

# Study of functional outcomes in proximal tibia intraarticular fractures (Schatzker's type-5 and type-6) treated by various surgical modalities

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## Abstract

**Objective:** To assess the functional outcome of proximal tibia intraarticular fracture by different modalities. **Method:** The study evaluated 30 patients with Schatzker's type 5 and 6 intraarticular proximal tibia fracture and the final assessment was done at 6 months using Modified Hohl and Luck knee scoring system. **Results:** Functional grading was done based on modified knee scoring system of Hohl and Luck (1956). In the final assessment, 13.3% had range of movement between 90 and 120 degrees and 6.7% had range of motion between 75 and 90 degrees. 4% were unable to walk more than 100 meters and all others were able to walk without much pain. Considering all parameters, the total pain score was assessed. 80% patients had no pain, 13.3% had mild pain and 6.7% had moderate pain. Functional results were excellent in 80%, good in 13.3%, fair in 6.7%. **Conclusion:** The present study has shown that the final rating of outcome was dependent on the comorbidity, age of patient, time interval between injury and surgery. Bi condylar fractures can be effectively treated by open reduction and fixation with lateral locking plate Bone grafting after elevation of the depressed fracture is always advisable as it gives a good anatomical and functional outcome. Post operative wound breakdown and infection is a major complication.

**Keywords:** Tibial condyle fractures, internal fixation, buttress plating

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## INTRODUCTION

The knee joint is complex joint and is the commonly injured joint now a day because of increased vehicular trauma and sports related injuries. Being superficial joint and more exposed to external forces, this joint easily gets injured<sup>1</sup>. Intra-articular fractures of proximal tibia are difficult to treat. Age, skin conditions, osteoporosis further increase the obstacles in the healing process. Various modalities of treatment are available but no ideal treatment has yet been evolved. At the Chicago

Orthopedic society in 1956 Manson Hole has rightly mentioned "these fractures are tough".

Jensen S<sup>1</sup> *et al* (1990), evaluated long term result of 109 tibial fractures; 61 treated by skeletal traction and early knee movement and 48 treated by surgery with average follow up of 70 months. They concluded that conservative treatment is valid alternative to surgery that it should be reserved for cases, where operation is not feasible. Marsh JL<sup>2</sup> (1995), treated 21 complex fractures of the tibial plateau with closed reduction, inter fragmentary screw fixation of the articular fragments and application of unilateral half pin external fixators. They considered this external fixation as a satisfactory treatment for complex plateau fractures.

Weigel<sup>2</sup> and J. Lawrence Marsh<sup>2</sup> (2002), studied the long-term outcomes of treatment of high-energy fracture of the tibial plateau that had been treated with a uniform technique of external fixation and assessed the function of the knee and the development of arthrosis at a minimum of five years after injury. Thirty patients with a total of thirty- one fractures of the tibial plateau were treated with a monolateral external fixator and limited internal fixation

of the articular surface. Follow-up data on twenty-four knees in twenty-three patients were obtained at a mean of ninety-eight months. Twenty patients (twenty knees) returned specifically for the study, at which time they completed an Iowa Knee Score questionnaire and Short Form-36 (SF-36). Thirteen patients rated their outcome as excellent; six, as good; and three, as fair. They concluded that patients with a high-energy fracture of the tibial plateau treated with external fixation have a good prognosis for satisfactory knee function in five years after injury.

Manjeet<sup>3</sup> *et al* (2013), studied Functional Outcome of Surgical Management of Tibial Plateau Fractures. In spite of complexity of these fractures we were able to achieve 83.3% acceptable results (33.3% Excellent and 50% good) with our methods of fixation, in addition we had 13.3% fair and 3.3% poor results. The functional evaluation was done as per the criteria given by Jensen *et al* which is a modification of criteria given by Hohl and Luck<sup>4</sup>.

Various studies have been carried out and different treatment modalities have been advised, however consensus has not been reached. As these are difficult fractures to operate, we have undertaken a study on the management of tibial condylar fractures.

## MATERIALS AND METHODS

The study was prospective, time bound, hospital based, randomized comparative study. 30 Cases satisfying inclusion criteria admitted in MGM Medical College, Aurangabad (Maharashtra) during the study period were included. Fractures of the proximal tibia were classified according to Schatzker's<sup>4</sup> classification.

### Inclusion criteria

Patients with

- Intra articular proximal tibial fractures (Schatzker's type-5, type-6).
- Skeletally mature and between the age group of 16 – 70 years.
- Closed fractures.
- Patients willing to give written informed consent for participation in the study.

### Exclusion criteria

- Skeletally immature patients.
- Pathological /Open fractures.
- Fractures with vascular complications.
- Ipsilateral fractures.
- Patients not willing to give written informed consent.

The final assessment was done using the functional grading of Modified Hohl and Luck knee scoring system. Minimum follow up of six months was ensured for all cases. Patients were reassessed at the intervals of 2

weeks, 6 weeks, 10 weeks, 14 weeks and the final assessment was done at the end of 6 months. They were evaluated clinically and the outcome was used for comparison.

Results are tabulated in Microsoft excel and statistical analysis was done using Epi Info for Windows 10. The statistical evaluation included descriptive statistics; frequencies and percentages were calculated for the data. Non- parametric test, the chi-square test was used as test of significance and for continuous variables, means differences in proportions were calculated along degrees of freedom. Findings were considered significant with p-value less than 0.05.

## RESULTS

The demographic profile showed that most patients in our study population were males (n=25, 83.3%) compared to the females (n=5, 16.7%). The mean age of the population was 41 years with 6 patients (20%) belonging to the age group of 18-30 years, 7 patients (23.3%) were in 30-40 years age group, 10(33.3%) were 40-50 years, 4 patients (13.3%) were 50-60 years and 3 patients (10%) were more than 60 years of age. 23.3% patients had comorbidity while 76.7% had no comorbidity. In our study, 21 patients (70%) presented with high velocity trauma and remaining ones (30%) with low velocity trauma. 19 patients (63.3%) presented on the same day of injury, 8 patients (26.7%) presented within 1-2 days, 3 patients (10%) were admitted after 2 days of injury. Average duration between injury and admission was 1.46 days, ranging from 1-5 days. Duration between injury and surgery ranged from 2-14 days, mean duration being 4.33 days. 50% of the patients were operated within 2 days of injury while 8 patients (26.7%) were operated between 3-5 days. In 11 patients (36.7%) bicondylar plates were used, unicondylar plates were used in 4 patients (13.3%), unicondylar plates with external fixator used in 2 patients (6.7%) and unicondylar plate with CC screws were used in 13 patients (43.3%). No significant association was found between the choice of implants and the final outcome of the patients (p=0.18). Bone grafting was done in 33.3% patients (harvested from ipsilateral iliac crest from all the patients), however no significant association was found between these two variables (p=0.1).

In our study, majority patients (n=24, 80%) had excellent knee score as measured by Modified Hohl and Luck knee scoring system. 16 patients (53.3%) were classified as Schatzker's type-5 and 14 (46.7%) patients as type-6. However no significant association was found between the type of fracture and Final outcome of patients (p=0.06). Significant association was found between age and final outcome of patients as measured by the final scores obtained on Modified Hohl and Luck<sup>4</sup> scoring

system ( $p < 0.05$ ). (table 1). No significant association was found between mode of injury and final outcome ( $p = 0.08$ ) Presence of comorbidities had a significant impact on the final outcome of the patients ( $p < 0.005$ ) similarly a significant co-relation was found between time interval of injury and surgery with the final outcome ( $p < 0.05$ ). (table 3)

**Table 1:** Comparison of age with final scores

Age (years)	Excellent	Good	Fair	Chi square test (p)
18-30 years	6	0	0	0.04328
30-40 years	6	1	0	
40-50 years	9	0	1	
50-60 years	3	1	0	
> 60 years	0	2	1	

**Table 2:** Comorbidity and Final Outcome

Variables	Excellent	Good	Fair	Chi square test (p)
Co morbid patients	3	2	2	0.0076
Patients with no co-morbidity	21	2	0	

**Table 3:** Final outcome and Time interval between injury and surgery

Time interval between injury and surgery (number of days)	Excellent	Good	Fair	Chi square test (p)
0-2 days	15	0	0	0.02685
3-5 days	5	3	0	
6-8 days	2	1	1	
> 8 days	2	0	1	

## DISCUSSION

The youngest patient in this study was 18 years and the oldest was 68 years. Most cases were between 31-50 years with mean of 41 years. Marsh JL<sup>2</sup> *et al* and Honkonen<sup>5</sup> *et al*. had similar observations. Majority of patients (80%) had excellent rating after treatment. Chi square test analysis showed significant influence ( $p = 0.04$ ) of age in final rating of outcome. Best functional outcomes were seen in the younger age group of 18-30 years. Therefore, younger the age better was the outcome of surgical treatment. In our study, 25 patients (83.3%) were males, this can be attributed to our Indian set up where female population largely work indoor and do not travel much. In the study by Hitin Mathur<sup>6</sup> *et al*. and kataria<sup>7</sup> *et al*, also reported male dominance. In our study, 21 patients (70%) presented with high velocity trauma, 9 patients (30%) presented with low velocity trauma. Honkonen and Jarvinen<sup>8</sup> and Singh<sup>9</sup> *et al*. also had similar observations. Mode of injury (high velocity trauma) had no significant association with the functional outcome ( $p = 0.08$ ). In patients with no co-morbidities ( $n = 23$ , 76.7%), 91% had excellent outcome whereas patients with co-morbidities (23.3%), 3 had excellent, 2 had good and 2 had fair outcome. Final outcome was statistically

significant ( $p = 0.01$ ) in co-morbid patients. All the fractures in this study were classified according to Schatzker's classification system. 16 patients were Type -V and 14 patients were Type VI. Rasmussen<sup>10</sup>, Lansinger<sup>11</sup> *et al* and Mills and Nork<sup>12</sup>, also had similar observations. Comparison between type of fracture and final outcome was assessed using chi square analysis; it did not show any significant co-relation between these two factors ( $p = 0.067$ ). Although, there was no statistical significance between the choice of implants and final outcome in our study ( $p = 0.18$ ), but patients who were treated with bicondylar plates and combination of unicondylar plate with CC screws had excellent outcome (81%, 84% respectively) as compared to the other methods. Oh<sup>13</sup> *et al*. Kataria<sup>7</sup> *et al*. and Weigel<sup>2</sup> *et al* obtained similar results.

Association between bone grafting and rating was not statistically significant ( $p = 0.13$ ). All cases with bone grafts had excellent rating whereas, those without bone grafting had good rating in four and fair rating in two patients. Unnikrishnan<sup>14</sup> *et al*. reported similar results.

Time delay was found to be a significant ( $p = 0.02$ ) factor associated with the final outcome. As the time interval between injury and surgery increased, outcome ratings were reduced. All cases operated within 2 days had excellent results while cases that were operated after 6-8 days, had fair response to treatment. This was similar to the findings of Schatzker<sup>8</sup> *et al*, Gaudinez<sup>15</sup> *et al*. reported.

Patients who had delay in time interval between injury and surgery were either lately presented to hospital or were not fit for surgery (due to poor skin conditions and co-morbidities). Delay of time poses more difficulty in reducing fracture fragments and achieving anatomical alignment. Therefore, poor outcome.

In our study, 17 patients (56.7%) were mobilized immediately after surgery while 13 patients (43.3%) were mobilized after 2-14 days of surgery. Of the 17 patients mobilized immediately, 16 had excellent outcome and 1 had good outcome and out of 13 patients not mobilized immediately, 8 had excellent outcome, 3 had good outcome, and 2 had fair rating of outcome.

Although there was no co-relation reported between postoperative immobilization and final outcome ( $p = 0.07$ ). But early mobilization had a positive impact on the final outcome.

## CONCLUSION

Tibial plateau fractures are fairly common fractures seen, especially in males (83%) of active age group (31-50 years). Road traffic accidents (high velocity trauma) form the commonest mode of injury (70%). All patient's are to be thoroughly evaluated to rule out any co-morbidities

and if any treated accordingly. Each patient's fracture type and soft tissue status should be analyzed appropriately before surgery. Achieving a congruous joint surface and correct alignment by open or closed reduction and stable internal fixation should be the goal to facilitate early knee mobilization and consequent good functional results. Bone grafting after elevation of depressed fracture is always advisable wherever indicated as it gives excellent results. Bi condylar fractures can be effectively treated by reduction and fixation with lateral locking plates. Early surgical fixation (interval between trauma and surgery) is very important to achieve good results and to prevent infection. Initiation of early knee joint motion after surgery is the most important factor to prevent knee stiffness and late osteoarthritis. Full weight bearing should be delayed until fracture union to prevent the articular collapse and axial mal-alignment. Postoperative knee stiffness and scar dehiscence are major complications. Extensive soft issue dissection is to be avoided as this often results in delayed wound healing and hence a delay in mobilization. The postoperative functional outcome indicates that surgical management is a feasible treatment option for tibial plateau fractures (Schatzker's type-5 and type-6).

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