Section: Orthopaedics

Original Research Article

SURGICAL TECHNIQUE AND OUTCOMES OF POSTERMEDIAL TIBIAL PLATEAU FRACTURES TREATED BY LOBENHOFFER APPROACH IN PRONE POSITION

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Received : 19/01/2024
Received in revised form : 23/03/2024
Accepted : 06/04/2024

Keywords:
Posteromedial Fracture, Tibial Plateau, Butress Plate, Lobenhoffer.

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DOI: 10.47009/jamp.2024.6.2.169

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 819-823

Abstract

Background: Posteromedial fractures of the tibial plateau which occur due to high velocity injuries are usually isolated or associated with a bi-column fracture. These fractures have traditionally been treated by medial plating in the supine position. The Lobenhoffer approach used in the prone position is a relatively better approach to visualise and surgically reduce and fix the posteromedial fragments. Lobenhoffer approach requires minimal neurovascular dissection and thicker posterior flaps prevents from wound healing issues. **Materials and Methods:** Retrospective study was done in the period of January 2020 to January 2023 and a total of twenty-two (22) cases of which sixteen male and 6 female patients with a mean age of 45 were considered for the study. All the patients underwent initial radiography with X-ray and CT scan to classify the fractures. Thirteen patients had an isolated Posteromedial fragment which was treated via the Lobenhoffer approach and fixed with an anti-glide buttress plate and nine patients had a bi-column fracture with an associated anterolateral fragment which was separately addressed using an anterolateral approach with an anterolateral proximal tibia LCP. Mean follow-up was 15 weeks which included Radiographic evaluation of reduction quality and bony union. Functional evaluation included Lysholm scores and range of motion. **Results:** All fractures healed within the mean follow-up period of 15 weeks. Fourteen patients had postoperative anatomic reductions (0 mm step off), seven patients had acceptable reductions (<2mm step off) and one patient had a poor reduction due to early weight bearing. The mean Lysholm score was 91.8 with a median extension of 5 and flexion of 135. No cases of post-traumatic knee osteoarthritis were observed during the follow-up period. **Conclusion:** The Lobenhoffer approach to the posteromedial fragment has several advantages in terms of reduction of fracture and stable fixation yielding good results.

INTRODUCTION

Posteromedial Tibial plateau fractures are high energy injuries to the knee joint. It has a bimodal age distribution and is most commonly seen in motor vehicle accidents. Though isolated medial condyle fractures are seen routinely, they might be associated with lateral condyle fractures too. When fractures involve both medial and lateral condyles, it is invariably a result of high velocity injury. Being an intra-articular fracture, the joint surface should be aligned and fixed surgically for early knee mobilization and good functional outcomes.

These fractures have traditionally been treated by medial plating in supine position. With a larger medial fragment size, it may extend to lateral condyle as well. Hence these fractures would be difficult to visualise making anatomical reduction difficult in supine position. The Lobenhoffer approach is used to fix posteromedial fractures with the patient being in prone position. The advantage of this approach is that the fracture fragments can be visualised adequately and hence allowing the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

surgeon to fix the fracture in a more anatomical position.

The supine position with a posteromedial or posterolateral approach requires extensive dissection for reduction purposes. Furthermore, the biomechanical principles of management of these fractures require placement of a posterior anti-glide buttress plate. Therefore, the posteromedial fragment sometimes cannot be optimally treated by conventional anterior, medial, or posteromedial approaches in the supine position.[1] A conventional vertical incision of the posteromedial collateral ligament and detachment of the medial capsule and medial head of gastrocnemius from the medial femoral condyle are generally required for full exposure of the posteromedial facet. Posterior approaches, such as described by Trickey in the 1960s,[2,3] are more demanding and involve dissection of the neurovascular bundle but the Lobenhoffer approach does not need any dissection of the posterior neurovascular bundle. The posterolateral aspect of the tibial plateau can be addressed by extending the approach distally if necessary. The incision has thick flaps raised on either side and hence usually have no problems with respect to wound healing. It is easy to apply an antiglide buttress plate to get a rigid anatomical fixation.

MATERIALS AND METHODS

A retrospective study done in the period of January 2020 to January 2023. A total of twenty-two cases of posteromedial tibial fractures were operated during this period. A detailed history and clinical examination as per the ATLS protocol is done in the emergency room and list of injuries were noted. Skin condition was inspected for blisters and a thorough clinical examination and the distal neurovascular condition noted. After stabilizing the patient in the emergency room, radiographs were obtained in both AP and lateral views. After the diagnosis of tibial plateau fracture was made, a CT scan was ordered to find the extent of involvement of 3 columns (lateral, medial and posterior column) and to identify the fracture pattern. Articular step-off if any, were noted. For the present study both isolated posteromedial fractures and bi-condylar fractures were included. Lateral column fractures which are a part of bicolumnar fractures were evaluated and planned for fixation with lateral plating but isolated lateral column fractures were not included in the study. All basic surgical investigations were carried out. ECHO and cardiologist opinion was obtained for elderly people above 60 years of age and those with pre-existing cardiac illness. Anaesthesia opinion and fitness was obtained for surgery. The possible risks and benefits were explained to patient and informed consent was obtained. They were planned for posteromedial buttress plating by Lobenhoffer approach.

Surgical Technique

Under spinal anaesthesia patient is placed in prone position. Local parts are painted and draped with tourniquet inflated. A vertical Skin incision of size 10 cm made near the medial border of gastrocnemius. If joint visualisation is required incision can be extended proximally in the shape of a “Reverse L”. Thick flaps are raised on both sides. The medial gastrocnemius fascia is visualised and incised longitudinally. The medial gastrocnemius muscle is elevated from the medial aspect and a blunt hohmanns retractor is inserted and the medial gastrocnemius muscle is retracted laterally. Periosteal elevator is used distally till the soleal line. Pes anserine tendons are dissected and they are looped and retracted medially. The Popliteus muscle is exposed and it is subperiosteally elevated to expose the fracture site. The fracture is reduced by giving traction in extension and valgus force applied to knee. An anteriorly directed periosteal elevator is used to secure the reduction and provisionally fixed with k wires. The fracture reduction is checked under C-arm guidance in both AP and lateral views. A 3.5 mm T-buttress plate applied in an antiglide fashion and the oblong cortical screw applied first to fix the plate to the bone and tightened. Distal and proximal screws are filled after confirming the position with intraoperative flouroscopy. Wound wash given and the gastrocnemius fascia and skin closed in layers. Suction drain was kept in all cases. Average blood loss during surgery was 230 ml. Blood transfusion was done in patients with haemoglobin levels less than 10g/dl. All patients were taken up for surgery within 24 hours of injury.

CASE 1

Figure 1A: Preoperative Xray Showing Postero Medial Tibial Plateau Fracture

Figure 1B: Ct Showing Unstable Postero Medial Fragment

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Figure 1C: Intra Operative Picture Showing Butress Plate

Figure 1D: Post-Operative Ap and Lateral Radiographs with Good Anatomical Reduction and Fixation

RESULTS

Twenty-two cases of tibial plateau fractures were included in our study. The average age of the study population was 45 years. [TABLE-1] 16 patients were males and 6 patients were females. The mechanism of injury was high velocity road traffic accidents in 19 patients, whereas 3 patients had low velocity trivial falls and were elderly and osteoporotic. Skin condition was normal without any blisters in all the cases. No distal neurovascular deficit nor associated injuries were present in all cases. CT scan showed isolated posteromedial fractures in 13 cases, bicondylar tibial plateau fractures were identified in 9 cases. In isolated cases posteromedial buttress plating was applied in prone position. In bi-condylar fractures 7 cases had only anterolateral column involvement. 2 cases had posterolateral comminution with anterolateral fragment. Another anterolateral tibial raft plate was applied to address the anterolateral fragment in these fractures through an anterolateral incision. If dual plating has been considered, the cases were operated on the posteromedial fragment through the Lobenhoffer approach initially followed by the anterolateral column. C-arm was used to assess the length of the screws and position of the plate. Tibial tuberosity avulsion was noted in 2 cases for which cannulated cancellous screw fixation done from anterior to posterior direction with the knee extended.

Patient was rehabilitated with knee brace for 3 weeks. Knee bending is started after 3 weeks. Toe touch weight bearing after 6 weeks and full weight bearing by 12 weeks based on follow-up radiographs. Follow up of patients is done at 2 weeks, 6 weeks and 12 weeks with a mean follow up of 15.63 weeks. Clinical assessment is made and outcomes were assessed by Lysholm score. Radiological outcomes were assessed with standard AP and lateral views of knee with leg. Reduction quality was assessed as anatomic, acceptable or poor. Perfect anatomic reduction was with no step off. Anything less than 2mm step off was considered acceptable. More than 2mm step off was considered poor. We had 14 radiographs with anatomic reductions in the subsequent follow-ups and 7 patients with acceptable reduction. One patient had a poor reduction on follow-up radiographs due to a possible fall or early weight bearing. None of the patients had any surgical site infections or delayed wound healing.

CASE 2

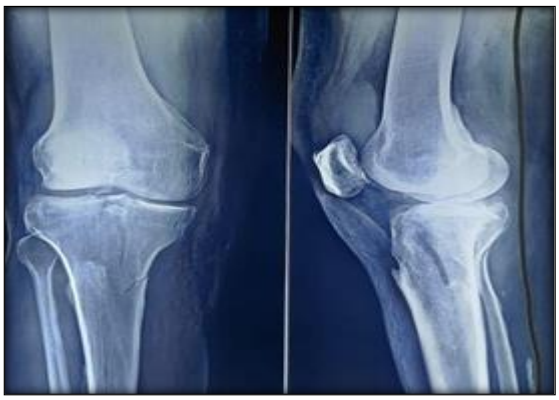

Figure 2A: Preoperative Xray Showing Postero Medial Tibial Plateau Fracture and Lateral Condyle Split Type

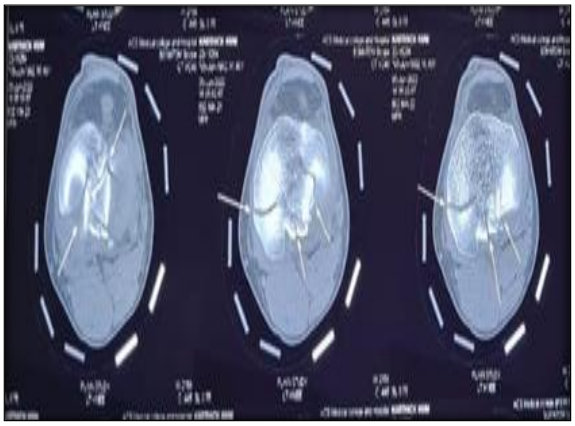

Figure 2B: Ct Showing Unstable Postero Medial Fragment with Comminution

ISSN (O): 2687-5365; ISSN (P): 2753-6556

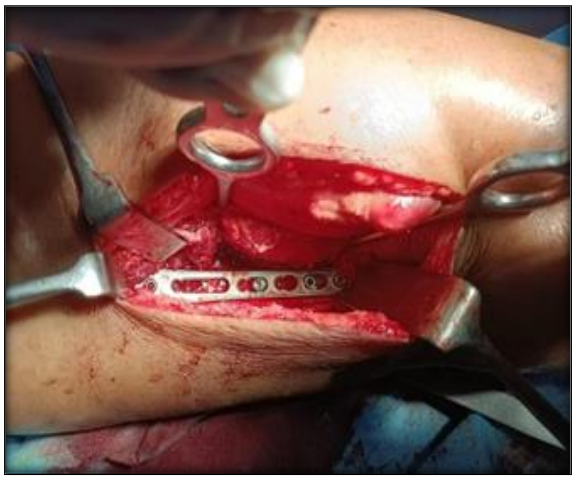

Figure 2C: Intra Operative Picture Showing Butress Plate in Prone Position

Figure 2D: Post-Operative Ap and Lateral Radiographs with Good Anatomical Reduction and Fixation with Butress Plate and Cancellous Screw

Table 1: ?

PATIENT NO	SEX	AGE	MODE OF INJURY	THREE-COLUMN CLASSIFICATION	FOLLOW UP (WEEKS)	POSTOPERATIVE REDUCTION	LYSOLM SCORE	FINAL ROM
1	M	38	RTA	PM	12	ACCEPTABLE	98	5-135
2	F	40	RTA	PM	14	ANATOMIC	95	10-120
3	M	33	RTA	PM	8	ANATOMIC	96	10-130
4	M	32	RTA	PM + AL	10	ANATOMIC	89	10-135
5	F	43	RTA	PM	12	ACCEPTABLE	90	5-135
6	M	45	RTA	PM + AL	12	ANATOMIC	91	5-100
7	M	52	RTA	PM + AL	12	ANATOMIC	92	10-120
8	F	55	RTA	PM	12	ACCEPTABLE	95	5-140
9	M	68	TRIVIAL FALL	PM	12	POOR	75	15-100
10	F	43	RTA	PM	16	ANATOMIC	92	5-130
11	F	46	RTA	PM	14	ACCEPTABLE	93	5-140
12	M	61	TRIVIAL FALL	PM	18	ACCEPTABLE	88	10-110
13	M	43	RTA	PM + AL	20	ANATOMIC	93	5-130
14	M	52	RTA	PM	12	ANATOMIC	96	5-140
15	F	37	RTA	PM	12	ANATOMIC	91	5-120
16	M	35	RTA	PM	12	ANATOMIC	94	5-140
17	M	45	RTA	PM	16	ACCEPTABLE	87	10-120
18	M	71	TRIVIAL FALL	PM + AL	18	ACCEPTABLE	86	10-100
19	M	33	RTA	PM	24	ANATOMIC	93	5-130
20	M	41	RTA	PM	12	ANATOMIC	99	5-140
21	M	40	RTA	PM + AL	12	ANATOMIC	94	5-130
22	M	39	RTA	PM	16	ANATOMIC	93	5-140

M – MALE; F- FEMALE; PM – POSTEROMEDIAL; AL – ANTEROLATERAL; RTA – ROAD TRAFFIC ACCIDENT;

DISCUSSION

Moore's classification 4 takes into account of higher-energy injuries and resultant knee instability. Posteromedial fractures were first described by Postel et al. in 1974 and later included in the Duparc classification, these fractures lead to specific problems in terms of approach and fixation.[5] Moore had described the posteromedial tibial plateau fracture in his classification. Posteromedial fragment is coronal fracture extending from the posterior articular surface with its apex in the medial cortex. Schatzker classification of tibial plateau fractures does not provide the various fractures of medial condyle nor by the AO classification system (41- B2.2/B3.2),[6] as it is based on plain radiographs and as a result these fractures can be missed.

Numerous case series have advocated the use of supine approaches for the treatment of complex tibial plateau fractures involving bilateral tibial condyles.[7,8,9] For comminuted three- column tibial plateau fractures, several approaches have been described for exposure of posteromedial or posterolateral split fractures. These standard techniques have in common the problem of an extensive approach with incision of the posteromedial ligament, detachment of the medial capsule and the medial gastrocnemius muscle from the femoral condyle, and the potential requirement

ISSN (O): 2687-5365; ISSN (P): 2753-6556

for detachment of the hamstrings to achieve adequate exposure and reduction of the fracture.[10] After the advent of CT scans we could appreciate the various subtypes of these fractures in detail. In the revised Duparc classification the medial condyle fractures of tibia was divided into spinocondylar, unicondylar, posteromedial and bicondylar.[5] Various approaches have been employed for treatment of complex tibial plateau fractures. Most of them involve supine positioning and figure of,[4] position to address the posteromedial fragment. Supine position approaches are gold standard for fixing anterolateral and anteromedial fractures. The disadvantage of these approaches in supine position is when addressing the posteromedial and posterolateral fragments, fracture visualisation and reduction becomes difficult and after applying the plate the screws are inserted from posterior to anterior direction. The Lobenhoffer approach in prone position allows good fracture visualisation and minimal dissection of the neurovascular bundle is required. Soft tissue dissection is minimal and good wound healing is achievable. Fracture can be reduced by traction and hyperextension of the knee. In biomechanical perspective applying the plate posteriorly is the strongest method to withstand posterior shearing force during walking. Applying side plate or lag screws from anterior to posterior direction were found to be inferior constructs on applying load. Also there is a chance of later collapse when patient loads weight after a period of strict non weight bearing. The best way to address these bone spikes is to apply the plate in antiglide mode to prevent collapse.

CONCLUSION

There are various approaches to posteromedial tibia in the present literature. Lobenhoffer approach in prone position gives the best visualisation for reducing posteromedial fragment and bicondylar fractures without the need for extensive dissection of the neurovascular bundle. This approach can expose both posteromedial and posterolateral fragments and achieve articular reduction and safe placement of antiglide plate and screws. The disadvantage of this approach is a delayed preparation and draping time, difficult to maintain in prone position in polytrauma patients. We need a larger sample size and longer follow up for further validating our findings.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556