

Original Research Article

Surgical management by Open Reduction and Internal Fixation with column specific plating of Complex Tibial Plateau Fractures—Three Column Fixation: A Prospective study analysis

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Abstract

Background: To treat the multiplanar complex tibial plateau fractures, in recent years, “three-column fixation” technique is used, which is based on the three-dimensional understanding of the fractures of CT rapidly. Most current classification systems for tibial plateau fractures are based on two-dimensional images of x-ray, that directing surgeons to pay attention to medial and lateral fixation without fixing posterior column fixation. After careful review and application of the 3DCT scan for the evaluation of upper tibial plateau fractures, importance of posterior fixation, especially for the posteromedial fragment is being realised. **Material and methods:** Type of study: Prospective. Place of study: Department of Orthopedics, Osmania General Hospital. Sample size and inclusion criteria: 20 patients with displaced tibial plateau fractures with posterior column involvement. Duration of study: 2 ½ years (June 2018 to December 2020). Material: Proximal tibial locking plates, T/L buttress plates, posteromedial and posterior tibial locking plate, 6.5 and 4mm cancellous screws (locking, non-locking), 4.5, 4.9 mm cortical screws (locking, non-locking). Position of patient during surgery: Both supine and prone Approach: Posteromedial (Loben Hoffer), posterolateral (mod. Frosch), Antero lateral. **Results:** Rasmussen’s Clinical and Radiological Criteria were utilized for evaluation of patients. 30% - excellent, 50% -good 10%-fair, 10% poor. **Conclusion:** Three-column fixation concept in treating complex tibial plateau fractures, is especially useful for multiplanar fractures involving posterior column with excellent functional outcome.

Key Words: Complex tibial plateau fractures, 3D CT scan, Open reduction and internal fixation, Fixation of three column of tibial plateau.

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Introduction

Tibial plateau fractures involve articular surface. Fracture displacement, pattern and place of fracture are important. And identification by good imaging is important other soft tissue, vascular and neurological injuries should be assessed proper fracture alignment along with limb will yield good results and outcome tibial plateau fractures are around 1-1.5% of all fractures of lower limb. [1-5] “Three-column fixation” technique is used in modern times to treat the multiplanar complex tibial plateau fractures, which is based on the three-dimensional understanding of the fractures after computer tomography has been rapidly evolving. Major classification systems for tibial plateau fractures use two-dimensional images (X-rays, 2D CT), leading to medial and lateral fixation avoiding of posterior fixation, importance of posterior fixation in tibial plateau fractures, especially for the posteromedial fragment is being realized after 3D CT scan studies. [5-10] LUO et al classified tibial plateau fractures according to 3D scan and divided to 3 columns. [11-12]

Materials and Methods

This is a Prospective study conducted at Department of Orthopaedics, Osmania General Hospital with a sample size 20 patients and inclusion criteria are displaced tibial plateau fractures with posterior column involvement.

Duration of study: 2 ½ years (June 2018 to December 2019).

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Investigations –Surgical profile, X-rays and both 2DCT and 3DCT scan of knee joints.

Material

Proximal tibial locking plates, T/L buttress plates, posteromedial and posterior tibial locking plate, 6.5 and 4mm cancellous screws (locking, non-locking), 4.5, 4.9 mm cortical screws (locking, non-locking).

Position of patient during surgery: Both supine and prone.

Approach: Posteromedial (Loben Hoffer), posterolateral (mod. Frosch), Antero lateral. Posteromedial approach surgical procedure was done as per patient specific and requirement.

Results

Rasmussen’s Clinical and Radiological Criteria [13-17]

Tibial plateau fractures were more commonly seen in the active productive age group (25–50 years) due to high-energy trauma-

- Conservative management, external fixators, and routine anterolateral plate osteosynthesis are difficult to reduce and fix the posterior column fractures, especially in posteromedial fragment and coronal splitting fractures in CT scan.
- Majority - male (90%) – RTA, no significant diff. on the side affected.
- This study is to analyze functional and radiological outcome and to plan for fracture fixation according to column involvement.
- Fracture distribution- 80% of two-column fracture (Schatzker type V 60% and type VI 40%), and 20% of three-column fractures (Schatzker Type V 70% and Schatzker VI 30%) included.

- Infection- Two cases of bicolumnartibial plateau fracture, treated with appropriate antibiotics period- longest was 20 months, shortest was 4 months, mean was 10 months.



Fig 1:Follow up period for 24 months

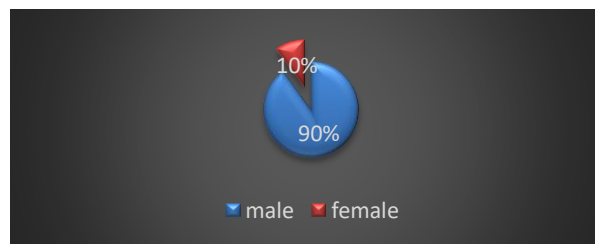


Fig 2:Sex distribution

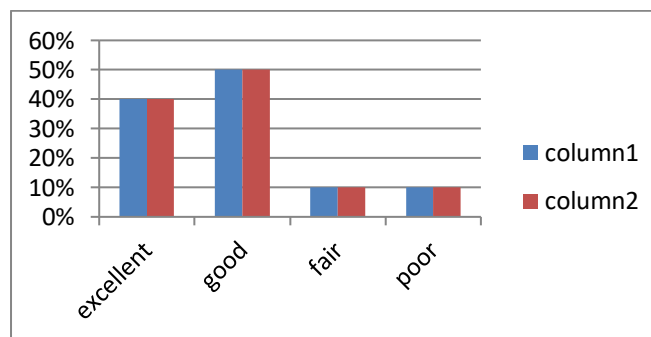
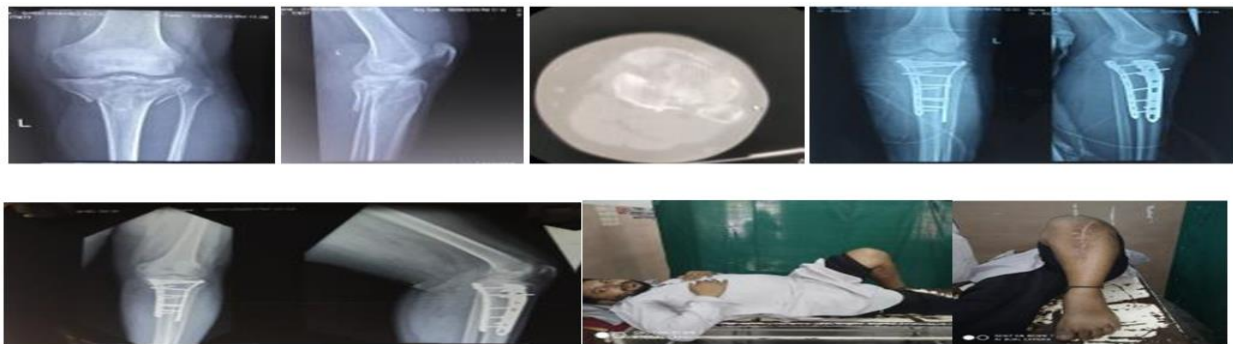


Fig 3:Radiological and clinical results





Discussion

Tibial plateau fractures are very common in relatively young age persons with high energy injuries like fall from height and road traffic accidents. Complex fracture patterns, ligament injuries, and severe soft tissue injuries are associated with tibial plateau fractures. Due to high variability in fracture outline there is much debate of investigation of radiology. 3D CT scans give more reliable outlines and lead to proper fixation. Posteromedial and posterolateral fragments fixation will give relatively good and excellent radiological and clinical results and outcomes. If both columns are involved, both medial and lateral plating will give better outcomes. [19-23]

Using the three-column fixation proposed by Luo *et al.* posterior fragment should be fixed with posterior rigid and anatomical fixation locking plate and antiglide plating either by screws or plates will give best results. [24] Varus or valgus deformities will occur if posteromedial and posterolateral fragments not fixed with rigid fixation, in a study by Waddell *et al.*, - single lateral plating developed varus malunion at the fracture site. [27]

Posteromedial T-plate can improve the strength and stiffness of posteromedial fragment fixation and had a buttress effect preventing descent of the fragment under load than other modes of fixation. Hence, reduce the varus collapse incidence and increase in the range of movements by fixing the unstable posterior fragments Zeng *et al.*, West *et al.*, and Luo *et al.* on-tibia bone model.

No patient developed neurovascular injury, no implant breakage, no varus valgus deformity, no delayed union, or non-union in our study.

Conclusion

Three-column fixation concept in treating complex tibial plateau fractures, is an excellent method useful especially for multiplanar fractures involving posterior column either with posteromedial or posterolateral fragment or single posterior fragment and that fragment fixation will give excellent functional outcome.

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