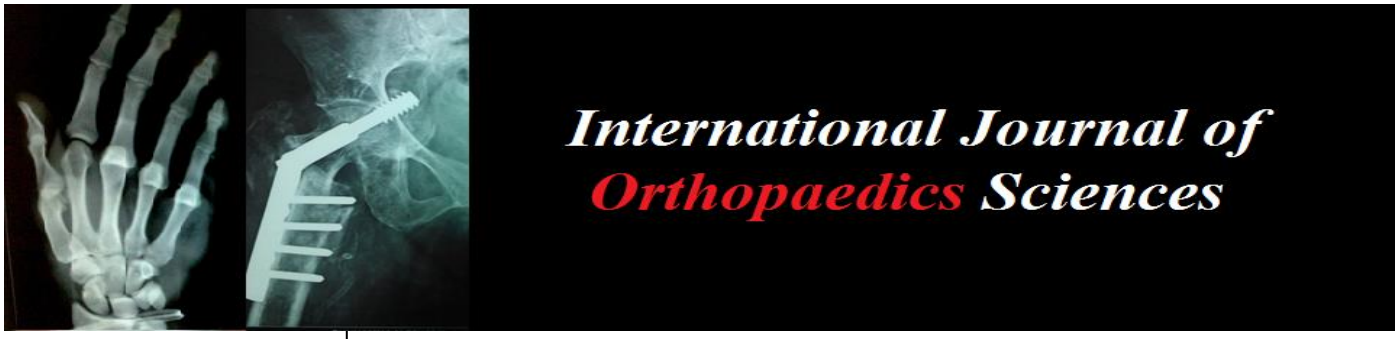

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Dr. Mohd Ashar EK
Junior Resident, Dept of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

Dr. Mohammed Shabir Kassim
Assistant Professor, Dept of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

Dr. Mayur Rai K
Professor, Dept of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

Dr. Chinmaya SP
Junior Resident, Dept of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

Corresponding Author:
Dr. Mohd Ashar EK
Junior Resident, Dept of Orthopaedics, AJ Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

Functional outcome of proximal tibia fracture treated with bicondylar plating by dual approach-lobenhoffer and lateral approach

Dr. Mohd Ashar EK, Dr. Mohammed Shabir Kassim, Dr. Mayur Rai K and Dr. Chinmaya SP

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Abstract
Background: Proximal tibia fractures necessitates early diagnosis and management to prevent severe complications. The goal of treating proximal tibia fractures is to achieve anatomical reduction of articular surface and bring back the functional mobility to pre injury status. Lobenhoffer approach provides direct visualization of fracture, better reduction technique which helps to achieve anatomical reduction and alignment.
Aim: To assess the reduction of proximal tibia fractures, radiological union and functional outcome associated with treatment by dual approach.
Objectives
1. To assess the anatomical reduction of proximal tibia articular surface in fractures treated with internal fixation.
2. Assessment of radiological union of fractures after internal fixation by dual plating.
3. Assessment of clinical outcome associated with this approach.

Materials and Methods: A total of 30 cases of bicondylar proximal tibia fractures were studied.
Inclusion criteria
1. All skeletally mature patients with proximal tibia fractures Schatzker type V and VI aged between 18 and 65 years.
2. AO Muller type 41-C1,41-C2,41-C3.

Exclusion criteria
1. Unicondylar tibial fractures.
2. Skeletally immature patients
3. Pathological proximal tibia fractures.

Observation and Results: Our study used Honkonen and Jarvinen criteria for functional outcomes and showed good results.
Conclusion: Early surgical management of proximal tibia fractures is necessary as tibial plateau can tolerate modest deformities. Lobenhoffer and lateral approach provides better visualization of fracture and aids in better surgical management of bicondylar proximal tibial fractures with dual plating and gives excellent anatomical reduction , maintenance of mechanical axis and hence a better functional outcome with effective rehabilitation.

Keywords: proximal tibia fracture, schatzker type V and VI fractures, lobenhoffer approach, posteromedial fragment

Introduction
Tibial plateau is an important part of articular surface of knee joint and plays a major role in biomechanics, i.e weight transmission and mobility [1]. Management of proximal tibia fractures have always been very challenging with high complication rates due to soft tissue concerns and fracture morphology [2-4] With an increase in high velocity accidents, the incidence of proximal tibia fractures are also on a rise.
These fractures encompass many varied fracture configurations that involve medial, lateral or both plateaus with varied degrees of articular depressions and displacements [5]. With recent change in trends, most of the authors recommend open reduction and internal fixation (ORIF) for these fractures. The objective of treating these fractures is to reduce the complications and

get back pre injury functional mobility. The goal of ORIF is to achieve stable fixation and early mobilization to achieve near anatomical reduction of articular surface, maintenance of mechanical axis, and anatomical alignment [6, 7]. There is high chance of varus collapse and later post traumatic arthritis when bi-condylar fractures have been treated with a single plate and a lag screw [8]. Hence fixing of both condyles using separate plates has been advocated.

To achieve anatomical reduction and alignment Lobenhoffer approach has been used for direct visualisation and fixation of the posteromedial fragments of the fracture. Lobenhoffer approach in prone position has minimal soft tissue and neurovascular bundle dissection, better visualization and appropriate placement of hardware [9] Lateral condyle is fixed using lateral approach in supine position.

The main objective of the study was to assess the functional outcome of proximal tibia fractures (Schatzker type V and type VI) treated with dual plating using Lobenhoffer and lateral approach. The anatomical reduction of articular surface of proximal tibia, radiological union and clinical outcome with this treatment modality was assessed.

Material and Methods

This was a clinical, prospective, observational study done in our tertiary centre from June 2018 to July 2020. The study was conducted on patients diagnosed to have proximal tibia fractures (Schatzker type V and Type VI) on AP and Lateral views of knee x-ray. A total of 30 cases were studied. The patients were treated surgically with dual plating using Lobenhoffer and lateral approach.

Inclusion Criteria

1. All skeletal mature patients with proximal tibia fracture Schatzker type V and VI aged between 18 to 65 years.
2. AO Muller type 41-C1, 41-C2, 41-C3
3. Patients willing to participate in study

Exclusion Criteria

A. Tibia uni-condylar fractures.
B. Skeletally immature patients.
C. Patients with pathological proximal tibia fractures
D. Isolated postero-lateral fragments.

Pre-operative planning

- Patients were received and a detailed history was taken, initial stabilization was done. Thorough examination was carried out, the limb was immobilizes with a splint and relevant imaging (x-ray and CT) and haematology studies were done.
- Once the diagnosis was made patients were planned for bi-condylar plating using dual approach. Definitive fixation was done only after adequate healing of soft tissues. Appropriate implants, (LCP plates, posteromedial and lateral plates) and instruments were selected.
- Appropriate antibiotic prophylaxis and pre-anaesthetic medications were given.

Surgical procedure

The patient is placed in prone position, parts painted and draped. The limb is exsanguinated and tourniquet is inflated. As per the Galla and Lobenhoffer approach an incision is made over the popliteal fossa, extending for 6-8 cm from the medial head of gastrocnemius from the joint line of knee distally. The incision is opened in layers through the subcutaneous tissue and fascia. Semitendinosus and medial head of gastrocnemius is identified. Semitendinosus is retracted medially and the medial head of gastrocnemius is retracted laterally. The periosteum is then incised and the fracture is identified. The fracture fragments are reduced with the knee in extension and simultaneous axial pull. The fixation is done using postero-medial plates. Wound wash was given and incision was closed in layers. Position was changed to supine and the lateral condyle fracture was approached antero-laterally. “S” shaped incision was made starting 5 cm proximal to joint line curving the incision anteriorly over Gerdy’s tubercle and extend it distally 1cm lateral to anterior border of tibia. Joint capsule was incised. Tibialis anterior was elevated by blunt dissection. If depression was present in the articular surface, it was elevated and fracture was reduced and fixed using proximal tibia lateral locking compression plate. Confirmed under fluoroscopy.

Post-operative protocol

Sterile compression dressing was done. Regular wound inspection and change of dressing was done. Active knee mobilisation was started as tolerated. Suture removal was done on day 12. Patients were advised non – weight bearing walker mobilisation for 8 weeks, and were advised for regular follow up for 6 months.

Follow up

At every follow up, operative site was examined for wound dehiscence, signs of infection, and imaging was done to assess fracture union, any loss of reduction and implant related failure. Patients were reviewed in the out-patient department at 6 weeks, 12 weeks and 6 months. Signs of union were noted in the serial x-rays taken. Partial weight bearing was encouraged after 8 weeks. Patients were advised full weight bearing mobilization after radiological signs of union was noted. Functional, radiological and clinical outcome was assessed and scored according to Honkonen and Jarvinen criteria at each follow up.

Results

The observational study was carried out on 30 patients diagnosed to have Schatzker type V and VI proximal tibia fractures. Majority of the patients in our study were male patients aged between 31-40 years. Motor vehicle accidents and fall from height accounted as mode of injury for these fractures. Majority of the cases were operated within 4-6 days following injury. The mean time delay for surgery was 4.9 days. 70% of the fractures were Schatzker type VI and rest 30 percent were Schatzker type V. About 25 patients in our study had no complications. However knee stiffness was the most common complication noted in 3 of our patients, and these patients were started on strict physiotherapy regimen. Superficial infection was noted in one patient and was managed with dressings and appropriate antibiotics according to the culture and sensitivity report. One patient had skin necrosis which was managed with skin grafting and regular saline dressing.

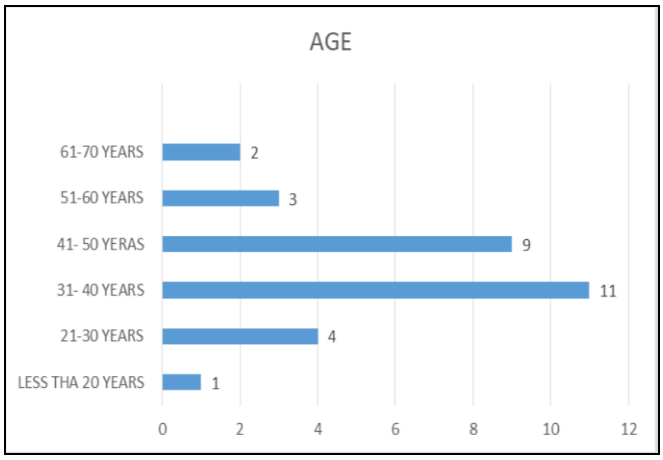
Discussion

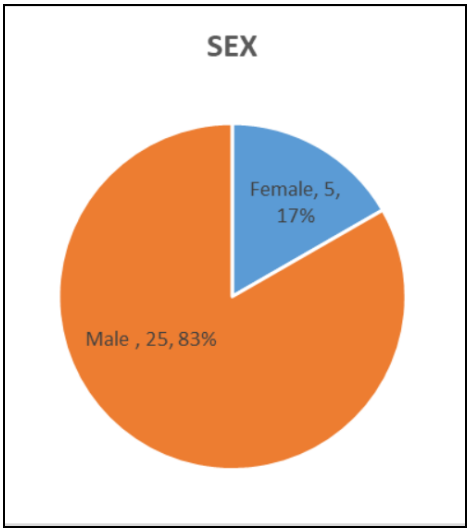
With increase in incidence of motor vehicular accidents, tibial fractures are justified to be termed as fracture of modern age. In depth technical knowledge and expertise in surgical skills is necessary for management of tibial plateau fractures. In the past these fractures were treated with a single midline incision (Mercedes Benz incision) and these were associated with high

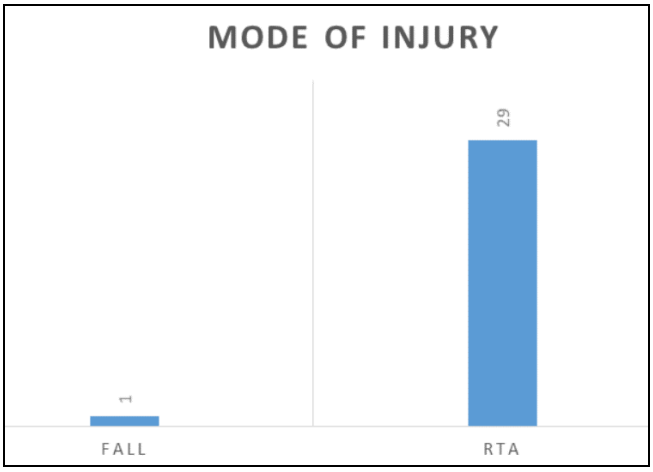
wound complication rates and secondary loss of alignment [10]. Wound complications led to use of hybrid external fixators, Ilizarov system for these proximal tibia fractures [11]. Coronal fractures like the posteromedial fragments were missed in the earlier days and usually led to loss of alignment and early arthritis [12] Due to their localization, posteromedial dislocation fragments are difficult to incorporate into the wire assembly of hybrid fixations. A pure transcutaneous screwing of such fragments without supporting plate appears in the face of the large acting forces, it makes little biomechanical sense. The goals of management for tibial plateau fractures are anatomical reduction, maintenance of alignment, and stable fixation to allow early rehabilitation. Initially locking compression plates were used only on the lateral side, but this method of fixation was associated with many complications like varus collapse of the medial fragments stabilised by screw [13, 14] This further led to the concept of dual plating using the two incision technique. Association for osteosynthesis has advised two incision dual plating for treatment of bicondylar proximal tibia fractures [15]. Dual plating with two incisions provides better visualization and hence better fixation with a rigid construct and lesser wound complications. Lobenhoffer and Gala approach provides better visualization of the fracture and easy anatomical reduction manoeuvre. In 1992, Honkonen and Jarvinen et al. described a comprehensive grading system according to which proximal tibia fractures would be classified as excellent , good , fair , or poor. The HJ criteria are based upon four parameters: subjective, clinical assessment, functional evaluation, and radiological scoring. The subjective assessment consists of the frequency of symptoms experienced by the patient: daily, weekly, fortnightly , monthly or never. The clinical evaluation is based upon extension lag, range of flexion, and thigh atrophy. The functional assessment comprises the ability to walk, climb stairs, jump, squat, and duck walk. The radiological assessment includes the degree of varus /valgus and tilting of the plateau, articular step- off and condylar widening in millimetres, and the relative joint space narrowing indicates degenerative changes after the plateau fracture [16]. In our study males were predominantly affected which can be attributed to our Indian set up where the female population predominantly work indoors. Most of our patients were between 31 – 40 years of age, hence we can conclude that the younger sections of our society sustain these fractures due to their active lifestyle. Among 30 patients most common mode of injury being the road traffic accidents, followed by fall from height , left side being more commonly involved than right side, we had 21 Schatzker type VI and 9 Schatzker type V. Our study used Honkonen Jarvinen criteria for functional, clinical outcome which showed excellent to good result. Our study reported Honkonen Jarvinen Clinical outcome to be 73.3% excellent, 23.3% good and 3.3% fair. The functional outcome was 80% excellent, 13.3% good, 3.3% fair and 3.3% poor. Complications seen in our study were, most common being knee stiffness in 3 cases (10%), skin necrosis, 1 case (3.3%) and superficial wound infection in 1 case (3.3%). Galla and Lobenhoffer approach technique in all of cases and had excellent results with the method proving that this surgery reduces the surgical trauma to soft tissue, decreases the need for immobilization and decreases the overall complication associated with surgery leading to excellent functional outcome of the knee joint as confirmed by the follow up of the cases.

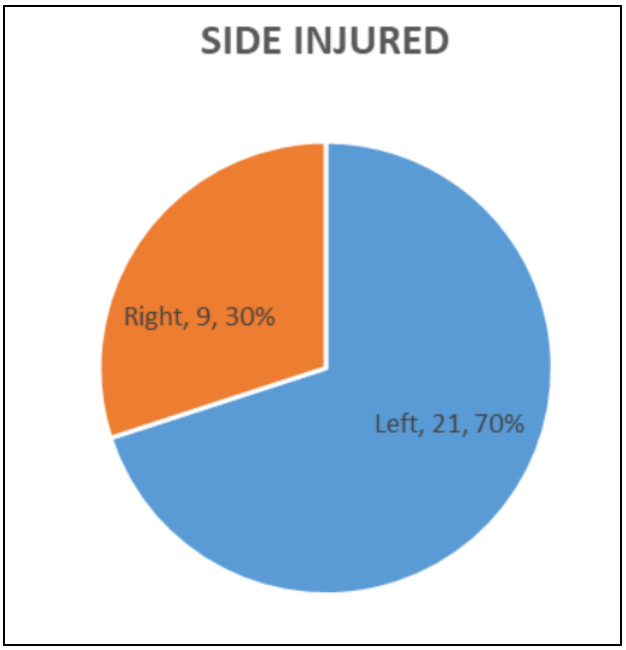
Conclusion

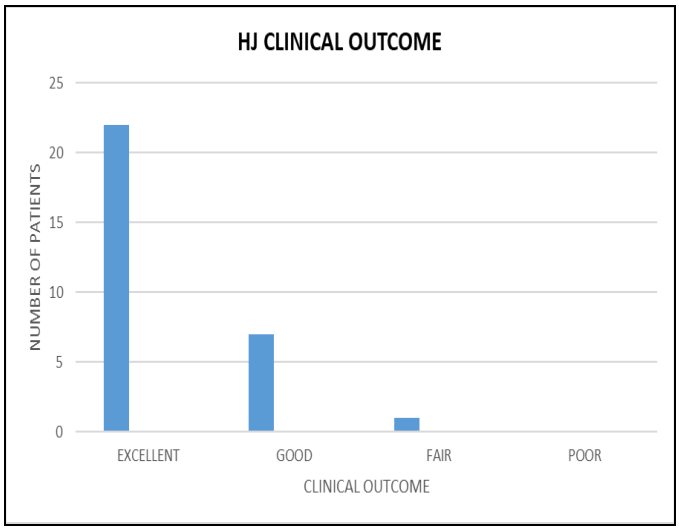
Considering the initial treatment modalities followed in the past we can conclude that proximal tibia fractures can tolerate minimal deformities. Hence from our study we can conclude that surgical management of bicondylar fractures is ideal. The Lobenhoffer approach offers a safe alternative to address posteromedial fractures often seen in high-energy tibial plateau fractures. It allows for direct visualization of the fracture fragment for accurate reduction and plating. Utilization of this approach will maximize treatment of isolated posteromedial and bicondylar fractures of the tibial plateau. Stable fixation and effective post op rehabilitation is important in management of proximal tibia fractures.

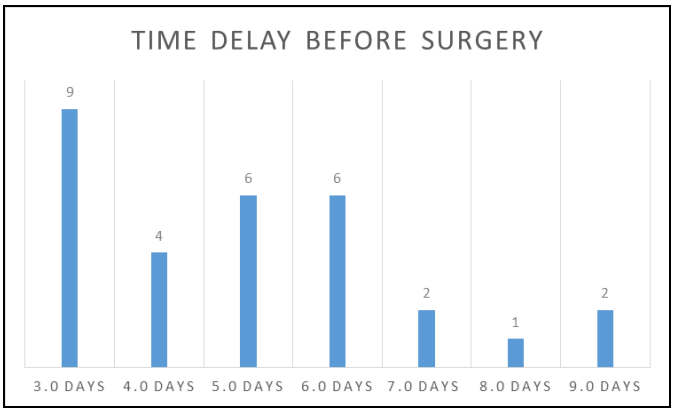


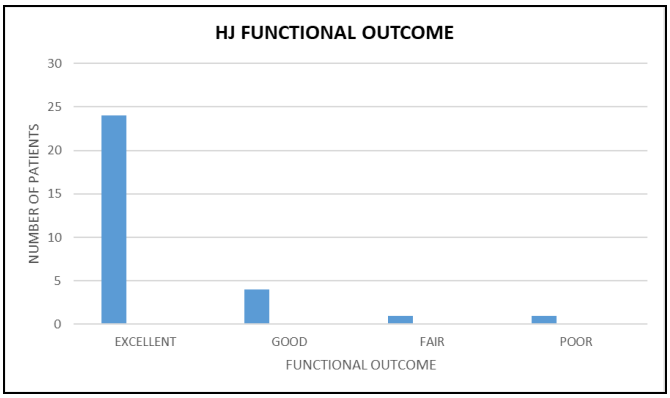


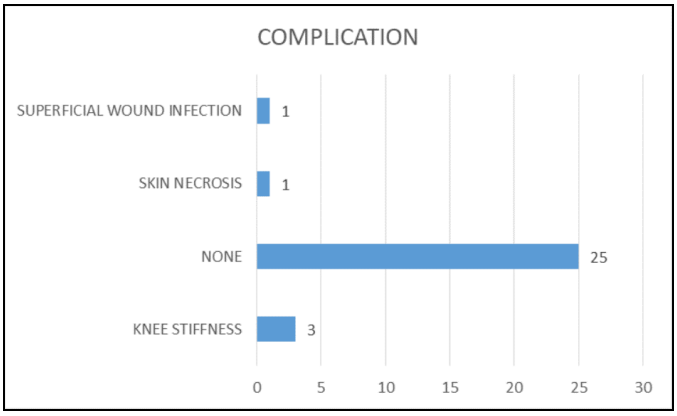






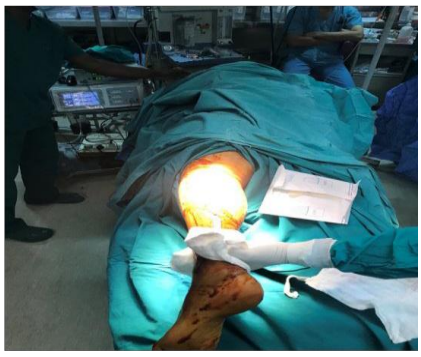


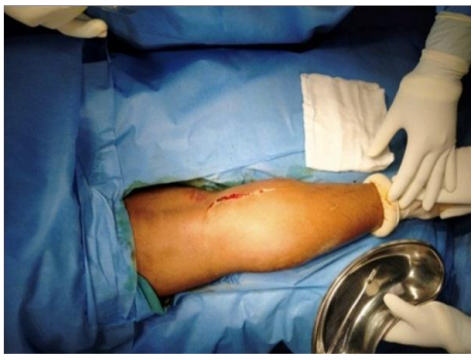




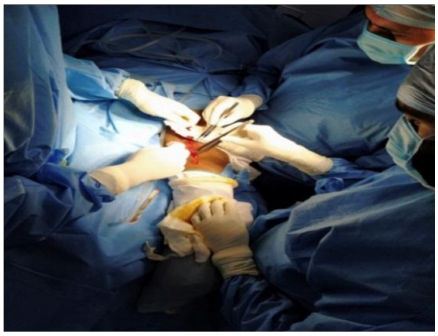
Intra Op Images

Patient in prone position





Incision



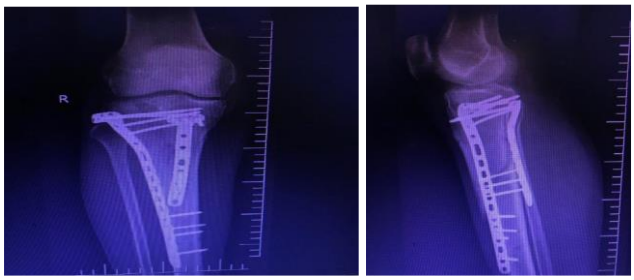
Gala and Lobenhoffer approach

Clinical Outcome Images

Radiological Images

Pre-op X-ray

Post Op X-ray



Follow up X-ray after six months

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