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Clinical Outcomes of 20 Schatzker Type II Tibial Plateau Fractures after Open Reduction, Internal Fixation and Bone Grafting

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Abstract

Schatzker type II tibial plateau fractures are most common type of tibial plateau fractures. Type II tibial plateau fractures with articular surface depression of more than 3mm and condylar widening of more than 5mm should be managed operatively. Open reduction, elevation of articular surface with filling of resultant defect with bone graft followed by rigid internal fixation with proximal tibial locking compression plate gives best possible clinical results.

Keywords: *type II tibial plateau fractures, bone graft, locking compression plate.*

Introduction

Like other intra-articular fractures, the tibial plateau fracture is challenging for orthopedic surgeons because of its severity of trauma and associated soft tissue injuries. Tibial plateau fractures make up 1% of all fractures and 8% of fractures in elderly. Lateral tibial plateau fractures account for 55 to 70% of cases [1]. The primary goal in the treatment of tibial plateau fracture includes restoration of articular congruity, axial alignment, joint stability, functional range of motion, and ultimately prevention of degenerative osteoarthritis [2]. Schatzker Classification is currently most accepted classification system for tibial plateau fractures used all over the world [3, 4]. Schatzker type II tibial plateau fractures are the most common type of tibial plateau fracture and necessarily involve a metaphyseal split in combination with articular depression of lateral tibial condyle [5]. Tibial plateau fractures occur in

the setting of varus or valgus forces coupled with axial loading [1]. Motor vehicle accidents account for majority of these fractures in younger individuals, but elderly patients with osteopenic bone usually experience these fractures after simple fall [1, 3]. The medial plateau is larger and stronger than the lateral plateau and is concave in both planes, the medial plateau carries about 60% of the knee's load and consequently has increased subchondral bone and a stronger, denser plateau when compared with the lateral plateau, the smaller and weaker lateral plateau is convex in the coronal and sagittal planes, as a result of this relative weakness combined with the natural valgus carry-angle of the lower extremity (the leg is often protected from varus forces by the contra-lateral leg), fractures of the lateral plateau are more common [1,6]. We describe clinical outcome of 20 patients with type II tibial plateau fractures with articular depression of more than 3mm and condylar widening of more than 5mm managed by open reduction, elevation of depressed articular surface, filling of defect with iliac crest bone graft and rigid fixation with proximal tibial locking compression plate.

Materials and Methods

This study consisted of 20 patients with type II tibial plateau fractures in adults of both sexes and was conducted in the post-graduate department of orthopedics Bone and Joint Surgery Hospital, Government Medical College Srinagar from September 2011 to October 2013. All the cases were initially assessed and resuscitated in the emergency section of bone and joint hospital. They were provided first aid in the form of analgesia, splints and other resuscitation measures. General physical and systemic examination was carried out. Local examination included examination of fracture site, and distal neurovascular status of injured limb. Radiological examination was done to assess amount of articular depression and fracture displacement. Radiological examination included X-rays of injured knee or knee with leg AP and lateral views, and CT scan of knee with 3D reconstruction images. After complete radiological examination Type II tibial plateau fractures with articular surface depression of more than 3mm and condylar widening of more than 5mm were selected for operative fixation. Written informed consent was taken from the patient after explaining the procedure in local language. Preoperative anesthetic check up was carried out, and any contraindication for anesthesia or surgery was ruled out and dealt appropriately. The part to be operated was prepared for operation. Preoperative prophylactic antibiotics were given at that time of induction of anesthesia.

Operative technique: The patient was positioned supine in operating table. In all patients surgery was conducted under spinal anesthesia. The lateral tibial plateau was approached through inverted L shaped incision. Horizontal limb of the incision was extended from the tibial tuberosity to Gerdy' tubercle and vertical limb was extended lateral to the tibial crest just below the fracture line, muscle origin was reflected laterally until fracture was exposed. Lateral fragment was retracted to give access to the central part of the tibial condyle, exposing the depressed articular surface and cancellous bone of the central depression. In some cases cortical window was made below the area of depression and elevation of the depressed fragment was done using bone punch. Bone punch was inserted beneath the depressed articular fragments or through the cortical window and by slow and meticulous pressure elevation of the articular fragment and compressed cancellous bone was done. The resultant bone defect was filled by the bone graft taken from the ipsilateral iliac crest. As the depressed articular surface was elevated and reduced; temporarily fixation was done with k wires. After reduction fracture was stabilised using proximal tibial locking compression plate. Plate was precisely fitted with tibial condyles. Plate was secured to the condyle with appropriate locking cancellous screws of sufficient length to engage the opposite cortex.

Locking screws of 4.5mm were used to attach the plate to the shaft of tibia.

Postoperatively Limb was kept elevated. Antibiotics and analgesics were given. Gentle active exercises of the knee were encouraged as soon as the pain allows usually first postoperative day. Crutch walking with non weight bearing was allowed as soon as pain was relieved and anesthesia effects were over usually on first post-operative day. Active ROM exercises was started 2nd post-operative day onwards with goals of 0 - 90 deg. at 2 weeks and full range of motion at 6 weeks. Partial weight bearing was allowed at 8-12 weeks and full weight at 13-17 weeks depending upon clinical and radiological assessment of fracture heeling and any other complication. The patients were then followed at 2, 4, 6 weeks then at monthly intervals. Final Follow-up was done at six months. At Final follow-up patients were assessed clinically using Rasmussen grading system [7].

Results

The patients in our study ranged in age from 24-59 years of age with mean age of 41.5 years. In present study there were 13(65%) males and 7(35%) females. Right limb was involved in 6 (30%) cases and left limb was involved in 14(70%) cases, left side was involved more than right side. RTA was most common mode of trauma in 8(40%) cases, in 6(30%) cases mode of trauma

was sports related injuries, in 4(20%) cases injury was due to fall from standing height, and 2 (10%) patients sustained injury due to fall from height. In our study average partial weight bearing time was 10.16 weeks and ranged from 8 to 12 weeks. In our study average time to full weight bearing was 15.4 weeks with range of 13-17weeks. Rasmussen score in our series ranged from 19 to 30 with mean score of 27.5. Over all 16 out of 20 patients showed excellent results, 3 patients with good and one patient with fair results. There was no case with poor results. All fractures united and most of patients 16 out of 20 returned to their pre injury status.

Pre-operative AP and lateral view of left knee showing type-II lateral tibial plateau fracture with more than 5mm articular depression


Post-operative AP and lateral view of left knee
(After elevation of depressed articular surface and filling the defect with bone graft)


Final follow up AP view

Final follow up lateral view

Functional Outcome at Final Follow-up


Full ROM

No extension lag

Discussion

Tibial plateau fractures have always been a challenge for orthopedic surgeon. The goals of treatment are to achieve anatomical reduction and to give a stable fixation to fracture fragments in order to begin early mobilization. Indications for

surgical management of tibial plateau fractures have been inconsistent with limits of acceptable articular displacement ranging from 2 to 10 mm [8]. Residual tilt of the tibial plateau and varus or valgus malalignment have been associated with higher risk of arthrosis. Biomechanical studies on articular step off show that a 6-mm stepoff of the lateral plateau produces 7.6 degrees of increased valgus and a 208% increase in contact pressure [1]. Honkonen (1994) [9] evaluated outcomes in 131 tibial plateau fractures and recommended surgical management for more than 5 degrees of valgus malalignment, more than 3 mm of articular step-off and more than 5 mm of condylar widening. Tibial plateau fractures with articular depression are best managed by elevation of the depressed articular surface; bone grafting and rigid internal fixation using peri-articular locking compression plates [10, 11]. Marschall B et al [5] reported the radiographic and clinical results of tibial plateau fractures treated with structural bone allografts including Plexur P and fibula allograft. Seventy-seven tibial plateau fractures with bone voids were treated with these structural grafts: 29 with Plexur P and 48 with fibular allograft, no cases experienced articular subsidence of greater than 2 mm at final follow up. With the introduction of locking plates, many limitations of conventional plating have been overcome; the angle stable locking screws allow secure fixation of the opposite condyle with a single plate thus avoiding extensive soft tissue dissection; contact area between the plate and with the bone is minimal thus preserving periosteal blood supply [10, 11].

Conclusion

Schatzker type II tibial plateau fractures are most common type of tibial plateau fractures. Open reduction, elevation of articular surface with filling of resultant defect with bone graft followed by rigid internal fixation with proximal tibial locking compression plate gives best possible clinical results.

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