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OUTCOME OF BICONDYLAR TIBIAL PLATEAU FRACTURES TREATED WITH DUAL PLATES VIA A TWO INCISION TECHNIQUE

Sanjeev Kumar Singhal* Senior Consultant, Maharaja Agrasen Hospital, Punjabi Bagh, Delhi *Corresponding Author

Rahul Agarwal Consultant, Maharaja Agrasen Hospital, Punjabi Bagh, Delhi

Siddharth Jauhar Resident Doctor,Maharaja Agrasen Hospital, Punjabi Bagh, Delhi

ABSTRACT

Objective: This study was done to evaluate the functional and radiological outcome and complications of Schatzker V and VI tibial plateau fractures treated with dual plating via a two incision technique with a regular follow-up of atleast 2 years.

Materials and Methods: Total 25 cases of tibial plateau fracture type V and VI treated with dual plating from January 2012 to December 2013 were included in the study and followed for minimum of 2 years. The patients were operated through an anterolateral approach for lateral plate and a medial column plate was put through a minimally invasive medial approach or an open posteromedial approach.

Results: Twenty five patients (21 men and 4 women) who completed the minimum followup were included in the study. There were 4 Schatzker type V and 21 Schatzker type VI fractures. Seventeen patients (68%) had excellent, 6 patients (24%) good and 2 patients (8%) had fair functional knee society score.

The radiological outcome, as assessed by the Rasmussen's knee criteria, was excellent in 20%, good in 72% and fair in 8% patients. There were no instances of deep infection.

Conclusion: Dual plate fixation of severe bicondylar tibial plateau fractures is an excellent treatment option as it provides rigid fixation and allows early knee mobilization. Careful soft tissue handling and employing minimal invasive techniques minimizes soft tissue complications.

KEYWORDS : Tibial Plateau Fracture, Dual plate fixation, Bicondylar fracture

INTRODUCTION

Tibial plateau fractures have a complicated intra-articular fracture pattern, representing approximately 1.2% of all fractures.[1] The operative treatment of complicated bicondylar fractures of the tibial plateau remains a challenge to even the most experienced surgeons. Such injuries are usually the result of high-energy trauma, and the management of such fractures is complicated by metaphyseal and articular comminution and the frequent occurrence of associated soft tissue injuries.[2-4] Various modes of treatment are available for treatment of high-energy tibial plateau fractures which include screws, external fixation, limited internal fixation combined with tensioned wire, unilateral periarticular locking plate and dual plating but the best treatment method still remains controversial.[5]

Various other methods of treatment have been described by various authors, each with its own merits and demerits.[6] The use of external fixators as mode of treatment often leads to joint stiffness because of delayed mobilization of knee joint.[6] Treatment by open reduction and internal fixation either with a single or dual plates through a single mid line incision causes extensive soft tissue injury of the proximal tibia, causing de-vascularization of the fracture fragments, thereby decreasing fracture healing and leading to risks of wound complications.[7] In order to improve outcome of high-energy tibial plateau fractures treatment, fixation using double plates via a medial and a lateral incisions is been widely used. This technique leads to anatomic joint reduction and minimal soft tissue dissection and its associated complications and therefore adequate fixation of the fracture fragments, hence allowing early mobilization of knee joint.[8]

In this study we evaluated the functional and radiological outcome and complications of bicondylar tibial plateau fractures treated with a lateral plate through an anterolateral approach and a medial plate through a minimally invasive medial approach or an open posteromedial approach.

MATERIAL AND METHOD

A prospective study done at tertiary care private hospital. Twenty five patients with Schatzker type V and VI tibial plateau fractures admitted in our institute between January 2012 to December 2013 were recruited and followed for minimum 2 years. They were excluded if they had ipsilateral fractures of the femur, any other lower limb fractures, open type 3 C tibial fractures, or severe head injury with neurological deficit. They were evaluated clinically and standard antero-posterior (AP) and lateral radiographs were taken. Computerized tomography (CT) scans were done only in selected patients, who had significant articular depression and comminution on x-rays. Internal fixation was delayed in cases, where there was huge soft tissue swelling and wound over the fracture site. Those cases were initially kept on Bohler-Braun splint with or without calcaneal pin skeletal traction and once the soft tissue conditions were amenable as evident by decreased swelling, healing of fracture blisters and wrinkling of the skin around the proximal tibia, plate osteosynthesis was done under C-arm image intensifier control

Operative procedure

Patients were operated under regional or general anaesthesia. Prophylactic antibiotics (i.v Cefuroxime 1.5mg) was started on induction. Patients were placed on a radiolucent table in supine position with a sand bag under ipsilateral gluteal region for the anterolateral approach. For posteromedial approach sand bag was placed under contralateral hip. All patients were operated under tourniquet.

Initially, indirect fracture reduction was achieved by longitudinal traction. Percutaneous Kirschner wires were then used as joysticks to reduce the fragments and restore articular congruity. The reduced fragments then provisionally fixed with Kirschner wires, which was later replaced with interfragmentary screws, either separately or through the plate. The articular surface was further verified during open reduction by direct visualization through submeniscal arthrotomy. Depressed articular surface was elevated using bone punch under direct visualization through submeniscal arthrotomy supplemented by image intensifier, resultant metaphyseal void was filled with autogenous cancellous or synthetic bone graft.

We typically fix the medial column first. Lateral column was fixed first only if the medial condyle was severely comminuted. Longitudinal skin incision was used for minimally invasive medial approach. The medial fragment was exposed subperiosteally by elevating the pesanserinus with a periosteal elevator. Once the medial fragment was reduced, a small buttress plate was placed beneath the pes anserinus and fix to the bone. Only if the medial fragment was posterior, open posteromedial approach was used. Adequate visualization of fragments was done to aid in anatomical reduction. Reduction of fragment was confirmed on image intensifier and fixed with a plate. We used the T buttress plate or a 3.5-mm locking proximal medial tibia plate.

The lateral tibial plateau fracture was visualized through a standard anterolateral approach. A "L" buttress plate, lateral tibial head plate or an anatomical lateral proximal tibial locking plates were fixed on lateral surface to fix the lateral column. Tibial tuberosity avulsion fractures in two patients were fixed with tension band wiring. After fixation, the tourniquet was released and hemostasis was achieved. The surgical incisions were closed over a suction drain. Postoperatively, the knee brace was given. A light compression dressing was applied.

Post-operative Management

Postoperatively patients were put in a long knee brace for 2 weeks. Isometric quadriceps exercises and knee range of motion was encouraged from 3rd day depending on patient tolerance to pain. Initially patients did non weight bearing crutch walking followed by partial weight bearing for at least 12 weeks and full weight bearing allowed only after radiological healing of the fracture. Followup visits were done at 1week, 2 weeks then 4 week's interval until fracture healing was seen and later at 3 months interval till 1-year and every 6 months until at least 2 years. At followup visits, they were evaluated clinically and radiologically for fracture healing and alignment. Bony union was defined radiolographically when at least three cortices united. Nonunion was defined as no evidence of healing after 6 months. Complications during the followup period were recorded.

RESULTS

Twenty five patients with tibial plateau fractures of Schatzker type V and VI treated by dual plating were analysed. Majority of study subjects were male (21 out of 25). 4 patients had Schatzker type V and 21 patients had Schatzker type VI tibial plateau fracture. Most common mode of injury was road traffic accident (23 out of 25) followed by fall (2 out of 25). Mean age of study subjects was 42.8 years. Both the sides were almost equally affected left side accounting to 56% and right side 44%. All except 2 out of 25 patients had ipsilateral fibula fracture. Two patients had fracture tibial tuberosity which was fixed with tension band wiring. Patients were operated between 0 to 5 days on an average of 2.4 days. Nine patients (36%) required bone grafting. Mean range of motion at 14 weeks follow up was 110^0. All fractures united within expected time with average of 15.7 weeks.

Out of 25 patients 21 patients (84%) had excellent and 4 patients (16%) had good objective knee society score.

Seventeen patients (68%) had excellent, 6 patients (24%) good and 2 patients (8%) had fair functional knee society score.

All the patients had an acceptable radiological outcome according to the Rasmussen's knee criteria. 20 % of patients had excellent, 72% good and rest 8% had fair results (Table 1).

Table 1: Rasmussen Modified Score

Rasmussen Assessment Criteria for Radiological Outcome	No. of Patients
Excellent(28-30)	5(20%)
Good(24-27)	18(72%)
Fair(20-23)	2(8%)
Poor(<20)	0
Total	25

DISCUSSION

High-energy tibial plateau fractures remain a challenge to the orthopaedic surgeon. The use of open reduction and internal fixation techniques has historically been associated with wound complications, especially when a single midline incision or a Mercedes-Benz incision is employed. This has led to the emergence of alternate methods of fixation such as Ilizarov ring fixation, external fixation with limited internal fixation, hybrid external fixation etc. Achieving good reduction and stable fixation sparing knee joint is a challenging task in external fixation.[9] Rigid fixation with good articular reduction is an important goal of surgery to get good knee function.[10] Reaching the posteromedial fragment through a single incision causes wide periosteal stripping and extensive muscle dissection and may hamper reduction as well.[11,12,13] Dual incisions are better than single incision.[14]

Using the image intensifier to aid in indirect reduction techniques and using K wires as joysticks, we were able to obtain reduction of the articular and metaphyseal fragments without damaging the soft tissues. Using minimally invasive techniques on the medial side to place and fix the plates with screws has helped mitigate soft tissue complications. As we were able to obtain rigid fixation with lateral and medial plates, we could start knee movements in the immediate postoperative period. Also, when the tibial tuberosity was avulsed, we fixed it with tension band wiring in order to allow early knee mobilization. This ability to start early aggressive knee rehabilitation has helped us achieve excellent functional outcome in our series, as functional outcome of knee surgeries is so intricately related to knee range of movements in our patient population.

Soft tissue complications are a major concern in the treatment of bicondylar tibial plateau fractures with plates. Papers reporting the results of dual plate through a single extensile incision have shown the incidence of deep wound infection of 23-88%.[11,15] With two incision dual plate technique, the incidence drops to 4.7-8.4%.[14,15] With LISS fixation, it is reported to range from 0% to 22%.[16,17,18] Jiang et al.[19] had a deep infection rate was 4.7% in dual plate group and 7.3% in LISS group. In addition in our study, we had 8 cases (32%) with blisters which got healed with time. There was no case of deep infection reported in our study.

Our study has several limitations. The number of patients in our study is a weakness as no prior power analysis was made. The final followup evaluation was only 24 months after the surgery. It is possible that, with time, many of these patients may develop posttraumatic arthritic change in the knee, especially since the articular reduction and alignment restoration was not perfect in some of them.

CONCLUSION

We conclude that open reduction and internal fixation of high-energy tibial plateau fractures with dual plates gives excellent to good functional outcome with minimal soft tissue complications. The minimally invasive approach should be utilized wherever possible, preventing soft tissue problems, and thus avoiding wound healing issues. Rigid fixation obtained with dual plating is essential to start early aggressive rehabilitation. Regaining full range of movements depends on early and aggressive knee mobilization, and this goes a long way in ensuring optimal functional recovery and patient satisfaction.

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