

Lower Extremity Post Traumatic Reconstruction, Etiology and Outcome

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ABSTRACT

Objective: To evaluate the management outcome of lower extremity trauma to preserve best possible function and appearance of affected limb. In an effort to avoid amputation of limb partial or complete, and also to avoid long term follow with open wound.

Study Design: Descriptive prospective study

Place and Duration of Study: This study was conducted at the Plastic Surgery Department of PIMS Hospital, Islamabad from January 2018 to December 2018.

Materials and Methods: This descriptive prospective study was conducted at PIMS Hospital plastic surgery department. Patients underwent multiple methods of reconstruction after complete assessment, stability; precise wound assessment, any neurovascular injury, wound infection, and fracture fixation were included. Evaluation of the reconstructive techniques in the term of co-morbidities, complications, with radiographic findings was done. Data was entered in self-made proforma.

Results: Total 30 patients were studied, their age range was from 8-45 years, 15 cases were with simple wound and 15 were with complex wound. Most frequent wounds were of distal 3rd. Most common trauma was of MVA 46.6%. Treatment employed skin grafting (15 patients) local fasciocutaneous flap (5 patients) Muscle flap (5 patients) reverse sural flaps (2 patients) delayed flaps (3 patients). According to the outcome 26.6% patients were extremely satisfied, 23.3% were very satisfied, 16.6% were moderately satisfied, 20% were slightly satisfied and 13.3% were not satisfied.

Conclusion: Different flap techniques show favorable result in preserving the function and appearance of the affected limbs. Skin grafting was the most common technique for simple injuries and in complex wounds.

Key Words: Lower extremity trauma Reconstruction Skin grafts Flap outcome.

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INTRODUCTION

Pakistan is developing country, uncontrolled traffic system, driver's negligence, using vehicle at the very young age had led traumatic injury into a serious problem. The leading cause of the preventable deaths is the road traffic accidents. Spectre of Injuries is insidiously taking a greater toll on human life and property worldwide. According to a survey every year 5 million people's dies because of injuries in which 25% are due to road accidents. The major causes of disability and deaths in the young adults are the motor cycle's injuries and also including 80% of the male fatalities.⁵ RTIs also exert a considerable economic burden on the developing countries.

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Pakistan is undergoing an epidemiological transition; it is facing the double burden of diseases. in the duration of 1960 to 1994 the increase in the injuries and other risk related factors are significantly increases, lifestyles of the peoples are also changes, development of the cities and also development in the rural areas, significant growth in the ratio of the motor vehicles.¹ The theme of our study is amputation, in which due to road traffic injuries is 55.9%, which is a major reason of disablement.² Injuries of lower limb reached a variety of range, and is usually caused by body of any physical damage to the body caused by violence or accident or fracture, with extensive loss of the skin and impaired tissue viability, associated with amputations of limbs or fingers, lacerations, crushing and exposures of noble tissues.³ The objective of the reconstruction of the lower extremity is to cover the defect and also it healed the wounds of the patients and to let them to restart their life again, ambulate, and go back to work while preventing amputation any exposed bone that is not covered by vascularized soft tissue is at risk for osteomyelitis, bone necrosis, and sepsis. Osteomyelitis is a major cause of amputation in patients after leg trauma or patients with systemic diseases, most commonly diabetes, and open wounds cause chronic pain, inability to ambulate, significant medical

expenses, and unemployment. Uncovered ligaments become dry and necrotic and uncovered veins are in danger for a break.⁴ In the course of the past 30 years, propels in reconstructive surgery, for example, the acknowledgment and utilization of pediculate fasciocutaneous/strong folds and the presentation of microsurgery have expanded the therapeutically arsenal of the plastic surgeon in the treatment of traumatic wounds.³ This study has been conducted to evaluate the management of lower extremity trauma to preserve best possible function and appearance of affected limb. In an effort to avoid amputation of limb partial or complete, and also to avoid long term follow with open wound.

MATERIALS AND METHODS

This was a descriptive prospective study and was carried out at plastic surgery department of PIMS Hospital from January 2018 to December 2018. All the patients those were admitted due to lower limb trauma, patients underwent orthopedics and then reconstructive treatment in plastic surgery department were included in the study. All the patients having uncontrolled diabetes, not agree to participation in the study and not comes in follow-up were excluded. 1st primary survey was done in ER, further management was done by orthopedics, immobilization, pop cast, internal or external fixation. Patients then referred to plastic surgery department for reconstructive surgery, where these underwent multiple methods of reconstruction after complete assessment of the patients, stability, precise wound assessment, any neurovascular injury, wound infection, and fracture fixation. Management of the lower limb injuries was done according to simple and complex wounds. The simple wounds were those wounds having no vital structure exposed, only skin and soft tissue involved. Partial and full thickness grafts were used. In complex wounds having tendon and bone exposed fasciocutaneous, muscle, delayed flap, reverse sural flap done. In Postoperative period patients were immobilized with cast, dressing open from 2-5 days. Stitches opened at 15 days. Outcome was assessed according to postoperative complications and patients satisfactions. All the data was recorded in the proforma. Data was analyzed by using SPSS version 20.

RESULTS

During the study period there were 30 patients with lower limb trauma, some having simple wound, and some with complex wound.

Mean age of the patients was 25.7 years with age range of 8 to 45 years. Males were found in majority 73.3% and females were 26.6%. Main cause of trauma was MVA 46.6%. The 2nd cause was at work place mostly the labors working on sites. Distal third, skin involved, Bone fracture and middle structures were mostly involved out of all patients. According to the

comorbidities, anemia was among 13.3% of the patients, diabetic patients were 10.0%, hypertensive was 6.6% and PAD was 3.3%. Tissue culture was positive among 53.3% of the patients. Table. 1

Table No.1: Descriptive Data of the Patients Having Lower Limb Trauma n=30

Parameters	Frequency	Percentage
Age groups		
8- 25 years	21	70.0%
26-45 years	09	30.0%
Gender		
Male	22	73.3%
Female	08	26.6%
Cause of injury		
MVA	14	46.6%
Work	06	20.0%
Run-over	04	13.3%
FAI	03	10.0%
Fall	03	10.0%
Structures Involved		
Proximal third	05	16.6%
Middle third	11	36.6%
Distal third	15	50.0%
Skin involved	15	50.0%
Soft tissue involved	08	26.6%
Tendon involved	07	23.3%
Bone fracture	14	46.6%
Bone exposed	10	33.3%
Comorbidities		
Diabetes	3	10%
Hypertension	2	6.6%
Anemia	4	13.3%
PAD	1	3.3%
Tissue culture		
Positive	16	53.3%
Negative	14	46.6%



Figure No.1: Partial thickness graft on 18-year-old patient

Table No2: Surgical Treatment According to Level of Injury and Structures Involved

Level of injury	Grafts	Fasciocutaneous flap	Muscle flap	Reverse sural flap	Delayed flap
Proximal third	4 (13.3%)	0	3(10%)	0	0
Middle third	3 (10%)	4 (13.3%)	2(6.6%)	0	0
Lower third	8(26.6%)	1 (3.3%)	0	2(6.6%)	3 (10%)

**Figure No.2: Gastrocnemius flap covering exposed tibi****Figure No.3: Reverse sural artery flap for heel coverage****Table No.3: Postoperative Complications and outcome n=30**

Complications	Frequency (%)
Hematoma	1(3.3%)
Skin necrosis	2(6.6%)
Graft rejection	2(6.6%)
Flap vascular compromise	3(10.0%)
Infection	5(16.6%)
Outcome	
Extremely satisfied	26.6%
Very satisfied	23.3%
Moderately satisfied	16.6%
Slightly satisfied	20%
Not satisfied	13.3%

Grafts and muscle flaps were used among 13.3% proximal third, 10% middle third and 26.6% lower third patients. Fasciocutaneous flaps were used in 13.3% patients of middle third and in one patients of lower third. Muscle flap was applied in 10% proximal third patients and two patients of middle third. Reverse sural flap was applied only in 2 patients of lower third and Delayed flap was used among three patients of lower third. Table.2

Flap vascular compromise and infection were the most common complications among 3(10.0%) and 5(16.6%) patients, followed by Skin necrosis 2(6.6%), Graft rejection 2(6.6%) and hematoma only one patient. Table.3

Functional outcome after operation was based on the movement with or without limitations. Many patients were having pain while walking but there was no limitation of movements. Some patients were having ever pain in reconstruction area causing limitations of moments. According to treatment and questions asked after during follow up 26.6% patients were extremely satisfied, 23.3% were very satisfied, 16.6% moderately satisfied, 20% were slightly satisfied and 13.3% were not satisfied. Table 3.

DISCUSSION

Lower limb trauma is the common preventable cause of death. A Pakistan is the developing country trauma is a serious threat in the young generation. In this study Mean age of 25.7 % victims of lower limb trauma were verified. Most common cause of trauma was MVA 46.6% and the 2nd cause at work place 20%. Lower appendage injury, with open high vitality delicate tissue wounds, is as often as possible experienced at injury focuses and frequently requires plastic surgery engagement. Open injuries have high rates of malunion and contamination, particularly when they include the tibia, and require emanant water system and debridement in the working space to expel devitalize delicate tissue and bone.^{4,5} Wounds are as often as possible left open and require recurrent debridement's.⁴ The basic purpose behind the reconstruction of the lower extremity injuries is to heal the wounds. When planning the reconstruction of the lower limb of the patients, the patients' satisfactory status of the patients should be paramount.⁵ Many studies showed earl coverage of the lower limb defects caused by trauma to

prevent amputation, infection (osteomyelitis), long stay at hospital, burden on the family member's unemployment due to open wound.

In this study patients of lower limb trauma of mean age 25.7 years and 73.3% male were affected. These findings were similar to the study of Debbarma S et al,¹² MACEDO JLS et al.³ Bhatti MA et al¹ also found 75% males and mean age 27.9 years for males and 29.7 years for females.

The study showed that 50% of the cases involving lower limb were middle third, with 46.6% tibia/fibula fracture and 33.3% exposed bone. Management was done according to the complexity of the wound. Preoperative assessment was done for comorbidities. As disused by reddy v ET al.⁵ in the development of a successful treatment plan a perfect surgery assessment of the patients with the lower extremity wound is important. Patient comorbidities, including diabetes, vascular disease, obesity, and nicotine use, diminish the likelihood of achieving a healed wound. In this study 13.3% of the patients had having anemia, 10% were having diabetes only one patient was having peripheral arterial disease 3.3%. Tissue culture was done to rule out the infection element and 53.3% of the patients were having tissue culture positive. 56.6% of the wound required debridement. Vac dressing was also applied in the process of wound preparation. Graft was applied in simple wounds having no vital structure exposed. 50% of the lower limb trauma was managed by partial or full thickness graft. Flap coverage was done in complex wounds having bone exposed. Basic principles of the "reconstructive ladder" are valid for lower extremity reconstruction, and every attempt should be made to match tissues with similar properties, consistencies, and functional capabilities. Treatment plans are devised based on specific tissue requirements, the surgeon's skill and preference, and available resources.⁶

We used the guideline already established in literature. Muscle flaps applied on the proximal and middle third of lower limb, gastrocnemius flap in proximal third 10% of the cases, and soleus flap in middle third of lower limb 6.6% of the cases, in Middle third lower limb trauma 13.3% of the cases fasciocutaneous flaps were done. In the distal third there was a challenge to cover the exposed bone. Before the advent of local fasciocutaneous flaps for distal-third leg injuries, free flaps were the main reconstructive tool. Recognition that the vascular plexus accompanying cutaneous sensory nerves can supply areas of overlying skin and soft tissue has allowed the development of many useful, axial-pattern fasciocutaneous flap.⁵ In our study we use 6.6% of reverse sural flap, 10% delayed flaps and 3.3% fasciocutaneous flaps in distal third. Because of late presentation and limitation of resources free flaps were not done. Attinger et al wrote a comprehensive review of the local flap options for ankle and foot reconstruction. Use of a delay procedure is suggested

before transferring some of the leg muscle flaps. Most are useful for only small defects, but a judicious selection avoids the need for free flap coverage in certain cases of foot and ankle defects.⁸ Other studies also stated that sural artery flap remains better alternative to free flaps in the lower third.⁹⁻¹¹

CONCLUSION

It was concluded that lower limb trauma caused by motor vehicle accidents commonly involved males. Different flap techniques show favorable result in preserving the function and appearance of the affected limbs. Skin grafting was the most common technique for simple injuries and in complex wounds. Almost patients were satisfied after treatment.

Author's Contribution:

Concept & Design of Study:	Abdul Khaliq
Drafting:	Zarish Daniel
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Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Bhatti MA, Ajaib MK, Masud TI, Ali M. Road traffic injuries in Pakistan: Challenges in estimation through routine hospital data. *J Ayub Med Coll Abbottabad* 2008;20(3):108-11.
2. Soomro N, Jalal S. Injuries increase the amputee burden at the prosthesis centre: a 2-year retrospective survey of amputees in a low-income setting. *Int J injury control safety promotion* 2013;20(1):94-8.
3. Macedo JLS Rosa SC, Botelho DL, Santos CPD, Queiroz Mnd, Gomes Tgacb. Lower extremity reconstruction: epidemiology, management and outcomes of patients of the Federal District North Wing Regional Hospital. *Revista do Colégio Brasileiro de Cirurgiões* 2017;44(1):9-16.
4. Parrett BM, Matros E, Pribaz JJ, Orgill DP. Lower extremity trauma: trends in the management of soft-tissue reconstruction of open tibia-fibula fractures. *Plastic Reconstructive Surg* 2006;117(4):1315-22.
5. Reddy V, Stevenson TR. MOC-PS (SM) CME article: lower extremity reconstruction. *Plastic Reconstructive Surg* 2008;121(4):1-7.
6. Soltanian H, Garcia RM, Hollenbeck ST. Current concepts in lower extremity reconstruction. *Plastic and Reconstructive surg* 2015;136(6):815e-29e.

7. Hallock GG. Utility of both muscle and fascia flaps in severe lower extremity trauma. J Trauma Acute Care Surg 2000;48(5):913-7.
8. Griffin JR, Thornton JF. Lower extremity reconstruction. SRPS 2009;11:1-59
9. Boopalan PR, Nithyananth M, Titus VT, Cherian VM, Jepegnanam TS. Experience of using local flaps to cover open lower limb injuries at an Indian trauma center. J Emerg Trauma and Shock 2011 Jul;4(3):325.
10. Foran MP, Schreiber J, Christy MR, Goldberg NH, Silverman RP. The modified reverse sural artery flap lower extremity reconstruction. J Trauma 2008; 64:139–43.
11. Follmar KE, Baccarani A, Baumeister SP, Levin LS, Erdmann D. The distally based sural flap. Plast Reconstr Surg 2007;119:138e–48e.
12. Debbarma S, Singh NS, Singh PI, Singh S N, Singh A M, Meena RK. Fasciocutaneous flap as a method of soft tissue reconstruction in open tibial fractures. J Med Soc 2013; 27:100-5.