certain dominant vascular pedicles has permitted the direct transfer of tissue that is less reliant on the blood supply of the wound bed. Covering the back of the foot, heel, and lower third of the lower leg presents unique technical challenges. Different flaps based on the sural artery, the lateral calcaneal artery, the extensor digitorum brevis muscle, and the abductor hallucis muscle have all been used to successfully cover the foot. (2)

AIMS: The aim of the study is to evaluate soft tissue coverage in lower limb trauma.

OBJECTIVES OF STUDY: In this time-bound interventional study, we intend:
1. To study the epidemiology of lower limb defect.
2. To study various methods of reconstruction of lower limb.
3. To study the limitations and outcome of various reconstructive methods.
4. To study the comorbid factors and associated complications in lower limb reconstruction

II. MATERIALS AND METHODS

Our study were Interventional, time bound study. All patients of lower limb trauma with open wounds presenting to the Surgery OPD or Casualty of Subharti Hospital, referred from medical wards of Subharti hospital OR referred from outside diagnosed as case of avulsion injury will be included in the study. Approval of Ethics Committee will be taken before starting the study. Details of cases will be recorded including history

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and wound characteristics. Routine investigations follow up with appearance of flap or SSG after day 0, 3, 7, 10 on dressings. Duration of study was October 2020 to September 2022.

III. RESULTS AND OBSERVATIONS

A total of 50 patients were selected as per the inclusion and exclusion criteria admitted in surgery ward, surgical ICU or attending surgery OPD in Subharti medical college to evaluate soft tissue coverage in lower limb trauma.

The percentage of male (84%) participants in our study was significantly larger than the percentage of female (16%) participants. In Indian culture, men typically take on the role of breadwinner. They have to travel for their jobs and operate heavy machinery, both of which increase their risk of injury. Similar findings were found in a study by **Gong X et al**.Maximum patients are in middle age group and are least among < 15 years of age group (Table-1). A study by **Vishal Patil et al**, road traffic accident is the most common cause of trauma of lower extremity (45-50%), and the most commonly affected age group is 11-40 years (60-65%) with a predominance of males (75-80%). [4]

Table 1- Age distribution among study subjects

Age Group(yr)	Frequency	% of Total
<15	5	10.0
16-30	13	26
31-45	13	26
46-60	11	22
>60	8	16

Lower limb trauma is most common among farmers (44%), according to the current study, whereas it is least common among working women (2%). Farmers are more likely to experience lower limb trauma because they work in fields or with heavy gear. In a similar study**vein, Janice A. Neil** surveyed a hundred farmers at a sizable farm in the south-Eastern United States and found that the combination of farming and chronic illness affecting the lower extremities poses significant risks to the lower extremities of people everywhere. On average, 4.86 injuries per farmer were reported. Farmers can avoid these by learning to identify and avoid potential foot dangers at work and by having their feet checked routinely. [5]

We found that split skin grafts (Table-2) account for the vast majority (54%) of reconstruction cases, followed by fasciocutaeous flaps (38%), muscle flaps with skin grafts (4%), and in very rare instances, cross leg flaps (4%).[6]

Reconstruction choices are presented as a spectrum on the reconstructive ladder. When possible, the quickest and least invasive method should be used to close the wound.

Table2 Reconstruction Types

Reconstruction	Frequency	% of Total
Fasciocutaneous FLAP	19	38
Muscle Flap+skin graft	2	4
Cross Leg FLAP	2	4
SSG	27	54

The majority of these deaths (62%), however, are caused by motor vehicle accidents, while only 2% are caused by injuries sustained in machinery. Local trauma, such as the weight of an object falling on a leg, accounted for 36% of all instances.

The Gong X et al. study, which analysed 36 patients, was quite comparable to ours in many respects. Of those patients, 12 had suffered injuries from machines, 22 from automobile accidents, 1 from an infection, and 1 from cold. Among both young people and farmers, lower limb trauma is more common due to the use of heavy gear. [7] Frequency of type of wound among study subjects. 47 patients had raw areas out of which 36% of them had exposed bones while 58% did not have exposed bone. Least prominent is traumatic amputation (2%) and degloving injury that is 4%

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Fig A- Cross leg flap with external fixator in situ in lower limb trauma, B- Fasciocutaneous flap cover in case of post traumatic amputation

The frequency of previous surgery associated(Table-3) among study subjects are ORIF with nailing and debridement (10% each) are the second most common associated surgeries after external fixator application (12%) among the patients with lower limb trauma. 42% cases are not associated with any previous surgery. Patients' ages, body mass indexes, smoking histories, and the number and severity of previous injuries to the affected limb were all shown to be important factors by **Daniel J Jordan et al**[8]

Table 3-Frequencies of type of wound

Type of wound	Frequency	% of Total
Traumatic amputation	1	2
Degloving injury	2	4
Raw area(bone exposed)	18	36
Raw area(bone not exposed)	29	58

Lower limb fractures are the most often reported secondary injury, occurring in 32% of cases. Therefore, the plastic surgeon and the orthopaedic team must collaborate for the patient's quickest and healthiest recovery.

These fractures may involve the entire lower leg, the tibia, or just the fibula. Soft-tissue injuries were the only reported injury in 46% of patients. Similarly, **Boopalan PR et al**[9] conducted a retrospective evaluation of the outcomes of lower limb local flaps performed by orthopaedic surgeons. Among the total of 105 patients, 64 were diagnosed with **Gustilo and Anderson** Type IIIB injuries. There were 39 patients who only suffered from soft tissue damage. [10]

We found in our study that split skin grafts account for the vast majority (54%) of reconstruction cases, followed by fasciocutaeous flaps (38%), muscle flaps with skin grafts (4%), and in very rare instances, cross leg flaps (4%). In a single-center retrospective cohort research and literature meta-analysis, **Christopher Tam Song et al**. This meta-analysis is the first to show that free perforator flaps in the lower extremity are just as reliable as non-perforator flaps, which has long been assumed. This does necessitate an understanding of the anatomical nuances, care when manipulating these flaps, and a willingness to go back and try again if necessary. [11]

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Fig - C- Partial flap necrosis- split skin graft with fasciocutaneous flap over left foot D-Split skin graft placed to cover raw area

Among the participants in our study (table-4), 6% experienced partial flap necrosis, and 2% experienced partial graft failure. Three of the patients had flap revision surgery, and the fourth had SSG.

Flap infections, flap loss, total flap-specific problems, and total recipient site complications were the major outcomes in a comparable study by **Charles W. Patterson et al.**[12]

However, **Michael Wagels and colleagues** conducted a literature assessment on lower limb reconstruction that covered both old and new material. In contrast to our findings, ancient studies focused on wound mortality, amputation mortality, and amputation rate. Lower extremity free flap transplants for soft tissue restoration have been found to have a greater complication rate than transplants in other locations [13]

Table 4- Frequencies of Complication

Complication	Counts	% of Total
None	46	92
Partial graft failure	1	2
Partial Flap necrosis	3	6

Kevin T. Jubbal et al. found that higher body mass index (BMI), an ASA classification of 3 or higher, longer hospital stays, and longer operational times were all linked to an increased risk of surgical complications [14]

IV. CONCLUSION

In our study we found that most of the patients presenting with leg trauma are male of middle age group. Farmers are most commonly affected due to occupational hazards and therefore occupational health education is crucial to prevent these injuries. Skin graft and fasciocutaneous flap served the purpose of reconstruction in most of the cases. Skin graft cannot be used in compound fracture leg whereas flap (fasciocutaneous and muscle graft) is used for these fractures. However, local fasciocutaneous flap has limitations if there is large soft tissue defect and local healthy tissue is unavailable and each flap has its reach where it can be applied to cover the defect. Most common complication was partial flap necrosis.

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