Original Research Article

Intra–Articular Proximal Tibia Fractures Treated with Dual Plate Osteosynthesis – The Study of Functional Outcome

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Abstract

Background: The fractures of proximal tibia particularly plateau fractures are more difficult to treat due to complexity of configuration and associated soft tissue injuries. AO 41C fractures are high energy fractures often accompanied by other injuries and complications, such as postoperative inflammation, wound problems and infections.**Aim:** Functional outcome of intra-artcular proximal tibia fractures (41C) treated with dual plate osteosynthesis.**Materials and Method:** The study was conducted over a period from March 2017 to March 2021 in the department of Orthopaedics. All cases attending OPD and emergency >18 years of age with intra articular fracture proximal tibia (41C) were assessed clinically and radiologically. Clinically assessment was done by Rasmussen's score treated with open reduction internal fixation with dual plate osteosynthesis of intra-articular proximal tibia fractures, and those followed up at every 6 week for 3 month then every 3 months for any complications and morbidity.**Results:** The mean age of patients was 31.38+-11.37 years. The male: female ratio was 2.33. Among 30 patients; 6 had Diabetes Meliteus while 3 had hypertension. Mean duration of surgery from time of injury was 7.89 ±3.98 days. Mean hospital stay of patients was 18.16 ±3.69 days. Mean time for union in patients was 12.18±4.83 weeks. Rasmussen radiological outcome (immediate postoperatively) was excellent in 18, good in 9, and fair in 3 patients.**Conclusion:** Dual plate osteosynthesis is the best, effective and simple procedure in treatment of complex inta-articular proximal tibia fractures (41C).

Keywords: Intra articular proximal tibia fractures (41C), Open reduction and internal fixation, Dual plate osteosynthesis.

Introduction

The knee joint is complex joint and is the commonly injured joint now a day because of increased vehicular trauma and sports related injuries. Being superficial joint and more exposed to external forces, this joint easily gets injured. Complex kinematics of its weight bearing position and complex ligamentous stability and articular congruency are the main reason why these fractures are concern to surgeon and cause disability to the patients. The fractures of proximal tibia particularly those that extended into the knee joint are termed as tibial plateau fractures.

The aim of surgical treatment of proximal tibial fractures was to restore and preserve normal knee function, which can be accomplished by anatomical restoration of articular surfaces, maintaining mechanical axis, restoring ligamentous stability and preserving a functional pain free range of motion of knee.

In this present study we hereby study the functional outcome of intra-articular proximal tibial fractures treated with dual plating[1-3]

Materials and Methods

This prospective, descriptive, cross-sectional, study was conducted by department of Orthopedics, at Rajendra Institute of Medical Sciences, Ranchi, Jharkhand,India. The study was approved by the institutional research and ethical committee. The study was conducted over a period from March 2017 to March 2021.

The Study sample consisted of patients attending OPD and emergency in the age of >18 years with intra- articular fracture proximal tibia. A total of 30 patients contributed towards the completion if this study. The subjects were selected by random sampling of cases meeting the inclusion criteria.

Inclusion criteria: All patients with type 41C tibial plateue fractures as per Orthopaedic Trauma Association classification.

Closed Fractures.

Exclusion criteria:

Polytrauma patients
Head injury patients
Fractures with vascular injury.
Fractures with compartment syndrome.
Fractures with severe soft tissue injury.
Fracture in ipsilateral lower limb
Medically unfit patient.

The patients were examined thoroughly with emphasis on radiological, functional, socioeconomic status. Operative intervention was done on due course and post op follow up done at every 6 week for 3 months then every 3 month for any complications and morbidity. Pre and post operative radiological and functional outcome was compared.

Parameters Studied

Clinical Parameters: Determined by score. Limb evaluation for extent of soft tissue damage, wounds and distal neurovascular status, skin condition.

Radiological Parameters: AP, lateral and oblique views of knee joint , CT scan with 3D reconstruction

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Study technique:

Pre-operative regimen:

Evaluation of the patient- Patients were evaluated according to the ATLS protocol.

Evaluation of the limb- Limb evaluation for extent of soft tissue damage, wounds and distal neurovascular status, skin condition. Primary fracture stabilization was done with above knee slab and limb elevation.

Radiological assessment: AP, lateral and oblique views of knee joint, CT scan with 3D reconstruction

Surgical Technique Used

1. Antero-lateral approach
2. Postero-medial approach[4-7]

Antero-Lateral Approach: Straight or slightly curvilinear anterolateral incision, starting 3 to 5 cm above the joint line proximally and extending distally below the inferior margin of the fracture site from just anterior to the lateral femoral epicondyle to Gerdy's tubercle.

Fascial incision parallel to the anterior border of the iliotibial tract was made. Underlying muscle was retracted laterally. The fragments were elevated and reduced, followed by temporary fixation with multiple small Kirschner wires in reduced position. Hockey stick–shaped lateral tibial locking plate for definitive fixation was then applied. Cortical screws (4.5-mm) were used to fix the plate to the shaft of the tibia.

Posteromedial approach: Skin incision was given just posterior and parallal to the posteromedial tibial border. Skin and subcutaneous tissue was sharply divided and mobilize the inferior border of pes anserinus tendon, interval created with the medial head of the gastrocnemius. Reduction and internal fixation done using a 3.5mm small fragment plate centered over the apex of the distal fracture extension[8-10]

Post-operative regimen: The knee was placed into a removable knee immobilizer. At 1 to 2 days postoperatively, physical therapy was initiated with quadriceps exercises and gentle active –assisted exercises were begun, or a passive motion machine was used. Crutch walking begun, but non weight bearing permitted for 10-12 weeks[11]

Results

Thirty patients met the criterion in this study. All fractures in this study were classified according to the AO classifications. Based on the AO classification, there were 6 type C1 fracture, 3 type C2, and 1 type C3 fractures. It was observed that majority of patients were from age group 25-55. The mean age of patients was 31.38 ±11.37 years. The male: female ratio was 2.33. Among 30 patients 21 (70%) had history of high velocity trauma. Of all 18 (60%) had right sided fracture while 12 (40%) had left sided fracture. It was observed that among 30 patients; 6 had Diabetes Melliteus while 3 had hypertension. It was observed that among 30 patients; 18 had no associated injuries while 12 had associated injuries. Mean duration of surgery from time of injury was 7.89 ±3.98 days. Mean operating time was 108± 09 min (range, 90– 140 min). Mean hospital stay of patients was 18.16 ±3.69 days (range, 15–25 days). Mean time for union in patients was 12.18 ±4.83 weeks.

Complete follow-up was performed in 30 patients. Mean follow-up duration was 16± 2.2 months (range, 12-24 months). At final follow-up, two patients displayed loss of reduction loss but no loss of alignment. Functional results were evaluated in 30 patients. Overall, functional evaluation was satisfactory. Mean knee flexion at the end of treatment was 115 degrees; only one patient achieved flexion of less than 90 degrees. No patient had a fixed flexion deformity. Mean Rasmussen clinical score was 26.14± 3.80 (range, 10–29). Rasmussen functional outcome was excellent in 18, good in 9, and fair in 3 patient. Overall rate of excellent and good outcomes were 95.5%, 86.2% and 55.6% for types C1, C2, and C3 fractures, respectively.

Discussion

Compared with other fixation methods, dual buttress plates provide more stability and more convenient reduction. At a mean follow-up of 16 months, the overall outcomes were favourable, with no serious soft tissue complications and non union.

Rasmussen clinical score showed excellent and good outcomes in most patients. Two incisions and two plates method reduced soft tissue irritation, the infection rate in which ranged from 0 to 22.3% in recent literature. We believed that the selection of operation chance and limited soft tissue separation were the most important elements for preventing infection and tissue necrosis. We observed that postoperative wound exudation was appeared in 2 patients. In this study, fracture healing and stability of limb alignment were satisfactory. In the present study two variables (AO fracture type and reduction quality), however, significantly influenced postoperative function and were found to be independent predictors of postoperative function. These results were not consistent with previous reports and may be attributable to differences in numbers of patients, types of fractures, durations of follow-up. The present study identified AO fracture type as an independent predictor of outcome. Difficulty reaching the anatomic diaplasis in 41 type C3 fractures, and unavoidable articular cartilage cataplasia resulting from high-energy trauma, may explain the influence of fracture type on outcome. This study has a number of limitations, including a relatively short follow-up period and a small number of cases. More complications may appear over a longer follow-up period. The limited number of cases may decrease statistical power as well as our ability to analyze the influences of infection, alignment, and other factors on function. Finally, serious open fractures (Gustilo grade III) were excluded, which may be related to the small number of complications in our study. Limited soft tissue stripping, appropriate selection for operation chance, and filling of osseous defects may lessen or prevent serious complications such as infection, wound skin necrosis, and loss of alignment. Fracture reduction quality and AO fracture type were independent predictors of clinical function. Anatomical reduction of fracture is still one of the treatment goals, and type of fracture, especially those resulting in serious damage to the cartilaginous surface, will affect joint function[12-15]

Conclusion

Dual plate osteosynthesis is the best, effective and simple procedure in treatment of complex inta- articular proximal tibia fractures (41C).

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