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CASE STUDY

A CASE REPORT OF MANAGEMENT OF GROSSLY COMMUNITED TIBIAL PLATEAU FRACTURE WITH TRIPLE PLATING A TWO STAGED PROCEDURE

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ABSTRACT

High-energy tibial plateau fracture poses a significant challenge and difficulty for orthopaedic surgeons. Fracture of tibial plateau involves major weight bearing joint and may alter knee kinematics. AnatomicReconstruction of the proximal tibial articular surfaces, restoration of the limb axis (limb alignment) and stable. Fixation permitting early joint motion is the goals of the treatment. In cases of complex bicondylar tibial plateau fractures, isolated lateral plating is frequently associated with varus malalignment and better results have been obtained with bilateral plating through dual incisions. However sometimes a complex type of bicondylar tibial plateau fractures is encountered in which medial plateau has a biplanar fracture in posterior coronal plane as well as sagittal plane. In such fractures it is imperative to fix the medial plateau with buttressing in both planes. One such fracture pattern of the proximal tibia managed by triple plating through dual posteromedial and anterolateral incisions is discussed in this case report with emphasis on mechanisms of this type of injury, surgical approach and management.

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INTRODUCTION

The treatment of complex bicondylar tibial plateau fractures remains a very demanding surgical procedure with a large number of pre-, peri- and postoperative complications (Mallik, 1992; Young, 1994; Dendrinos, 1996). The bicondylar fractures are a result of high axial loading to both compartments in neutral position. High-energy tibial plateau fractures are always accompanied by serious soft tissue damage influencing the treatment strategy (Berkson, 2006; Ruth, 2001; Egol, 2005; Dirschl, 2004). The articular restoration of the tibial plateau needs to be achieved early along with sufficient stability permitting immediate passive motion training. Among various methods for fixation of highly unstable bicondylar fractures, optimum results can be achieved by direct reduction and bilateral plating (Barei, 2004; Schatzker, 1979; Müller, 1982), but the problem arises when the medial plateau is comminuted and splits into a large posterior coronal plane fracture and sagittal plane fracture of the medial condyle. This medial plateau cannot be adequately fixed with single posteromedial plate and thus the needarises of the third plate to buttress the posterior coronal plane fracture.

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The main hindrance with surgical fixation of complex tibia fractures lays in the additional soft tissue damage, with an increased chance of skin necrosis and superficial or deep infections (Young, 1994; Ruth 2001; Schatzker *et al*., 1979). We hereby present a case of complex tibia plateau fracture in which medial plateau had a second split component in the coronal plane and was adequately fixed with triple plating of tibia and resulted in good functional outcome.

Mechanism of injury

Fractures of the tibial plateau are caused by a Varus or valgus force combined with axial loading (a pure valgusforce is more likely to rupture the ligaments). This is sometimes the result of a car striking a pedestrian (hence the term 'bumper fracture'); more often it is due to a fall from a height in which the knee isforced into valgus or Varus. The tibial condyle is crushed or split by the opposing femoral condyle, which remains intact.

Case Report

Radiological investigations

X ray Right Knee

Grossly communited proximal tibia fracture with intra articular extension and displacement.

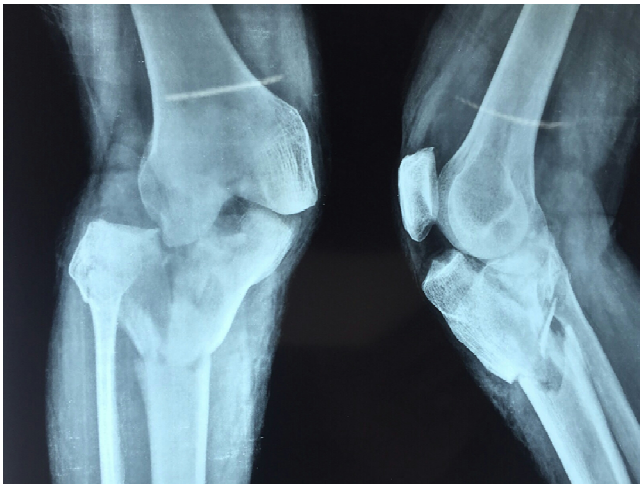

Fig. 1. Showing Pre-op X-ray of Right knee showing Ap and lateral view

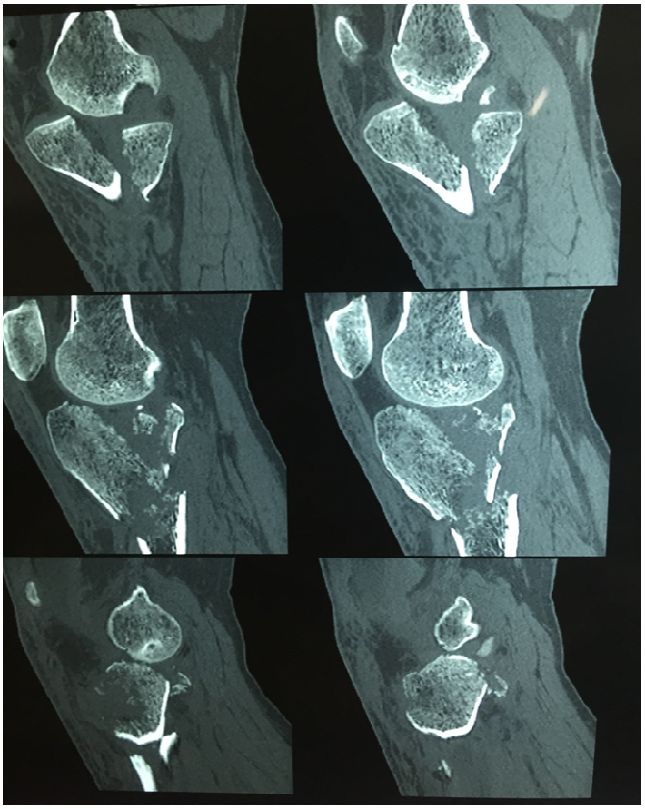

Fig. 2. Showing CT of Rt knee

CT Right Knee

Grossly communited and displaced fracture involving the proximal tibia and fibula. Fractures involving the articular surface of tibia and fibula predominantly involving the intercondylar surface. Fracture fragments are seen scattered around the knee joint.

Undisplaced fracture lines also seen in the anterior surface of the patella no definite extension into the posterior articular surfaces.

MRI right Knee

- Communited displaced fracture seen involving the medial, lateral plateau, inter condylar region of tibia with extension into the proximal shaft of tibia with involvement of ACL insertion site.
- Communited displaced fracture seen involving the head of fibula.
- Mild T2W/STIR hyper intensity seen involving the mid substance of ACL.
- T2W/STIR hyper intensity seen involving distal half of medial collateral ligament- grade 2 tear.
- Disruption of medial collateral ligament at the junction of anterior horn and the body.
- Lipohemarthrosis seen.

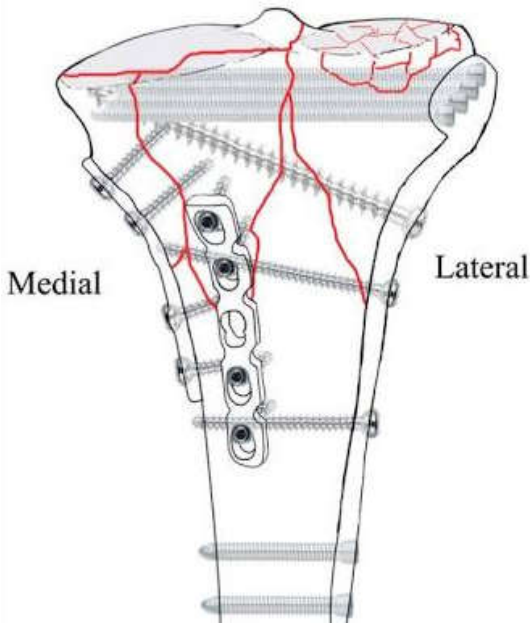

Fig. 3. Showing diagrammatic representation of Rt proximal tibia with implant in situ

Operative Procedure (Mallik *et al*., 1992)

Positioning and approach: Prone position postero medial approach. L buttress plate secured with 4.5 system cortical screws of sizes 28mm, 30mmx2, 32mm, 38mm and 40mm. Posterior locking compression plate and synthetic bone grafting.

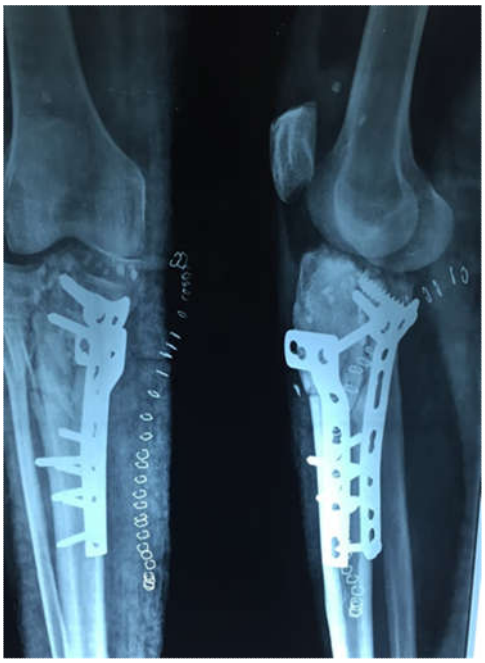

Fig. 4. Showing post- op X-ray with implant in situ

Operative Procedure (Young, 1992)

Positioning and approach:Supine position anterolateral minimally invasive approach. Mippo (Minimally Invasive Percutaneous Plate Osteosynthesis) with side specific right side lateral condylar buttress plating secured with 2 cancellous locking screws of sizes 75mm and 70mm, and one screw 0f size 50mm and distally locking cortical screws of size 18mm and 24mm.

Post-operative period

Patient was immobilised post operatively for a period of two weeks in view of the complex nature of the fracture and after suture removal tests for instability was conducted and found to be a stable knee on Varus and valgus stress and thus started was started on mobilisation and physiotherapy, static quadriceps and knee ROM exercises and the range of movements gradually improving and was 50^{o}in one month from the initial 30^{o}

Fig. 5. Showing Patient three months post op was started on continuous passive mobilisation and currently patient range of movements improved to 90deg

Conclusion

Bicondylar tibial plateau fractures are a result of high-energy traumatic injuries. They are associated with extensive damage to the surrounding soft tissues (Gardner, 2006).Various surgical options include traditional open reduction internal fixation, percutaneous screw fixation, application of a hybrid circular external fixator with or without limited internal fixation. The initial evaluation of fracture pattern is of utmost importance to guide the treatment strategy, consisting of routine AP, lateral and oblique views and CT scan images with 3D reconstruction. The posteromedial fragments are usually not distinctly. Outlined on routine X-rays, and are usually visualised on the lateral views. Most of the classification systems (Schatzker 9 and AO10) are based on the anteroposterior X-ray appearances. Bhattacharyya *et al*. (2005) stressed the importance of evaluating tibial plateau fractures on lateral views, criticizing the above fact. The peculiar fracture patterns are explained by the typical anatomical considerations. The medialpart of the knee is concave to the tibial side and the femoral condyle glides fairly confined in thetibial cavity.

Axial loading from the femur leads to a blasting effect on the tibia similar to an expulsion fracture seen in mechanical physics. Due to the posteriorly directed anatomic slope of the tibia plateau, the resulting force vector mostly points posteriorly, resulting in a posterior split fragment (Eggli, 2008). Hence it is imperative to bear in mind the possibility of a posteromedial fracture fragment. Yoo *et al*. (2010) conducted a study to evaluate the stabilisation of the posteromedial fragment using single and duallocking and non-locking plates. They concluded that the posteromedial fragment tolerated higher loads with the conventional locking proximal tibial plate+1/3 tubular plate construct. Biplanar fracture of the medial tibial plateauis not uncommon and needs to be identified preoperatively and requires buttressing in both the coronal as well as sagittal planes which can only be achieved by double plating of the medial plateau. Anterolateral and poster medial skin incision sallow a wide skin bridge between the two incisions and decrease the chances of skin necrosis and infections. Anterolateral approach allows elevation of the depressed lateral plateau and bone graft to be placed under the elevated fragment and fixation with proximal tibial locking plate. This fixedangle construct provides angular stability and prevents collapse of the elevated fragment. The posteromedial approach provides buttressing of the medial plateau and application of posterior as well as poster medial plates. This combined approach allows the reduction and fixation of entire tibialplateau. This fracture pattern may pose difficulties in surgical treatment if biplanar nature of the fracture of the medial plateau is not recognised and adequately planned. Thus in cases of this typical fracture pattern we recommend fixation of the medial plateau with posterior as well as posteromedial plates.

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