



FUNCTIONAL RESULTS OF PROXIMAL TIBIAL FRACTURES MANAGED WITH HYBRID EXTERNAL FIXATOR

Orthopaedics

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ABSTRACT

Background: Management of high energy proximal tibial fractures, associated with marked soft-tissue trauma, can be challenging, requiring the combination of accurate reduction and minimal invasive techniques. **Method:** A total of 20 patients were included in the study based on the inclusion and exclusion criteria and were managed by hybrid external fixator as definitive treatment. They were kept in follow up for at least 6 months. **Result:** All fractures were united in an average time period of 18 weeks. one patient developed deep infection and one Varus collapse, 1 patient develop knee stiffness. **Conclusion:** Hybrid external fixation gives a very good outcome in managing complex high energy proximal tibial fractures by simultaneously providing adequate fracture stabilization and necessary protection to soft tissue healing to achieve bony union.

KEYWORDS

Proximal tibia, varus collapse, Hybrid external fixator, knee stiffness

INTRODUCTION

Fractures of the proximal end of tibia are often high energy injuries with extensive comminution and meta physal diaphyseal disassociation. Most injuries affect lateral tibial condyle (55 to 70%) and isolated medial condyle fractures occur in 10 to 23% whereas the involvement of bicondylar lesions is found in 10 to 30% as reported in many series. Even though various modalities of management offered to these fractures, the management is still challenging and confusing to most of the orthopaedic surgeons today. Over the years, many proposed treatment modalities, from simple traction to demanding surgery, presented fair results, but also serious complications. The amount of energy involved at the time of injury determines the severity of the tibial plateau fractures. With modern diagnostic procedures like computerized tomography with 3 Dimensional reconstruction the various fracture patterns have been widely studied and described. These fractures represent a wide range of severity ranging from simple fractures which can be treated conservatively with predictable outcomes and complex fracture patterns which challenges even an experienced surgeon. Complex fracture patterns with comminution and extensive soft tissue involvement seen in high energy trauma. Goals of treatment in such high energy tibial plateau fractures are to maintain joint stability, articular congruity and alignment without much soft tissue dissection thereby helping in early mobilisation of knee joint. Operative management of the tibial plateau fractures include internal fixation with plate and screws, external fixator or hybrid external fixator

METHODOLOGY

This is a prospective study conducted from 1st June 2022 to 1st December 2022. 20 patients with proximal tibial fractures admitted in Government Medical college jammu were included in the study after their valid informed written consent. Ethical committee approval obtained before the commencement of the study.

Inclusion Criteria

1. Tibial plateau fractures according to Schatzkar classification Type 4, Type 5 and Type 6
2. Proximal 1/4th extra articular tibial fractures

Exclusion Criteria

1. Schatzkar type 1, type 2 and type 3
2. Proximal tibial fractures with neurological disorder

The sample of 20 patients included all the patients who presented in the emergency and out patients clinics with proximal tibial fractures who were managed with hybrid external fixators. An informed written consent was obtained from all the study participants after explaining the nature of the study in their local language. After initial stabilization of the patient, a careful history was elicited from the patient and/or attenders to reveal the mechanism of injury and the severity of the

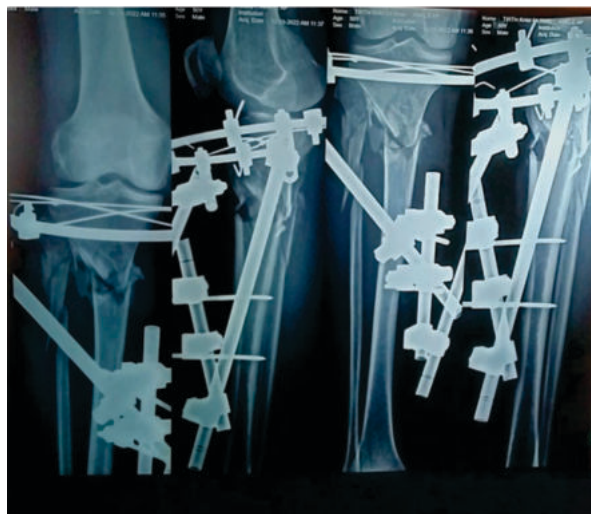
trauma. The patients were then assessed clinically to evaluate their general condition and the local injury. General condition was assessed with the vital signs and systemic examination. Methodical examination was done to rule out fractures at other sites. Open fractures were graded using the Gustilo Anderson classification for open fractures. Antibiotics were started immediately for all patients. Injection cefuroxime 1.5- gram intravenous twice daily along with injection amikacin 500 mg intravenous twice daily were the antibiotics. Single dose of tetanus toxoid was given. Open fractures were treated by cleaning of the wound with copious amount of normal saline, and Hydrogen peroxide, followed by painting of the skin around the wound with povidone iodine and surgical spirit. The limb was then immobilized in an above knee plaster of Paris slab till definite fixation was done. Appropriate radiographs and blood investigations were obtained. The fractures were classified according to the AO classification and open fractures were classified according to Gustilo.

Surgical intervention and follow-up

1.8mm / 2.0mm k wires introduced in the safe zone of proximal tibia, 15mm from the joint line, minimum angle between the two wires is 60 degrees. Placement of wires planned preoperatively according to fracture planes. Interfragmentary compression achieved using olive wires perpendicular to the fracture plane. If needed lag screws used to hold the reduction. In addition to the proximal ring and tensioned wires, one drop pin used in some cases to increase the stability of the proximal fragment. For articular fracture reduction a distractor or pointed reduction forceps used. Stable incision made and blunt dissection done down to the bone. Protection sleeves inserted until it reaches the bone. Under image intensification, wires passed parallel to the knee joint until it penetrates the far cortex without impaling the tendons or neurovascular structures. k wires attached to the ring, wires tensioned Schanz pins inserted in the shaft. Schanz pins connected to external fixator rod, which was then coupled to the ring using the external fixator clamp after the correction of metadiaphyseal alignment. Daily thorough pin track care with immediate passive range of motion started on 1st POD. The patients were encouraged to start controlled knee movement as soon as possible. Patients were discharged from the hospital between 5th POD to 10th POD depending on their general condition and wound condition. Wound management was done with daily dressing, higher antibiotics according to pus culture and sensitivity, wound debridement on necessary basis and plastic surgery management for the patients who had loss of soft tissue. Static quadriceps strengthening exercises, knee mobilisation exercises, seated knee extension exercises and nonweight bearing walking with walker were started on 2nd-3rd POD. Partial weight bearing was started from 6 to 10 weeks depending on radiographic appearance of callus. Weight bearing walking started from 10 to 16 weeks depending on the clinical and radiological signs of union.



Preoperative Radiograph



Post operative Radiograph

RESULTS

A present study consists of 20 cases of fracture of the proximal tibia. All the cases were fixed using the hybrid external fixator. The study period was from 1st June 2022 to 1st December 2022. The age of the patients ranged from 24-67 years with the fracture being most common in the age group of 30 to 40 years and an average age of 47.5 years. Out of 20 patients, 14 (70%) patients were males and 6 (30%) patients were females showing male preponderance because of traveling and working in fields and factories. There were 6 (30%) patients with right proximal tibia fractures and 14 (70%) patients with left proximal tibia fractures. In our study, 18 (90%) of patients sustained injury following road traffic accident, 1 (5%) patient sustained injury following fall and 1 (5%) had history of trauma due to falling of heavy object on leg. All the open fractures were classified based on Gustillo Anderson classification of open fractures. The fixators were removed at an average of 8 weeks. The average rate of fracture union was 18 weeks. In present study we obtained the excellent results in 7 patients, Good in 9, Fair in 3, Failure in 1 patient. One patient went with varus collapse in knee joint. One patient got deep infection for which the patient underwent knee aspiration & subsequently sent the specimen for biochemical and microbiological analysis. The accordingly treated with IV antibiotics and finally recovered satisfactorily with good range of movements. One patient developed knee stiffness.

DISCUSSION

High velocity periarticular fractures of tibia closed as well as compound injuries are complex to treat. Management of these fractures are difficult and varies from surgeon to surgeon. Such injuries are usually associated with soft tissue injury and marked comminution of articular surface. Conservative treatment of comminuted high energy proximal tibia fractures as proven to be inferior when

compared to operative treatment. Internal fixation, despite the advantages of direct visualization, proper and stable reduction of the articular surface as well as the acute repair of soft tissue injuries, presents also serious disadvantages, including skin and soft tissue necrosis caused by surgical manipulations on an already damaged soft tissue envelope and the high rate of infection, which may compromise the final results. Our study revealed the average age of patients with such injuries to be 47.5 years (Range 26 to 67 years) which is comparable to that of other studies like study by Ariffen et al where average age was 44 years and by Zeman et al with average age of 49.2 years. In our study, the males were more in number (70%) as compared to females (30%). This is comparable to the study by Zeman et al, which showed male preponderance with 59%. In terms of mechanism of injury, our present study correlates with the study conducted by Babis et al who had 81.8% with high energy injuries. In our study road traffic accident (90%) was the predominant mode of injury. Our study had an average fracture union of 18 weeks which was comparable with studies conducted using the hybrid external fixator. Babis et al and Ariffen had an average fracture union of 14 weeks. Reddy et al had an average of fracture union of 28 weeks. Functional outcome was compared on the basis of American knee society score. In our study, 9 (39%) patients had excellent outcome, 10 (43%) had good results, 3 (13%) had fair outcome and 1 (4%) patient had a poor result as per objective examination. Babis et al in 2011 used hybrid fixators for tibial plateau fractures in 33 patients and achieved excellent and good results in 78.8% of patients. Mankar et al operated on 78 patients and achieved excellent results in 47 patients, 25 in good, fair in 2 and poor result in 1 patient. Aseri et al operated on 32 patients and had excellent results in 16, good in 13 and fair in 3 patients. Jahan et al in 2017 had excellent results in 15 patients and fair in 4 patients. In our study, 20 patients were operated with Hybrid external fixation. Out of 20, 7 had excellent results, 9 had good, 3 had fair and 1 patient had poor results.

CONCLUSION

The degree of soft tissue involvement in tibial plateau fractures is an important determinant not only for the choice of treatment modality but also for the final outcome. Schatzker type V and VI tibial plateau fractures represent serious injuries with substantial limb specific and general health deficits. While confronting such life threatening limb injuries, hybrid external fixation successfully provided continuous access on the surrounding tissues as well as proper osseous stabilisation without compromising the sensitive soft tissue envelope. Hybrid external fixator is a safe and effective choice for treating high energy tibial plateau fractures. It reduces the soft tissue complications and improves bony union with acceptable reduction and favourable outcome. It allows early mobilisation of the patient. The complications are mainly related to sepsis either superficial pin track infection or deep infection which are preventable, treatable and curable. We feel that the technique merits a place in the armamentarium for managing complex high energy proximal tibial fractures.

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