

ORIGINAL RESEARCH

To evaluate the results of primary stabilization of compound fracture both bone leg with flexible nail along with external fixator

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ABSTRACT

Background: The tibial shaft is one of the most common sites of open fractures. The present study was to evaluate the results of primary stabilization of compound fracture both bone leg with flexible nail along with external fixator.

Materials & Methods: 25 patients with compound fractures of both bone leg were included. All the cases were treated at department of Orthopaedics in Guru Nanak Dev Hospital, attached Govt. Medical College, Amritsar and were followed for about 9 months. Evaluation of patients in terms of age/sex/mode of trauma was done. Musculoskeletal examination of patient was performed to rule out associated fractures. Stabilization of patient with intravenous fluids, oxygen and blood transfusion as and when required. Assessment of injured limb as regards to extent of wound, soft tissue injuries and neurovascular status was done. Depending upon the soft tissue injury, grading of the compound fracture according to Gustilo and Anderson Classification was done. Antiseptic dressing and primary immobilization of involved limb by POP Back splint was done.

Results: Age group 20-30 years had 4 (16%), 31-40 years had 9 (36%), 41-50 years had 7 (28%) and 51-60 years had 5 (20%) patients. The Mean± SD age was 41.0±4.5 years. Out of 25 patients, males comprise 17 (68%) and females 8 (32%). The mean± SD injury to surgery time was 3.12± 0.8 hours. Right side was involved in 14 and left in 11. Diabetes and hypertension was seen in 3 each. In 16 (64%) cases, the mode of injury was RTA, in 5 (20%) was fall and in 4 (16%) was others. The difference was significant (P< 0.05). The mean duration of hospital stay was 5.08± 0.7 days, time to union was 22.1± 3.5 weeks, time to return to work was 22.5±4.8 weeks. Varus/valgus angulation was 0.92± 0.04 degrees, antero-posterior angulation was 1.4± 0.08 degrees and limb length discrepancy was 2.08±0.9 mm. Gait following treatment was normal in 23 and mild limp was seen in 2. 23 were able to squat and 2 did not. 23 were able to run and 2 did not. At 4 weeks, final functional outcome was good in 3 and fair in 22 patients. At 8 weeks, good in 9, fair in 16. At 12 weeks, good in 23 and fair in 2 patients. At 6 months, excellent in 2 and good in 23 patients and at 9 months, excellent in 22, good in 2 and poor in 1 patient. The difference found to be significant (P< 0.05). Complications noted were neurovascular involvement in 2 (8%), infection in 3 (12%) and shortening in 1 (4%) patient.

Conclusion: Compound fractures of both bone leg are quite common. Traditional treatment options for compound fractures of both bone leg are antegrade insertion of elastic intramedullary nails, open reduction plate fixation, and external fixator fixation. Primary stabilization with flexible nail along with external fixator has a definite role in the management of compound fracture both bone leg. The technique offered better outcome with lesser post-operative complications.

Key words: external fixator, flexible nail, bone leg.

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Introduction

The tibial shaft is one of the most common sites of open fractures. Approximately 63% open fractures are involving tibia.¹Tibial plateau of knee joint is a major weight-bearing surface within the largest and most kinematically complex joint in the human body.¹ Fractures occur as a result of a combination of an axial loading force and a coronal plane (varus/valgus) moment leading to articular shear and depression and mechanical axis malalignment. The position of knee

flexion at the time of trauma dictates the fracture configuration.² With the increasing number of motor vehicle accidents, tibial fractures have become common, particularly with two wheelers (motor bike) accidents. Many problems arise when tibial fractures are associated with soft tissue trauma. Soft tissue trauma is directly proportional to the energy dissipated in the collision during accident. Associated soft tissue trauma invites many complications such as non-union, delayed union and infection etc.³ Earlier the surgeons

were very much reluctant to use intramedullary implants in open fractures of the tibia for a long time as remains of the medullary canal is theoretically considered to cause the damage to the endosteal blood supply, which may thereby increase the risks of deep infection and non-union. It has, therefore, been suggested that insertion of nails without reaming is safer. Closed nailing involves least disturbance of soft tissue, fracture hematoma and natural process of bone healing as compared to other forms of internal fixation.⁴ The use of external fixator has been popular since many years and it continues to be used for severe open fractures in the belief that the incidence of infection is less, as there is no metal implant across the fracture site and that the technique is associated with less vascular damage in tibia that are already compromised, but these advantages have been outweighed by the high incidence of pin-track infection, difficulties relating to soft-tissue management and the potential for malunion.^{5,6} The present study was to evaluate the results of primary stabilization of compound fracture both bone leg with flexible nail along with external fixator.

Materials & Methods

In this study 25 patients with compound fractures of both bone leg were included. All the cases were treated at department of Orthopaedics in Guru Nanak Dev Hospital, attached Govt. Medical College, Amritsar and were followed for about 9 months. The study was conducted after approval from Institutional Thesis and Ethical Committee. All the fractures were post-traumatic. An informed consent was taken from each and every patient before study and approval was taken from Ethical Committee of the Institution. General, systemic examination as well as local examination of the patient was done. Thorough assessment of patient was performed to rule out head/chest/abdominal/ spinal

or pelvic injury. Evaluation of patients in terms of age/sex/mode of trauma was done. Musculoskeletal examination of patient was performed to rule out associated fractures. Stabilization of patient with intravenous fluids, oxygen and blood transfusion as and when required. Assessment of injured limb as regards to extent of wound, soft tissue injuries and neurovascular status was done. Depending upon the soft tissue injury, grading of the compound fracture according to Gustilo and Anderson Classification was done. Antiseptic dressing and primary immobilization of involved limb by POP Back splint was done. Radiological assessment comprised of anteroposterior and lateral views of injured limb including complete knee joint, distal femur/proximal leg, middle and distal leg. The patient was put on an empirical antibiotic regimen and a swab for culture and sensitivity was taken from the wound site. Preoperative investigation comprised of Hemogram, blood sugar level, blood urea level, serum creatinine level, blood group and Rh typing, bleeding time, clotting time and any other investigations was assessed as required for pre-anaesthetic check up. After dealing with all the life-threatening conditions and investigations thoroughly, the patients were shifted to the operation theatre where the injured part was examined carefully under sedation and all the observations recorded. Wound and the surrounding part of the wound was washed and cleaned under aseptic conditions. Thorough debridement of the wound was done and where-ever possible, loose stitching was done to cover the underlying bone. Aseptic dressing was done and a POP splint was applied to immobilize the fracture. The final functional outcome was assessed as per Johner and Wruh's criteria. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Distribution of age of the study patients

Age group (years)	Number	Percentage
20-30	4	16
31-40	9	36
41-50	7	28
51-60	5	20
Mean± SD	41.0±4.5	

Age group 20-30 years had 4 (16%), 31-40 years had 9 (36%), 41-50 years had 7 (28%) and 51-60 years had 5 (20%) patients. The Mean± SD age was 41.0±4.5 years.

Table II: Gender distribution of patients

Gender	Number	Percentage
Male	17	68
Female	8	32

Out of 25 patients, males comprise 17 (68%) and females 8 (32%).

Table III: Assessment of parameters

Parameters	Variables	Number	P value
Duration of injury to surgery time (hours)		3.12	-
Side	Right	14	0.15
	Left	11	
Previous injury / Operation / Disease	Diabetes	3	0.04
	Hypertension	3	
	No	19	
Mode of injury	RTA	16	0.05
	Fall	5	
	Others	4	

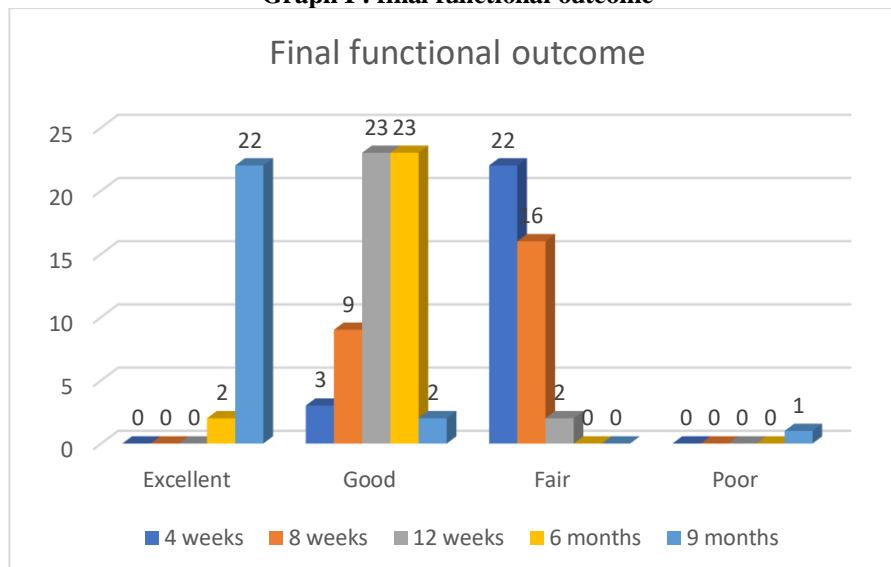
The mean± SD injury to surgery time was 3.12± 0.8 hours. Right side was involved in 14 and left in 11. Diabetes and hypertension was seen in 3 each. In 16 (64%) cases, the mode of injury was RTA, in 5 (20%) was fall and in 4 (16%) was others. The difference was significant (P< 0.05).

Table IV: Distribution according to scale & type of surgery

Clinical outcome		
	Mean	SD
Duration of hospital stay (days)	5.08	0.7
Time to union (weeks)	22.1	3.5
Time to return to work (weeks)	22.5	4.8
Radiological Outcome		
Varus/valgus angulation (degrees)	0.92	0.04
Antero-posterior angulation (degrees)	1.4	0.08
Limb length discrepancy (mm)	2.08	0.9
Functional outcome		
Gait following treatment	Normal	Mild limp
	23	2
Able to squat	Yes- 23	No- 2
Able to run	Yes- 23	No- 2

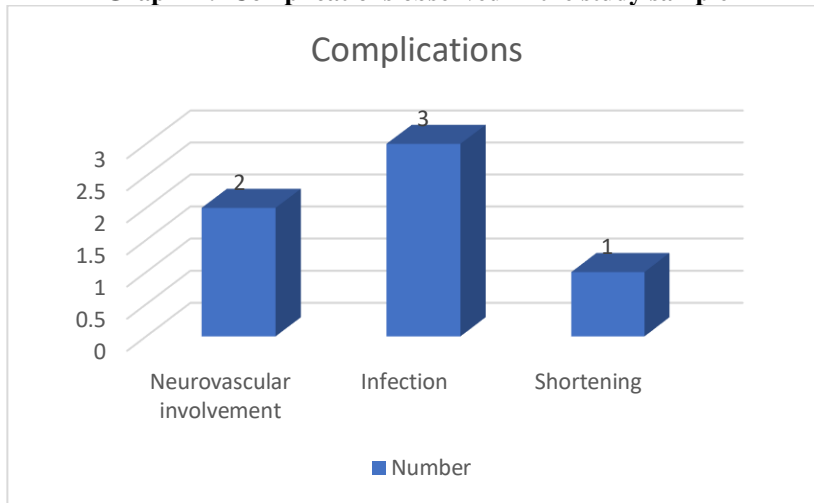
The mean duration of hospital stay was 5.08± 0.7 days, time to union was 22.1± 3.5 weeks, time to return to work was 22.5±4.8 weeks. Varus/valgus angulation was 0.92± 0.04 degrees, antero-posterior angulation was 1.4± 0.08 degrees and limb length discrepancy was 2.08±0.9 mm. Gait following treatment was normal in 23 and mild limp was seen in 2. 23 were able to squat and 2 did not. 23 were able to run and 2 did not.

Graph I : final functional outcome



At 4 weeks, final functional outcome was good in 3 and fair in 22 patients. At 8 weeks, good in 9, fair in 16. At 12 weeks, good in 23 and fair in 2 patients. At 6 months, excellent in 2 and good in 23 patients and at 9 months, excellent in 22, good in 2 and poor in 1 patient. The difference found to be significant ($P < 0.05$).

Graph II: Complications observed in the study sample

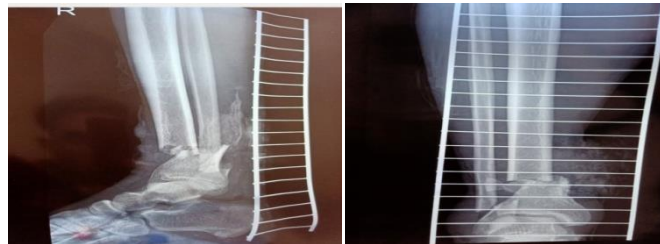


Graph II: shows that complications noted were neurovascular involvement in 2 (8%), infection in 3 (12%) and shortening in 1 (4%) patient.

CASE



**WOUND RIGHT LEG
RADIOGRAPHS**



PRE – OPERATIVE LATERAL AND ANTEROPOSTERIOR VIEWS



IMMEDIATE POST – OPERATIVE X RAYS SHOWING FRACTURE UNION

Discussion

Tibia is the most frequent site of an open fracture, with incidence ranging from 49.4% to 63.2%. India has the highest road side accident rates in the world, one in every forty- two vehicle in country had met with an

accident in 1986.⁷ A large proportion of vehicles involved were two wheelers. The lower limbs are involved in 49.6 % of motor cycle accidents.⁸ By its very location the tibia is prone to frequent injuries. Furthermore, the blood supply of the tibia is more

precarious, high-energy tibial fractures are associated with compartment syndrome or neural or vascular injuries.⁹ Open fractures have a higher infection rate than closed fractures and the rate increases with the increasing severity of the soft tissue injury. The risk of delayed union and non-union in closed, and open treatment is increased with comminution. The present study evaluated the results of primary stabilization of compound fracture both bone leg with flexible nail along with external fixator.¹⁰ The present study was to evaluate the results of primary stabilization of compound fracture both bone leg with flexible nail along with external fixator. We found that age group 20-30 years had 4 (16%), 31-40 years had 9 (36%), 41-50 years had 7 (28%) and 51-60 years had 5 (20%) patients. The Mean± SD age was 41.0±4.5 years. Out of 25 patients, males comprise 17 (68%) and females 8 (32%). The mean± SD injury to surgery time was 3.12± 0.8 hours. Right side was involved in 14 and left in 11. Diabetes and hypertension was seen in 3 each. In 16 (64%) cases, the mode of injury was RTA, in 5 (20%) was fall and in 4 (16%) was others. Anglen JO¹¹ conducted a study on wound irrigation in musculoskeletal injury. Wound irrigation to remove debris and lessen bacterial contamination is an essential component of open fracture care. Volume is an important factor, increased volume improves wound cleansing to a point, but the optimal volume is unknown. High-pressure flow has been shown to remove more bacteria and debris and lower pressure flow irrigation has been effective in experimental studies in some types of animal wounds, but human clinical data are unconvincing due to poor study design. We found that the mean duration of hospital stay was 5.08± 0.7 days, time to union was 22.1± 3.5 weeks, time to return to work was 22.5±4.8 weeks. Varus/valgus angulation was 0.92± 0.04 degrees, antero-posterior angulation was 1.4± 0.08 degrees and limb length discrepancy was 2.08±0.9 mm. Gait following treatment was normal in 23 and mild limp was seen in 2. 23 were able to squat and 2 did not. 23 were able to run and 2 did not. At 4 weeks, final functional outcome was good in 3 and fair in 22 patients. At 8 weeks, good in 9, fair in 16. At 12 weeks, good in 23 and fair in 2 patients. At 6 months, excellent in 2 and good in 23 patients and at 9 months, excellent in 22, good in 2 and poor in 1 patient. Milenkovic S et al¹² conducted a study on external skeletal fixation of the tibial shaft fractures. They evaluated the anatomical and functional outcome of tibial shaft fractures fixed by Mitkovic's external fixator on 115 patients. The results of external fixation were excellent or good in 94.07% of the cases and bad in 5.08% of cases. We observed that complications noted were neurovascular involvement in 2 (8%), infection in 3 (12%) and shortening in 1 (4%) patient. Rajasekaran S et al¹³ conducted a study on early versus delayed closure of open fractures. Options for wound closure in the treatment of open fractures include primary closure of the skin, split-thickness skin-grafting, and the use of either free or local muscle flaps.

Early closure is within the 24-72 h window, and delayed or late closure extends beyond 3 days. Current treatment strategies have been suggested which include debridement performed within 12 h, no excess skin loss primarily or secondarily during debridement, skin approximation possible without tension, no gross soil or other similar contamination, and no vascular insufficiency.

The limitation the study is small sample size.

Conclusion

Authors found that compound fractures of both bone leg are quite common. The acceptable goals for tibial fractures remain the prevention of infection; maintenance of normal length, alignment and rotation of the extremity, minimization of additional damage to soft tissue and bone; protection of remaining circulation and providing of a mechanical environment which stimulates periosteal and endosteal responses and favors bone healing. Traditional treatment options for compound fractures of both bone leg are antegrade insertion of elastic intramedullary nails, open reduction plate fixation, and external fixator fixation. Primary stabilization with flexible nail along with external fixator has a definite role in the management of compound fracture both bone leg. The technique offered better outcome with lesser post-operative complications.

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