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Dr. Kirthi Shivalingaiah
Assistant Professor, Kannur
Medical College, Kerala, India

Dr. Ullas Mahesh
Assistant Professor,
Rajarajeshwari Medical College,
Bangalore, Karnataka, India

Dr. Bobby John
Professor, CMC, Ludhiana,
Punjab, India

Functional outcome in Schatzker type V and VI tibial plateau fractures

Dr. Kirthi Shivalingaiah, Dr. Ullas Mahesh and Dr. Bobby John

Abstract

Introduction: Tibial plateau fractures occur due to a combination of axial loading and varus or valgus applied forces leading to articular depression, malalignment and an increased risk of posttraumatic osteoarthritis.

Aims and objectives: To study the functional outcome in the management of Schatzker type V and VI tibial plateau fractures.

Conclusion: Schatzker's type V and VI tibial plateau fractures represent serious injuries with substantial residual limb specific and general health deficits. The postoperative functional and radiological outcomes indicate that open reduction internal fixation is a feasible treatment option for bicondylar and complex tibial plateau fractures.

Keywords: Tibial plateau, fractures, schatzker, open reduction

Introduction

Tibial plateau fractures occur due to a combination of axial loading and varus or valgus applied forces leading to articular depression, malalignment and an increased risk of posttraumatic osteoarthritis [1]. Despite many advances in the care of intra-articular fractures, tibial plateau fractures continue to be a difficult surgical problem. The failures of treatment are usually due to residual pain, stiffness, instability, deformity and recurrent effusions. Review of over 140 of these fractures treated by both closed and operative methods has shed considerable light on the reason for failures [2]. Schatzker's classification of tibial plateau fractures is currently the most widely used and was the first to make the distinction between medial and lateral plateau fractures [3].

The Schatzker's classification differentiates tibial plateau fractures into six types [4]. All tibial plateau fractures are injuries with potentially devastating consequences. Management especially that of high-energy, complex tibial plateau fractures (Schatzker V and VI) continues to pose a challenge to the orthopaedic surgeon. These injuries are characterized by significant articular depression; severe fracture comminution and displacement; significant associated injury to the soft tissue envelope of the proximal tibia; and in addition with Schatzker VI fractures, dissociation of the tibial metaphysis from the diaphysis occurs [5].

The ideal management of bicondylar fractures of the tibial plateau remains controversial. Treatment goals include the satisfactory restoration of mechanical alignment, anatomic reduction of the articular surface, and stable fixation that allows an early range of motion of the knee; however, attaining these goals may not be directly correlated with improved patient outcomes. Specifically, several reports have suggested that residual articular incongruity of the tibial plateau does not compromise long-term functional outcomes. Additionally, open reduction and internal fixation, particularly through the compromised soft-tissue envelope, has been associated with major wound complications. Alternate methods of treatment for these serious injuries have therefore been suggested with its own merits and demerits [6].

Aims and objectives

To study the functional outcome in the management of Schatzker type V and VI tibial plateau fractures.

Materials and methods

This prospective study was conducted in Department of Orthopaedics, Christian Medical College & Hospital, Ludhiana over a period of 2 years beginning from 1st May 2011 up to 30th

Correspondence

Dr. Ullas Mahesh
Assistant Professor,
Rajarajeshwari Medical College,
Bangalore, Karnataka, India

April 2013. All the patients with Schatzker type V and VI tibial plateau fracture who were in the desired age group and who fulfilled the inclusion and exclusion criteria were included in the study.

Inclusion Criteria

1. All skeletally mature adults, in 18 to 70 year age group
2. Both open and closed Schatzker V and VI fractures.

Exclusion Criteria

1. Patients less than 18 year and over 70 years
2. Patients with associated ipsilateral acetabulum and femur fractures.
3. Patients with Schatzker V and VI fractures who underwent amputation because of vascular injury or crush injury of foot
4. Patients with ipsilateral Schatzker V and VI fractures and contralateral leg amputation.
5. Patients with Schatzker V and VI fractures with associated vascular injury.

Follow up of minimum 6 months to 2 year were included in the study. Patients were evaluated both subjectively and objectively using Iowa knee evaluation and Rasmussen radiological scoring system respectively.

Results and analysis

This study was conducted in Department of Orthopaedics, Christian Medical College & Hospital, Ludhiana over a period of 2 years beginning from 1st May 2011 up to 30th April 2013. Thirty nine patients with forty complex tibial condylar fractures (Schatzker type V and VI) were admitted during this period. Out of these patients, six patients had ipsilateral fracture acetabulum, fracture shaft of femur, distal femoral fractures. Two had polytrauma, three patients had vascular injury, two patients were operated outside, and seven patients were lost to follow up. These patients were excluded from the study. The final comparative analysis was done in 19 patients with 20 complex proximal tibial condylar fractures (Schatzker type V and VI).

Table 1: Age Distribution

Age	Male	Female	Total	Mean
18-34	9	1	10	25%
35-50	15	0	15	37.5%
51-70	11	4	15	37.5%
Total	35	5	40	100%

In our study, the youngest patient was 18 years of age and the oldest was 70 with an average age of 45 years. 75% of patients were between 35 to 70 years. However, 80% of female patients belonged to the age group of 51 to 70 years age group.

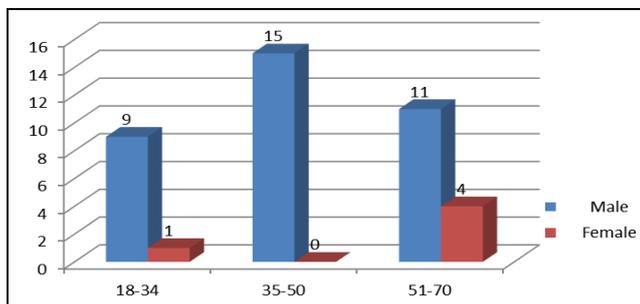


Fig 5: Age Distribution

Table 2: Gender Distribution

Sex	Number of patients	Percentage
Male	35	87%
Female	05	13%
Total	40	100%

There were 35 (87%) males and 05 (13%) were females with a male to female ratio of 7:1.

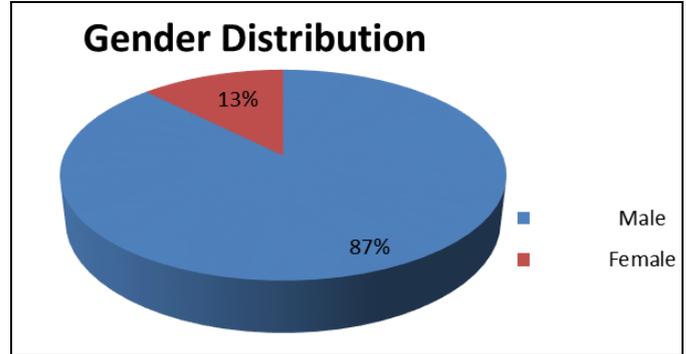


Fig 6: Gender Distribution

Table 3: Mode of injury

Mode of injury	Male	Female	Total	Percentage
RTA in 2 Wheeler	21	1	22	55
RTA of Pedestrian	3	2	5	12.5
RTA in 4 Wheeler	10	2	12	30
Others	1	0	1	2.5

Road traffic accident was the most common mode of injury (97.5%) and majority of them were 2 wheeler riders (55%) followed by 4 wheeler riders (30%).

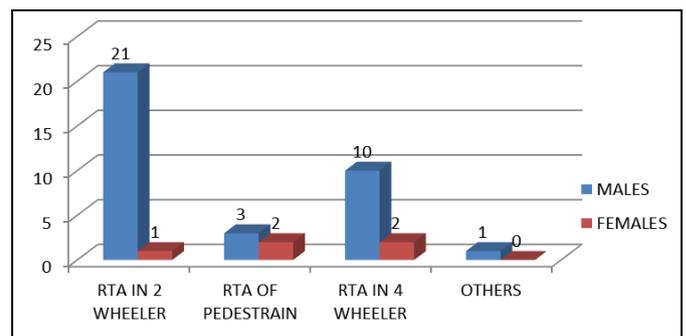
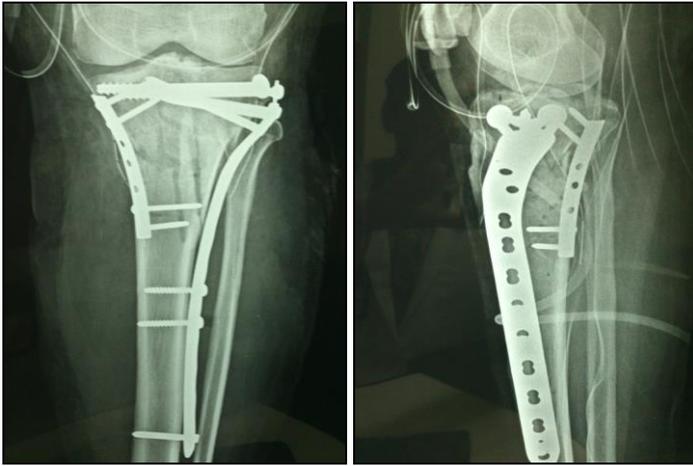


Fig 7: Mode of injury



Immediate Post OP with Anatomical Reduction



AT 6 Month Follow UP: Excellent Outcome



Discussion & Summary

Tibial plateau fractures are injuries with potentially devastating consequences. Management especially that of high-energy, complex tibial plateau fractures (Schatzker V and VI), continues to pose a challenge to the orthopaedic surgeon. These injuries are characterised by significant articular depression; severe fracture comminution and displacement; significant associated injury to the soft tissue envelope of the proximal tibia; and in Schatzker VI fractures, dissociation of the tibial metaphysis from the diaphysis. The ideal management still remains controversial. We prospectively studied the functional and radiological outcome in these schatzker type V and VI tibial plateau fractures. In the present study

Schatzker type V and VI fractures were more common in males (87.5%) compared to females with a ratio of 7:1.

Mostly occur in active age group with a mean age of 45 years.

These fractures are high energy injuries which occurs mostly by road traffic accidents (97.5%) Both right and left sides are equally prone for injury. Schatzker type VI was the most common type (85%). These were usually closed fractures (75%) with a significant soft tissue injury. At presentation 19 patients (47.5%) had swelling, abrasion, bruise on the skin who were operated early as compared to 11 patients (27.5%) who had blisters. Majority of open fractures were treated with spanning external fixator with or without cannulated screw fixation.

These fractures were usually associated with significant co-morbid injuries (30%). 22.5% of patients had polytrauma, acetabular fractures, and fracture shaft of femur. 7.5% of patients had vascular injury and were taken up for vascular repair, fasciotomy and spanning across knee external fixator. Compartment syndrome was associated with 5% of these fractures. 20% of the patients had medical co-morbid illness and 50% of them were females as 80% of these female patients belonged to elderly age group (51-70).

The average time for open reduction and internal fixation of fractures is 16 days following initial trauma and is the reason for low rate of deep infection in our study.

70% of our patients were treated with open reduction and internal fixation, out of which 30% with dual plating, 30% fixed angle lateral locking plating and 10% (type V) fractures with cannulated screws and medial buttress plating.

15% were treated with traction mobilization and cast application and 15% with spanning external fixation with or without cannulated screw fixation (open fractures and in compartment syndrome).

Most common mode of treatment in closed fractures was open reduction and internal fixation and spanning across knee external fixation in open fractures.

Patients who did not have blister or open fracture were just given long leg splint until the swelling subsided, evidenced by appearance of skin wrinkling and taken up for definitive fixation (35%).

Patients with significant blisters and open fractures were temporarily stabilized with skeletal traction or spanning across knee external fixation (65%).

After open reduction and internal fixation, knee mobilization was started from 2nd or 3rd day, hence these patients had mean range of motion of about 120 degrees at final follow up compared to other treatment modalities (110 and 90 degrees).

There is statistically significant correlation between early gait training and early return to work ($p < 0.05$).

Varus collapse of medial condyle was observed in 35% patients following open reduction and internal fixation, who were allowed to bear weight at 12 weeks. Hence weight bearing has to

be delayed until after 12 weeks.

Schatzker type V fractures had 100% excellent outcome both clinically and radiologically compared to Schatzker type VI fractures ($p>0.05$), but is not statistically significant. However, this is to be interpreted with caution as there were only two Schatzker V fractures and both were closed.

Closed fractures had better functional outcome ($p>0.05$) but is not statistically significant and show earlier union time which is statistically significant ($p<0.05$).

There is negative correlation between the time to post-operative mobilization and final range of movement (T test 11.17) which means earlier the mobilization better the Range of movement and this was statistically significant ($p<0.0001$).

With the above said treatment strategies we got 85% of good and excellent clinical scores and 90% of good and excellent radiological scores.

At 6 months follow up clinical and radiological scores did not correlate with each other. Out of 80% of patients with excellent radiological scores, only 11% had excellent clinical score and is statistically significant ($p<0.05$).

At final follow up both clinical radiological scores correlate with each other and is statistically significant ($p<0.05$). 80% of patients with excellent radiological score had excellent clinical score and all patients with fair radiological score had fair clinical scores too.

Best functional and radiological outcomes are seen following open reduction and internal fixation of these high energy complex tibial fractures compared to other modalities of treatment.

Osteomyelitis seen in 10% patients both were open fractures.

The high incidence of varus collapse of medial condyle may be due to inadequate initial reduction (patient 6), allowing early weight bearing (partial weight bearing at 8 weeks), use of low profile medial plate.

The varus malalignment of more than 10 degrees has negative correlation with the functional outcome.

Conclusion

Schatzker's type V and VI tibial plateau fractures represent serious injuries with substantial residual limb specific and general health deficits.

Bicondylar fractures are heterogeneous injuries, with a high risk of complications of treatment. The treating surgical team should have in their armamentarium the capacity to treat these fractures with either internal or external fixation depending on the nature of injuries. Whatever method of stabilization is chosen, the principles of stabilizing these high-energy injuries are soft tissue care, accurate articular surface reduction and maintenance, whilst achieving satisfactory length, rotation and alignment. The choice of treatment should be dictated by the soft tissues and fracture configuration.

The postoperative functional and radiological outcomes indicate that open reduction internal fixation is a feasible treatment option for bicondylar and complex tibial plateau fractures. Our results are consistent with the international standards. Although technically demanding internal fixation provides reliable stability without additional postoperative adjuvant external fixation. The potential postoperative complications associated with internal fixation can be reduced by practices including careful timing of surgery, extraperiosteal dissection and limited dissection of comminuted bone fragments.

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