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ORIGINAL RESEARCH ARTICLE

FUNCTIONAL AND RADIOLOGICAL OUTCOME OF TIBIAL PLATEAU SCHATZKER TYPE V AND TYPE VI TREATED WITH DUAL PLATING

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ABSTRACT

Background: The bicondylar fractures are common fractures. These high energy fractures are most commonly associated with the various complications like malalignment, varus collapse, postoperative stiffness, wound complication. This study is aimed to assess the functional and radiological outcome and stability of dual plating for these fractures.

Methods: This was a retrospective study which included 25 cases tibial plateau fractures Schatzker V and VI treated with dual plating from 1st January 2016 until 30th December 2019 in Chitwan Medical College Nepal.). These fractures were operated with anterolateral approach and medial approach and dual plating was done. The clinical outcome was evaluated using Rasmussens score and radiological evaluation was done by calculating MPTA, PPTA angle.

Results: The functional outcome of our patients was assessed with Rasmussens functional score which showed excellent 15 (60%), good 9 (36%) and fair in 1 (4%) of the patient. The four cases had superficial infection. There was no secondary loss of reduction, malalignment in the study. The medial proximal tibial plateau angle (MPTA) of the injured and uninjured Limb had no significant statistical differences, however proximal posterior tibial plateau angle (PPTA) showed Significant difference p=0.025.

Conclusions: The open reduction and Internal fixation with dual plating for bicondylar proximal tibia fracture is biomechanically efficient in preventing collapse and malalignment, however an accurate intraoperative reduction is the most important to achieve the alignment close to uninjured limb. The stable fixation allows early range of motion and rehabilitation and thus provide excellent to good functional outcome with minimal complication.

INTRODUCTION

Proximal tibial articular fractures are caused by high-energy mechanisms and may be associated with neurologic and vascular injury, compartment syndrome, deep vein thrombosis, contusion, crush injury to the soft tissues, or open wounds.The involvement of both the condyle of tibia are classified into Schatzker V and VI classification. The goals of treatment of proximal tibial articular fractures include restoration of articular congruity, axial alignment, joint stability, and functional motion. The treatment of complex tibial plateau fractures is technically difficult and controversial.[1-3] The treatment of severe or "complex" tibial plateau fractures can be quite difficult. Severe or complex tibial plateau fractures include bicondylar fractures (Schatzker type V), tibial plateau fractures with metaphyseal-diaphyseal discontinuity (Schatzker type VI).[4] There are different techniques of internal and external fixation that are used to treat these fractures.[3,5,6] The management of bicondylar tibial plateau fracture still remains a challenge to most of the experienced orthopedic surgeons.

Biomechanical cadaveric studies have demonstrated that dual plate fixation of these fractures allows less subsidence and loss of alignment as compared to single plate fixation.[7] However, bilateral plating may require excessive dissection through the injured soft tissue, leading to wound complications or compromised osteosynthesis.[1,8] It is very difficult to achieve and maintain joint reduction in these bicondylar fracture. This study was aimed to assess the functional outcome and effectiveness of dual plate in preventing loss reduction in Schatzker V and VI.

METHODS

This was a retrospective study conducted in Chitwan Medical College and Hospital, after approval from the ethical committee board members IRC(CMC-IRC/076/077-125). All the patients with bicondylar fracture treated with dual plating from 1st January 2016 until 30th December 2019 were included in the study. Data was obtained from the medical record department, Radiology Department of Chitwan Medical college and calculation of the angles was done using RadiAnt DIACOM viewer 2020.1.1 All the patients meeting the criteria were

called and the clinical examination and Xray evaluation was done. Adult older than 18 years where bicondylar plating was done was included in the Study. The bilateral proximal tibia fracture, fracture involving ipsilateral tibia and femur, deformity in the Limb, Gustilo III fracture were excluded from the Study. The cases which had crossed minimum 1 year period was included and at the time of visit X-ray of the fractured limb and uninjured limb was taken, immediate postoperative X-ray was retrieved from Radiology Department. The Rasmussen scoring was also done at the visit time. The data collected was entered in the excel Sheet. Statistical analysis was performed using IBM SPSS ver. 20. The data collected measuring Medial Proximal Tibial Plateau angle (MPTA) and proximal posterior Tibial Plateau angle (PPTA) of injured tibia was compared with normal limb using t test. A p-value < 0.05 was considered statistically significant. The study was conducted as per ethical guideline of the institute written informed consent was taken from all the patients enrolled in the study.

Surgical Technique:

Patients were positioned supine on the radiolucent table. All the operation was performed in the Spinal anesthesia using tourniquet. The anteromedial and anterolateral incision were made. The joint line reduction was confirmed in the C -Arm fluoroscopy. The joint was inspected with sub meniscal arthrotomy and the articular fragment elevation was done when necessary. The Final fixation was done with Locking plate and screw in both the side. The second-generation antibiotic was given for 3 days and converted to oral antibiotic for 7 days. The patient was started on active ROM exercise as the pain subsided, partial weight was given at 6 week and gradual wt. bearing was increased.

The Medial Proximal Tibial Plateau angle (MPTA) on the Anteroposterior was calculated corresponding to the medial angle between the line tangent to the joint line and the anatomical which is formed by the angle between line tangential to medial tibial plateau and line perpendicular to tangent at Posterior tibial cortex. These angles were calculated by two surgeon and average was taken using RADIANT DIACOM Viewer. The MPTA and PPTA angle were calculated immediate Postoperative and minimum 12 month after surgery. These angles were also compared with the uninjured limb (Figure 1-4).

Figure 1: Normal Limb MPTA

Figure 2: Postop MPTA

Figure 3: Normal limb PPTA

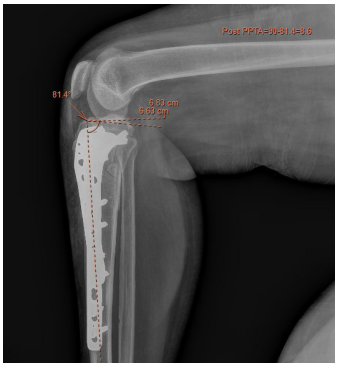

Figure 4: Postop PPTA

The MPTA angle ≥90 degree or≤80 degree and posterior slope angle ≥15 degree or≤5 degree was defined as malalignment. The change of ≥3 degree when comparing postop Xray and last visit Xray was defined as the loss of reduction. The functional assessment was done using Rasmussen Functional Knee Score. Data was analyzed in SPSS 20,t test was used to calculate p- value, RADIANT DIACOM software was used to calculate radiological parameter.

RESULTS

The most common method of the injury is Road Traffic Accident in 17(68%), Fall from height in 8(32%) of the cases. Three of the patients had Gustilo Anderson Grade 1 fracture, while the other fractures were closed Fracture. Out of the 25 cases, 14 cases were Schatzker type V fracture and 11 cases were

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Schatzker type VI the average time in which the operation was done was 6.44 days. The Demographic Profile of the patients is shown in Table 1.

Table 1: Demographic Characteristics

Age(yr.)	37.12 (18-78)
Gender	
Male	17(68%)
Female	8(32%)
Schatzker Classification	
Type V	14(56%)
Type VI	11(44%)
Site of injury	
Right Side	18(72%)
Left Side	7(28%)
Time of injury and surgery(days)	6.44 (2-14)

The functional outcome of our patients was assessed with Rasmussen functional score which showed excellent15 (60%), good 9 (36%) and fair in 1 (4%) of the patient. In our study we compared the Radiological Parameter MPTA, PPTA immediate postoperative and Last visit which was not statistically significant which is shown in Table 2.

Table 2: Rasmussen Functional Score

Clinical Results	No of cases
Excellent	15(60%)
Good	9(36%)
Fair	1(4%)

There was no malalignment in any cases. There was no significant difference in MPTA angle between uninjured and injured limb but there was Significant difference in PPTA angle between injured and uninjured limb(p=0.02) which is shown in Table4. Out of the 25 cases, 4 cases had superficial infection. These superficial infections were resolved with the antibiotic treatment (Table 3 and 4) (Figure 5-7).

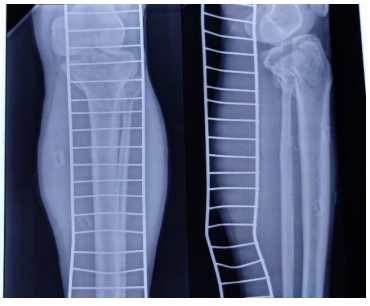

Figure 5: Type 5 Schatzker fracture

Table 3: Comparison of Radiological Parameters

Variable	Mean (degree)	p value
MPTA		**0.066**
Fracture Side Postoperative	86.19(81-89)	
Fracture side last visit	85.75(81.50-88.70)	
PPTA		**0.106**
Fracture Side Postoperative	7.57(4.3-13.2)	
Fracture Side last visit	7.72(4.5-13.5)	

Table 4: Comparison of Radiological Parameter of injured limb and uninjured limb

Variable	Mean (degree)	p-value
MPTA		**0.274**
Fracture Side last visit	85.75(81.50-88.70)	
Normal Side	86.30(83.50-89.10)	
PPTA		**0.025**
Fracture Side last visit	7.72(4.5-13.5)	
Normal side	9.140(5.7-12.30)	

Figure 6: Follow up X ray at 12 months

Figure 7: Squatting at 12 months

DISCUSSION

Bicondylar Tibial plateau fracture are high energy fracture. It is most of the time associated with various complication like soft tissue injury, severe comminution like malalignment, collapse, postop stiffness.[9,10] The Primary objective of the fixation of the tibial plateau fracture include anatomical reduction and restoration of articular congruity and Early Range of motion.[1,3] There is various surgical option available for the management of bicondylar fracture such as Bilateral plating, External Fixator or combination of those.[11]

The biomechanical Study by Muller et al has found that Dual plating had no statistical difference in the postoperative malalignment and malreduction.[12], Similarly in our Study the immediate Postoperative MPTA and last visit MPTA and Postop PPTA and last visit PTA showed no statistical difference. This is suggestive that Bicondylar plate provide sufficient stability to

the fracture.

We also Compared our Last visit MPTA angle with uninjured limb MPTA which showed no statistical difference. However, PPTA of last visit and uninjured Limb PPTA was statistically significant p (0.025). This could be due to intraoperative malreduction.[13]

The functional outcome of the patients was assessed with the Rasmussen score. In our study we found that there were 60% Excellent, 36% Good, 4% fair Results. The functional outcome study done by Neil Rohra et al showed 24 patients (70.59%) had Excellent, 8 patients (23.53%) had good and 1 patient (2.94%) were each of poor and fair.[14] This finding suggests that good biomechanical fixation by bilateral plating allows early range of motion and rehabilitation and provide optimal functional recovery and outcome in bicondylar Tibial plateau fracture.

The soft tissue injury is a major concern in proximal tibia fracture. In our case the average delay in the surgery was 6.44 days. We had four cases of superficial infection, there was no deep infection in any of our cases. There are literature describing up to 27% Deep infection.[15] Thus, determine the optimal time when the soft tissue injury settles are also crucial in the surgical treatment of bicondylar fracture.

The collection of the data was difficult as this was a retrospective study, so many patients had to be excluded from the study as there was no complete data available.

CONCLUSION

Open reduction and internal fixation with dual plating for bicondylar proximal tibia fracture is biomechanically efficient in preventing collapse and malalignment, however an accurate intraoperative reduction is important to achieve the alignment. The stable fixation allows early range of motion and rehabilitation and thus provide excellent to good functional outcome with minimal complications.

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FINANCIAL DISCLOSURE: None

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