



The Outcome of Coverage of Upper Tibia by Medial Gastromyocutaneous Flap

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Abstract

Background: The treatment of exposed bone of the upper tibia with local gastrocnemius flaps enables satisfactory results in covering exposed structures, favouring local vascularization and improving the healing. It offers the advantage of treatment in only one stage surgical procedure, an earlier recovery and reduced hospital stay. The standard methods for the reconstruction of soft tissue defects in the upper third of the leg include gastrocnemius but sometimes the wound is as such that gastrocnemyocutaneous is small for the wound and taking soleus for the rest of it is too much. Along with length gastrocnemyocutaneous also adorable coverage. To evaluate the outcome of coverage of exposed upper tibia by a medial gastrocnemyocutaneous flap. **Material & Methods:** This Quasi-experimental study is to be carried out in the National Institute of Traumatology and Orthopaedic Rehabilitation, Sher-E Bangla Nagar, Dhaka from July 2016 to June 2018. Detailed information was obtained in each case according to protocol. A complete history was taken either from the patient or accompanying attendants. A thorough clinical examination was done. Relevant investigation reports were collected. All the information was recorded in the data collection sheet. Collected data were classified, edited, coded and entered into the computer for statistical analysis by using SPSS-23. **Results:** The mean age was found 35.6113.2 years. The male-female ratio was 9:1. All (100.0%) patients were found with a proximal injury. The majority (75.0 %) of patients were found with a right leg injury and 5(25.0%) with a left leg injury. The majority (90.0 %) of patients were found complete survival, 1(5.0%) was partial necrosis and 1(5.0%) was marginal. necrosis. The mean duration of operation was found 125.0130.0 minutes with a range from 90 to 150 minutes. Two (10.0%) patients had flap infection, 2(10.0%) had recipient site infection, 1(5.0%) had donor site infection, 1(5.0%) had wound discharge and 1(5.0%) had superficial epidermolysis. Majority (85.0%) patients had excellent or good, 2(10.0%) had regular and 1(5.0%) had unsatisfactory. **Conclusions:** Gastromyocutaneous flap is still one of the best commodities to cover problem wounds in the upper leg, favouring the local blood supply and the improvement of the initial injury. Even in extensive complicated trauma, it is useable. Its harvest does not involve a sacrifice of major blood vessels and has no or little effect on gait.

Keywords:- Outcome, Coverage, Upper Tibia, Medial Gastromyocutaneous, Flap.

INTRODUCTION

Soft tissue defect of the upper leg with exposed bone, tendon, and osteosynthesis plates or total knee arthroplasty is a challenging therapeutic problem. The gastromyocutaneous flap is one option for coverage. This flap is probably one of the safest flaps, and relatively easy to dissect.^[1] Local muscle flaps since first reported by Stark in 1946 became an established procedure for coverage of soft tissue defects of the upper leg having exposed bone and tendons with or without infection. A greater understanding of the blood supply to the skin in recent years has led to the wider use of myocutaneous flaps on the lower limb. By its range of rotation, the gastrocnemius myocutaneous flap, as described by McCraw, Dibbell and Carraway (1977) is a suitable flap for providing skin cover for the upper tibia, the knee and the lower femur.^[2,3] Local myocutaneous flaps are an option for treatment in patients who are not willing or healthy enough to undergo free microvascular tissue transplantation and do not require microsurgical expertise. The proximal tibia has been defined as the part of the tibia that extends from the knee joint distally for 1.5 times the medial to lateral joint width.^[4] In this area, fractures are grossly heterogeneous and their prognosis depends on Intra-articular involvement, fracture comminution, condition of the soft tissue, osteoporosis, patient's age and co-morbidities.^[5] The gastrocnemius muscle flap, described by Ger (1971) as a muscle flap, is used in cases of exposed defects of the proximal tibia.^[6,7] This is a type (single vascular pedicle) according to the Mathes & Nahai (1981) classification with a dominant vessel in most patients the media sural artery.^[8] The medial gastrocnemius is greater than the lateral ones,

with a longer vascular pedicle and greater arc of rotation, reaching the knee easily and thus is more frequently used.^[9] The lateral head of the muscle, compared with the medial, is used more rarely in reconstructive surgery.^[10] Its restricted use is the size, limited area of rotation, and the risk of peroneal nerve palsy of the muscle, which might cause surgical procedure itself.^[11] The medial the gastrocnemius muscle, which is most often used, their disadvantages associated with the application of the gastrocnemius flap, such as deformation in the donor area but a study revealed no major complications occurred in the areas apart from the wound of the gastrocnemius favour its use as this surgical technique is relatively easy to perform and requires lesser time than free tissue transfers.^[12] Furthermore, the gastrocnemius flap provides better.^[13] All these beneficial effects are due to increased oxygen tension in the tissues, increased supply of leukocytes and phagocytic activity, and decreased bacterial counts in wounds reconstructed with muscle flaps.^[14] Nevertheless, there is little information found regarding the outcome of myocutaneous flap in our setting. So, the present study aimed to see the outcome of gastromyocutaneous flap coverage of upper tibial defects. The study aimed to evaluate the outcome of coverage of exposed upper tibia by a medial gastrocnemyocutanious flap.

MATERIAL AND METHODS

This Quasi-experimental study is to be carried out in the National Institute of Traumatology and Orthopaedic Rehabilitation, Sher-E Bangla Nagar, Dhaka from July 2016 to June 2018. Purposive sampling (nonrandom sampling) was followed considering the inclusion and exclusion criteria.



Inclusion criteria:

- Open fracture with the exposed upper third of the tibia.
- Soft tissue loss with the exposed upper third of the tibia (eg. infection, burn etc.).

Exclusion criteria:

- Neurovascular injury.
- Peripheral vascular disease.
- The patients needed a gastrosoleal flap.

Research methodology:

All patients with Upper tibial injury of both sexes in the Orthopaedic outpatient department of the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Sher-E-Bangla Nagar, Dhaka was selected as a case based on inclusion and exclusion criteria. Detailed history taking, physical examination and routine laboratory examinations were done. Based on history, examination and investigations the patient other than Upper tibial injury was excluded. The eligible patient was explained about the study and participated in the study after getting written informed consent. After fully explaining to the patients about the possible options of soft tissue coverage, they were operated on. Those patients whose soft tissue defects could have been repaired by other ways such as skin graft or skin flap were excluded from this study. The cause of soft tissue defect in all patients was a motor vehicle accident. Initially, in all of the patients, the tibia fracture was immobilized by an external fixator or cast. In the case of the soft-tissue defect, debridement was performed several times and finally, after the wound was

ready the flap was designed and performed. We used gastro myocutaneous flaps in soft tissue defects in the proximal third of the leg. For this purpose, under spinal or general anesthesia with a tourniquet on the upper thigh, a longitudinal incision was made in the medial border of the tibia and gastrocnemius was dissected and split in the middle. The myocutaneous flap separated as a proximally based flap with particular attention to the defect size. Then it was carried subcutaneously and sutured to the skin and the donor site of the flap was covered by skin grafting. In all cases, after the operation, the patient's limb was elevated. After 24 hours, the dressing was opened and flap viability was assessed by its colour, muscle tone, and the absence of necrosis. After 5 days of the operation, the flap site was rechecked, and the dressing was removed and covered by supratuli and antibiotic ointment. The bleeding and pain at the operation site were assessed and recorded. The patients were visited at 2, 4 and 6 weeks. The flap situation was recorded and assessed by skin colour and the presence or lack of necrosis and skin repair. Detailed information was obtained in each case according to protocol. A complete history was taken either from the patient or accompanying attendants. A thorough clinical examination was done. Relevant investigation reports were collected. All the information was recorded in the data collection sheet. Collected data were classified, edited, coded and entered into the computer for statistical analysis by using SPSS-23.

RESULTS

This observational study was conducted in the Department of Orthopaedic Surgery, National Institute of Traumatology and Orthopaedic



Rehabilitation, Dhaka, from July 2016 to June 2018. Adult patients (age >15 years) with Upper tibial injury due to acute, traumatic fractures of both sexes were included in this study. A total of 20 patients were enrolled in this study as per inclusion and exclusion criteria. [Table 1] shows the age distribution of the study patients; it was observed that more than one-third of 7(35.0%) patients belonged to age 31-40 years. The mean age was found 35.6 ± 13.2 years. The majority of 18(90.00%) patients were male and 2(10.00%) patients were female. The male-female ratio was 9:1. [Table 2] shows the occupational status of the patients, it was observed that the majority of 8(40.0%) patients were farmers, 6(30.0%) were businessmen, and 3(15.0%) were a student. Other results are depicted in the table. [Table 3]

shows the level of injury of the patients, it was observed that all 20(100.00%) patients were found with a proximal injury. [Figure 2] shows the location of injury of the patients, it was observed that the majority of 15(75.0%) patients were found with a right leg injury and 5(25.0%) with a left leg injury. [Figure 3] shows the flop outcome of the patients, it was observed that the majority of 18(90.0%) patients were found complete survival, 1(5.0%) was partial necrosis and 1(5.0%) was marginal necrosis. The mean duration of operation was found 125 ± 30.3 minutes with a range from 90 to 150 minutes. Figure 8 shows the outcomes of the patients, it was observed that the majority of 17(85.0%) patients had excellent or good, 2(10.0%) had regular and 1(5.0%) had unsatisfactory.

Table 1: Distribution of the study patients by age (n=20)

Age (Years)	Frequency	Percentage
≤20	2	10
21-30	4	20
31-40	7	35
41-50	5	25
>50	2	10
Mean±SD	35.6 ± 13.2	

Table 2: Distribution of the patients by occupational status (n=20)

Occupational status	Frequency	Percentage
Business	6	30
Service	1	5
Farmer	8	40
Student	3	15
Housewife	2	10

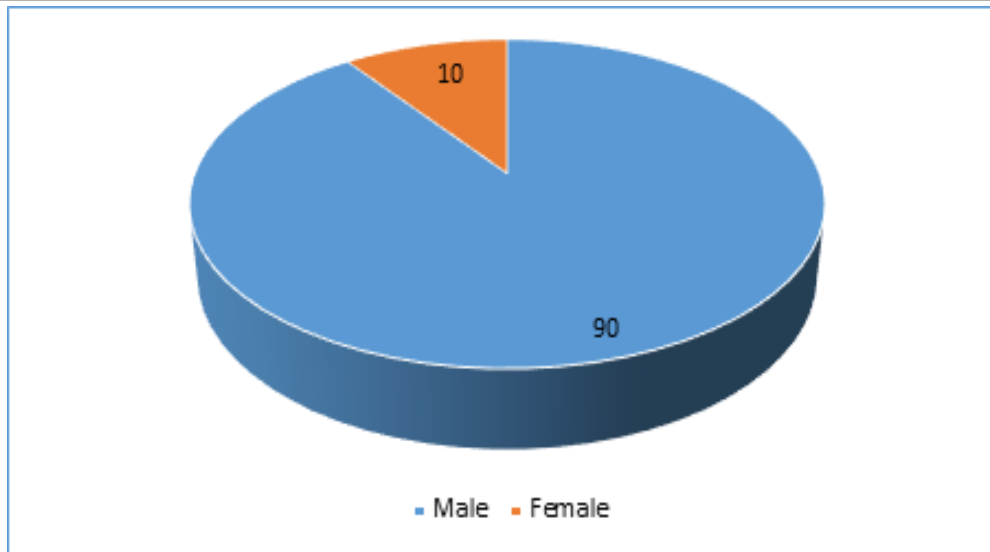


Figure 1: The pie chart shows the sex distribution of the patients.

Table 3: Distribution of the study by level of injury (n=20)

Level of injury	Frequency	Percentage
Proximal tibia	20	100
Middle	0	0
Distal	0	0

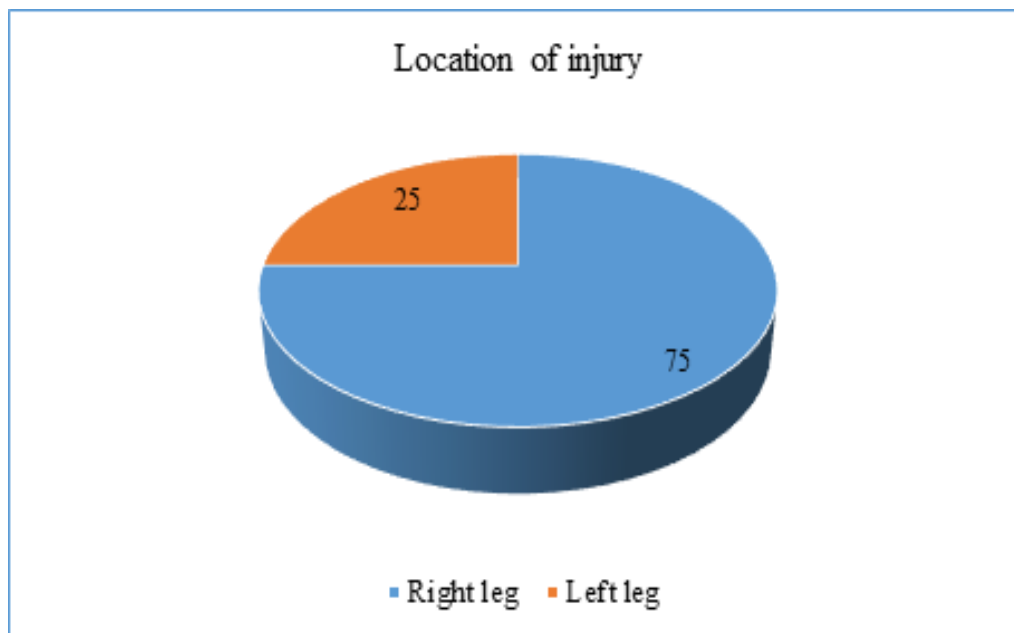


Figure 2: Pie chart showing the location of injury of the patients (n=20)

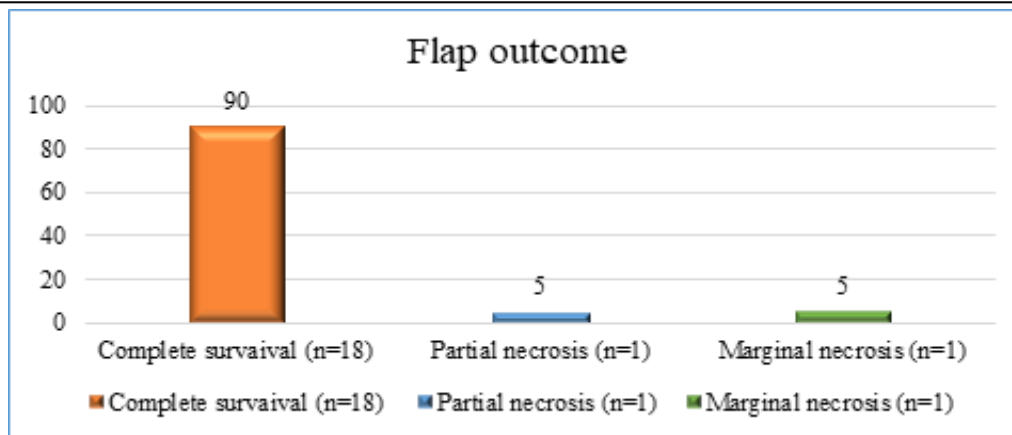


Figure 3: Bar diagram showing flap outcome of the patients (n=20)

Table 4: Distribution of the study by operative time (n=20)

	Mean±SD
Duration of operation (Minute)	125±30.0
Min-Max	91-150

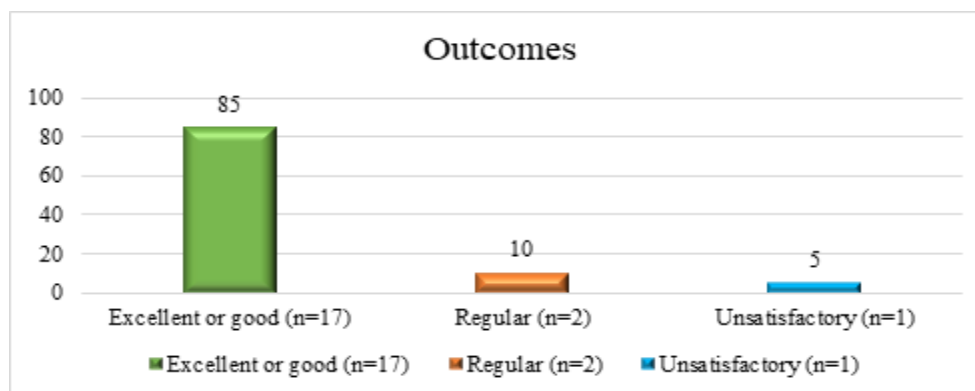


Figure 4: Bar diagram showing the outcome of the patients (n=20)



Figure 5: Digital photographs of postoperative follow-up.

DISCUSSION

In this present study, it was observed that more than one-third (35.0%) of patients belonged to age 31-40 years. The mean age was found 35.613.2 years. A similar observation was found in Shahzad et al.'s (2016) study they showed the mean age of 30.05 years and the age range of the study population was between 18 years to 55 years.^[15] Karbalaekhiani et al. (2015) study observed that the mean age was 32.13 years (14 to 65).^[16] D' Avila et al.'s (2014) study showed that ages ranging from 9 to 84 years with a mean of 41 years.^[17] Sayed (2009) study reported that aged from 28 to 72 (average 46.5) years.^[18] In this current study, it was observed that the majority (90.0 %) of patients were male and 2(10.0%) patients were female. The male-female ratio was 9:1. Shahzad et al. (2016) study was observed that among 139 patients 105 (75.5%) were males and 34 (24,5%) females.^[15] Karbalacikhani et al. (2015) study observed that 20 were male and 3 were female.^[16] D' Avila et al. (2014) study showed that the group included 53 patients, 42(79.24%) male and 11(20.75%) female.^[17] In this series, it was observed that all (100,0%) patients were found with a proximal injury. Karbalacikhani et al. (2015) study observed that eight patients had soft tissue defects in the proximal third, 7 in the middle third, and 8 in the distal third.^[16] D' Avila et al. (2014) the most frequently used muscle was the soleus, in 40 patients (75.5%), of whom 31 (58.5%) in injuries of the middle third of the leg, five (9.4%) in proximal third injuries and four (7.5%) in lesions of the distal third.^[17] The fasciocutaneous or fascial flaps of the distal pedicle can be a good alternative to the distal regions, although this requires good local

circulation.^[19,20] In this present study, it was observed that the majority (75.0%) of patients were found in a right leg injury and 5(25.0%) in a left leg injury. Karbalacikhani et al. (2015) study showed soft tissue defects were in the right leg of 13 patients and the left leg of 10 patients.^[16] In this study it was observed that the majority (90.0%) of patients were found complete survival, 1(5.0%) was partial necrosis and 1(5.0%) was marginal necrosis. A similar observation was found by Shahzad et al. (2016) showed 134(96.4%) patients were found complete survival, 1(0.7%) was partial necrosis and 4(2.9%) was marginal necrosis.^[15] Karbalaekhiani et al. (2015) study observed that distal leg wounds in 5 patients were without any partial or complete necrosis and were repaired on the fifth day with skin grafts. In this present study, it was observed that the mean duration of operation was found 125.0 30.0 minutes with a range from 90 to 150 minutes.^[16] Karbalaekhiani et al. (2015) study showed the average operation time was 92 minutes (75-125 minutes). [16] D' Avila et al. (2014) the time between the initial injury and muscle transposition ranged from 1 to 46) months, with an average of 6.8 months.^[17] In this study it was observed that 2 (10.0%) patients had flap infection, 2(10.0%) had recipient site infection, 1(5.0%) had donor site infection, and 1(5.0%) had wound discharge and 1(5.0%) had superficial epidermolysis. In their study. Shehjad et al. (2016) found infection of either donor site, flap or recipient site was a big complication.^[15] But in our study, it was easily encountered by proper antibiotics. Statistically, these results are better when compared to other studies, and complications in their study were mainly technical errors. inadequate

debridement, use of diseased and traumatized muscle and unrealistic objectives.^[21,22] In this series it was observed that the majority (85.0%) had excellent or good, 2(10.0%) had regular and 1(5.0%) had unsatisfactory. D' Avila et al. (2014) study showed that the short-term evaluation of the skin covering showed that 49 (92.5%) patients had an excellent or good outcome, three (5.6%), regular and one (1.9%) unsatisfactory.^[17] Another study by Jentzsch et al. (2013) showed excellent scores were achieved in four (33%) and good in eight (67%) patients.^[23]

Limitations of the study:

The study was conducted in a single hospital with small sample size. It was a non-randomized sampling method using a study with a short-term follow up. So, the results may not represent the whole community.

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CONCLUSIONS

Gastromyocutaneous flap is still one of the best commodities to cover problem wounds in the upper leg, favoring the local blood supply and the improvement of the initial injury. Even in extensive complicated trauma, it is useable. Its harvest does not involve the sacrifice of major blood vessels and has no or little effect on gait. For further study, the following recommendations are proposed: Soft tissue coverage of the upper third of the tibia by medial gastromyocutaneous flap was very much purposeful and can be done confidently. Large sample size should be taken for further prospective study with a long period of follow up. A long time randomized comparative study, a large series aiming at the merits and demerits of the medial gastromyocutaneous flap is recommended.

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