

Original Article
Orthopedics

**MANAGEMENT OF
SPLIT DEPRESSION
TIBIAL PLATEAU
FRACTURES WITH A RAFT
CONSTRUCT THROUGH
A LOCKING PLATE
WITHOUT BONE GRAFT**

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Abstract

Aim:- Aim of this study is to assess the outcome after open reduction and internal fixation using a periarticular raft plating with screw fixation without bone grafting for split – depression tibial plateau fractures.

Methods:- 15 patients with 15 knees in 10 male and 5 female were managed by open reduction & internal fixation with, raft locking plate with raft screws through plate without use of bone graft or bone substitute for split depression fracture (> 5 mm.).

Proximal tibial fractures (Schatzker type II or Ao / OTA type 4.1 B3) were treated and the result were assessed by radiographs & clinical examination. The Rasmussen radiological score & clinical score, the Lysholm knee score, and the Tegner activity score were also assessed.

Result:- The mean follow was 12.5 (rang, 6 -19) months. All patients achieved bone union after a mean of 12.4 (range 8 -24) weeks. The mean range of motion was 116 degree (100o – 130 o). The Rasmussen radiological score was excellent in 10 patients, good in 4, and fair in 1. The Rasmussen clinical score was excellent in 8, good in 6, and fair in 1 patient. The Lysholm was excellent in 9 patients, good in 4, and fair in 2. 13 out of 15 patients recovered to their pre operative Tegner activity scores. Only 1 patients having severe comminution had loss of reduction after full weight bearing.

Conclusion:- Internal fixation using a periarticular raft locking compression

plate without using a bone graft or bone substitute for split depression proximal tibial plateau fractures is a viable option.

Keywords: bone graft, raft plate & screws, internal fixation

Introduction

Management for proximal tibial plateau is difficult, especially when metaphyseal comminution is associated with osteoporosis¹ and soft tissue injury². The tibial plateau involves weight bearing & restoration of joint congruity is important to preserve the normal function of the knee.

The goal in treating fractures of tibial plateau are to restore the joint space, mechanical alignment of the limb, to achieve optimal healing of bone, tendon and ligaments and to allow painless full range of motion of the knee. Schatzker type –II fractures³ with severe depression of the articular surface require open reduction to elevate the depressed fragments with a bone tamp through a cortical window in the metaphysis followed by stable and rigid internal fixation. To maintain the reduction the subchondral void is usually filled with cancellous autographs, allografts or bone substitutes⁴. Autograft is associated with donor site morbidity, risk of infection, increased surgical time and blood loss⁵, whereas allograft is associated with the risk of disease transmission, low initial stability in the metaphyseal defect and inadequate incorporation of the graft to host bone⁶. The trend of open reduction and internal fixation has become evident in the recent years with good results being obtained with the use of a raft locking plate & screws through the plate in the subchondral bone for providing the support to the articular surface of the lateral and medial condyle of the proximal tibia, irrespective of bone quality and the type of fixation. This approach prevents collapse, even in the absence of bone grafts or bone substitutes and avoids the potential problem of the bone grafting.

Aims and objectives

The aim of this multicentric study conducted between May 2017 to December 2018 is to analyze results of open reduction and internal fixation of closed tibial plateau split depression fractures with raft locking compression plate and screws with raft construction, prospectively by clinical, radiological and functional methods.

Material and Method

This is a prospective original research, multicentric study conducted between May 2017 to December 2018. 15 Patients 15 Knees, 10 Males and 5 Females, Aged between 25 to 65 (Mean 40.5) Years having split depression schatzker type – II tibial plateau fractures were included in this study.

Exclusion Criteria

- Open tibial plateau fractures.
- Patients with previous knee surgery
- Tibial plateau fractures with depression <5mm

The mode of injury included road traffic accident 12 cases and fall from height 3 cases. Injured leg was elevated, in order to decrease the local swelling. Surgery was performed within a week of injury. Perioperative intravenous antibiotics were administered patients were placed in a supine position under spinal anesthesia and tourniquet was used. A curved anterolateral incision was made. The mensci were tagged and conserved. The depressed fragment were elevated with the help of a bone tamp through cortical window and the articular surface was reduced anatomically. Reduction was maintained using Kirchner wires. The articular surface congruency was checked under fluoroscopy before definite raft locking plate fixation

using 3.5mm locking subchondral screws (raft technique) through 3.5 raft locking compression plate, as revealed in figure 1 A & B

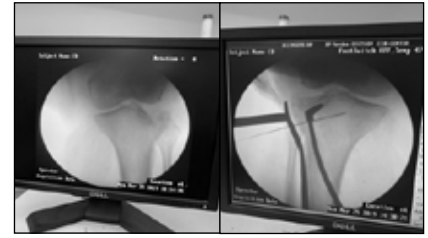


Figure – 1A (Pre & Intra Operative)



Figure 1B (Post Operative)

Wound is closed in layers. Postoperative continues passive motion with the assistance of a physiotherapist was allowed at day 1 to 2. Non weight bearing walking with walker or crutches was allowed for 6 to 8 weeks. Partial weight bearing was started in 8 (6 to 14) weeks and progressed full weight bearing when union was noticed in the radiographs.

The integrity of articular surface was assessed using radiographs. The Rasmussen radiological score (Table) & clinical score⁷ the Lysholm knee score⁸, and the Tegner activity score⁸ also assessed.

Table: - The Rasmussen radiological scoring system⁷

Parameter	Score
Depression (mm)	
None	10 (excellent)
<6	4 (good)
6-10	1 (fair)
>10	0 (poor)
Condylar widening (mm)	
None	10 (excellent)
<6	4 (good)
6-10	1 (fair)
>10	0 (poor)
Angulation (valgus/varus)	
None	10 (excellent)
<10°	4 (good)
10-20°	1 (fair)
>20°	0 (poor)

Results

The mean followed period was 12.5 (range, 6-19) months. All patients achieved bone union after a mean of 12.4 (range, 8 to 24) weeks. The mean range of motion was 116° (range, 100° - 130°) the Rasmussen radiological score was excellent in 10 patients, good in 4 and fair in 1. The Rasmussen clinical score was excellent in 8, good in 6 fair in one patient. Lysholm knee score was excellent in 9, good in 4 and fair in 2 patients. 13 out 15 patients recovered to the preoperative Tegner activity scores. Only one patients having severe communitation had loss of reduction after weight bearing

Two patients developed superficial infection and delayed wound healing which was resolved by debridement and insertion of antibiotic impregnated cement beads for 4 weeks and intravenous antibiotics. None had any intraoperative complications, frank infection, implant failure or screw back out.

Discussion

The goal of treatment for intra articular fractures is to restore joint

stability, articular surface congruence and axial alignment and to avoid, post traumatic osteoarthritis⁹. Restoration of depressed tibial lateral condyle fracture is important to maintain articular congruity and stable fixation as it involves weight bearing¹⁰⁻¹¹. Treatment is difficult elderly patients with weak subchondral cancellous bone and soft tissue damage¹²⁻¹⁴. The use of raft construct through raft locking compression plate provides adequate stability to subchondral bone without filling the metaphyseal void with bone graft or bone substitutes and achieves radiological union after a mean period of 8 (6-14) weeks, which is similar to other techniques with bone grafting¹⁵⁻¹⁶.

Complications after bone grafting have been reported. In patients with iliac crest bone grafting, up to 3% developed infection necessitating readmission, up to 20% develop minor complications such as persistent discomfort, cutaneous nerve damage, and local wound complications. In addition donor site morbidity after iliac crest bone grafting includes arterial injury, ureteral injury, herniation, chronic pain and cosmetic defects.

Allografts are associated with transmission of viral infections, histological incompatibility and low union rates¹⁷⁻¹⁸. The use of periarticular raft plate in anatomically reduced split depression tibial plateau fractures provides sufficient stability & rigidity and prevents collapse, irrespective of underlying bone quality¹⁹⁻²⁰.

The use of small fragment screws for fixation of tibial plateau fractures is recommended; as the pull out strength of 6.5mm, 4.5mm and 3.5mm screws is comparable²¹⁻²².

The 3.5mm small fragment screws and low profile raft locking compression plate decreases the bulk

of hardware and improve fixation for small fragments²³.

Fixation with raft locking compression plate using 3.5mm subchondral raft screws is more resistant to local depression loads than buttress plate with or without bone graft²⁴.

Fixation with screws through (rather than outside) the plate enables more stability against plateau depression²⁵

Conclusion

Osteosynthesis using a periarticular raft construct through a raft locking compression plate without use of a bone graft are bone substituted for split depression proximal tibial plateau fractures is a viable option.

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