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Dr. Joseph Dickson Olivero
Assistant Professor, Department
of Orthopaedics, Govt. T.D
Medical College Alappuzha,
Kerala University of Health
Sciences (KUHS), Kerala, India

Dr. Tomichan MC
Associate Professor, Department
of Orthopaedics, Govt. Medical
College Kottayam, Kerala
University of Health Sciences
(KUHS), Kerala, India

Clinical radiological & functional outcome of Tibial Bi-Condylar fractures treated surgically

Dr. Joseph Dickson Olivero and Dr. Tomichan MC

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Abstract

Objectives: With the advancement in surgical, approaches, technique and newer fixation devices the treatment outcome of bicondylar proximal tibial fractures have improved. Therefore it is paramount to identify the appropriate treatment techniques for better functional outcomes in terms of better stability and early weight bearing without pain. Hence this study was carried out to study the functional outcomes of Intra-articular bicondylar tibial fractures, treated with operative management using contoured locking plate over both the condyles.

Material and Methods: This study was carried out as a prospective study. Fifty (50 fractures) patients with acute, displaced Intra-Articular bicondylar tibial aged above 18 years, were enrolled in the study. Open fractures and fractures older than two weeks were excluded. The functional outcome was assessed every 4 weeks. Assessment included OA change, limitation of ROM, or malalignment.

Results: Of the 50 patients, all were males. 35 patients had left sided fractures, while 15 had right sided fractures. Post operatively all 50 patients had swelling, 20 patients had persisting pain, 5 had superficial infections and 2 had deep infection. Superficial infections healed with antibiotics and dressings, while the patient with deep infection had persistent pain and difficulty in walking with discharge from surgical wound site. Both of them underwent implant removal and debridement after a year. Of the 50, 32 had OA changes, 14 had fair limited ROM and 4 had malalignment. Hence we conclude from the above findings that dual plate fixation helps in improving the functional outcome of the patients in view of their physical and radiological findings. Soft tissue problems should be kept in mind, and usage of locking plate can reduce the discomfort of hardware impingement effectively.

Conclusion: A relatively better functional outcome was observed in displaced and comminuted fractures in dual plating, provided that the intra-articular congruity was restored. The technique of dual plate fixation is good with regards to fracture union and functional outcome.

Keywords: Intra articular bicondylar fracture, dual plating, proximal tibial fracture

Introduction

Bicondylar fractures of the tibia, representing the Schatzker V and VI fractures present a bimodal prevalence. It is usually a high-energy injuries in young patients, but are becoming increasingly prevalent in elderly patients with low-energy trivial falls. The goal of treatment of these injuries is restoration of the articular surface, and maintaining of the metaphyseal-diaphyseal alignment. The most important factor in deciding the timing and modality of definitive management is the status of local soft tissues. With the advancement in surgical technique and newer fixation devices the treatment outcome has improved. Therefore it is paramount to identify the appropriate treatment techniques for better functional outcomes in terms of better stability and early weight bearing without pain. Plate fixation is important when medial plateau is involved in proximal tibial fractures ^[1, 2].

Understanding the geometry of the tibial fractures is not easy as any other bone. Because of its subcutaneous anatomy, surgical treatment was associated with complications till recently. Computerized Tomography imaging has helped in better understanding of the fracture pattern. Treatment of Intra- Articular proximal tibial bicondylar fractures is still a controversy with various modality of treatment. Lack of standardization of results has made it difficult to compare studies that have evaluated outcomes. Last two decades has seen marked advances in anesthesia, prophylactic antibiotics, CT scanning, and intra-operative fluoroscopy resulting better outcomes in bicondylar fixation.

Corresponding Author:
Dr. Joseph Dickson Olivero
Assistant Professor, Department
of Orthopaedics, Govt. T.D
Medical College Alappuzha,
Kerala University of Health
Sciences (KUHS), Kerala, India

Various treatment modalities like open reduction and internal fixation with plate osteosynthesis, percutaneous screw fixation or external fixation with pin or wire fixators, closed manipulation and casting [3, 4].

Acute tibial bicondylar fractures undergoing fixation has shown better outcomes in recent studies. Various fixation methods have been advocated. Open Reduction Internal Fixation with dual plate of the Intra-Articular fractures is the treatment of choice. Complications like poor wound healing and infection, OA knee, malalignment is always a concern.

The goal of treatment is the restoration of joint congruity, normal limb alignment, ligamentous stability, knee stability and a functional range of knee motion [10].

Methodology

Study design

It is a prospective study, patients presenting to casualty and outpatient clinic of Department of Orthopaedics, Medical College Hospital, Kottayam with tibial bicondylar fracture between August 2014 and November 2015 were included. All patients above the age of 18 years undergoing surgery were included. Patients with open fracture having neurovascular injuries, pathological fractures, knee dislocations, multiple fractures or other associated fractures were excluded from the study. Patients were explained the purpose of the study and a separate informed written consent for being included in the study was obtained from them. The study was approved by the Institutional Ethics Committee.

Pre-operative evaluation

The swelling of the knee and status of the skin was recorded. X-ray imaging of knee with tibia included AP and Lateral views. CT imaging was done. The patient was temporarily put on an above knee slab with adequate limb elevation until the swelling subsided and until wrinkle sign positive. The fractures were classified based on the 3 COLUMN Classification System. After pre-anaesthetic evaluation patient was then posted for open reduction internal fixation with Dual plates.

Operative technique

A double-incision approach has been used. The medial condylar fragment is stabilized first, using a posteromedial approach. A distal radius volar T-buttress plate, in buttress mode, usually suffices in patients with good bone quality. Newer precontoured locked plates, specially designed for the posteromedial surface of the proximal tibia can also be used.

The lateral condylar fracture is then approached through a separate anterolateral incision – The preservation of the anterior skin bridge results in a negligible risk of wound breakdown. Following restoration of the articular surface through open reduction and “raft” fixation, a lateral condylar plate is used

Post-operative

Immediate

- NPO for 6 hours postoperatively.
- I.V antibiotics and I.M analgesics
- Limb elevation over pillows
- Active knee ankle and toe movements
- Check X-ray of the tibia with knee joint in both AP and lateral views.

Later

- IV antibiotics for 3 days and change of dressing with

wound inspection on postoperative day 3.

- Switch over to oral antibiotics if the wound is clean with no discharge.
- If discharge is present culture sensitivity sent and antibiotics started as per the sensitivity report.
- On post op day 10 suture removal done after wound inspection.

Follow up and criteria for evaluation

The patients were followed up clinically and radiologically at 6weeks, 12weeks, 6 months, and 1year, with respect to height of tibia, width of the tibia, range of movements at knee joint and deformity.

At every follow up clinical examination was done to assess status of the surgical wound, pain, tenderness, range of motion of subtalar joint, stability of the fracture and clinical union. Roentgenograms were taken in Lateral and axial views to look for signs of radiological union. In our study we concluded clinical union when the fracture site had become stable and pain free. The union is confirmed radiologically when plain X-ray showed bone trabeculae or cortical bone crossing fracture site on at least three surfaces on orthogonal radiograms. The time taken for clinical and radiological union was noted. If there are no clinical and radiological signs of union by 16 weeks, the fracture was categorised as delayed union and if absence of fracture union after 24 weeks after injury was categorized as non union. We had 5 cases of delayed union following fixation.

Results

There were 50 adult patients who presented with tibial fractures to our hospital during the course of the study. Of the 50 patients, all were males. Five patients had bilateral fractures. Of the 50 patients, 35 (70%) had left sided fractures, while 15 (30%) had right sided fractures. Of the 50, all patients had gross swelling of the limb following trauma, only 10 (20%) had blisters associated with it. The number of days from the fall to surgery varied from 1- 18 days (mean 5.3days). Days of hospital stay varied from 4- 15 days (Mean- 7.04 days). Post operatively all 50 had swelling, 20 patients had persisting pain, 5 had superficial infections and 2 had deep infection. All the patients with superficial infections were treated with injectable antibiotics for a week, and oral antibiotics for another week. Suture removal was delayed till the wound infection subsided and patients were discharged. Further follow up showed no signs of any infection. The one patient with deep infection was treated repeatedly with a course of injectable and oral antibiotics. Patient had persistent pain and difficulty in walking with discharge from surgical wound site at every follow up. X rays showed delayed union. Patient developed osteomyelitis and underwent implant removal and debridement after a year.

Clinical outcome

The average range of movement was 128 degrees. The range of movement varied from 90 degrees to 145degrees. None of the patient had poor range of movement. The average thigh atrophy in the injured side was 1.5cm. The average range was from 1cm to 4cm. None of the patients has extension lag.

Radiological Outcome

There was only 11 degrees of varus tilt in one patient. Average varus tilt was about 5degrees. The average articular step post op was reduced from 10.55mm to 5.30mm. About 5 patients had average articular step of 1-3mm only.

About 13 patients had excellent articular widening less than 5mm. The average condylar widening was 3.77mm from an average pre-operative widening of 6.14mm.

Discussion

Intra-Articular proximal tibia fracture treatment is considered to be difficult. The management of every aspect of Intra-Articular proximal tibial fracture is controversial. Although some studies with more than 100 cases have demonstrated good results after open reduction and internal fixation of Intra-Articular proximal fractures, the best choice of treatment remains controversial because prospective randomized studies have not shown convincingly better results after surgery. However, in the largest prospective randomized trial described to date found better results in some subgroups of patients after surgery compared to Conservative treatment. Low and high energy tibial plateau fractures show various bone and soft tissue injuries that may lead to permanent disabilities and their treatment is often challenged by severe fracture comminution^[6].

Schatzker, 3-column and 4-column are the commonly used classification systems for proximal tibia fractures. Although, classifications show positive correlation with outcome, there is no correlation with choice of treatment. In our study we have used the 3 column classification system.

It is difficult to compare outcome between studies since different measures of outcome are often used and there is no consensus among surgeons as to which is the most scientific and practical system.

Historic cohort studies have concluded no difference in functional outcome with operative and conservative treatment of displaced Intra-Articular tibial fractures. Many of the recent studies have also shown significant advantage of operative treatment

Surgical treatment is definitely associated with significant incidence of wound complications, particularly sepsis. On the other hand, conservative treatment is also associated with joint pain, arthritis and deformity.

We staunchly believe that displaced Intra-Articular fractures of the tibia should be treated on the same principles as any other injury of the weight bearing joints; that is by anatomical reduction and stable internal fixation, to allow early movement for a better functional outcome.

Application of these principles to Intra-Articular tibial fractures have been slow because of complex bony and fracture anatomy, tenous soft tissue envelope and difficulty of achieving anatomic reduction and stable fixation. With Improved surgical techniques and novel implants especially locking plates, limited complication rates have made many surgeons more confident in operative treatment for these fractures.

Tibial fracture surgery can be performed using medial, lateral, posteromedial, poasterolateral or combined approaches. Fracture morphology dictates the approach. Various fixation devices like buttress plates 3.5mm and 4.5mm locking plates or a combination can be used for fixing these fractures. We used a contoured buttress locking plate and screws to fix these fractures. Bone graft was stuffed to fill the void.

In our analysis, we confirmed correlation between the range of movement and patient satisfaction in terms of their functional outcome. This fact, proved and verified by a lot of other authors, confirms the role of range of movement, arthritic change, deformity as a predictive factor for subsequent late complications.

Outcome measurements can be expressed by various scoring

systems or its modifications based on the author's experience of important symptoms and functional abilities. Honkonen & Jarvinen functional criteria is a standard scoring system for upper tibial function evaluation. Using this standard scoring system that takes into account subjective and objective assessments enables to achieve relevant results and comparisons of different patients' studies.

Complications occur regardless of the management strategy chosen for displaced Intra-Articular fractures and despite management by experienced surgeons. Complications are a cause of significant morbidity for patients. In a study by Thiruvengita Prasad G *et al.* assessed functional outcome by Oxford Knee Score criteria, among the cases 16 cases had a score between 40-48, other 16 cases had a score between 30-39 and 8 cases had a score between 20-29. In postoperative outcome, 16 cases had no pain, 14 had very mild pain and 10 cases had mild pain^[8]. The rate of wound complications (superficial and deep infections) in this study was 32%, which is similar to that in many studies in the literature. Pradyumna Sharma *et al.* in their study noted that 3 cases developed wound infection, 3 cases developed knee stiffness, one case had malunion and shortening of limb length around 1.8cm was seen in one case^[7].

There were certain limitations to our study. Only 50 patients with tibial fractures were operated and their functional outcome score was measured at a short term period. A study involving more patients followed up for a longer period of time can more accurately define the functional outcome of displaced Intra-Articular tibial fractures treated by this method. All measurements were performed by the same author, all values were captured manually. This author was not involved in patient surgery or care, thus keeping observer bias to the minimum. Therefore this discussion is essentially a preliminary assessment.

Conclusion

Intra-articular Tibial fractures are one of the common fractures and the treatment modality has to be decided according to the fracture pattern for the better functional outcome. We conclude that all Intra-Articular tibial bicondylar fractures should be treated with open reduction & internal fixation with dual plating. Anatomical reduction and stable internal fixation allows early mobilization and weight bearing. The technique of dual locking plate fixation is good with regards to stable fixation and fracture union resulting in better functional outcome in bicondylar fractures. Intra-articular Step, Arthritic changes, Range of movement and deformity are detrimental of good anatomical reduction.

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