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FUNCTIONAL OUTCOME OF HIGH ENERGY TIBIAL PLATEAU FRACTURES TREATED WITH OPEN REDUCTION AND INTERNAL FIXATION

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HOW TO CITE THIS ARTICLE:

K. Kanagasrathy, Chander S. G, Narayana Reddy M. "Functional Outcome of High Energy Tibial Plateau Fractures Treated with Open reduction and internal fixation". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 25, March 26; Page: 4317-4323, DOI: 10.14260/jemds/2015/623

ABSTRACT: BACKGROUND: High-energy tibial plateau fractures, i. e., the bicondylar Schatzker type V fractures and the comminuted Schatzker type VI fractures are complex injuries that require adequate preoperative planning, detailed evaluation and surgical expertise. **MATERIALS AND METHODS:** From September 2009 to September 2014, 20 patients with high-energy (Schatzker type IV to type VI) tibial plateau fractures were treated with Open reduction and internal fixation with dual plating at the Department of Orthopaedic Surgery, Chettinad Hospital and Research Institute. **RESULTS:** A follow up ranging from 12 to 18 months showed that all fractures went in for union, both clinically and radiologically. The average time between the surgery and union was 16 weeks (range, 12–20 weeks). Functional outcome was evaluated using Rasmussens criteria, which showed 90% of acceptable anatomical and functional results. **CONCLUSION:** Open reduction and internal fixation is recommended for high-energy tibial plateau fractures with significant displacement. By careful selection of patients with "acceptable" soft tissues, a reasonable outcome can be expected, even in more severe injuries.

KEYWORDS: Tibial plateau fractures, Dual plating, double incision, internal fixation.

INTRODUCTION: The bicondylar type fracture includes both lateral and medial tibial plateau, along with lateral depression and ligament injuries, more commonly the anterior cruciate ligament and menisci. Type-VI fracture is characterized by metaphysis-diaphyseal dissociation with a more severe soft tissue injury.

The aim of treatment of these fractures is to make the joint stable and perfectly aligned with minimal soft tissue dissection, so that early joint motion is possible and weight bearing can be allowed.

However achieving this becomes difficult, because of the higher complication rates that are associated with the surgical management. Treatment using external fixators often causes joint stiffness, pin tract infection etc. Traditional open reduction and internal fixation with buttress plates (Dual plating) through a single incision results in extensive soft tissue stripping, leading to de vascularisation of fracture fragments, delayed fracture healing and high risk of infection and non-union.

Hence, in order to improve the outcome of high-energy tibial plateau fractures, we did internal fixation with dual plating (double buttress plates) applied through separate medial and a lateral incisions. This approach aids in achieving anatomic joint reduction with lesser soft tissue handling and provides stable fracture fixation and early mobilisation.

AIM: The aim of this study is to assess the functional outcome of high energy tibial plateau fractures treated with Open Reduction & Internal Fixation with dual plating.

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MATERIALS AND METHODS: From September 2009 to September 2014, 20 patients with high-energy (Schatzker type IV to type VI) tibial plateau fractures were treated with Open reduction and internal fixation at the Department of Orthopaedic Surgery, Chettinad Hospital and Research Institute.

The general condition of the patient, including the pre-injury status was recorded on admission to casualty. Radiological investigations (X-rays & CT scan) were done to evaluate the fracture pattern. Internal fixation was delayed in cases, where there was huge soft tissue swelling and wound over the fracture site. Those cases were initially treated with external fixator and once the soft tissue conditions were amenable, plate osteosynthesis was done. The patients were assessed for the functional outcome with follow up ranging from 12 to 18 months. The patient demographics and fracture pattern of all the 20 patients were recorded.

- From 2009 to 2014.
- 20 patients, M=14, F=6.
- Age: 26 yrs – 48 yrs (35.5yrs).
- Mode of injury: Road Traffic Accident (n= 16), fall from height (n=4).
- Side of injury: R (13) L (7).
- Type of fracture: Schatzker type 5 (n=8) & type 6 (n=12).

EXCLUSION CRITERIA:

- Open fractures.
- Schatzker type 1, 2, 3, and 4 fractures.
- Old/Neglected fractures.
- Multiple fractures.
- Pathological fractures.
- Fractures in age group <18yrs.

PROCEDURE: The patients were positioned supine on a radiolucent table with a pillow under the knee. All patients were operated under tourniquet control. Under Image Intensifier guidance, anteromedial approach was used to access the medial condyle. Initially, indirect fracture reduction, was achieved by longitudinal traction. Percutaneous Kirschner wires were then used as joysticks to reduce the fragments & restore articular congruity and provisionally fixed, which was later replaced with interfragmentary screws, either separately or through the plate. Articular surface depression was elevated under direct visualization through the submeniscal arthrotomy. The medial condyle fractures were stabilized with a T-buttress plate. The lateral tibial plateau fracture was visualized through a standard anterolateral approach and stabilized with T-buttress plate/screws. Wound was closed over a suction drain. Postoperatively antibiotics were continued for 3 days. Quadriceps exercises and nonweight bearing mobilization were started from the 3rd postoperative day. Suture removal was done on 10th POD. Followup was done at 6 weeks, 3 months, 6 months and 12 months. In each follow up, the patients were evaluated both clinically and radiologically for union and range of motion at the knee.

RESULTS: A follow up ranging from 12 to 18 months showed that all fractures went in for union, both clinically and radiologically. The average time between the surgery and union was 16 weeks (range,

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12–20 weeks). During followup visits, the mean range of motion of the knee was 102° (80°-120°). There was 1 case of varus collapse in the late followup, probably due to premature weightbearing, 2 cases of superficial wound infection (settled with debridement and antibiotics), 1 case of delayed union, which healed with secondary bone grafting.

The surgical details, clinical summary and functional knee score are given in the following tables.

Details	Number
Average time to surgery	6days (range 4-11days)
Mean operation time	160 minutes
Bone Graft	6 (autograft)

Table 1: Surgical details of 20 cases of tibial plateau fracture

Details	Number
Mean duration of follow up (months)	22. 4 (range 12-18)
Mean ROM	102 (range80-120)
Mean time for bony union (weeks)	16 (range 12 -20)

Table 2: Clinical summary and functional score of the patient

DISCUSSION: The tibial plateau forms one of the major weight bearing joint. To maintain the normal knee function, our aim should be to restore joint stability, accurate alignment and congruency of articular surface in order to obtain full range of motion at the knee joint. The treatment of high energy tibial plateau fractures (type IV-VI) remains a challenge.

Operative treatment can be either internal fixation or external fixation. Among the internal fixation methods, open reduction and internal fixation with dual plating remains popular, due to its advantage of restoring articular congruity, aligning mechanical axis, and preventing the incidence of post-traumatic degenerative arthritis. Though external fixation technique using external fixator (Ilizarov fixator) can be used to treat these type of high-energy tibial plateau fractures with soft tissue injuries in an effective manner, they are not comparable to dual plating technique, with regard to stability and anatomic reduction. Though open reduction and internal fixation with plates and screws has a few complications like wound infection, surgical wound dehiscence and soft tissue problems, a careful preop planning, deciding the timing of surgery, minimal soft tissue dissection during surgery will help to reduce the complications.

CONCLUSION: Based on this study, open reduction and internal fixation is recommended for high-energy tibial plateau fractures with significant displacement. By careful selection of patients with “acceptable” soft tissues, a reasonable outcome can be expected, even in more severe injuries.

The main advantages with this techniques are:

- With Dual incision technique, the main fracture fragments and the postero-medial fragment are easily accessible with minimal soft tissue dissection.
- Dual Plates helps to prevent varus collapse.

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In conclusion, it can be said that tibial plateau fractures, especially types IV, V, VI and variants need:

- Anatomic articular reduction.
- Stable fixation.
- Early mobilisation.
- Use of damage control orthopaedics (external fixators).

SPAN –SCAN-PLAN is very useful before ORIF.

The key parameters to be considered before doing ORIF are:

- Understanding fracture anatomy.
- Proper planning & execution and
- Usage of appropriate implants with limited soft tissue dissection.

Although the series is small, but the results are extremely satisfactory and encouraging in 90% of patients (excellent 60% and good in 40%).

CASE 1: 45/M

PRE-OP

POST-OP

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CASE 2: 40/F

PRE- OP

POST-OP

PRE- OP

POST-OP

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FINANCIAL OR OTHER**COMPETING INTERESTS:** None

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Date of Submission: 05/03/2015.
Date of Peer Review: 06/03/2015.
Date of Acceptance: 14/03/2015.
Date of Publishing: 25/03/2015.