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ORIGINAL ARTICLE

Posteromedial Approach for Fixation of Medial and Posteromedial Tibial Plateau Fractures

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Abstract

Background: **One of the crucial load-bearing parts of the human body is the proximal tibial articular surface. Axial loading and valgus or varus applied forces may combine to cause this region to fracture. Tibial plateau fracture has a significant impact on the knee's stability, mobility, and alignment of the lower limb. The fracture becomes more complicated the more force is given to the limb.**

Objective: **To study the posteromedial approach for treating the medial and posteromedial tibial plateau fractures, and to evaluate the efficacy of such an approach in decreasing morbidity.**

Patients and methods: **This prospective investigation had 15 patients with medial or posteromedial tibial plateau fracture. 66.7% of cases have bicondoylar fracture, 20.0% have a posterior medial fracture and 13.3% of cases have a medial fracture. 80.0% of patients were managed by dual plating while 20% of patients were managed by single plating. Patients were recruited and assessed for eligibility at the Outpatient Clinic, Orthopeadic Surgery Department of Al-Salam Specialized Hospital.**

Results: **Regarding the incidence of infection, the present study indicated that only one patient has a superficial infection while the rest of the patients have no infections. The present study revealed that the majority of cases achieved excellent clinical results representing 66.7% and good clinical results were achieved in 26.7% of cases, however, only one case had poor clinical results.**

Conclusion: **The posteromedial approach is regarded as a secure and effective method of treating posteromedial tibial plateau fracture. It allows perfect visualization and reduction.**

Keywords: Anteroposterior, Bicondylar tibial plateau, Open reduction and internal fixation, Posteromedial plate, Tibial plateau fracture

1. Introduction

Different forms of tibial plateau fractures need distinct treatment modalities. Based on fracture morphology, a number of categorization methods have been put out, with the Schatzker classification being the most popular.[1]

This classification and others simply depend on plain radiographs, primarily in the anteroposterior (AP) plane, to identify the kind of fracture; as a result, they may not take into consideration fracture structures perpendicular to the AP plane (sagittal plane).[2–4]

Computed tomography (CT) has made it possible to better define the patterns of tibial plateau fractures by providing vital information.[5]

It has been previously shown that posteromedial shear or coronal fractures of the tibial plateau may occur alone or as part of bicondylar fractures.[3,6,7]

These fracture forms are often treated surgically using many incisions and a variety of implants, along with reduction and fixing procedures.[3,4,7,8]

Several papers have addressed fracture patterns similar to these, and they often describe a true posterior technique for reducing and fixing this

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particular fracture type, which is typically carried out in the prone position.[3,9,10]

When a distinct anterolateral technique is considered, a posteromedial technique in medial and posteromedial fractures is thought to reduce surgical soft-tissue damage.[11]

Our study was aimed to spotlight on the posteromedial approach in managing the medial and posteromedial tibial plateau fractures and to assess efficacy of this approach in decreasing morbidity.

2. Patients and methods

2.1. Type of study

Prospective study till completion of the study with regular follow-up for average 6 months.

2.2. Ethical consideration

All patients felt free to withdraw from the trial at any moment, at their request, once the local ethics and committee of Al-Azhar University Hospital approved it. Patient privacy was protected, and the data was exclusively utilized for scientific research.

2.3. Patient consent

All participants provided signed permission that was informed.

2.4. Study population

15 patients admitted to Al-Salam Specialized Hospital.

2.5. Inclusion criteria

Age above 20, medial tibial plateau fracture and posteromedial tibial plateau fracture.

2.6. Exclusion criteria

Age below 20, patient with co-morbid medical condition, patient with open Fracture, patient with neurovascular injuries and isolated lateral tibial plateau fractures.

2.7. Study tools: Preoperative evaluation

Patients were assessed clinically, laboratory and radiologically. Clinically: History taking, examination of limb deformity (unilateral or bilateral), neurovascular examination, soft tissue injury, compartment syndrome, and any other associated deformity. Radiologically: radiograph of knee AP/Lat, 3D CT. Laboratory: routine preoperative Investigations.

2.8. Surgical technique

2.8.1. Anesthesia

Patients had operations while under spinal anesthesia.

2.8.2. Position

On a radiolucent operating table, the patients are either prone. It was important to see the proximal tibia under fluoroscopy from both the lateral and anterior perspectives. After a sensitivity test was performed, a preoperative antibiotic was given, and the individual's leg was exsanguinated and a tourniquet placed around his or her thigh.

2.8.3. Incision

The medial head of the hamstrings and the gastrocnemius muscle, which are palpated on the medial and distal borders of the popliteal fossa, are surgical markers in the posteromedial method. We made a longitudinal incision 3 cm above the joint line along the posteromedial side of the tibia, extending it as far distally as necessary. The medial head of the gastrocnemius muscle is cut along the border by an incision that is approximately 10 cm long. Steer clear of the saphenous and great saphenous veins. With a blade knife, sharp dissection is performed in the popliteal fascia and subcutaneous tissue.

2.8.4. Procedure (Fig. 1)

We located the medial head of the gastrocnemius muscle, dissected it bluntly from distal to proximal, and then retracted it laterally. After medially retracting the hamstring tendon insertion (pes anserine), the popliteus muscle can be fully or partially dissected and separated from the proximal tibia subperiosteally using a periosteal elevator. The periosteum is incised gently and carefully lifted to expose the fracture site, and then a Hohmann retractor is positioned subperiosteally. The first screw is inserted through the plate and into an oblong hole immediately distal to the fracture to provide indirect reduction, and then hyperextension with axial traction is applied to the fragment and a T-shaped buttress plate is applied. The fracture was reduced by aligning the plate with the bone.

Temporarily secure the plate in place utilizing wires. The plate's ideal proximal level was maintained with the use of an image intensifier in the lateral view. The remaining screws are then installed through the plate.

Positioning of patient.

Skin and subcutaneous incision in posteromedial approach.

Exposure of the fracture site.

Inserting the plate.

Closure wound in layers.

Fig. 1. Use of the posteromedial approach method as a Posterior Column Orthopedic Fixation Technique for Tibial Plateau Fracture.

2.8.5. Closure

Before closing the incision, vascularity was assessed, and any minor vessels were cauterized before the tourniquet was gently removed. The incision was closed by suturing together the deep fascia, subcutaneous tissue and skin. The drain installed was 12 mm in size. A sterile bandage was applied to the wound afterward. The leg is prepped and draped once again for the conventional method to fracture fixation in patients with bicondylar fractures requiring fixation of the lateral tibial condyle, which can be done with an anterolateral plate or with percutaneous 6.5 mm or 7.3 mm cannulated lag screws.

2.8.6. Postoperative protocol: hospital stay

Patients are kept for 3–5 days observation period then discharged. Proper analgesia was administered

for the first two days, and anti-edematous measures were taken by elevating the operated limb and applying cold compresses for the first 24 h. On the initial postoperative day, chest exercises and cold therapy were administered. On the first post-operative day, continuous passive motion was initiated for individuals with unicondylar fractures. Bicondylar fractures were managed with a posterior above-knee splint, and range of motion was delayed for between ten and fourteen days. On the third postoperative day, every individual were permitted to walk utilizing two aids without placing weight on their injured limb. Postoperatively, hospital stays varied among two and five days.

2.8.7. Follow-up

Patients followed every 1–2 weeks with clinical and radiological assessment. Patients observed for Complications.

2.8.8. Mobilization

Early mobilization includes active aided and passive range-of-motion activities, commencing the first postsurgical day with Continuous Passive Motion. Early mobilization aims to attain 90° of flexion during the first few days after surgery.

2.9. Statistical analysis

Data were gathered, coded, reviewed, and put into IBM SPSS version 20 of the Statistical Package for Social Science. The quantitative and qualitative data were given as numbers and percentages, the quantitative data with parametric dispersion as means, SD and ranges, and the quantitative variables with non-parametric dispersion as median and interquartile range (IQR).

3. Results

Table 1 showed that there were three females and twelve males, ranging in age from 21 to 56 years, with a mean age of 37.53 years at the time of injury.

Table 1. Demographic data among studied patients.

	Number
Sex	
Female	3 (20.0%)
Male	12 (80.0%)
Side	
Lt	10 (66.7%)
Rt	5 (33.3%)
Age	
Range	21–56
Mean ± SD	37.53 ± 12.48

Table 2. Mode of trauma among studied patients.

	Number
Mode of trauma	
Falling	3 (20.0%)
RTA	12 (80.0%)

Table 2 showed that there were 3 patients (20%) were falling and 12 patients (80%) were RTA.

Table 3 showed that there were 10 patients (66.7%) were bicondylar and 2 patients (13.3%) were medial.

Table 4 showed that there were 2 patients (13.3%) were having intra-operative complications (long time of operation) and 3 patients (20%) were need to primary bone graft, there was 13 patients (86.7%).

Table 5 showed that range of motion of the studied patients were >120° and 1 patients only were from 90° to 120°.

Table 6 showed that there was 1 patient (6.7%) were having Superficial infection and 12 patients (80%) were need to dual plating.

Table 7 showed that there was 1 patient (6.7%) were union duration of them were <12 weeks and 12 patients (80%) were from 12 to 16 weeks.

Table 8 showed that there was 1 patient (6.7%) were poor, 4 patients (26.7%) were good and 10 patients (66.7%) were excellent.

Table 3. Classification of fracture among studied patients.

	Number
Classification of fracture	
Bicondylar	10 (66.7%)
Medial	2 (13.3%)
Posterior medial	3 (20.0%)

Table 4. Intra-operative complications and primary bone graft among studied patients.

	Number
Intra-operative complications (long time of operation)	
No	13 (86.7%)
Yes	2 (13.3%)
Primary bone graft	
No	12 (80.0%)
Yes	3 (20.0%)

Table 5. Range of motion among studied patients.

	Number
Range of motion	
<90°	1 (6.7%)
90°–120°	1 (6.7%)
>120°	13 (86.7%)

Table 6. Infection and dual plating among studied patients.

	Number
Infection	
No	14 (93.3%)
Superficial infection	1 (6.7%)
Dual plating	
Dual	12 (80.0%)
Single	3 (20.0%)

Table 7. Union duration (Weeks) among studied patients.

	Number
Union duration (Weeks)	
<12	1 (6.7%)
>16	2 (13.3%)
12–16	12 (80.0%)

Table 8. Clinical results among studied patients.

	Number
Clinical results	
Excellent	10 (66.7%)
Good	4 (26.7%)
Poor	1 (6.7%)

3.1. Case presentation

3.1.1. Case no (1)

Age: 23 years.

Sex: male.

Diagnosis: Right bicondylar tibial plateau fracture Schatzker type V.

Radiology (Figs. 2–5).

ROM (Figs. 6 and 7).

3.1.2. Case no (2)

Age: 48.

Sex: male.

Fig. 2. Preoperative plain X-ray

Diagnosis: left bicondylar tibial plateau fracture Schatzker type V (Figs. 8–13).

4. Discussion

Tibial plateau fractures are those that involve one or both of the medial or lateral condyles of the proximal section of the tibia bone and have different degrees of articular depression and displacement. As these fractures are intraarticular, they are more vulnerable to stiffness and post-traumatic arthritis, making effective therapy of such instances essential.[12]

These fractures may develop as a consequence of direct or indirect compressive stresses. In addition to fractured bones, these injuries often cause substantial soft tissue damage and ligament dislocation. Plain radiographs may reveal diagnostic imaging features such as elevated trabecular density in the lateral epicondyle and fat-fluid levels in the suprapatellar bursa, as well as misaligned femoral condyles and tibial edges. Computerized tomography imaging should be done on cases in whom a tibial plateau fracture is suspected but no radiographs have been taken.[13]

A posteromedial tibial plateau fracture is regarded as a difficult tibial plateau injury pattern. A posteromedial piece of varying size is separated by a coronal-plane fracture line. While this kind of fracture is relatively uncommon, it has not previously received enough attention. These fractures are often brought on by high-energy trauma, which frequently results in soft tissue damage, metadiaphyseal separation, and articular surface comminution.[14,15]

Several surgical approaches are present however; controversies are present regarding the optimal approach in treatment of medial and posteromedial tibial plateau fractures.

Therefore, the aims of the current research were to study the posteromedial approach in managing the medial and posteromedial tibial plateau fractures, and to estimate efficacy of such approach in decreasing morbidity.

This prospective study included 15 patients with medial or posteromedial tibial plateau fracture. 66.7% of cases have bicondoylar fracture, 20.0% have posterior medial fracture and 13.3% of cases have medial fracture. 80.0% of patients were treated by dual plating while 20% of cases were treated by single plating.

In terms of the demographic characteristics of the examined cases, the present results revealed that the mean age of the recruited patients was 37.53 ± 12.48

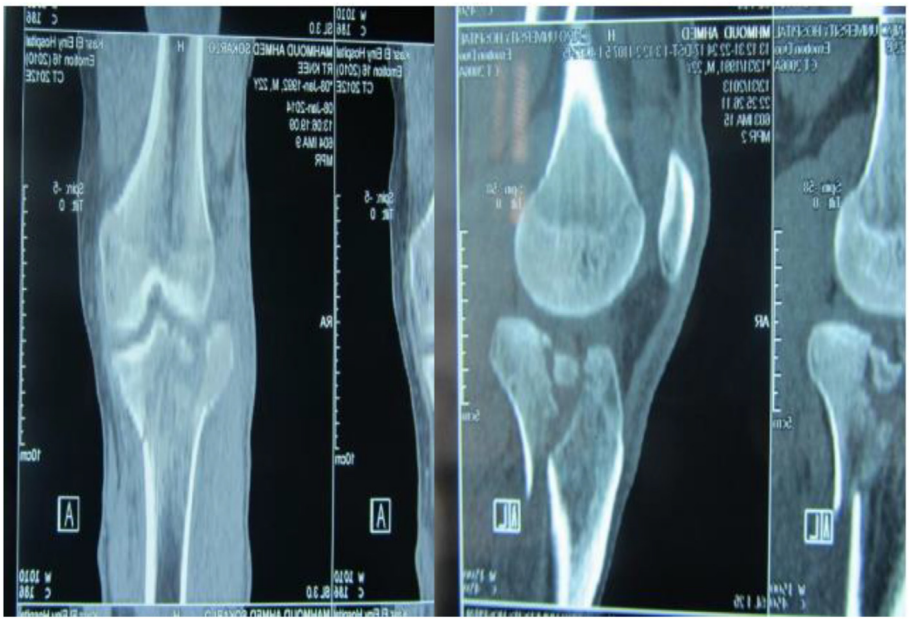

Fig. 3. Preoperative CT scan.

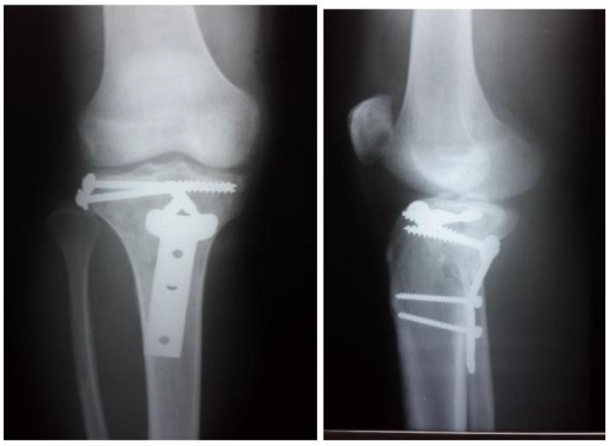

Fig. 4. Immediate postoperative X-ray.

Fig. 6. Range of knee extension.

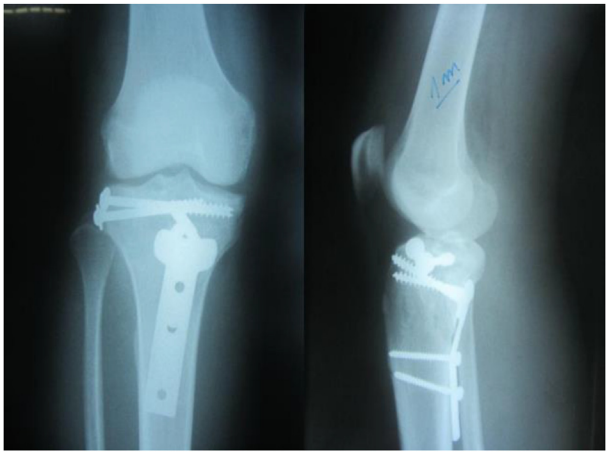

Fig. 5. Three months postoperative X-ray.

Fig. 7. Range of knee flexion.

Fig. 8. Preoperative plain X-ray.

Fig. 9. Preoperative CT scan.

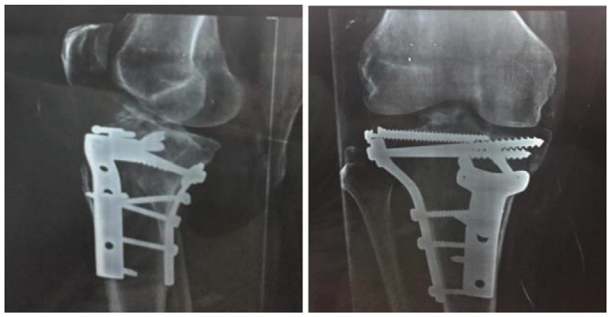

Fig. 11. Three months postoperative X-ray.

Fig. 12. Range of extension.

years. Male patients represented 80% and female patients represented 20%, moreover, the majority of fractures occurred in the left side (66.7%).

Regarding mode of trauma among studied patients, the present study revealed that the majority of cases got the fracture through Road Traffic Accidents (RTAs) representing 80% and 20% of cases got the fracture through falling.

Regarding the intra-operative complications and the need for primary bone graft among studied patients, the present study revealed that 13.3% of cases showed intraoperative complications (long time of operation) and 20.0% of cases needed primary bone graft.

Regarding the range of motion among studied patients, the present study indicated that 13 patients (86.7%) achieved range of motion >120° and 1 patient only achieved range of motion from 90° to 120° and 1 patient only achieved range of motion <90°.

Regarding the incidence of infection, the present study indicated that only one patient has superficial infection while the rest of patients have no infections.

Fig. 10. Immediate postoperative X-ray.

Fig. 13. Range of flexion.

Regarding union duration (Weeks) among studied patients, the present study indicated that the majority of cases needed 12–16 weeks to achieve full fracture union, representing 80.0%. Two cases (13.3%) needed more than 16 weeks to achieve full fracture union, however, only one case achieved full fracture union in less than 12 weeks following fixation.

The present study revealed that the majority of cases achieved excellent clinical results representing 66.7% and good clinical results were achieved in 26.7% of cases, however, only one case has poor clinical results.

4.1. Conclusion

The posteromedial technique is considered a safe and effective method for treating fractures of the medial and posteromedial tibial plateau. It's a great tool for locating and rearranging dislodged pieces.

Authorship

All authors have a substantial contribution to the article.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Conflicts of interest

The authors declared that there were no conflicts of interest.

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