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Evaluation of the functional outcome in open tibial fractures managed with an Ilizarov fixator as a primary and definitive treatment modality

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Abstract
Introduction: Open fractures are rapidly compounding problem for trauma surgeons. Open fractures of leg, which are perhaps the most common among open fracture, were taken as prototype in which extra articular fracture of tibia and fibula were taken. The key components of approach were aggressive debridement; primary Ilizarov fixation and soft tissue coverage. The study was undertaken to see if the patient can be treated with single surgery of primary external fixation with Ilizarov technique so as to reduce hospitalization stay and early return to work.
Material and Methods: In the present study, twenty patients with open fracture tibia were operated with Ilizarov over period of two years and the results were analyzed.
Results: 25%(5) had excellent, 45%(9) had good, 30%(6) had fair result based on bone score and 30%(6) had excellent, 55%(11) had good, 5%(1) had fair and 10%(2) had poor result based on functional score.
Conclusion: Compound fracture of the leg can be effectively managed with use of ilizarov external fixator as a single staged procedure.

Keywords: Functional outcome, Ilizarov fixator, ilizarov external fixator

Introduction
Open fractures are rapidly compounding problem for trauma surgeons. The industrialization of society, crowded highways have increased the incidence of these serious and fatal injuries. The long period of morbidity, pain, infection and ultimately functional impairment have a serious impact on individual, country in terms of patient care, loss of productivity, time and lowered quality of life.
The study was undertaken to see if the patient can be treated with single surgery of primary external fixation with Ilizarov technique so as to reduce hospitalization stay and early return to work. Open fractures of leg, which are perhaps the most common among open fracture, were taken as prototype in which extra articular fracture of tibia and fibula were taken. The key components of approach were aggressive debridement; primary Ilizarov fixation and soft tissue coverage.

Materials and Methods
20 patients with compound fracture of tibia treated with Ilizarov fixator in MVJ Medical College and Research Hospital between February 2013 to February 2015.

Inclusion Criteria
1. Age between 15 -60 years
2. Compound fracture of tibial diaphysis – Gustilo type I, II and IIIa with or without associated fracture of fibula, with or without bone loss.

Exclusion Criteria
1. Polytrauma patients
2. Neurovascular injury
3. Intra articular fracture

All patients who were included in our study were planned for Ilizarov external fixator. Appropriate radiographs including antero-posterior and lateral view of the involved leg were taken. Patients and attendants were given appropriate counseling regarding Ilizarov fixator and its working principle. By this way, the patient and the attendant were actively involved in the treatment process, which is very essential in treatment of Ilizarov.

The frame was planned according to the fracture pattern and soft tissue injury assessed in accordance with GUSTILO ANDERSON Classification of Open fracture. With the patient under appropriate anesthesia, Ilizarov external fixator was applied to the involved leg according to principle laid down by ASAMI Group of Surgeons. In patients with isolated fracture of tibia, fibular osteotomy was done at a higher level during primary procedure and a foot frame was added if the distal tibial hold was inadequate for fracture stabilization. Primary closure of the wound was possible in all cases.

In post-operative period, postoperative radiographs were taken and patient was given antibiotics, analgesia and edema controlling measures. Limb was kept elevated for 3-4 days. Repeated examinations were done to rule out any increase in swelling / any impending compartment syndrome.

Patient was encouraged to do isometric quadriceps exercises as well as knee, ankle and toe range of motion both actively as well as passively.

Ilizarov frame adjustments if needed were done on 2nd or 3rd post-operative day. Patient was allowed partial weight bearing from 2nd post-operative. The amount of weight bearing was governed by the tolerance of pain by the patient and type of fracture pattern.

Patient was taught proper pin care dressing. Patient was discharged depending upon the wound condition and was given instruction regarding pin tract care, mobilization exercise and follow up.

Observation and Results

A prospective study of a total of 20 patients with open tibia fracture which were operated between February 2013 and February 2015 in MVJ Medical College and Research Hospital, Bengaluru. The mean age of the study group was 25.5 years (16-56). 16 patients suffered right limb injury and 4 patients suffered injury to the left limb. Mode of injury for 16 patients was road traffic accident. 2 patients had assault and 1 patient had fall of heavy object as mode of injury. According to Gustilo's Anderson Classification 3 patients were Grade I, 10 patients were Grade II, 7 patients were Grade III. Bone loss occurred in 3 patients with Grade III.

Bone Score

25% (5) had excellent, 45% (9) had good, 30% (6) had fair result.

Table1: Bone Results

Radiological Results	No of Patients	Percentage (%)
Excellent	5	25
Good	9	45
Fair	6	30
Poor	0	0
	20	100

Functional Result

30% (6) had excellent, 55% (11) had good, 5% (1) had fair and 10% (2) had poor result.

Functional Results	No of Patients	Percentage (%)
Excellent	6	30
Good	11	55
Fair	1	5
Poor	2	10
	20	100

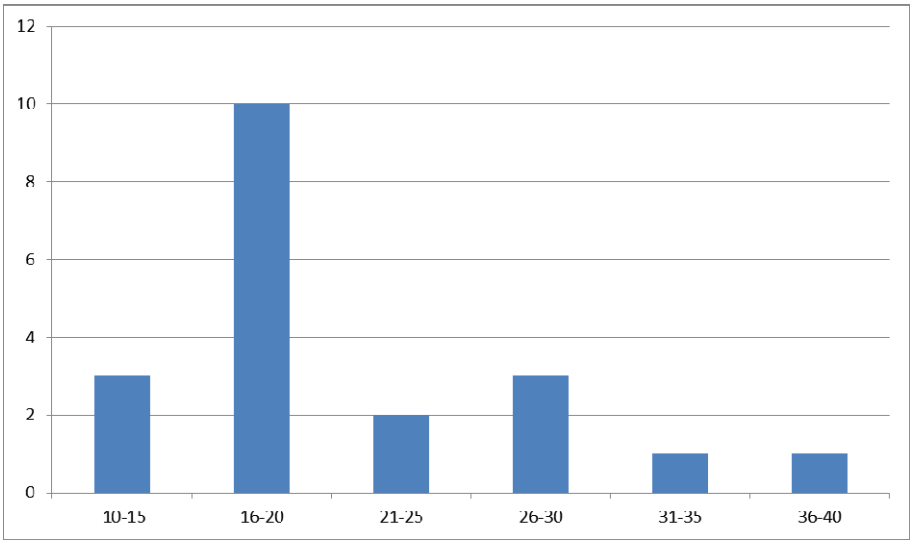
Complications

5 patients had pin tract infection, 3 patients had superficial skin infection, 1 patient had chronic osteomyelitis.

Table3: Radiological Union

Duration (weeks)	No of patients	Percentage (%)
10-15	3	15
16-20	10	50
21-25	2	10
26-30	3	15
31-35	1	5
36-40	1	5
	20	100

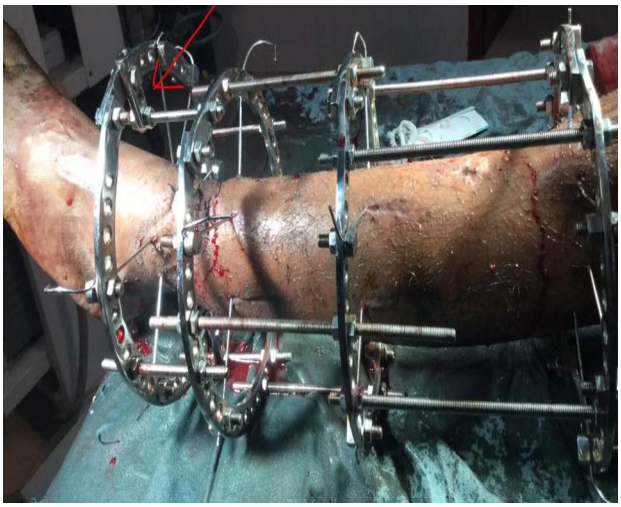
Average duration to radiological union was 20.76 weeks.



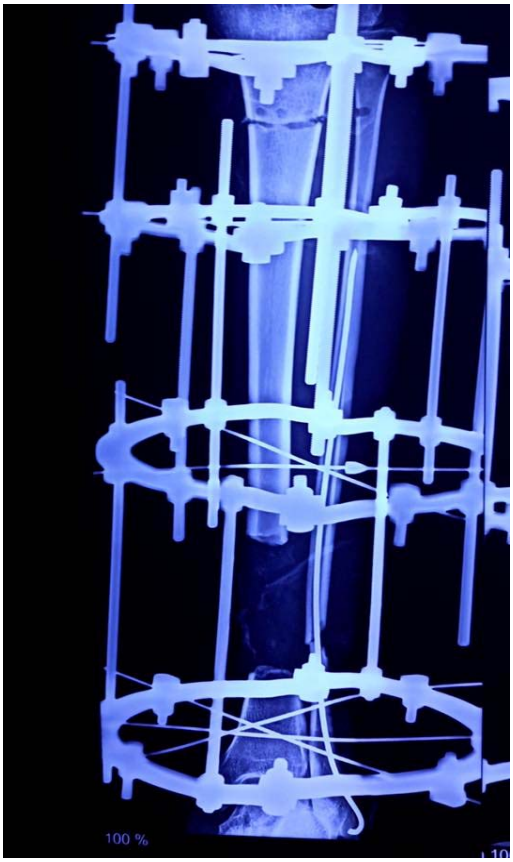
Clinical Pictures

X Ray-Ap and Lateral View

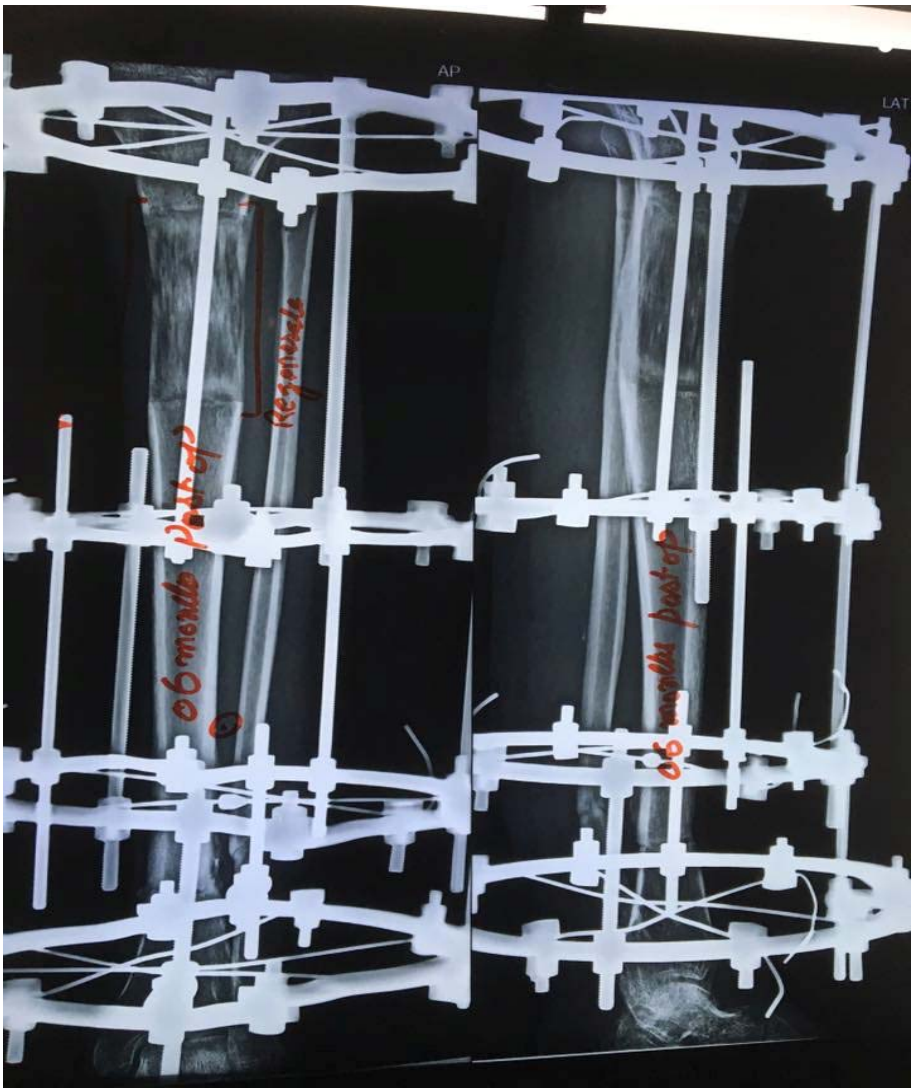
Pre-op X-ray



Post Op Clinical Picture



Post-op x-ray



Discussion

Orthopedic training and practice has traditionally been dedicated to the care of bone and joint injuries. With the evolution of open method of fracture fixation and the increasing incidence of high energy trauma, the soft tissue has come to attention of orthopedic traumatologist.

In comminutted fracture of tibia, the goal of treatment is getting reduction and stability without compromising the soft tissue attachment and vascularity of fragments. This can be achieved using illizarov technique [1].

Use of external fixators in multiparated, defective, and contaminated open fracture, especially Gustilo-Anderson type 3B and 3C open fracture, is routinely accepted in these days [2].

Fewer studies have compared ORIF with Ilizarov treatment modalities. Canadian Orthopaedic Trauma Society conducted a randomized multi centre study comparing plate fixation with circular external fixation similar to Ilizarov. It was found that number and severity of complications were more in ORIF, though both techniques produced satisfactory fracture reduction [3].

Tucker *et al.* reported 100% union of 26 tibial fracture in 22 patients treated primarily with ilizarov external fixator [4]. The average time to union was 25.6 weeks. In our study the average time to radiological union was 20.76 weeks.

Foster *et al* studied 40 patients (19 open and 21 closed). Time from injury to application of Ilizarov frame was 0-35 day and mean time for union was 187 days [5].

Dagher *et al* found Ilizarov technique to be effective in the management of complicated compound fracture with bone loss and it allowed simultaneous treatment of bone loss, infection, nonunion, and deformity [6].

Thirumal *et al.* showed that defect was bridged and bone regenerated in Compound Grade IIIb with bone and soft tissue loss with bone transport [7].

Bundgaard *et al* showed tibial bone loss and soft tissue defect was treated by gradual anterior angulation, compression and then straightening [8].

Satish Nesari *et al.* concluded that Ilizarov circular fixation is an ideal method for fracture when extensive dissection and internal fixation are contradicated due to trauma to soft tissue, deficiency of bone stock, and comminuted fracture [9].

Endrezt *et al* concluded that Ilizarov technique in combination with minimal invasive internal fixation is an effective method to treat complicated tibial pilon fracture with seveer soft tissue injury [10].

24 patients were studied by Ozturkmen Y *et al*. (19 males, 5 females) with segmental tibial fracture treated with ilizarov. Excellent bone result was obtained in 20 and good result in 4 patients. Functional results were excellent in 19 and good in 5

patients [11]. In our study excellent bone result was obtained in 5 and good result in 9 patients. Functional results were excellent in 6 and good in 11 patients.

Conclusion

We concluded that compound fracture of the leg can be effectively managed with use of ilizarov external fixator as a single staged procedure. The complication and follow up of this treatment modality is a bit complicated than the routinely used pin external fixator but the result and early return of patient to work is an added advantage with this fixator.

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