



Outcome Assessment of Ankle Spanning External Fixator with Limited Internal Fixation for Distal Tibial Extra Articular Fractures

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Abstract

Background: Road traffic accident claims the lives of almost 1.35 million individuals every year. Because of its subcutaneous arrangement, long bones, particularly the tibia, are usually fractured in these accidents. Since the late 1980s, external fixation with moderate interior fixation has increased. Extra-articular distal tibia fractures generally result from complex, high-energy trauma, which frequently includes accompanying fibular fractures and soft tissue injuries.

Method: This is a Hospital-based Prospective Interventional type of study, which include 54 patients, all patients were included in the study of the Orthopaedic department of S.M.S. (Sawai Man Singh) Medical College and attached hospitals in Jaipur Rajasthan, India. The most common trauma mode was road traffic accidents between October-2018 to march-2021.

Results: External fixation was used on all fifty-four patients, with or without limited internal fixation. Thirty-eight (70%) of the fifty-four fractures were open, while sixteen (third) were closed. After the operation, the fractures healed in an average of 15.5 weeks. Although none of the patients received bone grafting during the initial treatment of the fracture, twelve patients had bone grafting six weeks after the initial treatment. Mazur's scoring, modified by Teeny and Wiss, was used to score ankle functions. Angulation of more than 5 degrees is a sign of malunion.

Conclusion: External fixation with or without limited internal fixation is an additional option for treating extra-articular distal tibial fractures. Open reduction and plate osteosynthesis have similar union rates.

Keywords: Distal tibia; Orthopaedic surgery; External fixation; Road traffic accident; Malunion.

Introduction

Road traffic injuries are a serious but under-appreciated public health issue that needs strong efforts to prevent injuries in the long run. Road traffic accidents are the most complex and dangerous of all the systems people have to cope with daily. A road traffic accident claims the lives of almost 1.35 million individuals every year [1,2]. Because of its

subcutaneous arrangement, long bones, particularly the tibia, are usually fractured in these accidents. After diaphyseal tibia fractures, distal tibia fractures are the second most prevalent [3]. The distal tibia presents complications to treating surgeons in selecting an appropriate implant to ensure proper union and restoration to pre-injury levels due to its subcutaneous

and shaky blood supply [4]. In addition, the distal tibia fracture is one of the most difficult to treat. Pilon fractures are intra-articular fractures of the distal end of the tibia that account for about 5% to 7% of all tibial fractures [5]. The best way to treat this fracture is still up in the air, as an evaluation of open reduction and internal fixation results found significant rates of complications. Since the late 1980s, external fixation with moderate interior fixation has increased [6].

More recently, stepwise protocols have been recommended, with temporary external fixation. Usually, 2 to 3 weeks after the injury ankle joint is preceded by open reduction and internal fixation using plates and screws after the soft tissue condition has normalized [7]. In some severe open fractures with major articular injury, direct arthrodesis has been performed. The patient's general health, soft-tissue condition, fracture comminution, and the surgeon's skill typically affect the management, especially the timing, of surgery [8]. The purpose of surgery is to repair the plafond's articular surface, restore limb alignment, and safeguard the soft-tissue envelope [9]. Extra-articular distal tibia fractures are usually the result of complex, high-energy trauma, which often includes fibular fractures and soft tissue injury. Tibial fixation aims to increase fracture stability while limiting soft tissue morbidity after surgery [10].

Materials and Methods

Study location

Department of Orthopaedics in teaching hospitals attached to S.M.S (Sawai Man Singh) Medical College and attached hospitals.

Study design

Hospital-based Prospective Interventional type of study

Sample size

Minimum 54 cases

Study population

All patients (24 to 65 years of age, mean age of 38 years) were included in the study of the Orthopaedic department of S.M.S. (Sawai Man Singh) Medical College and attached hospitals. The most common trauma mode was road traffic accidents, with the right

limb becoming involved more frequently (60 percent) than the left. All of the patients in the study had a distal tibia extra-articular fracture, which was categorized using the AO/OTA classification system. Extra-articular distal tibial fractures are classified as type A fractures and are split into three groups (A1, A2, and A3) based on the extent of metaphyseal comminution.

Inclusion Criteria

Patients between 24 to 65 years of age are involved in road traffic accidents and trauma.

Exclusion Criteria

1. Pathological fracture.
2. Stress fracture, pediatric patients (<14 yr of age).
3. Metabolic bone diseases.
4. Distal tibia fractures with intra-articular involvement (type B and C of AO/OTA classification)
5. Patients with extra-articular fractures are involved in other interventional studies.
6. Vessel injuries

Observation

All of the patients in the study had a distal tibia extra-articular fracture, which was categorized using the AO/OTA classification system. Extra-articular distal tibial fractures are classified as type A fractures divided into three groups depending on the extent of metaphyseal comminution. The Gustilo-Anderson categorization method was used to categorize the open injuries. Tserne classification was used to categorize soft tissue ailments. External fixation was used on all fifty-four patients, with or without limited internal fixation. Thirty-eight (70%) of the fifty-four fractures were open, while sixteen (third) were closed.

Result and Discussion

Ankle function scoring (Mazur's scoring modified by Teeny and Wiss) [6]. This scoring system classified the evaluated items into eleven major categories: Running, toe lifting, hills (up or down), stairs (up or down), limp, edema, plantar range of motion, and dorsal range of motion factors to take into account. 50 points have been assigned to pain, 8 points to distance, 8 points to support or orthosis, 5 points to running, 5 points to toe-raising, 3 points to hills (up or down), 3 points to stairs (up or down), 8 points to limp, 3 points

to swelling, 2 points to a plantar range of motion, and 5 points to a dorsal range of motion on this scale. Each category is rated separately, and an overall score can

Table 1: Evaluated scoring system classified into eleven major categories

Parameters	Points
Pain	50
Distance	8
Supports or Orthosis	8
Running	5
Toe raising	5
Hills (up or down)	3
Stairs (up or down)	3
Limp	8
Swelling 3	3
Plantar range of motion	2
Dorsal range of motion	5
Total	100

Table 2: Clinical Rating Score.

Clinical Rating	Score
Excellent	>92 points
Good	87-92 points
Fair	65-86 points
Poor	<65 points

For the first year and every six months, patients returned for follow-up sessions at to 2,6,12,18,24 weeks to evaluate fracture healing, pain, and functional performance. The follow-up period extends anywhere from 5 to 24 months. A clinical score was calculated using a questionnaire in which the patient scored their discomfort and functional outcome. The effectiveness of the callous reduction was analyzed using postoperative radiography (Tables 2 and 3) [11].

The anatomical reduction was found in 39 fractures. Because all of the fractures were extra-articular, joint instability was not an issue. At ankle level, eight fractures healed valgus and three in varus malalignment of the tibia, whereas four were nonunion. Most of these fractures were associated with significant metaphyseal communication, bone loss, etc. The fractures that remained healed in anatomical alignment (Table 4 and 5) [11].

be derived, with a higher score representing improved performance. Direct questioning and examination provided these findings (Table 1) [10].

Table 3: Follow-up period extends anywhere form 5 to 24 months

Follow-up	
Maximum	24 months
Minimum	5 months
Average	12 months

Table 4: Reduction and union.

Cases	Union in anatomical alignment	Union in mal-alignment	Non-union
54	39	11	4

Table 5: Rate of union.

Minimum	Maximum
14 weeks	20 weeks

Table 6: Ankle function scoring (Mazure's scoring modified by Teeny and Wiss)

Clinical Rating	Score
Excellent	>92 points
Good	87-92 points
Fair	65-86 points
Poor	<65 points

After the operation, the fractures healed in an average of 15.5 weeks. Although none of the patients received bone grafting during the initial treatment of the fracture, twelve patients had bone grafting six weeks after the initial treatment. Ankle function scoring was done by Mazur Scoring modified by Teeny and Wiss Malunion, which shows angulation greater than 5 degrees. If the shortening was greater than 2cm, it was considered substantial. Marsh and Bonar's criteria were used to assess osteoarthritis despite the inclusion of extra-articular fractures in the study. There was no arthrosis in grade 0; in grade 1, small spurs but no narrowing of the joint space; in grade 2, osteophytes and significant joint-space constriction; and in grade 3, complete loss of joint space [12].

The average time from injury to operation was 3 days (range 2-8 days). Due to comorbid medical issues, two patients' operations were delayed. The average length of hospitalization was nine days (range 7-15 days). The external fixator was retained for an average of 7 to

8 weeks. The average time spent using an ankle brace was 4 to 5 weeks. As an outcome, the ankle was immobilized for 11-12 weeks [13]. In ten cases, a pin tract infection occurred (18%). All of them were superficial and were treated with pin track treatment. Eight of the patients had valgus malunion, while three had varus. Six individuals exhibited a 2cm limb shortening, whereas the others showed no limb length disparity. None of these patients showed impaired gait (Table 6 and Figure 1) despite their shortness [14]. According to modified Mazur grading, about 40 (74%) instances received excellent results, 7 (13%) good results, 4 (8%) acceptable results, and 3 (5%) cases received poor results. Three individuals experienced osteoarthritis and moderate ankle pain after a median follow-up of 24 months. Compared to the contralateral ankle, the other 50 showed no signs of osteoarthritis radiologically or clinically. The average time lag to work for 43 patients treated with this modality who achieved consistent union is 121 days. A proportion of cases treated with this modality achieved consistent union and time lag to work of 2.81 was observed [15].

Conclusion

External fixation with or without limited internal fixation is an additional option for treating extra-articular distal tibial fractures. Open reduction and plate osteosynthesis have similar union rates to open reduction and plate osteosynthesis, where wound complications are lower. The cost of the instruments and implants is low, and the surgical procedure is straightforward. An ankle-sparing external fixator, early mobilization, and a suitable rehabilitation plan can all help avoid ankle stiffness.

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Conflict of Interest

The authors declare that he has no conflict of interest.

Ethical approval

The study was approved by the S.M.S Medical College, Jaipur, India

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