

Outcome of Gustilo Type Iiib Fracture Shaft of Tibia Treated with Definitive Fixation and Flap Coverage within Two Weeks

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ABSTRACT

Background: Traditionally Gustilo III B fractures are treated with external fixators initially, which leads to various complications. Purpose of this study was to evaluate the role of definitive management of Gustilo type III B tibia fractures with intramedullary nailing and flap coverage within two weeks on overall outcome.

Materials and methods: This was a single group clinical trial and was conducted in the Department of Orthopedic Surgery and of Burn and Plastic Surgery of CMCH for a period of two years. Twenty two patients were enrolled through inclusion and exclusion criteria. Patients were followed up for 15 months and overall outcomes were measured by Tucker criteria.

Results: In this study, Out of 22 patients, male (90.9%) were more than female (9.1%). According to post-operative complications, superficial infection was in 09 (40.9%) patients, deep infection was in 05 (22.7%) patients, 07 (35%) patients had delayed-union, 05 (25%) patients had non union and only 01 (05%) patient had knee stiffness. Mean \pm SD time for fracture union was 11.27 ± 2.738 months (Range: 8-15 months). Functional outcome at the final follow-up, 10 (50%) had excellent outcome. Good outcome was in 02 (10%), fair outcome was in 03 (15%) and poor outcome was in 05 (25%) patients respectively according to Tucker et al. criteria, Post-operative infection and non union showed statistical significance according to p value.

Conclusion: After 15 months of surgery, intramedullary nailing and flap coverage within two weeks is a feasible treatment option for Gustilo type III B tibia fractures providing excellent to good outcome, minimum fracture union time and low rate of complications.

Key words : Bone infection (Osteomyelitis); Flap; Internal fixation; Intramedullary interlocking nail; Union.

Introduction

In a recent study good outcome was observed by immediate and definitive management of Gustilo type III B tibia fractures with SIGN nailing and flap coverage.^{1,2} Tibial fractures are the most common long bone fracture, with approximately 25% being open.³ The majority of open tibial fractures result from a high velocity trauma, such as a road traffic accident. The treatment of open tibial fractures is complex because of lack of soft tissue coverage and blood supply of tibia.

The outcome of the management is depended upon severity of comminution, degree of soft tissue injury, initial fracture displacement, and fracture reduction.⁴ Among all long bone injuries, an open fracture of Tibia-fibula has been the most challenging problem.⁵ Tibial fractures are also associated with high risk of infection, nonunion and malunion. It is assumed to be contaminated and may threaten the survival of the injured leg and occasionally life.^{6,7} The combined treatment of both the soft tissue and skeletal components of severe open tibial fractures by dedicated teams has further improved outcomes and reduced morbidity.^{7,8} Usually Gustilo IIIB fracture shaft of tibia is stabilized initially by External Fixator which is later replaced by intramedullary interlocking tibial nail. This leads to two operations and prolonged hospital stay and also increased chance of pin tract infection. Patient also has to bear increased cost. By considering above circumstances, treatment of fracture tibia fibula Gustilo type IIIB by interlocking intramedullary nail and wound coverage by muscle or fasciocutaneous flap within two weeks of injury in Bangladesh may salvage a limb or reduce the prolonged sufferings to a minimum level, with this aspiration a clinical trial was done. To evaluate the overall outcome and safety of Gustilo Type IIIB fracture shaft of tibia treated with definitive fixation and flap coverage within two weeks.

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Materials and methods

A clinical trial was undertaken of 22 Gustilo III fracture shaft of Tibia presenting at Chittagong Medical College Hospital between March 2018 to February 2020. Study population was all patients admitted in CMCH with Gustilo iiiB fracture shaft of Tibia within the study period. After admission into the hospital, resuscitation of the patients was done according to ATLS guideline. Patient's injury and general condition was evaluated clinically and radiologically. First wound swab was taken after initial evaluation and sent for culture and sensitivity. Then wound was covered with a sterile dressing to prevent further contamination. The limb was then immobilized by temporary splintage. Parenteral antibiotic (Second generation cephalosporin (Cefuroxime) 1.5 gm followed by 750 mg 8 hourly and Amikacin 500 mg 12 hourly) was used for five days followed by oral Cefuroxime upto Operative procedure. Prophylaxis against tetanus was given depending on immunization. At first, wound debridement was done adequately. After debridement, tissue from at least three deep quadrants were sent for culture and sensitivity. Then wound irrigation was done with 9L of normal saline. Limb was then finally immobilized by long leg back slab. Wound swab was also taken at second debridement at 24-72 hrs after first debridement if there was slough present and was sent for culture and sensitivity. C reactive protein was done preoperatively for any evidence of infection. For length of nail, the distance from tibial tuberosity up to highest point of medial malleolus was measured on the patient's uninjured leg. For diameter of nail, measurement was taken at the narrowest part of medullary canal of tibia from 100% X-ray of lateral view with deduction of 10%. After adequate wound excision, type of flap was assessed according to size and location of wound. For wound coverage, in upper third of Tibia Gasrocnemius muscle pedicle flap, for middle third Soleal muscle pedicle flap and for distal third Sural fasciocutaneous or Soleal muscle pedicle flap was selected. Fixation of fracture was done first by intramedullary interlocking nail and augmented with autogenous cancellous bone graft if bone loss was found. Then wound coverage was done by muscle or fascio-cutaneous flap followed by split thickness skin graft in the same or different set up according to the availability of resources. Follow up was given at 6th month, 9th month, 12th month and at 15th month. Lost to follow up was, 1 patient at 2nd follow up and 1 patient at 4th follow up. Outcome was measured according to Tucker criteria¹. Bony union was identified according to radiological evaluation.

Results

- The gender distribution of the study patients depicts that, there was male predominance with male to female ratio about 10:1.
- Service was the mostly occurring occupation among the patients (32%) and driver were 23%.
- In the present study, out of 22 cases, maximum of the cases (81.9%) were due to RTA. Left tibia was affected in majority of the cases (54.5%). Muscle flap was 95.5% and fasciocutaneous flap was only 4.5% of the flap type.
- Out of 22 cases, during operation bone grafting was done in 12 (54.5%) patients.

Table I Post-operative complications (n=22)

Complications	n (%)	Total
Superficial Infection		
Yes	09 (40.9%)	22 (100%)
No	13 (59.1%)	
Deep infection		
Yes	05 (22.7%)	22(100%)
No	17 (77.3%)	
Delayed-union		
Yes	07 (35%)	20 (90.9%)+2(9.1%)
No	13 (65%)	Lost to follow up
Non-union		
Yes	05 (25%)	20 (90.9%)+2(9.1%)
No	15 (75%)	Lost to follow up
Knee stiffness		
Yes	01 (5%)	20 (90.9%)+2 (9.1%)
No	19 (95%)	Lost to follow up

Above table shows, out of 22 patients, superficial infection was in 09 (40.9%) patients, deep infection was in 05 (22.7%) patients, Excluding lost to follow up, out of 20 patients, 07(35%) patients had delayed-union, 05(25%) patients had non-union and only 01 (5%) patient had knee stiffness (Table I).

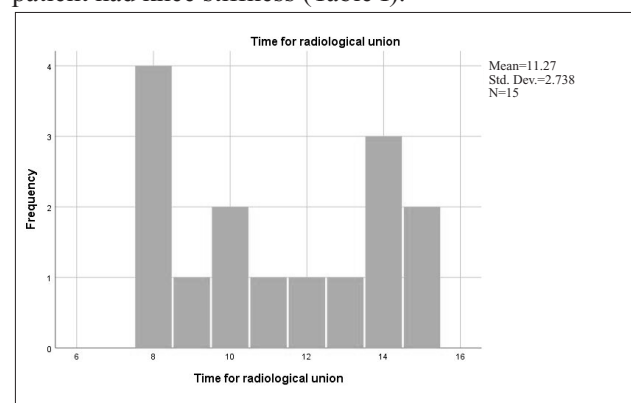


Figure 1 Time taken for fracture union (n=15)

Histogram shows that, out of 15 patients 04 (26.7%) patients needed 8 months for fracture union and 02 (13.3%) patient needed 15 months. Mean \pm SD time for fracture union was 11.27 ± 2.738 months (48.3 ± 11.73 weeks). Range of time taken for fracture union was 08-15 months (34.29-64.28 weeks).

After 6 months follow-up, all 20 (100%) patients had poor outcome, after 9 months follow-up, 15 (75%) patients had poor and 5 (25%) patients had excellent outcome, after 12 months follow-up, 11 (55%) patients had poor outcome and after 15 months final follow-up, excellent outcome was in 10 (50%) patients.

Discussion

The overall functional outcomes were categorized according to Tucker criteria as excellent, good, fair and poor. Concerning complications, out of 22 patients, superficial infection was in 09 (40.9%) patients, deep infection was in 05 (22.7%) patients, excluding lost to follow up 2 patients, 07 (35%) patients had delayed-union, 05 (25%) patients had non-union and only 01 (04.5%) patient had knee stiffness. This result corresponds with those of the, Jaque et al who had reported that deep infection was defined as purulent discharge from the tissue contiguous with the fracture site, which occurred in 7 cases, delayed union was seen in 5 cases and nonunion was seen in two fractures among 30 patients.^{9,10} A study showed that, among the 16 patients, there were 7 deep infections (43.75%), 5(31.25%) patients had non union.⁷ Another study showed 7(33%) superficial and 6(30%) deep infection in late (>72 hours) wound coverage group of 21 patients. In their series showed that superficial infection occurred in 1 case (8.33%) but no evidence of deep infection. 43 out of 119(36.1%) patients went into delayed or non union.^{1,11} Regarding union time at fracture site, out of 15 patients 04 (26.6%) patients needed 8 months for fracture union and 02 (13.3%) patient needed 15 months. Mean time for fracture union was 11.27 ± 2.738 months. Range of time taken for fracture union was 08-15 months. Average time required to achieve union of the tibia was 7.8 months (6-18months).⁹ The mean time to union was 43 weeks(14-94). When there was no bone loss, the mean time to union was 32 weeks, it was 45 weeks if there was bone loss.⁸ Average time taken for union was 8.4 month (5.3 to 30 months) in 113 out of 151 patients(74.8%)¹¹. Average time to radiographic union was 27 weeks.¹²

Limitations

Due to time constrain adequate sample size could not be included in the study.

Conclusion

With the development of new operative and aseptic techniques as well as a deeper understanding of the pathophysiology of fractures with soft tissue compromise, the results have been improved during the last decades. The careful handling of soft tissues with radical debridement of all necrotic tissues, the early coverage of soft tissue defects and the osseous stabilization by minimal invasive implants contribute to the avoidance of infections. It has been concluded that intramedullary nailing and exposed bone coverage by muscle flap is very important for prevention of infection, minimizing bone death simultaneously enhances bone healing and should be the method of choice if facilities and expertise permits. Radiological union time and complication associated with these procedures were minimum.

Recommendations

- Proper preoperative planning and good anatomical reduction is needed for less complication.
- Provide early surgical management for better functional outcome.
- As present study was done on a relatively small sample, a large scale study should be conducted to make the findings of the study generalized to reference population.
- A multicenter study could be undertaken to interpret such results better.

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Disclosure

There is no conflict of interest among the authors.

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