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Study of Schatzker Type V and VI Proximal Tibial FracturesFunctional Outcome, Treated with Bicondylar Plating atTertiary Care Centre

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Abstract

Background: The treatment of complex fractures of Tibial plateau is challenging even for the most experienced surgeons. These injuries, affecting mainly the younger population during their most productive years causes a socioeconomic impact. A retrospective study was performed to evaluate the of Schatzker type V and VI, functional outcome, managed through internal fixation and open reduction was thus evaluated in this retrospective study. **Materials and Methods:** In our study, we used Rasmussen *et al.,* score to evaluate patients. A simple and valid score, it helps the patient's to access their own perspective regarding surgical outcome. We have attempted to present Type V/VI Schatzker's proximal tibia fractures in our tertiary care centre. With the increase in population, intern giving rise to increase in automobiles, has resulted in more vehicle accidents. **Results:** The study was conducted on 30 cases of surgically treated closed proximal tibia fractures and was analysed under the criterias of - sex, age, cause of injury, fracture type, range of motion, time taken for union, and occurrence of complications. **Conclusions:** The results of this study thus show an excellent functional outcome, with the open reduction and internal fixation surgery as there is minimal soft tissue complication with it. The rigid fixation with bicondylar plating helps in stability for early mobilisation and the range of motion thus ensuring optimal functional recovery and patient satisfaction.

Keywords: Plateau Tibial Fractures, Rasmussen *et al*. Score, Schatzker Type V and VI, Soft Tissue Injury

1. Introduction

The plateau tibial fractures, both low and high energy types, present difficult challenges for treatment as they can produce various bony injuries with severe comminution and soft tissue injuries which may result in permanent disability[1].

The severity it which the traums occures, leads to some potential complications like - Compartment syndrome, injury to peroneal nerve, vascular injury, and soft tissue injuries requiring coverage[2].

The ligament injuries (cruciate and collateral) along with meniscal tears may be associated. Fractures with articular comminution or depression, metaphyseal extension, displacement of condyle, and open or closed soft tissue injuries are considered complex. Plenty of treatment options are available in the form of newer implants and surgical techniques, including, but not limited to, minimal invasive techiniques, articular surface restoration techniques and implants, ring and hybrid external fixators, percutaneous plating, and fixed angle designs for plates and screws[3].

Challenges in the treatment of these proximal tibia fractures include displacement, instability, comminution, and extensive soft tissue injury. A plethora of newer treatment options are provided by the availability of new implants and surgical techniques. Treatment should be targeted towards articular surface restoration, normal limb alignment, and a stable, functional knee[5]. There are plenty of options for the treatment of proximal tibial fractures. The unicondylar fractures of the tibial plateau, low energy, can usually be treated at an early stage.

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The external fixation of the knee is temporarily done for tibial plateau fractures of high energy to allow the healing of the soft tissue. After 7 to 21 days, once soft tissue is optimal, delayed definitive surgical treatment may be done.

For certain fracture patterns, a locking plate may be sufficient instead of a bicondylar plating[6], for example, when there is no comminution of medial condyle and the is no fragment posteromedially. In case of bicondylar tibial plateau fracture associated with separation of posteromedial segment, Dual plationg is used for the treatment. As there are only a few studies on the Schatzkers type V and VI proximal tibia fractures functional outcomes using bicondylar plating, the study aims at doing the same using Rassmussen's criteria.

2. Aims and Objectives

1. To study the upper end tibia fracture patterns and to classify/ identify type V and VI upper end tibia fractures.
2. Study of the functional outcome of condylar tibial fractures managed with locking plate
3. Study the immediate and postoperative complications.
4. To review the relevant literature.

3. Materials and Methodology

3.1 Study Design and Study Population

Type of Study: Retrospective Study
No. of Patients (Sample Size): Calculated using standard formula.
Duration of Study: August 2016 to November 2018
Study Centre: Department of Orthopaedics at a Tertiary Health Care Centre.
Study will be conducted on inpatient basis after taking patient's informed written consent.
The study will be conducted only after approval from ethics committee.

4. Inclusion Criteria

1. All Proximal Type V and VI metaphyseal tibial fractures.
2. Age- 18 to 65 years.

5. Exclusion Criteria

1. All Diaphyseal Fractures in patients more than 18 years of age.
2. Open fracture.
3. Ligament injuries.
4. DNVD (distal neurovascular deficit).

5.1 Methodology

This retrospective study was conducted on a sample size of 30 patients, satisfying the inclusion and exclusion criteria for this study were recorded from the casualty or inpatient register of the department of orthopaedics at the tertiary health care centre. The purpose of the study was explained and informed consent was taken from the patients.

The following protocol was followed to evaluate these patients:

- Patient History and Clinical Examination.
- Functional outcome.
- Laboratory Investigations & Radiology (CT SCAN and X-Rays).
- Follow Up: Post operatively at 1month, 3 months and 6 months.
- Rasmussen *et al*. scoring was done at 6 months follow up.

The injuries of the soft tissue were first assessed in cases of these fractures, followed by radiographs of the fractures using the Schatzker's classification.

Protocol for the patients admitted and posted for the surgery:

1. Preoperative work up- Routine investigations include haematocrit, fasting blood sugar, blood urea, serum creatinine, HIV, HBsAg, HCV, chest radiograph and ECG.
2. Assessment of any comorbidities in the patient.
3. Antibiotics were administered preoperatively and continued till suture removal.
4. Obtained surgical fitness.
5. Preoperatively sterilization f all the required instruments were done.

Type of Surgery did- Bicondylar Plating.
Post-operative protocol:

1. Monitoring of TPR and BP hourly, with adequate post-operative analgesia.
2. Dressings checked for soakage daily.
3. Postoperative antibiotics were continued till suture removal: Intravenous for 5 days, followed by oral for a week.
4. Post-operative Xrays done on the next day.
5. Suture removal - on post-operative day 10 to 12.

5.1.1 Follow up

Patients were followed up at 2,4,6-8 weeks and at 6 months and checked for the following points:

5.1.2 Clinical Features

- Surgical scar,
- Range of motion,
- Presence of pain, and
- Stability.

5.1.3 Radiological Features

- Callus,
- Maintenance of reduction,
- Widening and/or depression of joint surface, and
- Varus and/or valgus collapse.
- Any signs of secondary osteoarthritis.

Patients were followed up at 6 months to evaluate their anatomically and functional outcome using modified Rasmussen clinical and radiological scoringsystem.

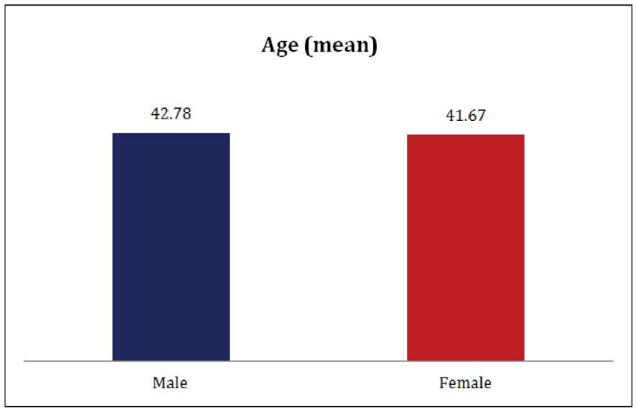
6. Results

6.1 Age

Mean	42.33
Standard Deviation	9.84
Highest	60
Lowest	19

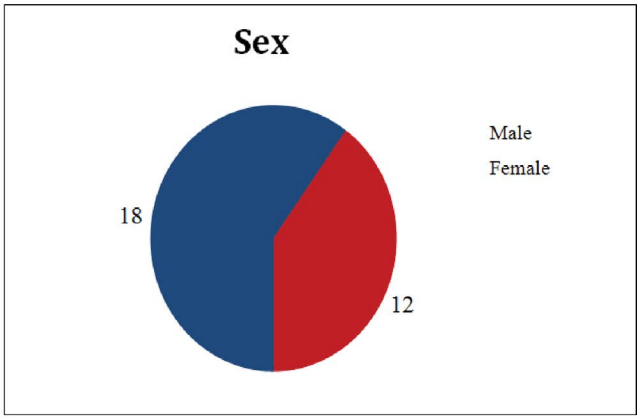
6.2 Sex-wise Age Disrtibution

	Male	Female
No.	18	12
Mean	42.78	41.67
Standard deviation	10.67	8.88
Highest	60	59
Lowest	19	21



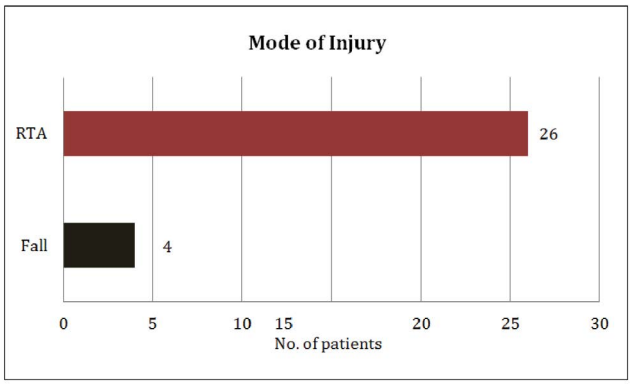
6.3 Sex

Male	18 (60.00%)
Female	12 (40.00%)



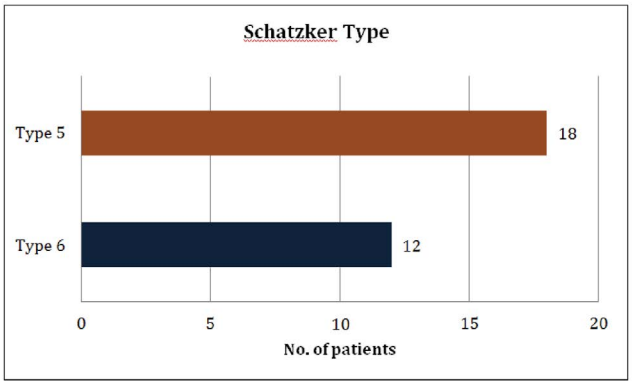
6.4 Mode of Injury

RTA	26 (86.67%)
Fall	4 (13.33%)



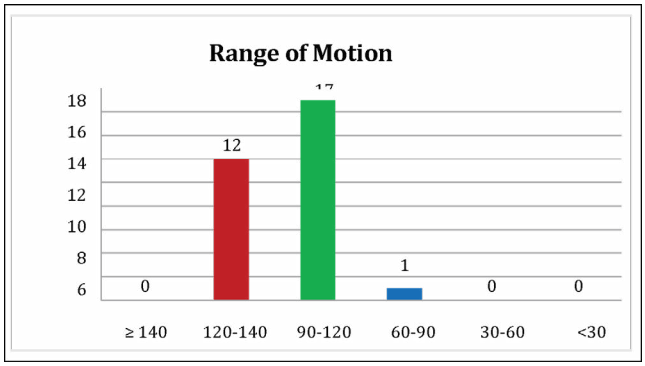
6.5 Schatzker Type

Type 5	18 (60.00%)
Type 6	12 (40.00%)



6.6 Rasmussen *et al.*, Score

Excellent	20 (66.67%)
Good	6 (20.00%)
Fair	3 (10.00%)
Poor	1 (3.33%)

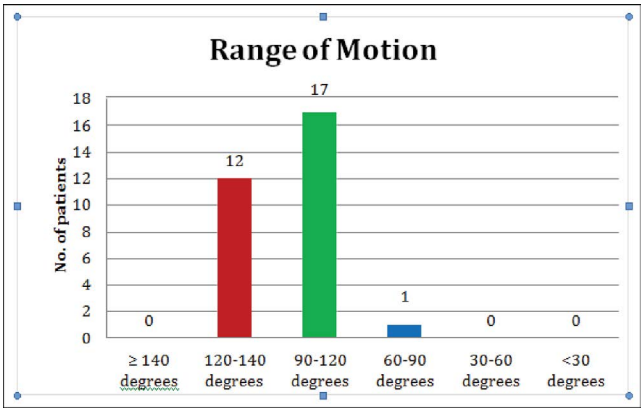


	Score
Mean	24.37
Standard Deviation	6.64
Highest	30
Lowest	6

6.7 Range of Motion

≥ 140 degrees	0
120-140 degrees	12 (40.00%)
90-120 degrees	17 (56.67%)
60-90 degrees	1 (3.33%)
30-60 degrees	0
<30 degrees	0

Range of motion	Degrees
Mean	112.83
Standard deviation	9.97
Highest	130
Lowest	85



6.8 Complications: 3 Patients (10.00%)

Stiffness	1 (3.33%)
Wound dehiscence	1 (3.33%)
Non-union	1 (3.33%)

7. Discussion

Fractures of the tibial plateau are considered severe traumatic injuries which may be due to road traffic accidents, fall, violence, etc. These fractures are important as they create major morbidity and adverse effects on individual quality of life. High energy tibial plateau fractures remain a challenge to orthopaedic surgeons even to this day, this is because the knee is a biomechanically complex joint and these fracture patterns are often combined with trauma to surrounding tissues.

To achieve the best possible results, the surgeon needs to map out and execute a well designed preoperative surgical strategy which involves minimal soft tissue damage. In the present era there are multiple treatment options ranging from simple skin traction, cast immobilisation, external fixation, open reduction and external fixation with different implants. The basic goal of treatment is to get a rigid fixation and restoration of articular continuity, so as to achieve good knee function. ORIF perfectly helps achieve this.

A biomechanical study by Egol *et al.*[15] using the LISS plating system showed that equal stability was provided

that of double plating however there was a high rate of malreduction and loss of congruity of fixation in their clinical series. Single midline incisions put the soft tissues at stretch and also pose a difficulty for fixing posteromedial fragments. We therefore used dual plating with dual incisions in our study.

In our study, we followed have followed prescribed protocol, stabilized patients using guidelines for advanced trauma management. In cases with extensive soft tissue destruction, definitive treatment was delayed to allow soft tissue healing. The limb was elevated The Bohler-Braun splint was used for limb elevation, and the patient was then taken for surgery only after soft tissue edema was reduced.

Using indirect reduction techniques, K-wires as joysticks and C-arm for image intensification, adequate reduction of the articular surface was obtained, without any further damage to the soft tissue.

Articular reduction is most commonly assessed using arthrotomy, fluoroscopy, and arthroscopy[7–10]. In this study, it was assessed using fluoroscopy (C-arm).

While most studies in the past have depended on radiological parameters to assess functional outcomes, currently, it is preferable to use tools specific for a patient to assess functional outcomes[11].

7.1 Age Distribution

Incidence of proximal tibia fractures is found to be greatest in the age group of 18-60 years, which coincides with maximum productivity. Mean age of incidence is 42.33 years. A study Seppo[16] also showed similar results with incidence between 20-60 years, averaging at 39.8 years.

7.2 Sex Distribution

A higher incidence is seen in males as they are more likely to be active outdoors. We studied 30 patients, out of which 18(60%) were male and 12(40%) were females. In a study by Ebrahim Ghayem Hassan Khani *et al.*[12], there were 16 males and 6 females in a series of 22 patients. In compariso, our study has a higher incidence of female patients which is attributable to regional population dynamics.

7.3 Mode of Injury

The most common mode of trauma was road traffic accidents. In our study of 30 patients, 26(86.7%) patients had sustained fractures as a result of road traffic accidents and 4(13.3%) fractures were a result of fall and other causes. Our results are comparable to a study by Yonzz Hang *et al.*, in which 71(89.9%) cases were due to road traffic accidents and 8(10.1%) were due to fall and other causes.

Out of 30 patients, 18 patients were classified as Schatzker's type V and 12 were classified as Schatzker's type VI fractures.

7.4 Range of Motion

Out of 30 patients, post-operative range of motion was 120-140° in 12(40%) patients and 90-120° in 17(56.67%) patients and 60-90° in 1(3.33%) patient. None had below 60°. In our study, we found the average range of motion to be 112.83°. In a study by Yunfeng Yao *et al.*[13] where the fractures were treated with dual buttress plates, mean post-operative range of motion was around 115°. The cause of these results can be because of rigid fixation, proper soft tissue handling, anatomical reduction and early mobilisation.

In our study Rasmussen et al score was Excellent for 20(66.67%) patients, good in 6 (20%) and poor in 1(3.33%) patient which is comparable to a study by Khatri *et al.*[18], in which 65 cases of Schatzker's Type V and VI fractures were studied, an excellent outcome was seen in 83 % according to the Oxford knee score. We did not any find any studies where in Rassmussen score was used to assess functional outcomes.

One study showed that the time for bony union was averaging at 16.31 weeks, with a range of 13 to 19 weeks, and nonunion was seen in 1(3.33%) patient. A study conducted by Zhang et al found that union took an average of 14.1 weeks in dual plating group[14].

8. Complications

Infection is the most dreaded complication in surgically managed tibial plateau fractures. Chances of infection are greatly reduced by ensuring low surgical time and proper

handling of soft tissues. In our study, one patient (3.33%) had post-operative infection, which was managed with adequate surgical debridement and intravenous antibiotics. Barei *et al.* reported deep wound infection in 3.6% patients. We consider 3.3% as low rate of infection. We attribute this to proper soft tissue handling, aseptic process and short surgical time.

We encountered a single case of non-union (3.33%) after 6 months which was treated with iliac crest bone grafting with radiological union seen at 11 months from primary surgery.

One patient (3.33%) developed stiffness which was treated with continuous passive mobilisation therapy and range of motion improved further 10°.

9. Conclusion

Proximal tibia fractures presenting Type V/Type VI Schatzker's classification were assessed. The Rasmussen et al score was used for assessing patients, with their own point-of-view regarding outcome of surgery. It is simple, short, reliable and valid method of assessment.

9.1 Limitations of the Study

The study does have its shortcomings the sample size we used was comparatively small. Also the follow up period was of shorter duration to assess long term complications like post-traumatic arthritis and refractures. We have also excluded open fractures which may be related to the less number of complications in our study.

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