**ORIGINAL ARTICLE**

# Restoration of Posteromedial Cortex with Additional Antiglide Plate in Bicondylar Tibial Plateau Fracture Fixation: Radiographic and Clinical Outcome

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## ABSTRACT

**Aim:** To evaluate the radiological and functional outcome of an alternate surgical technique in which one third tubular plate is used along with a single T buttress plate or 6.5mm cancellous screws in the management of bicondylar tibial plateau fractures.

**Methods:** A descriptive case series was conducted from July 2011 to July 2013. 24 (18 male and 6 females) patients, mean age 34, with bicondylar fractures presenting in the Accident and Emergency department were operated. In all the cases posteromedial cortex was anatomically reduced and stabilized with 1/3rd tubular plate as the first step of the procedure, directly approaching the posteromedial cortex. It was followed by reduction of the lateral condyle and fixation with buttress plate or cancellous lag screws, depending on the situation.

**Results:** Out of 24 patients 21 patients completed the follow-up program and were included in the study. In all 21 patients articular surface remained intact till the final follow up. 4 patients has complications which included infection in one case and arthrofibrosis in three.

**Conclusion:** Addressing the posteromedial column of the proximal tibia in bicondylar tibial plateau fractures with 1/3rd tubular plate produces very good outcome regarding maintenance of the articular surface and lesser soft tissue complications.

**Keywords**: Tibial plateau, bicondylar fractures, antiglide plate

## INTRODUCTION

The proximal tibial articular surface is one of the critical load bearing areas of the human body. Fracture of this area can occur due to a combination of axial loading and valgus or varus applied forces. Stability of the joint, alignment of the lower limb and motion of the knee joint are severely affected as a result of tibial plateau fracture. The more energy applied to the limb, more complex is the fracture[1].

Bicondylar fractures create a challenging situation to the surgeon as any attempt of open reduction and internal fixation may jeopardize the delicate soft tissue in the region and different techniques have been applied. The ideal management of such fracture however, remains controversial[2,3,4].

Anatomical reduction of fracture fragments, restoration of mechanical alignment, stable fixation to allow early range of motion and preservation of soft tissue envelope are the goals which a surgeon tries to attain. However, all the treatment goals may not be achieved simultaneously. It is not unusual that one of these goals get compromised. This is particularly seen in cases of traumatized soft tissue envelope where increased percentage of wound complications have been reported[5,6,7].

Due to the increased complication rate followed by the conventional operative management of bicondylar tibial plateau, many authors have suggested alternate methods of treatment of fractures of tibial plateau to achieve better functional outcome[2,8,9,10]. Focus has been shifted from anatomical and rigid fixation of fracture fragments of proximal tibia to preservation of vascularity and restoration of joint congruity and mechanical axis of limb[11]. The purposes of this study was to evaluate the radiological and functional outcome of an alternate surgical technique in which one third tubular plate is used along with a single T buttress plate or 6.5 mm cancellous screws in the management of bicondylar tibial plateau fractures. Application of this low profile plate over the posteromedial cortex to serve antiglide purpose needs less soft tissue dissection and therefore it was hypothesized that lesser complications and better functional outcome may be achieved.

## MATERIAL AND METHOD

A descriptive case series was conducted in the department of Orthopaedic Surgery Unit II of King Edward Medical University. From July 2011 to July 2013, 24 (18 male and 6 females) patients, mean age 34, with bicondylar fractures presenting in the Accident and Emergency department were operated.

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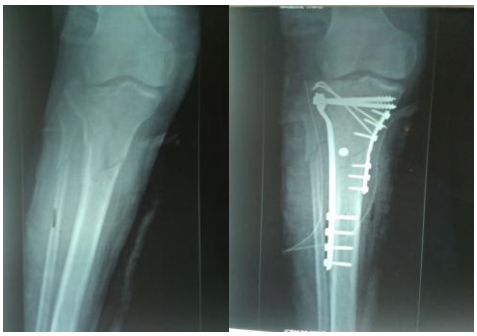
Tibial plateau fractures having extensive soft tissue injury and Gustilo type IIIb were excluded from the study. Patients developing compartment syndrome and those with delayed presentation were also not included. In all the cases posteromedial cortex was anatomically reduced and stabilized with 1/3rd tubular plate as the first step of the procedure. Depending on the situation incision was made but in most cases posteromedial incision was made for limited dissection and direct approach to the posteromedial cortex. It was followed by reduction of the lateral condyle and fixation with buttress plate or cancellous lag screws, again, depending on the situation.

Patients were followed up on 1st, 3rd 6th and 12th postoperative week. Radiographs were obtained to assess the integrity of articular surface and complications regarding surgery were assessed. Articular subsidence of more than 5mm was considered as failure of articular surface integrity. Presence of infection, deep vein thrombosis, arthrofibrosis, wound dehiscence and exposed implants were regarded as complications of internal fixation.

## RESULTS

Out of 24 patients 21 patients completed the follow-up program and were included in the study. In all 21 patients articular surface remained intact till the final follow up. 4 patients have complications which included infection in one case and arthrofibrosis in three.



(a) b)

Fig. (a) fracture proximal tibia involving both condyles
(b) open reduction and internal fixation with1/3rd tubular plate applied on posteromedial cortex and buttress plate for fixate on of lateral condyle

## DISCUSSION

Tibial plateau fractures, particularly those which involve both the medial as well as the lateral condyles, create a challenging situation for the surgeons as the complication rate in the management is quite high.[12] Different methods have been adopted to deal with the situation but all having their merits and demerits making the optimal management controversial.[13] However, there is no doubt about the fact that the articular incongruity leads to uneven loading in the joint and predispose the knee joint to early osteoarthritis[14].

Therefore, the primary objective in the management of 21 patients with bicondylar fractures in our series was to restore the articular surface to pre injury status as much as possible. The implant of choice in our study was one third tubular plate which was used along with other plates and screws. This particular plate has the advantage of requiring minimal soft tissue dissection for its application and it can easily be contoured according to the surface where it is being applied. This implant was used over the posteromedial cortex of the proximal tibia which served multiple purposes as follows:

1. The height of the posteromedial column of proximal tibia was restored directly and therefore medial and posterior part of tibial articular surface was indirectly restored.
2. The plate provided antiglide action and helped in the maintenance of the reduction of the articular surface. We believe that the excellent outcome in all our cases regarding absence of articular subsidence was primarily attributed to the use of this particular plate at the particular site.
3. With its application over the posteromedial column further requirement of T- Buttress plate on the medial side is decreased and in many cases in our study the later was not used and therefore less metal placement in the region helps preserve the soft tissue envelope. Preserved soft tissue and vascularity in the region contributes in decreasing the surgical site infection. This fact was backed by our study as 20 out of 21 patients (95%) remained free of superficial or deep infection. One patient developed surgical site infection which was dealt with culture specific antibiotic therapy.

The successful outcome in our series was also attributed to the proper case selection. Fractures of tibial plateau involving both of the condyles presenting within 48 hours of injury were included in the study. However, those requiring additional surgical procedure like fasciotomy, repeated wound debridement, flap coverage or ligamentotexis by knee spanning external fixators were not included.

Manidakis[13] in his study of functional outcome of tibial plateau fractures, found loss of reduction of articular surface in 50% of patients in bicondylar group in the final visit. The mode of treatment was internal fixation with double buttress plating or external fixation with hybrid frame complimenting the reconstruction with percutaneous screws. Comparing our result from this study the method of fixation adopted in our series seems to be much better in terms of maintenance of reduction till the final follow-up period.

The primary area of focus in the tibial plateau fractures in this study was the posteromedial cortex of proximal end of tibia (Fig). Being a part of the medial tibial condyle, discontinuity of this column is observed mostly in high energy trauma. Such posterior fractures are observed on the lateral view of the radiographs where as the widely used classification proposed by Schatzker[15] is mainly based on anteroposterior views of the radiographs. The authors therefore, feel that the fracture description in the Schatzker classification system is sometimes inadequate. There is need to address the fractures in the coronal plane of proximal tibia caused by shearing forces for proper documentation and communication among surgeons and most importantly for the better operative planning.

However, the shortcomings in the plane X rays can be overcome by the CT Scan. Based on the axial views of CT scan Yi Zhu and his colleagues developed a three column classification system in tibial plateau fractures[16]. This new classification system has better inter-observer as well as intra-observer reliability. The authors in this series also share the views of Yi Zhu and his team regarding addressing the posterior element of the tibial plateau fractures as all the cases in this series were managed by restoration of posteromedial cortex by 1/3 tubular plate.

The concept of fracture of posterior column of tibial plateau as a separate entity is relatively new in the literature[17] but understanding this concept is very important in the correct management of high energy proximal tibial fractures. Current study has shown promising results in its unique approach to the management of posterior fractures but has this larger group of patients need to be studied and long term follow up is required. Further work on the subject of three column concept is being done by the authors and more represetative cases are being included so as to have better understanding regarding the approach to the tibial plateau fractures.

## CONCLUSION

Addressing the posteromedial column of the proximal tibia in bicondylar tibial plateau fractures with 1/3rd tubular plate produces very good outcome regarding maintenance of the articular surface and lesser soft tissue complications.

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