Section: Orthopaedics

Original Research Article

EVALUATION OF RESULT OF PRIMARY DEFINITIVE FIXATION IN BOTH BONE LEG OPEN FRACTURE WITH GANGA HOSPITAL OPEN INJURY SEVERITY SCORE 7 – 14

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Abstract

Background: The optimal methods for managing soft tissues and stabilising the skeleton when treating open fractures are a topic of continuous study in the field of orthopaedic traumatology. Due to the precarious blood supply and lack of soft tissue surrounding the tibia shaft, these fractures are prone to non-union and infections. Aggressive techniques were devised in an attempt to mitigate these issues, including early soft tissue covers, stability of the fractures, recurring soft tissue debridement, early intravenous antibiotics, and preventive bone grafting. **Materials and Methods:** A prospective study was conducted on 45 patients who underwent primary definitive fixation following extensive debridement and primary or secondary wound closure with suturing, split thickness skin grafting, and muscle pedicle flap, as needed, for open fractures of the ganga hospital injury severity score 7-14. Every patient had at least 1 years of follow-up. **Result:** We operated on just 8 patients (17.7%) in our research during the "golden period" (0-8 hours interval). Most of our patients (82.3%) had surgery after the golden period of intervention has elapsed. 14.5 hours was the average amount of time that passed before surgery began. Overall, 20% of cases had infection. Based on the functional scale of Katenjian and Shelton which was modified by Yokoyama et al5 66.7% of the subjects showed excellent outcome,17.8% showed good outcome,11.1% showed fair outcome and 4.4% showed poor outcome when evaluated for functional outcome at 1year of follow up. overall, 95.5% patients show bony union and rest 4.5% shows non-union at the end of the follow up. No case had any implant failure or any malunion. **Conclusion:** We conclude that, when compared to alternative methods, primary definitive fixation with early soft tissue coverage in open both bone leg fracture cases results in better biomechanical stability, earlier rehabilitations with better functional outcome, faster healing of soft tissue and bony defects, easier soft tissue coverage, and comparable rate of infection. Even with the advancements in modern medicine, open injuries to the lower extremities still have worse than ideal results, such as infection, non-union, and poor functional outcomes. Reducing the probability of negative outcomes can be accomplished more successfully with careful management of the injury and a comprehensive approach to the patient. Counselling and managing the patient's co-morbidities need special attention.

INTRODUCTION

The most common long bone fractures, accounting for 15% of all adult fractures, are tibial shaft fractures, which have a bimodal distribution according to age and sex, with young men and old women most frequently experiencing fractures.[1-7] More over half of tibial shaft fractures are caused by traffic accidents; the remaining cases are caused by simple falls, injuries sustained in sports, or direct trauma.[8] Among them, approximately 40% of all open fractures are open tibial fractures, which are

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commonly accompanied by severe harm to soft tissues such the skin, muscles, and neurovascular systems.[7]

The optimal methods for managing soft tissues and stabilising the skeleton when treating open fractures are a topic of continuous study in the field of orthopaedic traumatology.[1] Due to the precarious blood supply and lack of soft tissue surrounding the tibia shaft, these fractures are prone to non-union and infections.[1,2] Aggressive techniques were devised in an attempt to mitigate these issues, including early soft tissue covers, stability of the fractures, repeated soft tissue debridement, fast & judicious use of intravenous antibiotics, and preventive bone grafting.[3,4]

The characteristics of the fracture, the patient's age, general health, the condition of the soft tissue surrounding the fracture, and the patient's circulatory system all influence the available treatment choices for open tibial fractures. The preferred method must provide for the finest feasible bone alignment and length as well as the most functional restoration of the extremities. In instances of compound tibial fractures, the most important aspects that positively affect the prognosis are early intervention, preservation of soft tissue and circulation, infection control, superior surgical skill for fracture repair, and an effective rehabilitation plan. After restoring the integrity of the injured soft tissue, maintaining a stable repair of the fracture with little injury to the soft tissue can help improve the outcome in the treatment of complex tibial fractures, categorised according to the extent of soft tissue injury present9.Because external fixators are reasonably easy to employ and don't significantly affect the tibia's blood flow, they have been utilised extensively. These advantages, however, have been eclipsed by the possibility of non-union or malunion, the high prevalence of pin tract infections that result in refracture and intramedullary infection, and the difficulties in maintaining soft tissues.[10–13] Results of outcome studies generally support intra medullary nailing ; a recent meta-analysis showed that intramedullary nailing decreased malunion and the requirement for reoperation.[14]

Primary intramedullary nail or plate fixation is becoming more widely accepted as a treatment option for open tibia fractures in the western world. We may still debate this in the context of India. The aim of the present investigation was to evaluate the results of primary definitive fixation in open tibia fracture patients, particularly in the context of India.

MATERIALS AND METHODS

A prospective study was conducted on 45 patients who underwent primary definitive fixation following extensive debridement and primary or secondary wound closure with suturing, split thickness skin grafting, and muscle pedicle flap, as needed, for open fractures of the ganga hospital injury severity score 7-14. Every patient had at least 1 years of follow-up.

Inclusion Criteria

1. The patients who presented with open fractures of the tibia within the first 24 hours of being injured
2. Age group 18-65 years of either sex
3. Patients consenting to participate in study.

Exclusion Criteria

1. history of any previous bony surgery of the same tibia
2. age <18 years
3. a stiff knee
4. coagulation disorder
5. head injury or other associated life-threatening injuries
6. fracture with vascular injury
7. articular fracture
8. limb not amenable to limb salvage surgery with ganga hospital injury severity score >14
9. patients not fit for surgery
10. patients refusing surgery

Method: Study was conducted for 18 months starting from January 2023 to June of 2024.In the first three months study patients were recruited and all were followed up and evaluated up to 1 year. Last three month was for statical analysis, manuscript writing & its submission.

RESULTS

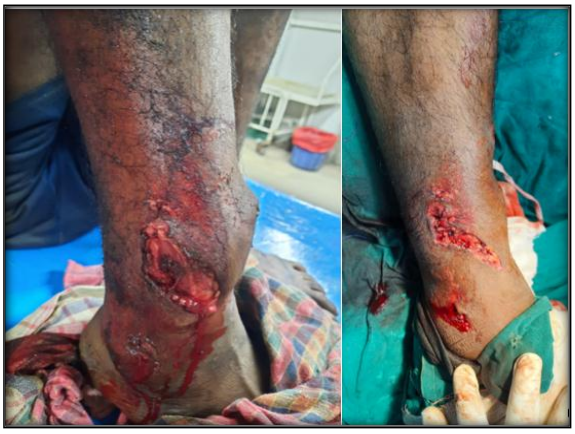

Figure 1: Contaminated wound is left Open for secondary suturing

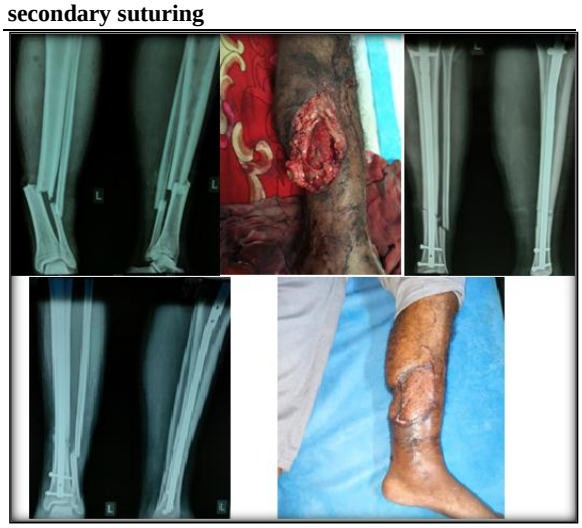

Figure 2: Case Of open both bone leg with GHOISS 12 for which primary nailing & secondary flap coverage done which showed bony union and good uptake of flap at 1 year of follow up.

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Table 1: The study shows that the mean age of the study participants is 32.5(±9.45) years. The age of study participants ranged from 18 years to 60 years of age. Of the 45 study participants, 80% were male (36) and the rest 20% were female (9).

Frequency of age	AGE
N	45
Missing	9
Mean	32.5
Standard deviation	9.45
Minimum	17
Maximum	60
Shapiro-Wilk W	0.932
Shapiro-Wilk p	0.011

Table 2: The mean time elapsed before proceeding to surgery post injury is 14.5(±5.34) hours, with the minimum and maximum duration being 6 hours and 28 hours respectively.

Interval between injury and surgery (in hours)	
N	45
Mean	14.5
Standard deviation	5.34
Minimum	6
Maximum	28
Shapiro-Wilk W	0.966
Shapiro-Wilk p	0.201

Table 3: Modified Katenjian score was evaluated at the end of 1 year of follow up for all the study subjects in which 66.6% of the subjects showed excellent outcomes, 17.8 % of the subjects showed good outcome and 11.1% of the study subjects showed fair outcome and 4.4 % showed poor outcome.

Functional outcome at 1 year of follow up	Counts	% of total	% cumulative
Excellent	30	66.7	66.7
Good	8	17.8	84.4
Fair	5	11.1	95.6
Poor	2	4.4	100

Table 4: frequency of other procedure: Out of all the 45 study subjects, 60% underwent primary closure, 8.9% underwent Split-thickness -skin grafting (STSG), 17.8% underwent secondary closure , 13.3% underwent flap coverage.

Other procedure	Counts	% of Total	Cumulative %
Primary closure	27	60%	60.0 %
STSG	4	8.9 %	68.9 %
Secondary Closure	8	17.8 %	86.7 %
FLAP	6	13.3 %	100.0 %

Table 5: frequency of deep infection at the end of 1 year of follow up: Out of all 45 study subjects, 80% did not show signs of infection initially whereas, only 20% showed signs of deep infection.

Deep infection at 1 year of follow up	Counts	% of Total	Cumulative %
NO	36	80%	80 %
YES	9	20%	100.0 %

Table 6: frequency of fracture union & non union

Fracture consolidation at 1 year of follow up	Counts	% of total	% cumulative
United	43	95.5	95.5
Non union	2	4.5	100

Table 7: functional result as per modified katenjian et al criteria

RESULTS	DESCRIPTION	% of outcome
Excellent (E)	Normal	66.7
Good (G)	Occasional pain Joint motion<75% normal Trivial sweeling Normal gait	17.8
Fair (F)	Pain with ordinary activity Joint motion<50% Slight lump	11.1
Poor (P)	Constant pain Joint motion<50% of normal Any visible deformity Limp, gait on cane or crutch	4.4

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DISCUSSION

The outcomes of primary open reduction and internal fixation (ORIF) treatments for open fractures have been documented by several traumatologists and orthopaedic surgeons. Primary ORIF is still a contentious topic, though. Stricter guidelines and more cautious postoperative care are required in immediate internal fixation to avoid infections and the ensuing non-union.

Only 8 instances (17.7%) in our research were operated on during the "golden period", which was between 0-8 hours of presentation. Most of our cases (82.3%) underwent surgery after the "golden period" of time. The average amount of time that passed before operation started was 14.5 hours. Because our institution is a tertiary referral facility where patients come after primary care outside of and, this might be the cause of the surgery's delay. Mishandled & delayed treatment of these high velocity type III injuries (Ganga hospital injury severity score 7–14) with severe tissue injury and contamination exacerbates subsequent worsening of bacterial colonization and persistent deep infection. Evaluation of the frequency of complications in these open fractures requiring primary fixation was one of the study's objectives. Even with a thorough debridement and a sufficient Overall, 20% of cases had infection. All these infections were type III open fractures, with a median ganga hospital injury severity score of 8 and an inter quartile range of 2.0 for each participant in our research. One observation of our study was that despite having low grade infection few of the cases have ultimately shown to be united [Figure 3] at the end of the follow up.

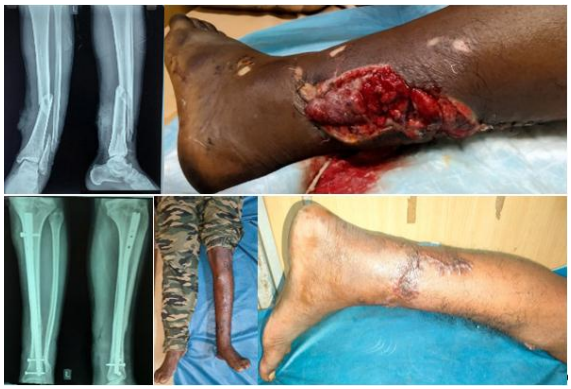

Figure 3: Case Of open both bone leg with ganga hospital injury severity score 10 for which primary nailing was done showed good consolidation at fracture site despite of having discharge with granulation tissue around fracture site

In 60% of instances, we were able to close the wound completely; in 8.9% of cases, split thickness skin grafting (STSG) was used; in 17.8% of cases, secondary closure was used [Figure 1] and in 13.3% of cases, flap covering was used. These outcomes were like those of Yokoyama et al,[5] who reported 29.8% of patients requiring secondary closures using split skin grafts or flaps and 70.2% of cases requiring effective primary closures. Since the afflicted legs were not encircled by external fixator frames, doing soft tissue treatments was simpler for us. Overall, 95.5% patients show bony union and rest 4.5% patients show non-union at the end of the follow up.

Based on the functional scale of Katenjian and Shelton,[15] [Table 7] which was modified by Yokoyama et al,[5] 66.7% of the subjects showed excellent outcome, 17.8% showed good outcome, 11.1% showed fair outcome and 4.4% showed poor outcome when evaluated for functional outcome at 1year of follow up.

The primary variables affecting the prognosis of open tibial fractures after high-energy trauma are the degree of soft tissue damage, the degree of contamination, the fracture pattern, and the degree of comminution. Any surgical technique, including screw or plate fixation, might further devitalize the local tissues that are already badly injured. So, it is crucial to avoid such surgical procedures in order to promote healing of tibial fractures and prevent infection.

Because it was so adaptable, the external fixator had seen a lot of use in the past. It does, however, come with a significant risk of pin tract infections (16%), necessitating a further definitive surgery. Therefore, it is not economical.[13]

CONCLUSION

We conclude that, when compared to alternative methods, primary definitive fixation with early soft tissue coverage in open both bone leg fracture cases result in better biomechanical stability, earlier rehabilitations with better functional outcome, faster healing of soft tissue and bony defects, easier soft tissue coverage, and comparable rate of infection. Even with the advancements in modern medicine, open injuries to the lower extremities still have worse than ideal results, such as infection, non-union, and poor functional outcomes. Reducing the probability of negative outcomes can be accomplished more successfully with careful management of the injury and a comprehensive approach to the patient. Counselling and managing the patient's co-morbidities also need special attention.

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