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A Study of Functional Outcome Following 3 Column Fixation of Complex Tibial Plateau Fractures

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Abstract

Background- Complex tibial plateau fractures are not uncommon in routine orthopaedic practice.[6] Most commonly used classification system is Schatzker Classification[1, 3, 4] which is based on single view x-ray. After advent of CT based Luo's 3 column classification[4, 7, 8] and Chang's 4 quadrant classification[2], column/ quadrant specific fixation concept has evolved which has given better stability and lesser soft tissue complications compared to conventional fixation with dual plates. In our study, we have applied Luo's 3 column concept[4, 7, 8] in the fixation of complex tibial plateau fractures using 3 plates and assessed the functional outcome in postoperative period.

Materials and Methods- 22 adult patients with bicondylar 3 column tibial plateau fractures were fixed with 3 plates using separate posteromedial and anterolateral approaches[10, 15]. The patients were followed up at 6 weeks, 3 months and 6 months postop and functional outcome was assessed by IKDC subjective knee evaluation score[17].

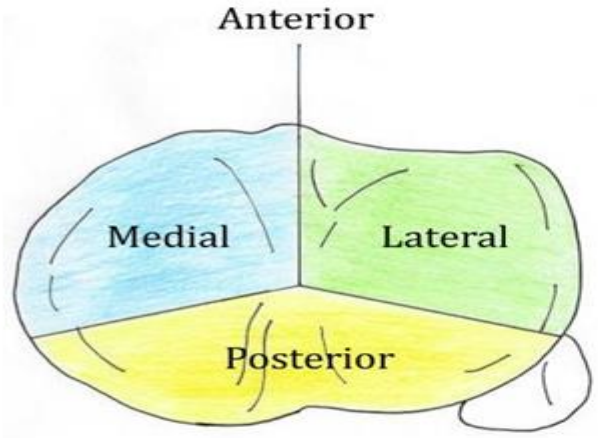
Results- Radiologically all patients achieved fracture union after an average of 18.6 weeks. Average IKDC score[17] was 92.8 at 6 months postop which indicated good functional outcome. Soft tissue problems were less and early-stage rehabilitation was possible.

Conclusion- 3 column fixation concept[7, 8] in the treatment of complex tibial plateau fractures provided stable fixation to allow for early-stage rehabilitation and yielded good functional outcome at 6 months postoperative follow up with low soft tissue complications.

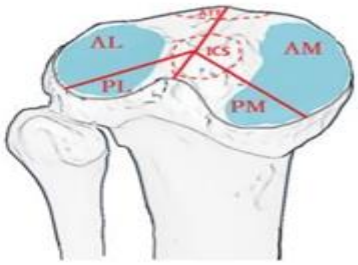
Keywords: Complex tibial plateau fractures; Early-stage rehabilitation; Functional outcome; IKDC score; Three column fixation

INTRODUCTION

Tibial plateau fractures result from high velocity injury like motor vehicle accident or fall from a tall height.[11,12,13,14] Most commonly used classification systems are Schatzker system[1,3,4] and AO/OTA classification[4,5]. Schatzker classification is based on single view x-ray.[1,3,4] With advent of Computed Tomography and 3 dimensional image reconstruction, tibial plateau fractures are being assessed by different new classifications.[4] Luo et al.[4,7,8] has proposed CT based 3 column classification (medial, Lateral and posterior) whereas Chang et al.[2] has proposed CT based 4 quadrant classification (anteromedial, anterolateral, posteromedial and posterolateral).



Luo's 3 column classification[4,7,8]



Chang's 4 quadrant classification[2]

There is controversy in the ideal treatment of these fractures, which depends on the degree of fracture comminution and soft tissue injury and quality of bone.[2] Instead of conventional dual plates, we have fixed 3 column tibial plateau fractures with 3 plates using separate posteromedial and anterolateral approaches[2, 10, 15] and postoperative functional outcome was assessed in this paper.

MATERIALS AND METHODS:

From October 2016 to October 2019, 22 adult patients with bicondylar 3 column tibial plateau fracture were prospectively enrolled in our longitudinal follow up study after approval of our institute's scientific and ethical committee and taking informed consent from every patient. As we had followed up the operated patients for 6 months, our study extended upto April' 2020. 10 patients presented with skin blisters over fracture site at the time of admission and these fractures were initially stabilised with a spanning external fixator for one to three weeks for soft tissue injury to heal (Span- Scan- Plan).[2] Preoperatively, X-rays- anteroposterior and lateral views of knee joint and CT scans with 3D reconstruction were taken to assess the articular involvement and cortical split.[2]

Surgical protocol- All 3 column tibial plateau fractures were fixed with 3 plates using separate posteromedial and anterolateral approaches.[2, 10, 15] The patients were placed in floppy lateral position and a high thigh pneumatic tourniquet was applied to the injured extremity.

Posteromedial inverted L shaped incision[2, 10], centring the horizontal limb at the popliteal crease and conventional anterolateral incision were made.[2, 10, 15] Long T plate was used to fix posteromedial column and recon plate was applied to support anteromedial column by posteromedial approach.[2, 10, 15] T buttress plate was used to raft and buttress lateral column against reconstructed medial column by anterolateral approach.[2, 10, 15]

Postoperative management and follow up- Limb elevation without any plaster slab was given.[2] 90° knee flexion was allowed from postop day 4 to 2nd week. Full range of motion of knee was given from 2nd week postop. Toe-touch walking was allowed for first 2 months.[2] Full weight bearing was permitted from 3 months postop.[2]

Patients were followed up at 6 weeks, 3 months and 6 months postop. Knee ROM was assessed by clinical examination. Clinical and radiological assessment of progress of fracture healing and complications were done infollow up. Functional outcome was assessed by IKDC subjective knee evaluation score[17] at 6 weeks, 3 months and 6 months postoperative follow up.

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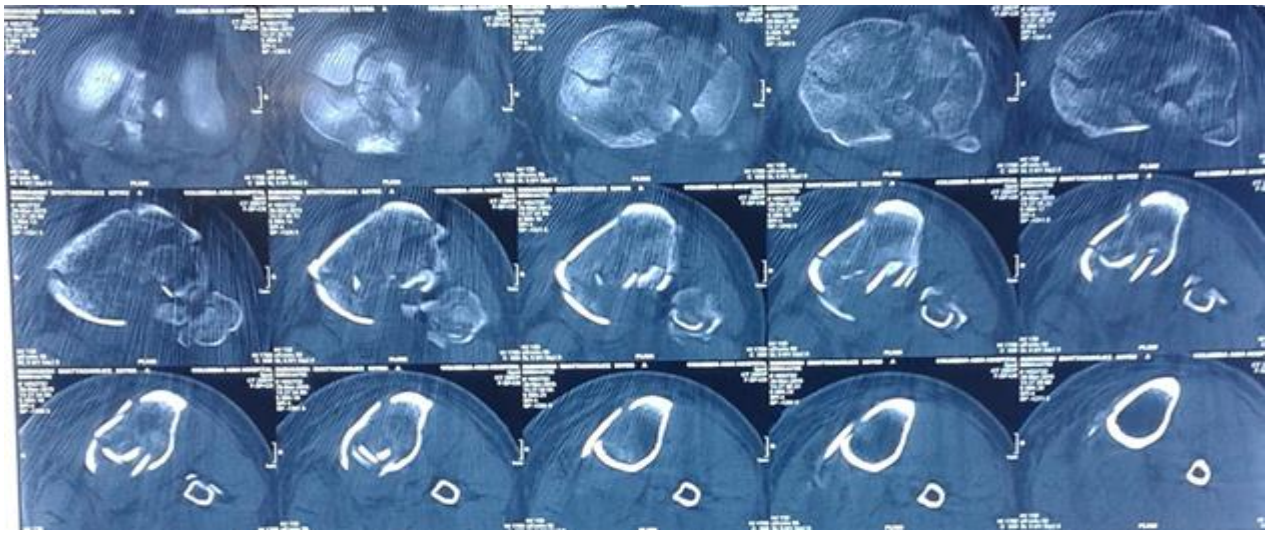
49 years old male fall off motorbike

Compromised soft tissue- Blisters

Spanned, Scanned and Waited

Classified- Schatzker V



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Column specific fixation using 3 plates- intraoperative C-Arm image



3 column fixation- postoperative xrays

Functional outcome 6 months postop

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RESULTS:

Radiologically all patients achieved fracture union after an average of 18.6 weeks. 2 patients lost in follow up. 3 patients developed wound dehiscence which needed 3 extra dressings. No patient developed wound infection. The average knee ROM was 90 ± 10.5. The average IKDC subjective knee evaluation score was 55.5 (range 51.2 – 59.7) at 6 weeks, 73.1 (range 70.4 – 77.3) at 3 months and 92.8 (range 89.3 – 96.1) at 6 months postoperative follow up.

DISCUSSION:

Complex bicondylar tibial plateau fractures involving the three columns are commonly encountered.[6] Operative treatment is indicated for all of them.[2] However, there is controversy over the approaches and implant preferences.[2, 9] Conventional treatment for bicondylar fractures is done by using dual incision and bilateral buttress plates which causes significant soft tissue destruction.[2] But, complex tibial plateau fractures with 3 column involvement are difficult to stabilise with bilateral plates.[2] Chang et al.[2, 10, 15] achieved better stabilisation of coronal posteromedial and posterolateral quadrant fragments with additional reconstruction plates in 12 patients. Zhai et al.[16] obtained satisfactory outcome according to Rasmussen score at final follow up with application of multi-plates for complicated bicondylar tibial plateau fractures in 26 young patients. Luo et al.[7] proposed three column fixation concepts in treating complex tibial plateau fractures which gave better functional outcome in 29 patients having multiplaner fractures involving the posterior column.

In our cases, Luo's 3 column fixation concept[7, 8] was applied in 22 adult patients using posteromedial inverted L shaped incision and conventional anterolateral incision[10, 15]. We achieved stable fixation in each case and good functional outcome at 6 months postoperative follow-up in terms of IKDC subjective knee evaluation score[17]. Soft tissue problems were less and this fixation protocol helped us to carry out early-stage rehabilitation.

CONCLUSIONS:

For complex bicondylar 3 column tibial plateau fractures, 3 plates application using separate posteromedial and anterolateral approaches provided stable fixation to allow for early-stagerehabilitation. Soft tissue complication was low in this procedure. We achieved good functional outcome at 6 months postoperative follow-up.

LIMITATIONS:

As it was a longitudinal follow up study, we had followed up our patients for only 6 months. So, short duration of follow up was a limitation of our study. Less number of patients in the study had limited the final result.

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