



Midterm Results of Postero-Medial Column Shearing Type Tibial Plateau Fracture :A Retrospective Study

KEYWORDS

Posteromedial column tibial plateau fractures, postero-medial approach, Buttress plate

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ABSTRACT *Background:Posterior column shearing tibial plateau fractures are not very common as anterolateral or anteromedial column fractures. Generally posterior fragment of these fracture could not be exposed & reduced well in conventional anterior approaches.Osteosynthesis with buttress plate by postero-medial approach to manage posteromedial tibial fracture can achieve satisfactory results.*

Material & Methods: 23patients with displaced posteromedial fracture of tibial plateau operated from January 2011 to June 2013 were retrospectively studied. All patients were treated by posteromedial approach and internal fixation with T or L plate in buttress mode.

Results: After a minimum follow up of 36 months the average range of knee motion is 5-110° of flexion at the final follow up. In all the patients fracture was united and have maintained satisfactory articular reduction without any major instability and had acceptable alignments. No major complications occurred in our study group. Rasmussen functional 30 point grading system result show excellent in 10 (44%),good in 12 (52%) and fair in 1 (4%).

Conclusion: Posteromedial column shearing type of tibial plateau fracture gives good functional results at midterm follow up when treated with buttress osteosynthesis by posteromedial approach.

Introduction:

Posterior column fractures occurs due to high energy trauma.To manage them is always a great challenge because of there anatomical position and concomitant ligamentous injury.Although with the advent of sophisticated surgical approaches, and precise imaging methods, it is still a great challenge to deal with them. This injury could result in secondary osteoarthritis which may lead to persistent pain and disability if anatomical reduction and/or mechanical axis of leg could not be achieved.^{1,2,3} In general, Schatzker types 4-6 fractures were categorized as high energy related, although it is believed this category system could not include all injury types.⁴ Schatzker classification limits its morphological assessment only in sagittal plane and cannot be used in coronal fracture of the posterior condyle. AO classification with three dimensional Computed Tomography Reconstruction helps in understanding these fractures.

Goals of treatment while treating such fractures are anatomical restoration of articular surface, repair of soft tissue injury and rigid internal fixation to obtain stable painless knee joint with normal range of motion.In this retrospective study we have analysed 23 cases of shearing type of posteromedial column tibial plateau fracture which are managed by posteromedial approach and osteosynthesis with 4.5mm buttress plate. We hy-

pothesised that, this surgical technique is beneficial for the anatomical union of fracture and better functional result.

Material and methods:

In this retrospective study we included 23 patients having displaced posteromedial column tibial plateau shearing type of fracture with or without medial or lateral tibial condyle fractures treated with Open reduction and internal fixation with buttress plating through posteromedial approach in between 2011 to 2013 at our institute. Patients with multiple injuries, open fractures, comminuted fractures and patients who did not have minimum 3 years of follow up were excluded from the study. All fractures were treated according to the principles advocated by AO/ASIF.⁵ These principles include anatomical reduction of joint surface, rigid internal fixation along with repair of ligaments, torn menisci and early mobilisation.

Pre-operative planning was done by evaluating Antero-posterior, Lateral and plateau tilt view Radiographs. Computed Tomography was done in every case to define the fracture pattern, amount of depression, amount of displacement and angulation.



Figure 1 A & B: Preoperative antero-posterior and lateral radiographs – Showing bicondylar fracture with Arrow showing postero-medial fragment.

Intra-operative attention was given on careful soft tissue handling, temporary reduction and fixation of fracture. Soft tissue injuries such as bruising and simple degloving were healed by dressing changes before surgery. We applied Plaster of Paris slab to all patients and elevation was given on the Bohler Brown's frame. Primary external fixator was applied when needed.

The patients were operated using regional anaesthesia. The patients were positioned supine with limb in attitude of abduction and external rotation and put it in figure of 4 position. A small roll under opposite hip was placed to facilitate the position. Straight or slightly curved incision was made running from medial epicondyle towards posteromedial edge of tibia. The incision was extended as needed. Second antero-medial or antero-lateral incision was taken to fix associated medial or lateral condylar fractures if required. After opening the fascia, Pes anserinus was identified and exposed. The pes was retracted anteriorly and medial head of gastrocnemius retracted posteriorly and distally. The medial edge of the tibial plateau was identified. The capsule was incised between the meniscus and the edge of the plateau thus getting access to the joint and fracture. Visualisation of articular surface was limited, but, if necessary, visualisation was improved with a longitudinal split in the medial collateral ligament and capsule. Temporary reduction was achieved with 'k' wires. Depending upon fracture morphology L or T buttress plate was placed in buttress fashion and by butting first apical screw fracture was fixed. Some fractures needed additional transverse cancellous screw. Injured meniscus and/or collateral ligament was/were repaired. Then other associated fracture if present were tackled. The image intensifier was used to check the adequacy of reduction before closure. A tension free layered closure was carried over a suction drain.



Figure 2A, B, C: Postoperative antero-posterior and lateral Image Intensifier images showing anatomical reduction and fixation of postero-medial fragment with posterior buttress plate (Arrow) and fixation of medial and lateral condyles.

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The knee was immobilised in 10°-15° of flexion in long knee brace and isometric quadriceps exercise and hip raising exercises started from 1st post-operative day. Knee mobilisation was started from 5th post operative day onwards or as tolerated by patient and depending upon type of fracture, adequacy of fixation and treating surgeon's judgement. Protected weight bearing was begun in all patients from 6th weeks post-surgery. The patients were followed up in Outpatient department at 3rd weeks, 6th weeks, 3rd months, 6th months and 1 year and thereafter at appropriate intervals. During each visit the patients were evaluated using Rasmussen's 30 point clinical grading system.⁶ The results were analysed in relation to fracture union, adequacy and maintenance of reduction, knee alignment, range of motion and instability. All patients were followed up till a minimum period of 3 years.



Figure 3A&B: Antero-posterior and lateral radiographs after union.



Figure 4 shows the functional results of a patient after treatment.

Results:

There were 18 male and 5 female patients with a mean age 36 years (range 21-49 yrs). The right knee was involved in 16 and left in 7 patients. 19 patients had injuries due to road traffic accident and 4 patients due to fall. All were closed fractures; however, 6 of them had soft tissue bruise and contusion. None had compartment syndrome. Average time from injury to surgery was six days. (range 1-14 days) Out of 23 patients, 7 patients had pure posteromedial shearing fracture. The minimum duration of follow up was 36 months. (Mean 50 months, Range 36 - 66 months). The mean time of union was 15 weeks. (Range 13 - 18 weeks) 20 (87%) patients had maintained satisfactory reduction after union and 3 (13%) patients had articular step of 3-4 mm. All patients demonstrated satisfactorily coronal and sagittal alignment. The range of motion of the knee averaged 5° (range 0° to 8°) of extension to 115° (range 105°-130°) of flexion. 2 patients had revealed 5° of varus collapse. No patient had antero-posterior or rotational instability. Ras-

museen's mean functional score was 25 (range 17-30), Excellent in 10 patients (44%), good in 12 (52%) and fair in 1 (4%).

Table 1: Master chart

Sr. no	Age/ Sex	Side	Mode of injury	Union in weeks	Follow up in months	ROM in degrees	Rasmussen Results	Varus/Valgus/Articular step
1	39/M	Rt	RTA	14	66	0-125	Good	-
2	23/M	Rt	RTA	13	63	0-120	Good	-
3	42/F	Lt	RTA	17	60	10-105	Fair	4 mm step
4	49/M	Lt	Fall	18	57	0-120	Good	Varus 5°
5	41/M	Rt	RTA	16	56	0-130	Excellent	-
6	28/M	Rt	RTA	14	56	0-125	Excellent	-
7	31/M	Rt	RTA	15	54	0-130	Excellent	-
8	45/F	Lt	Fall	15	54	5-110	Good	5 mm step
9	29/F	Rt	RTA	13	53	0-130	Excellent	-
10	48/M	Rt	RTA	17	51	10-125	Good	Varus 5°
11	44/M	Rt	RTA	15	51	0-125	Good	-
12	33/M	Rt	RTA	14	51	5-125	Excellent	-
13	42/M	Lt	RTA	16	50	5-115	Good	-
14	47/F	Rt	Fall	15	49	0-115	Good	-
15	32/M	Rt	RTA	13	48	0-120	Good	-
16	36/M	Lt	RTA	18	48	0-130	Excellent	-
17	21/M	Rt	RTA	14	46	0-130	Excellent	-
18	25/M	Rt	RTA	14	41	5-120	Good	-
19	46/F	Lt	Fall	16	40	10-110	Good	3 mm step
20	37/M	Rt	RTA	17	40	0-130	Excellent	-
21	34/M	Rt	RTA	16	39	0-125	Good	-
22	26/M	Lt	RTA	13	39	5-125	Excellent	-
23	37/M	Rt	RTA	15	36	0-130	Excellent	-

Discussion:

A new way of thinking of three column fixation for complex tibial plateau fracture demonstrates morphology of fracture and mechanism of injury.⁷ The preferred treatment and specific method of fixation of low energy tibial plateau fracture varies widely among surgeons. Numerous Authors have reported satisfactory results using both, either operative or non-operative.^{8,9} Treatment of posterior tibial condyle fractures of tibia is challenging. Poor articular reduction having step of more than 7 mm, condylar widening, varus collapse, inadequate fixation, bone/cartilage defect gives poor results.⁸ Antero-posterior lag screw fixation through anterior approach is described by many Authors. This method has certain disadvantages such as indirect reduction method as fracture fragment is not exposed directly leading to less satisfactory anatomic reduction and difficulty in maintaining reduction due to lack of buttress effect.

In Comparison with anterior approaches, the Postero-medial and postero-lateral approaches enables direct visualisation of posterior fracture fragment and joint surface, easy anatomical reduction of articular surface, which could be stabilised and maintained more accurately and rigidly with buttress plate. Buttress plate principle with apical screw is

always preferred for column fracture. The placement of the plate is very important. It should go to the apex of the fracture fragment. Buttress plate prevent inferior displacement of the fracture fragment but poor resistant against flexion and varus force on medial plateau. Supplementary transverse lag screw avoids varus derotation of the fragment. Most of the cases hamstring only needs to be retracted. In case of long fracture spike they can be incised and sutured back at the end of surgery.⁹

Posterior approaches are relatively complex in anatomy, but complications concerning soft tissue are rare. Posteromedial approach allows repair of meniscal and ligament injuries more easily as compared to anterior approach. Disadvantages of this surgical exposure are that important structures such as neurovascular bundle is very close and requires careful dissection and hence has a long learning curve. Also surgical exposure through posterior to medial collateral ligament and anterior to hamstring require major soft tissue dissection.¹⁰ Our study results demonstrated overall good results at mid-term follow up and less complications.

Conclusions: Posterior shearing tibial plateau fractures can be managed successfully using a posteromedial approach with the direct reduction and buttress fixation of articular fragments. Fully understanding the morphology of fracture is essential for decision making. Quality and stability of articular reduction and early mobilisation are factors that influences long term functional outcome.

Limitations: The limitation of this study is that the sample size is quite small, inhomogeneous population with variety of fracture pattern and no control group.

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