

Functional and radiological outcome of bicondylar tibial plateau fractures treated with dual buttress plating

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Abstract

Background: There are different ways to treat bicondylar tibial plateau fractures, treatment remains a challenge to most orthopaedic surgeons. The objective of the study is to analyse the functional and radiological outcomes of bicondylar tibial plateau fractures treated with dual plating.

Methods: Clinical data of 80 patients are prospectively and retrospectively reviewed from March 2012 to March 2019. All patients were evaluated both radiographically and clinically according to Rasmussen score, Hospital for special surgery (HSS) and Rasmussen functional knee score.

Results: Rasmussen anatomic score was excellent in 49 patients, good in 29, and fair in the remaining 2 patients. Functional results using Rasmussen functional score was excellent in 45, good in 32, fair in 1 and poor in 2. Functional results using HSS score was excellent in 41, good in 21, fair in 16, and poor in 2.

Conclusion: Bicondylar tibial plateau fracture have excellent to good functional and radiological outcome with dual plating. Early mobilization of the joint provides good range of motion.

Keywords: Bicondylar tibial plateau, Dual plating.

Introduction

Tibial plateau fractures are intra-articular fractures in one of the major weight bearing joints [1]. These fractures denote a wide spectrum of severity which ranges from simple injuries with predictable excellent outcome after non-operative treatment to complex fracture patterns, that challenge even the most experienced surgeons.

Tibial plateau fractures comprise about approximately 1 % of fractures in adults [2]. These fractures occur most commonly in the 3rd to 5th decade. Road traffic accidents and bumper strike injuries are common modes of injuries in young adults [3].

Schatzker type V & VI fractures occur usually due to high-velocity trauma. Which contribute to 20 – 40 % of tibial plateau fractures [2]. They include bicondylar fractures & proximal metaphyseodiaphyseal dissociation fractures. Local soft tissue injury, compartment syndrome, associated ligamentous instability, vascular injuries need to be looked upon in these type of high velocity injuries [3].

The controversy of surgical vs conservative management for bicondylar tibial plateau fractures is overcome by enlightening the aim of surgical management with anatomic reduction, restoration of articular congruity and alignment, stable

fixation to allow early knee motion [5].

Among various methods of operative management like dual plating, isolated lateral locking plate, hybrid external fixator, Ilizarov, less invasive stabilization system (LISS), dual plating via two incision is most preferred as it has its own advantages when compared to other modalities of treatment. Hence this study focuses on the importance and significance of dual plating in management of Schatzker type V and VI fractures based on Rasmussen anatomical and functional knee scores and Hospital for special surgery (HSS) Knee Score.

Objective: The Objective of the study is to analyse the functional and radiological outcomes of bicondylar tibial plateau fractures treated with dual plating.

Material & Method

Between March 2012 to March 2019, all patients with age group of 20-50 admitted to our hospital and diagnosed to have bicondylar tibial plateau fracture were eligible to participate in the study. Exclusion criteria were pathologic fracture, paediatric age group, polytrauma with serious head and chest injuries. Preoperative radiographic examination consisted mainly of x-ray and computed tomography (CT) scans.

Patients were received in the casualty and initially stabilized to achieve adequate haemostasis. Then adequate analgesics were given. The affected limb was immobilised in an above knee splint and anteroposterior & lateral x-rays were taken. Above Knee Slab applied and patient admitted for further workup. Decreased swelling, absence of fracture blisters, wrinkling of skin around proximal tibia shows signs of soft tissue recovery after which the patient is taken up for surgery.

The patient in supine position with folded pillow under knee

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and a sand bag under ipsilateral gluteal region for anterolateral approach. We made a straight incision lateral to the patella, opened the deep fascia anterior to ilio-tibial tract. Released the proximal attachment of tibialis anterior muscle. Femoral distractor if needed was used. First indirect fracture reduction was achieved with longitudinal traction, under C-arm guidance percutaneous K wires were used to hold the fragments in reduction. We typically fix medial tibial condyle first. If medial condyle is comminuted we fix lateral condyle to achieve length.

In posteromedial approach, position the patient in supine and abduct and externally rotate the leg and put in figure of 4 position. A slightly curved incision is made from medial epicondyle to posteromedial edge of tibia. After opening subcutaneous fat, the long saphenous vein and saphenous nerve identified and preserved. Pes anserinus expansions identified. Tibia approached after incising pes anserinus longitudinally in the line of skin incision. The gastrocnemius muscle was gently freed from posteromedial surface by blunt dissection. The fracture fragments visualized, reduced under C-arm guidance. If there was articular depression a bone punch was used to elevate the depressed fragment. The reduced fragments were fixed with 3.5 mm proximal tibial plate and screws.

Patient was reviewed in Out Patient Department every 4 weeks up to 6 months and X rays were taken at 3rd, 6th and 9th months to assess union. Partial weight bearing was started after 8 weeks. Full weight bearing was allowed after radiological evidence of bony union was achieved. After 6 months patients were reviewed every 3 months.

Statistical analysis was performed using IBM SPSS version 20.0 software. Categorical variables are expressed using frequency and percentage. Continuous variables are presented by mean and standard deviation. To test the statistical significance of the agreement between two functional scores McNamara's chisquare test and Kappa statistics were used.

Results

A total of 80 patients with bicondylar tibial plateau fractures participated in the study. The mean age of the study participants was 40.55 ± 8.899 and maximum participants belonged to the age group of 40 to 50 years i.e. 58%. Majority of the study participants were males i.e 61 (76%) while only 19 (24%) were females. Among 80 patients 36 (45%) were on the right and 44 (55%) were on the left was the side of injury. Among 80 patients included in the study 29 (36.3%) are type V and 51 (63.8%) are type VI Schatzker fractures. The average period from time of injury to surgery was 92.56 ± 27.3 hrs with a range between 48 to 168 hrs.

Radiographic results was analyzed using Rasmussen anatomic score were 49 patients (61.3%) scored excellent and 29 (36.3%) patients had scored good and 2 (2.5%) patients had fair outcome (Table 1) Functional results were analyzed using Rasmussen functional score and HSS score. Using Rasmussen functional score 45 patients (56.3%)

scored excellent and 32 (40%) patients had scored good and 1 (1.3%) patient had fair outcome and 2 (2.5%) patients had poor outcome (Table 2) In HSS score 41 (51.3%) patients scored excellent and 21 (26.3%) patients had scored good, 16 (20%) patients had fair outcome and 2 (2.5%) patients had poor outcome. (Table 3). Agreement of Rasmussen Functional score & HSS score is 78.75%, however departure from the agreement is 21.25% (Table 4)

Discussion

The management of bicondylar tibial plateau fracture dislocations is challenging, considering soft-tissue complications, fracture comminution and morphology, and delayed complications such as varus collapse, stiffness, and arthritis

Motor vehicle accident being the commonest mode of injury leading to these high velocity fractures. The goal of anatomic reduction and stable fixation can be achieved with plating but with associated complications such as soft-tissue healing and implant failure. With better understanding of fracture morphologies such as coronal split and posteromedial fragment, most of the surgeons have employed dual plating in these fractures to avoid secondary loss of alignment and reduction.

Historically due to poor technique of fixation with dual plates with single midline incision or Mercedes Benz incision, alternate methods of fixation with Ilizarov ring fixation hybrid external fixation were being employed.

Single incision technique had high incidence of wound breakdown and infection. [12]

Association for osteosynthesis/association for the study of internal fixation has recommended dual plating for fixation of bicondylar tibial plateau fracture dislocations.

With the advent of isolated lateral plating with locking compression plate the spectrum has shifted towards locking plate with medial fragment being stabilised by screws passed through lateral plate. Varus collapse in these patients raised the question of its sustainability and the reason found to be inadequate fixation of posteromedial fragment. This has paved way for dual plating via two incision technique.

In our study, males outnumbered females in the ratio 3.2 : 1. This is explained by more active life style of males and higher chance of road traffic accidents. In our study 76 patients sustained road traffic accident, 2 patient had slip and fall, and 2 off them had fall of heavy weight on the leg. Distribution of incidence between sides were near equal. We had 29 schatzker Type V & 59 schatzker Type VI with preponderance of the latter.

Our study reported Rasmussen functional outcome of knee to be 45 patients (56.3%) scored excellent and 32 (40%) patients had scored good and 1 (1.3%) patient had fair outcome and 2 (2.5%) patients had poor outcome. The HSS score 41 (51.3%) patients scored excellent and 21 (26.3%) patients had scored good and 16 (20%) patients had fair, 2 (2.5%) had poor outcome. Radiological criteria 49 patients (61.3%) scored excellent and 29 (36.3%) patients

had scored good and 2 (2.5%) patients had fair outcome.

The mean time of union was 12 weeks ranging from 11 to 16 weeks. Knee flexion of 90 and 105° was noted in two patients and physiotherapy was encouraged. Superficial infection occurred in 5 patients and healed with debridement, wound dressing and intravenous antibiotics. Occasional pain in 4 patients was managed with analgesics. There were no associated injuries in our patients.

Limitation

As this is a short term study, the results may also vary with further follow up.

Conclusions

The functional outcome of dual plating in bicondylar tibial plateau fracture dislocations is encouraging with minimal soft-tissue complications. Early mobilisation of the joint provides good range of motion.

Secondary loss of reduction and alignment is none to minimal in patients with dual-plate construct as seen in this study. The postoperative complications can be reduced by proper timing of surgery, good soft-tissue care intraoperatively and postoperatively. The patients with good soft tissue cover should undergo anatomical reduction and rigid fixation immediately without deferring time.

Bicondylar tibial plateau fracture have excellent to good functional and radiological outcome with dual plating.

Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflict of interest : Nil **Source of support :** None

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