CASE SERIES

Outcome of management of tibial plateau fracture by posterior Lobenhoffer approach: case series

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Abstract

Displaced Tibiai plateau fractures are complex periarticular injuries. Restoration of the anatomy and internal fixation are key elements for early return to function and better functional outcome. Newer modalities like CT scans has enabled better understanding of these fractures. Posterior approaches were not very common as compared to anteromedial and anterolateral surgical approach. Posterior approach has the advantage of avoiding anterior skin and soft tissues that has been compromised as a result of the fracture; it is also particularly helpful in direct and accurate reduction in certain fracture patterns. This case series highlights the importance of posterior approach to restore the articular surface of complex periarticular proximal Tibial fractures. All displaced tibial plateau fractures with posteromedial fragment were included in the study. Pathological fractures and all open fractures were excluded from this study. Oxford Knee score was done at regular intervals for functional outcome assessment. No wound complications or iatrogenic neurovascular damage were observed with this approach in this series. Anatomical reduction and radiological union was obtained in all patients with excellent functional outcome. We recommend posterior Lobenhoffer approach for fixation in select group of patients with Tibial plateau fractures.

Keywords: Tibial plateau fractures, posterior approach.

DOI: 10.47391/JPMA.1566

Submission completion date: 10-06-2021
Acceptance date: 19-03-2022

Introduction

Management of periarticular fractures, especially in the proximal Tibia, is a very demanding endeavour. Restoration of articular congruity, resumption of coronal and sagittal plane alignment and obtaining a stable construct are of utmost importance to re-establish knee range of motion. Failure to achieve these goals may lead to secondary arthritis.[1-3] Though historic classification systems based on x-rays were successful in providing the management plans and exceptional results, the desire for improvement led to the evolution of three dimensional approach to address these complex fracture patterns. Recent studies have introduced three-column concept in proximal Tibial fractures reflecting importance of surgical fixation of posterior column via posterior approach.[4, 5]

Wang Y et al in 2016 shared the updated three column concept for the classification, planning and management of proximal Tibial fractures and highlighted exceptional results with limited number of fixation failures. They pointed out that restoration of the three columns along with articular congruity are of utmost importance to reach the premium outcome.[5]

The aim of this case series was to highlight the importance of posterior approach to knee as described by the Lobenhoffer, in addressing the complex proximal Tibia fractures[6]. If performed effectively, it safely addresses posterior column of proximal Tibia with no compromise to the neuro-vascular structures.

Case Series

In this retrospective study eight cases of proximal Tibia fractures where posterior Lobenhoffer approach was utilised were recruited. The study started after approval from ethical review committee and the cases operated in Aga Khan University Hospital between June 2015 to February 2020 were included. Fractures were assessed on plane anteroposterior, lateral radiographs and CT scans to provide detailed assessment of the fracture geometry. Pathological fractures and injuries with neurovascular insult warranting intervention by vascular surgery were excluded.

Pre-operative pre-requisites were fulfilled. The patient was made to lie in prone position and important structures such as flexion crease of the knee, Semitendinosus tendon and medial head of gastrocnemius muscle were identified and marked. Our incision is well co-related with literature and was 10 -12 cm along the medial border of gastrocnemius extending proximally lateral to semi-tendinosus. The incision was extended transversely across the flexion crease according to fracture geometry, anticipated length of the plate and

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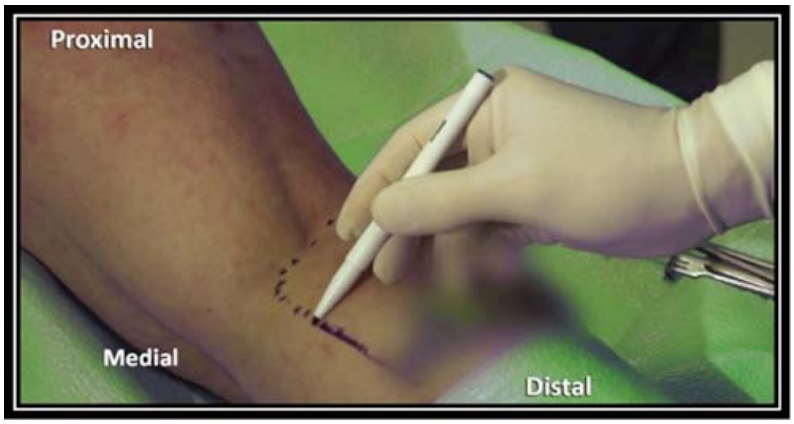

Figure-1: Landmarks & incision for Posteromedial approach (right knee), patient in prone position.

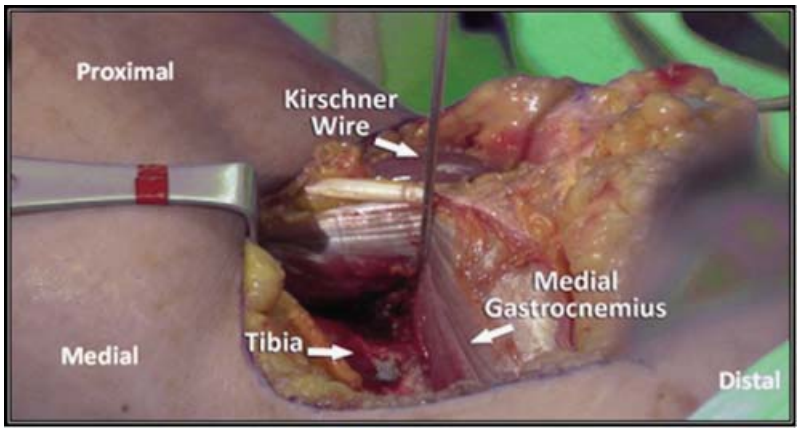

Figure-2: Sub periosteal elevation of gastrocnemius and temporary fixation of the posterior fragment with k wire.

the calf circumference (Figure1). After dividing the skin, subcutaneous fat and the fascia, the head and whole belly of medial gastrocnemius muscle was identified and lifted meticulously in sub-periosteal plane and retracted to the side with Hohmann's retractors. This manoeuvre is sufficient to protect the entire neurovascular bundle on posterior aspect of the knee joint and provides access to the large posterior fragments of the tibial plateau fracture.[7]

The fracture was assessed and temporarily stabilised with Kirschner wires (Figure 2) under fluoroscopic assistance and then fixed with locking plate in buttress mode. The wound was closed in standard fashion at the end of the procedure. Based on fracture geometry, the approach was either performed alone or in combination with anterolateral or anteromedial approach.

Post-operatively, the patient was kept non-weight bearing for six weeks, then gradually progressed to full weight bearing. The patients were regularly followed-up in clinic at two and four weeks, then at three, six and 12 months, respectively. Oxford knee score is used for functional assessment, the results were stratified to Excellent, Good, Fair, and Poor categories. Radiological union, neurological dysfunction, and knee stability and range of motion were also accessed.

All eight patients who met the inclusion/exclusion criteria were male. The mean age was 33.75±8.01year. Right side was involved in 2 (25%) patients and the left side in 6 (75%) patients. All eight patients had history of road traffic accident (100%). Average length of stay at the hospital was 3.3±1.63 days. All the patients were operated under general anaesthesia. No neurological dysfunction was noted in any patient and according to Oxford knee Score[8], 8 (100%) patients showed excellent results. The mean follow-up was 48±5 weeks. Mean radiological union time was 16.4 ±1.95 weeks. There was no case of non-union, infection or malunion Table-1 and Table-2.

Table-1 : Patient demographics, fracture detail & functional outcomes.

Characteristics	Variables	N (%)
Gender	Male	08 (100%)
SITE	left	06 (75%)
	Right	02 (25%)
Mode of injury	RTA	08 (100%)
Fracture	Closed	08 (100%)
Anaesthesia	General	08 (100%)
Knee Range of Motion	0-120	01 (12.5%)
	0-130	04 (50%)
	0-140	03 (37.5%)
Oxford Knee Score	Excellent	08 (100%)
	Good	00
	Fair	00

Table-2: Patient details and radiological outcomes

Variables	Mean/SD
Mean Age (years)	33.75 ±+ 8. 01
Length of Stay	3.375+± 1.63
Healing Time	16.4 ± 1.95

Discussion

Anterior, lateral or medial approaches are commonly preferred for majority of the surgeries around the knee

including fixation of Tibial plateau fractures. Anterolateral or anteromedial approaches are useful in most Tibial plateau fractures but do not give access to big posterior fragments, not uncommon in these fractures. Anterior approaches also pose additional risk of soft tissue dehiscence, infection, and flap necrosis, as usually the anterior skin and soft tissues are involved in these fractures.

Posterior approach is useful in gaining direct access and fixation of posterior column of Tibial plateau and it avoids anterior skin and minimises the risk of soft tissue problems. The main concern with posterior approach is the risk of iatrogenic injury to the major neurovascular structures at the back of the knee joint. The medial Sural cutaneous nerve and the small saphenous vein are close to the fascia in the middle of the popliteal fossa while the popliteal artery, vein and the tibial nerve runs longitudinally in the popliteal fossa in between the two bellies of the gastrocnemius muscle. One key measure to protect these structures is to stay medial to the medial belly of the gastrocnemius muscle and lifting it subperiosteally.

The aim of fixation for periarticular fractures are anatomical reduction, stable fixation and acceptable alignment to allow early rehabilitation. Computerised tomography and 3D reconstruction has pointed out the presence of posteromedial fragment. Failure to do so may lead to the loss of alignment and early arthritis. Barie et al describes the presence of these fragments in 33% of all tibial plateau fractures.[9,10] These fractures have also been treated with single long midline incision, which was associated with high wound complication rate and secondary loss of alignment.[11]

The Posterior Lobenhoffer approach was first described in German literature in 2003[6]. Recent studies of fixation of tibial plateau fractures via posterior approach have shown excellent results for such fractures with a good outcome and without any neurovascular damage.[8,12-15] In our experience, this approach is safe and fundamental in direct reduction of fracture fragments as it provides adequate access to the posterior and postero-medial structures (Figure 3).

In our patients, fixation was done with locking plate in a buttress fashion. Zeng et al compared the use of different modalities like anteroposterior lag screws, anteromedial locking plate, lateral locking plate and posteromedial buttress plate and found that posteromedial fixation with buttress plate was most stable biomechanically for fixation in these fracture patterns.[16]

Figure-3 (a-b) : Pre- and post-operative x-rays of a patient. Large Posterior fragment anatomically reduced and fixed with Buttress plating posteriorly.

We have observed excellent results using posteromedial fixation through Lobenhoffer approach. We recommend routine use of computed topography for detailed assessment of tibial plateau fractures. Posterior fragments are not uncommon and reduction of such fragments with Lobenhoffer approach is safe and helpful in the management of these complex fractures. The main limitation of our study was small number of cases and shorter follow-up.

Conclusion

It can be concluded that posterior approach to the knee is safe and helpful in direct anatomic reduction in select cases of Tibial plateau fractures. No significant associated adverse clinical effects in terms of access and neuro-vascular damage were encountered. A limitation to our study is small number of patients and it is recommended that a study with long duration and larger sample size could be better to prove the efficacy of this approach.

Consent: Verbal consent has been taken from all the patients for the publication of this case report.

Disclaimer: The study has been presented in the surgical grand round at the Aga Khan University Hospital in 2018.

Conflict of Interest: None.

Source of Funding: None.

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