

Outcome of Locking Compression Plate in Treatment of Tibial Plateau Fracture

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Abstract

Background: Modern locking plate systems, provides increased angular stability, has low implant profile, improved design matching the peri-articular bone surface, as well as is compatible with the minimal invasive techniques. We performed this prospective study to evaluate the functional and radiological outcome of management of tibial plateau fractures using locking compression plate.

Material & Methods: 30 patients of tibial plateau fractures were surgically managed using locking compression plate and were evaluated by Rasmussen's criteria, clinically and radiological for union.

Results: Average age was 46.13 years and average fracture union time was 13.62 weeks. All patients had excellent (53.3%) to good (46.7%) results with none of the patients having poor or fair results. Average Rasmussen's clinical score was 27.56. Three and one patients had articular depression and increased condylar width respectively, but both the depression and increase in width was less than 5 mm.

Conclusion: Locking plate in treatment of tibial plateau fractures ensures stable fixation with maintained reduction, thereby providing early rehabilitation and good functional outcome however, injury severity continues to represent the decisive predictor for outcome.

Keywords: Tibial Plateau Fracture, Locking Compression Plate, Proximal Tibia Fracture.

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Introduction

Aim of treatment in intra-articular proximal tibial fractures is to obtain a stable congruous joint permitting early range of motion [1]. Various treatment modalities have been used over the years, with varied results. More recent techniques such as the use of locking plates are constantly gaining popularity amongst orthopaedic surgeons.

Modern locking plate system provides increased angular stability, has low implant profile and has improved design and contour to anatomically fit the bone surface. These systems are also well compatible with the minimal invasive techniques [2,3].

The biomechanical advantages of locking plate constructs are realized specially in complex fracture rather than relatively straightforward simple fracture patterns [3,4]. Locking plates in treatment of complex tibial plateau fractures holds many potential advantages, like increased holding power in osteopenic bone, unicortical purchase in periarticular region and ability to successfully and stably bridge severely comminuted meta-diaphyseal shaft areas [5,6]. Thus we evaluated the functional and clinical outcome of tibial plateau fractures treated with locking plate.

Material and Methods

This prospective study included 30 patients of tibial plateau fractures treated by locking plate, done at our centre after obtaining approval from institutional ethical committee. All patients of tibial plateau fractures presenting within two weeks of injury with age more than 18 years were included in the study. Patients with compound fracture, any other associated lower limb fracture, with neurovascular injuries or pathological fractures were excluded from the study.

All patients were subjected to a same protocol of investigation, temporary slab, ice fomentation and limb elevation to decreased swelling. All patients were operated under spinal anaesthesia under C-arm in supine position. All patients were treated by anatomically contoured locking plate via minimal invasive technique. The side and number of plates to be used was decided as the fracture pattern, which was classified according to the Schatzker's classification using plain radiographs and three dimensional reconstruction CT scans, which was done when needed. The depressed fracture was elevated in all cases.

Postoperatively patients were given long knee brace support for two weeks, but isometric quadriceps exercises and intermittent knee range of motion were encouraged from the third day. Mobilization was started as soon as pain permitted; first with non-weight bearing, crutch support walking, followed by toe-touch crutch support walking and then progressive weight bearing depending upon tolerance and radiographic evidence of fracture healing. Patients were followed up regularly at intervals until fracture healing was seen. Radiological evaluation was done for union and functional assessment was done according to the Rasmussen's Knee score.

Results

30 patients of tibial plateau fracture with mean age 46.13 years (range 30 to 49) were included in the study. 25 were males and 5 were females. As per the Schatzker's classification, fracture was type I in 3 (10%), type II in 7 (23.3%), type III in 1 (3.3%), type IV in 5 (16.6%), type V in 4 (13.3%) and

VI in 10 cases (33%). The mean delay in surgery was 5.3 days (range 3 to 8 days). 4 (13.3%) cases were treated with bone grafting at the time of primary fixation to elevate the depressed fragment (one of type III and 3 case of type II).

All fractures united in mean duration of 13.62 weeks. 11 (36.7%) fractures united between 9-12 weeks, 16 (53.3%) fractures united between 13-16 weeks and 3 fractures united between 17-20 weeks. But this difference was not statistically significant ($p>0.05$).

At 1 year follow-up, 16 (53.3%) and 14 (46.7%) had good and excellent Rasmussen's Clinical Score respectively (fig 1 & 2). None of the patients had poor or fair results. Average Rasmussen's Clinical Score was 27.56. There was no statistically significant difference ($p>0.05$) in Rasmussen's Clinical Score when compared to age of patient, gender of patient, mode of injury, duration from injury to surgery, fracture union time and bone grafting.

3 patients had articular depression and 1 patient had increased condylar width as seen on x-rays at final follow up of one year, but both the depression and increase in width was not more than 5 mm in all these cases ($p<0.05$). None of the patient had developed arthritic changes by 1 year follow-up. 3 (10%) had complications, one each with wound dehiscence, implant prominence and surgical site infection, which was treated accordingly.

Discussion

Tibial plateau fractures are result of axial compressive forces alone or combined with varus or valgus stress on the knee joint. These fractures are serious injuries, associated with significant early and late complications. Prompt diagnosis, thorough pre-operative assessment of the bony and soft-tissue trauma, adequate soft-tissue monitoring and resuscitation, anatomic reduction and sound fixation allowing early joint movement, and intensive rehabilitation are mandatory for good clinical results [1,2].

Locking plates have advantages over normal compression plates as they provides angular stability by locking mechanism, low implant

profile design matches the anatomic contours of the bone surface and can be done with the minimal invasive techniques [3-6]. All these features make locking plates pretty advantageous in tibial plateau fractures, particularly because the tibia being an uneven and subcutaneous bone is associated with severe soft tissue injury as well.

We evaluated the functional and radiological outcome of management of 30 tibial plateau

fractures treated by locking plate. In our series, all fractures united in mean time of 13.62 weeks. Average Rasmussen's Clinical Score was 27.56, at final follow of one year; all patients had good to excellent functional outcome. Most of the studies on locking plate fixations for tibial plateau fractures are not comparable due to the use of different scoring systems and fracture classifications.

Fig 1. Pr-operative AP(a) & lateral(b) X-ray view and immediate post-operative AP(c) & lateral(d) X rays view of type IV fracture showing fixation with lateral locking plate. AP(e) & lateral(f) X rays view and clinical photography (g to i) of the same patient at final follow-up showing excellent outcome and union.

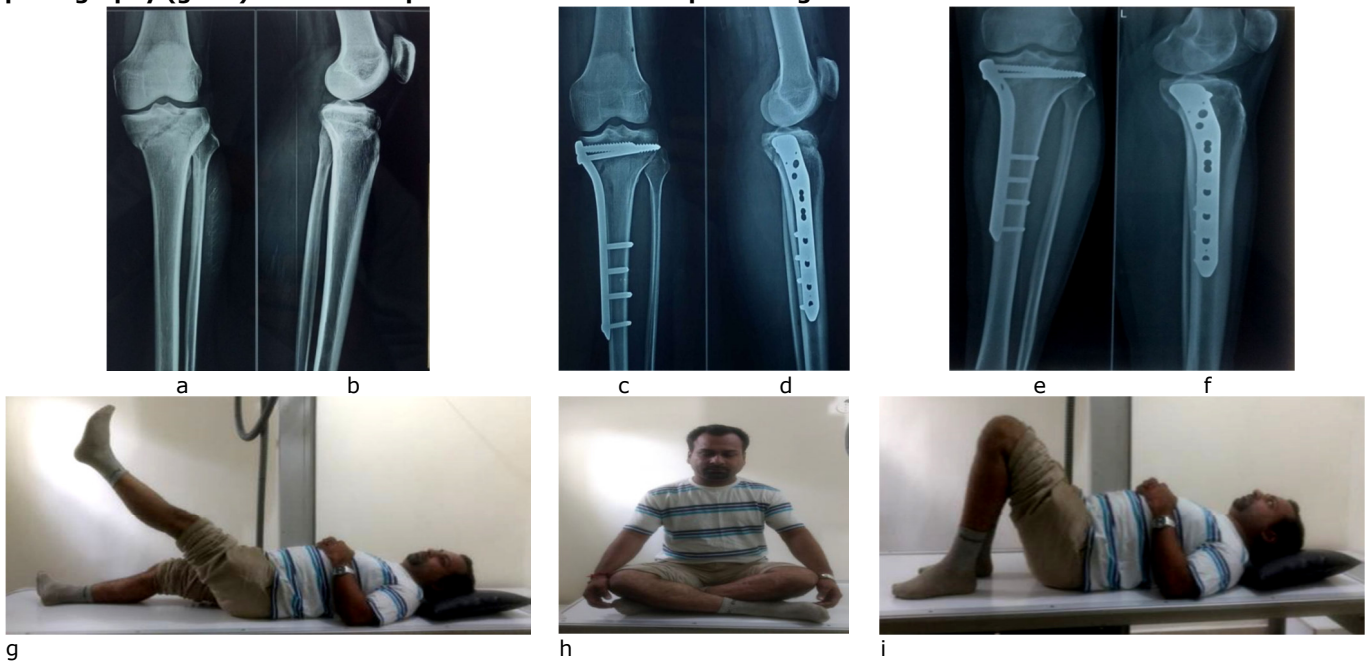
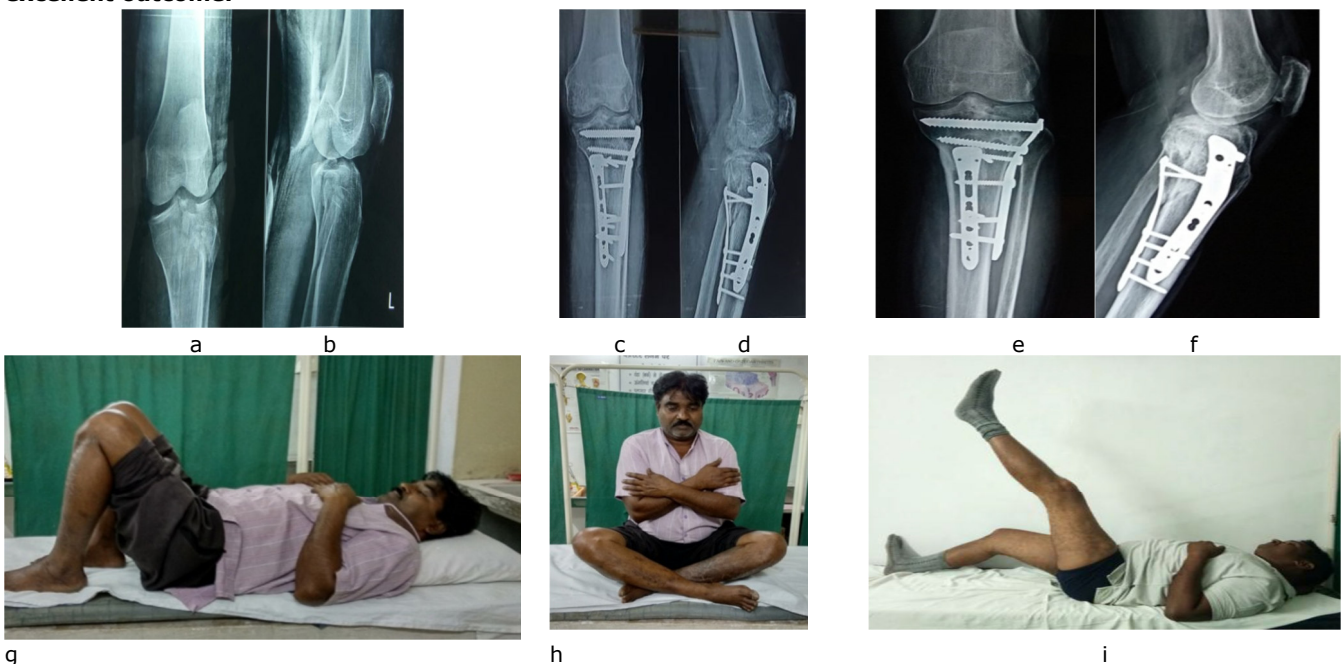


Fig 2. Preoperative AP (a) and lateral (b) X rays view, immediate post-operative AP (c) and lateral (d) X rays view of type V fracture showing fixation with lateral locking plate and posterior medial buttress plate. AP (e) and lateral (f) X rays view and clinical photography (g to i) of the same patient at final follow-up showing excellent outcome.



In our series, only three and one patient had articular depression and increased condylar width respectively, but it was not more than 5 mm in all these cases ($p < 0.05$). These were patients of type VI Schatzker, which also had postero-medial fragment.

Our Study showed that simple fracture patterns like isolated lateral tibial plateau or isolated medial tibial plateau fractures healed faster as compared to complex bicondylar tibial plateau fractures ($p < 0.05$). Further, we found, a positive correlation between injury severity and function as the type V and type VI were among the groups with lesser

Rasmussen's score. Thus increasing injury severity appears to remain the most predictive factor for outcome. Similar results were seen with other studies as well [4-8].

Conclusion

Locking plate in treatment of tibial plateau fractures ensures stable fixation with maintained reduction, thereby providing early rehabilitation and good functional outcome however, injury severity continues to represent the decisive predictor for outcome. There should be caution in using single lateral plate for fractures associated with posterior column fracture or medial comminution.

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