Original Research Article Odisha Journal Of Orthopaedics & Trauma| Jan-June 2020 | 41;(1): 17-20

A prospective study of clinical outcomes of management of arthroscopic assisted tibial plateau fractures fixation

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Abstract

This is a prospective case study about tibia plateau fractures in 28 patients which was managed with arthroscopic assisted internal fixation with plating and with or without bone grafting. In our study we saw domestic fall was a cause of fracture in about 60 yrs age patient with osteoporosis . Intra operative findings showed lateral meniscal tear in 6 patients medial meniscal tear in 1 patient which were repaired or menisectomy was done accordingly. In most of the patient fracture union seen by 4 to 6 months. Radiological Rasmussen score was Excellent in 53.5% in 3 months of follow up where as it improved to 75% by 6 months and 1 year follow up. Clinical Rasmussen score was Excellent in 50% of patients in 3 months where as it was improved to 71.4% by 6 months and 75% by 1 year follow up. Complications like infection in 3 patients , malunion in 2 patients, wound dehiscence in 2 patients. Arthroscopic assisted tibial plateau fixation is a preferred treatment for tibial plateau fracture because arthroscopy gives a precise visualization of pathology in the knee joint which can be meticulously addressed which gives early mobility and excellent range of movements.

Keywords: Intra-articular fracture , Tibial plateau , Arthroscopy-assisted internal fixation

Introduction

Tibia plateau fractures, like other intra-articular fractures is challenge for orthopeadic surgeons, the ultimate goal of these fractures is to maintenance of joint congruity by intra-articular reduction and rigid fixation allowing early post operative mobilization. But the question that remains is how to predict and determine the perfect anatomical reconstruction of tibia articular surface. Now, much debate is focused on direct visualization of tibia articular surface using arthroscopy which addresses intra-articular pathology which affect postoperative range of movements and prevention from early osteoarthritis. In this study the clinical outcomes of ARIF with ORIF has been evaluated.

Materials and methods

A total of 28 patients with tibia plateau fractures (Schatzker type I-VI) were enrolled in the study which was done between November 2017 to October 2019. Patients with various types of tibia plateau fractures were assessed with Radiography and Computed tomography, classified by Schazkter Classification System and then each patient was managed with ARIF. An immediate postoperative radiograph was performed, and then repeated at 3, 6 and 12 months after surgery. Demographic data (age and sex), additional intra-articular injuries, and complications were noted, and clinically and radiologically evaluated by Rasmunssen score at 3, 6 and 12 months.

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Procedure

Patients were placed in supine position on operative table under spinal anesthesia. Operating room was prepared with general instruments along with Arthroscopy instruments and Fluoroscope. Arthroscopy monitor was placed on ipsi-lateral side of affected limb where as fluoroscopy machine and monitor was placed at contra-lateral side of the limb. Pneumatic tourniquet was applied over the affected limb's thigh. Then, as pre operative protocol scrubbing followed by draping and painting was done. The operative limb was examined clinically to evaluate knee stability intra operatively.

Antero-lateral and antero-medial portal were made for diagnostic arthroscopy. The arthroscopy fluid inflow was placed either at gravity or at low pressure to avoid extra-vasation and compartment syndrome. The arthroscopic examination permits evacuation of hematoma and loose bodies. The intra-articular ligamentous structures, meniscus were then probed, and the associated lesions were evaluated. Related pathology such as articular cartilage damage and meniscal injury were thoroughly addressed. Few were repaired and others were managed by menisectomy. Then fracture site was visualized after complete debridement and removal of haematoma. (Figure 1) Then according to the fracture pattern, we approached through antero-lateral approach for schatzker type 1,2,3 and postero-medial approach for type 4 and both antero-lateral and postero-medial approach for schaztker type 5 and 6 as it needs bi-columnar fixation. Then intra-articular fracture was provisionally reduced with ball tipped reduction forceps and followed by provisional fixation with k-wires which generally should be placed 1 cm below the joint line. In schatzker type 2 and 3 where there was lateral plateau depression, that was approached by a medial cortical window and the depression was elevated with a spatula, curette or bone punch till it matched to the articular surface under fluoroscopy guidance.

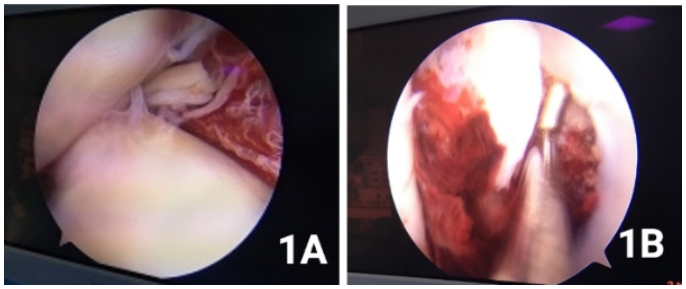


Figure 1: Arthroscopic images showing Intra-articular pathology
1A: Meniscal tear
1B: Depressed fracture

(Figure 2) The articular margins were re-evaluated with Arthroscopy following which it was internally fixed with cortical locking screws through proximal locking holes of anatomical anterolateral locking plate used for tibia plateau. Extra-articular fractures with intra-artiuclar extension was thereby addressed through plating in buttress mode. Schatzker type 1,2,3 fractures were addressed by lateral buttress plating, schatzker type 4 fractures were addressed by medial buttress plating and schatzker type 6 fractures were addressed with bicolumnar buttress plating. The created void through cortical window via which articular step up was addressed, then filled with autologous bone graft or bone graft substitutes or bone cement. Then reduction was checked through fluoroscopy, varus or valgus mal-alignment was then checked .Then meticulous closure in all layers was done as soft-tissue infection and wound dehiscence were common complications.

Post-operative care

(Figure 3) Patient was given long knee brace post-operatively. Drain was usually removed 24 to 48 hrs post surgically depending on the collection. Inspection of surgical wound was done after 48 hrs. wound care was done in utmost sterile conditions to reduce infection and wound dehiscence. Quadriceps strengthening exercises was started as early as possible. Knee bending was done at earliest in stable fractures and may be delayed in comminuted fractures. Non weight bearing walking with Walker or Crutches was allowed. Full weight bearing was started at 10 to 12 weeks.

Result

From total number of 28 patient who were assessed in study, 20 were males and 8 were females, average age was 40.6 years (range= 18-67 years). About 57.14% were affected on left side. About 78.5% of patient meet with RTA where as 17.8% patients who got injured by domestic fall were had a average age of 57.6 years (range= 47 -67 years) which was probably due to osteoporosis. 32.1% patient were affected with Schatzker type I and 21.5% suffered from Schatzker type V. Six out of 28 patients suffered from skin blisters. About 21.4% patient has depression as arthroscopic finding where as where as 10.7% had meniscal involvement and 14.2% of patients suffered from both depression and meniscal injury. Lateral meniscus was affected in 6 patients and only one patient had medial meniscal injury. Two patients underwent meniscal repair and rest 5 patients were managed with menisectomy. About 53.5% underwent Lateral plating, 32.1 % underwent bi-columnar plating and rest were managed with medial plating. Radiological Rasmussen score was Excellent in 53.5% in 3 months of follow up where as it improved to 75% by 6 months and 1 year follow up. Clinical Rasmussen score was Excellent in 50% of patients in 3 months where as it was improved to 71.4% by 6 months and 75% by 1 year follow up.

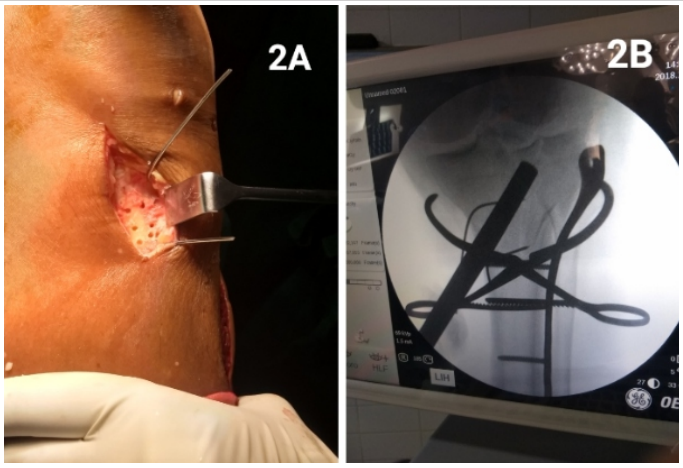


Figure 2: Making medial cortical window for Reduction of Depressed fracture
2A: clinical image of medial cortical window
2B: fluoroscopic image of reduction of depressed articular fracture through medial cortical window by bone punch

Complications

Complications like soft tissue infection was in 3 patients, malunion in 2 patients, wound dehiscence in 2 patients.

Two patients with soft tissue infection were managed with debridement and secondary closure, One patient was managed with implant removal and vancomycin beads and stabilized with posterior slab because there was clinical and radiological union at the fracture site.

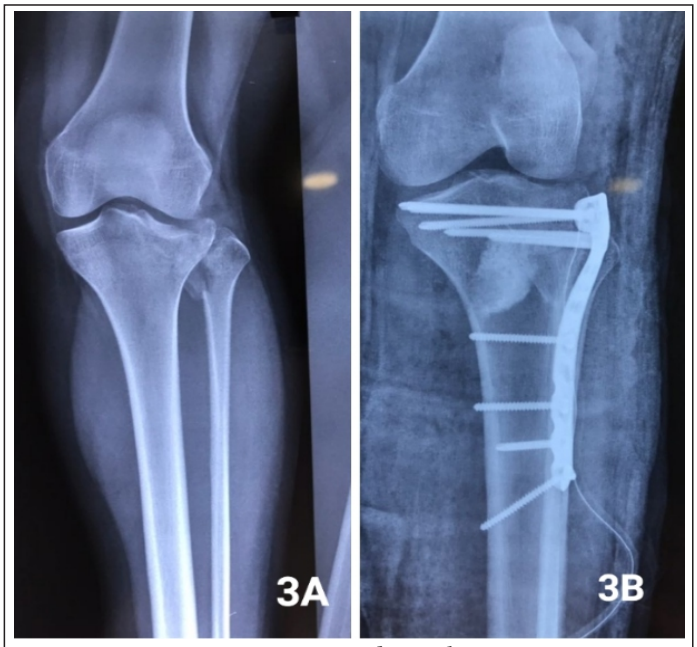
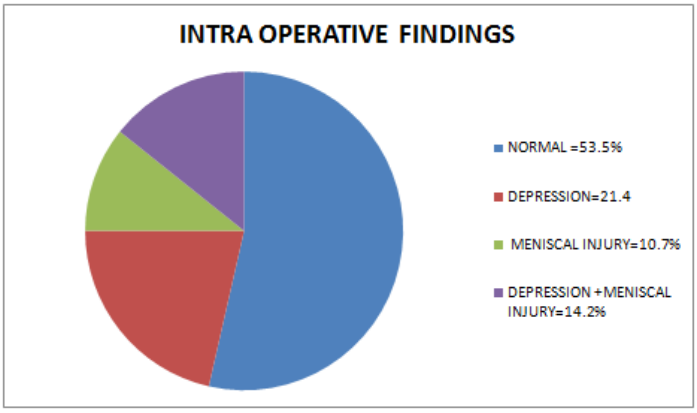
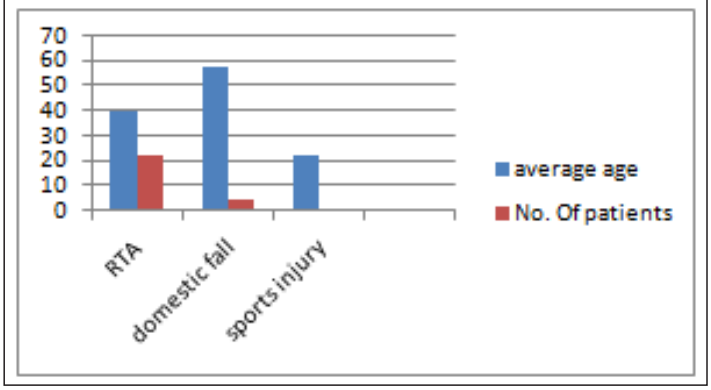


Figure 3: Radiograph
3A: Pre- operative Radiograph
3B: Post operative Radiograph

Table : Intra-operative findings:



Average age on mode of injury: patients suffering from domestic fall had average age of 57.6 years (range 47- 67 years)



CLINICAL RASMUSSEN SCORE AFTER 6 MONTHS			
TYPE(Schatzker)	EXCELLENT	GOOD	FAIR
I (9)	8		1
II (4)	3	1	
III(2)	1	1	
IV(4)	4		
V(6)	4	1	1
VI(3)	1		2
TOTAL(28)	21 (75%)	3 (10.7%)	4 (14.2%)

Two patients with Malunited fractures were managed referred elsewhere and lost follow –up.

Two patients with wound dehiscence were managed with repeated dressing and wound healed after 2 weeks of proper dressing.

No case of Compartment syndrome was recorded post operatively in our study.

Discussion

Tibial plateau fractures represent only 1% of all fractures; however, if not managed appropriately, the consequences can be severe [1]. Arthroscop¬ic-assisted Internal fixation (ARIF) initially was described by Caspari et al [2] and Jennings [3] in the 1980s.

The use of arthroscopy for the treatment of tibia plateau fractures makes it possible to visualize the fracture without arthrotomy or meniscal detachment, achieve anatomical reduction, wash out all debris, and treat concomitant intra-articular lesions.

In a Study by Roerdink et. al. [10] 80% of the patients were with Clinical Rasmussen score Excellent or good. Meniscal tears were noted in 42.7 % of all tibia plateau fractures. Which is nearly same in our study as we had 75% of patients with excellent clinical and radiological Rasmussen score [6] after 1 month follow up and 25% of patients had meniscal injury in our study.

Fowble et al. [8] reported the results of treatment in 23 patients with tibial plateau fractures. They performed arthroscopic reduction and percutaneous fixation in 12 and open reduction and internal fixation in 11 patients and compared the final results. They concluded that arthroscopic surgery is more advantageous in terms of anatomical reduction, rate of complication, period of hospitization and weight bearing.

Early rehabilitation can be started, and hospital stay is shortened. It has been demonstrated that early motion postoperatively results in better articular cartilage nutrition and improved healing. It is also more pleasing cosmetically due to less scar formation. Although arthroscopy provided a better cosmetic result in Schtazker type 1-4 fractures, our purpose and a more important aspect was to ensure anatomical reduction of intraarticular fragments and treat other intra-articular lesions. Although the incision was extended in type 5 or 6 fractures for plate application, we did not open the joint for reduction of fragments which was achieved by arthroscopy.

Weight bearing of the patient depends upon the fracture pattern, age of patient and stability of fixation. Radiological union is usually seen by 3 months. Patients are advised for weight after proper assessment of radiological and clinical union. As Arthrotomy is well avoided and continuous irrigation there is reduced risk of infection in ARIF [12,13].

Conclusion

ARIF is an excellent and minimally invasive method for assessment of intra-articular pathologies and treatment of tibial plateau fractures. Experience in operative arthroscopy and fracture management is essential to avoid complications and improve long-term functional results.

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Conflict of Interest: NIL
Source of Support: NIL

How to Cite this Article

Mall B, Dash S, Das A, Mishra S, Sahu H. | A prospective study of clinical outcomes of management of arthroscopic assisted tibial plateau fractures fixation | Odisha Journal of Orthopaedics & Trauma | Jan-June 2020; 41(1): 17-20.