

Evaluation of treatment outcome of proximal tibial fractures using dual plating in adults – A prospective study.

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Abstract

Background: Fractures of the tibial plateau represent 1% of all fractures and approximately 8% of fractures occurring in the elderly. Tibial plateau fractures continue to be a difficult surgical problem despite many advances in the care of intra-articular fracture. This is attributed mainly to the complex biomechanics of its weight bearing position and complex ligamentous stability and articular congruency. A survey of the literature indicates that many authors report only slightly better than 50% satisfactory results with either closed or operative methods of treatment. The failures of treatment are

usually due to residual pain, stiffness, deformity, recurrent effusions, and instability.

Aim: To assess the functional outcome of dual plating of proximal tibial fractures.

Material and Methods: A prospective study was done on patients with proximal tibial fracture (graded preoperatively using Schatzker classification) coming to orthopaedic department at tertiary health care Centre for a duration of November 2020 to October 2022. Total 70 patients, were included in this study. Patient were followed from 6 weeks to 6 months on OPD basis at intervals of 6 weeks, 12 weeks, 6 months and was evaluated based on Rasmussen score. Findings were

recorded in the proforma and entered in Microsoft Excel 2010. Data was analysed using SPSS (Statistical Programme for Social Sciences) software 21 version, OpenEpi Software Version 2.3. For quantitative type of data test of significance applied was student t test and for Qualitative data Chi square test was applied.

Results: The mean age of the patients was 35.54 years. Majority of the patients 63 [90%] included in the study was male. Majority cases 55.7% had both column involved. 25.8% were treated with dual plating of proximal tibial fractures. Mean Rasmussen's functional grading score at the final follow-up was 26.75.

Conclusion: Tibial plate provide excellent fixation of intra-articular extension fractures and are most useful when the soft tissue environment is amenable to dissection in the area of the proximal tibia. The use of long plates spanning the length of the fracture also gives adequate stability to allowing for fractures union and soft tissue healing. Recent trend is to use 2.7 system locking T-plate of small size and more number of screws to hold multiple fragments.

Keywords: Proximal tibia plateau fractures, dual plating, Schatzkers Classification, ORIF, Rasmussen score.

Introduction

The proximal tibia includes the tibial condyles, which along with distal end of femur take part in formation of knee joint; and upper part of tibia i.e. the tibial plateau.¹ The Knee joint is comprised of distal femur, proximal tibia & patella. The Knee joint is a superficial joint. It is very vulnerable to injury because the articulating bony surfaces (ends of the femur and tibia) don't form a very deep bony socket.² As a result the knee relies mainly on ligaments and muscles for its stability.³

Fractures of the tibial plateau represent 1% of all fractures and approximately 8% of fractures occurring in the elderly.^{4,5} Tibial plateau fractures continue to be a difficult surgical problem despite many advances in the care of intra-articular fracture. This is attributed mainly to the complex biomechanics of its weight bearing position and complex ligamentous stability and articular congruency. A survey of the literature indicates that many authors report only slightly better than 50% satisfactory results with either closed or operative methods of treatment.

The failures of treatment are usually due to residual pain, stiffness, deformity, recurrent effusions, and instability. Review of over 140 of these fractures treated by both closed and operative methods has shed considerable light on the reason for the failures.⁶ For over three decades various modality of treatment starting from (traction, knee spanning external fixator to total knee arthroplasty) used for tibial plateau fractures. Traction and closed reduction followed by POP application will not restore the articular surface and lead on to articular surface collapse and knee stiffness. Open reduction and fixation with plating will lead to good reduction of articular surface. ORIF with dual plating has been an attractive treatment method for complex types of Injuries. Dual plate fixation using locking or buttress plate through two-incision approach allows for anatomic joint reduction, adequate fixation, maintenance of alignment, and early rehabilitation to achieve better functional outcome. As fixed-angle constructs, we have assumed that locking plates might be able to reduce secondary loss of reduction and alignment in bicondylar tibial plateau fracture dislocations; therefore, locking plates in combination with buttress plates were used to

fix bicondylar tibial plateau fracture dislocations in most of our patients in a dual-plating technique.⁷

Thus this study was carried out to study the treatment outcome of proximal tibial fractures using dual plating in adults.

Objective

- To assess the functional outcome of dual plating of proximal tibial fractures.
- To assess the complications after dual plating of proximal tibial fractures.

Material and methods

A prospective study was conducted over period of two years from November 2020 to October 2022 in Orthopaedic department of Ashwini rural medical college, hospital and research Centre, Solapur. During this period, all patients above 18 years of age, diagnosed with proximal tibial fractures were screened and included.

Patients excluded from study were Skeletally immature patients, neurovascular injuries, having concomitant lower limb fractures like patella, femur, ankle and pelvic fractures. All Tibial condyles fractures were graded preoperatively using Schatzker classification. All the patients who will fulfill the inclusion criteria were called for assessment of functional outcome of knee using Rasmuseen score.

Data Collection Procedure

Patient were followed from 6 weeks to 6 months on OPD basis at intervals of 6 weeks, 12 weeks, 6 months and 1 yr. at the institute and was evaluated.

Data Analysis

The collected data was compiled in Microsoft Excel 2010. Data describing quantitative measures was expressed as mean, median, mean + SD, standard deviation. Qualitative type of data was expressed as

percentage or proportion. Data was analysed using SPSS (Statistical Programme for Social Sciences) software 21 version, OpenEpi Software Version 2.3.

For quantitative type of data test of significance applied was student t test and for Qualitative data Chi square test was applied. Institute Ethical committee approval was taken prior to the study. Written informed consent was taken from the study subjects before enrolling them in the study.

Results and observations

Table 1: Distribution depending on age

Age in years	Frequency	Percentage
<20	3	4.3
20-40	45	64.3
>40	22	31.4
Total	70	100
Mean	35.4	
SD	8.1	
Minimum	18	
Maximum	56	

In our study, there were total 70 subjects, of which majority, i.e., 64.3% cases in the age group of 20 to 40 years of age, 31.4% cases were more than 40 years of age, while only 4.3% cases were less than 20 years of age. Mean age was 35.4 years with SD 8.1, while minimum age was 18 years and maximum age was 56 years.

Table 2: Distribution depending on gender

Gender	Frequency	Percentage
Male	63	90
Female	7	10
Total	70	100

In our study, there were 90% Male cases, and 10% female cases.

Table 3: Distribution depending on mode of injury

Mode of injury	Frequency	Percentage
RTA	63	90
Fall	7	10
Total	70	100

Of total 70 cases, 90% cases had sustained RTA and 10% cases fall.

Table 4: Distribution depending on side affected

Side	Frequency	Percentage
Right	38	54.3
Left	32	45.7
Total	70	100

Of total 70 cases, 54.3% cases had Right side affected, while only 45.7% cases had Left side affection.

Table 5: Distribution depending on three column classification

Classification	Frequency	Percentage
Lateral	4	5.7
Medial	3	4.3
Three columns	24	34.3
Two columns	39	55.7
Total	70	100

Of total 70 cases, majority cases 55.7% had both columns involved, 34.3% cases had three columns involved, 5.7% cases had lateral side involved, while 4.3% cases had medial side involved.

Table 6: Distribution depending on column fixed

Column	Frequency	Percentage
Lateral	17	24.3
Lateral, Posterior	2	2.9
Medial	25	35.7
Medial, Lateral	6	8.6
Medial, Lateral, Posterior	6	8.6
Posterior	8	11.4
Posterior, Lateral	3	4.3
Posterior, Medial	3	4.3
Total	70	100

Various columns were fixed, we noted the frequency of them in each case. Majority 35.7% cases had their Medial column fixed, 24.3% cases had their Lateral column fixed, 11.4% cases had Posterior column fixed, 8.6% cases had Medial and Lateral columns fixed together, another 8.6% cases had their Medial, Lateral and Posterior columns fixed, 4.3% cases had their Posterior and Lateral columns fixed, while another 4.3% cases had their Posterior and Medial Column fixed.

Table 7: Distribution depending on implant used

Implant used	Frequency	Percentage
'L'	1	1.4
'L' buttress, 't' buttress	3	4.3
'L' buttress, distal radius 't' plate	2	2.9
'T' plate 2.7 system	12	17.1
6.5 mm ccs	3	4.3
Distal	3	4.3
Distal radius 't' plate	5	7.1
Distal radius 't' plate, 6.5 mm ccs	3	4.3
Distal radius 't' plate, 6.5mm ccs	3	4.3
Distal radius lcp	3	4.3
Lcp	13	18.6
Lcp, 'l'	1	1.4
Lcp, 'l'	6	8.6
Lcp, 'l' buttress	3	4.3
LCP, 1/3rd	3	4.3
Lcp, distal radius 't' plate, 6.5 mm ccs	3	4.3
Lcp, 6.5 mm	3	4.3
Total	70	100

Various implants were used as per the fracture configuration, we noted them in all specific cases. In 18.6% cases, LCP was used, second most common was T plate, which was 17.1% cases, while other implants were used as per cases demanded, like T buttress plate, 6.5mm CC screws, etc.

Table 8: Distribution depending on follow up

Period	Frequency	Percentage
<1 year	32	45.7
>1 year	38	54.3
Total	70	100

Majority, i.e., 54.3% cases had more than 1 year follow-up, while 45.7% cases had follow-up of less than 1 year.

Table 9: Distribution depending on Rassmussen score

Rassmussen score	Frequency	Percentage
20	3	4.3
21	2	2.9
22	2	2.9
23	6	8.6
24	21	30.0
25	18	25.7
26	9	12.9
27	3	4.3
28	6	8.6
Total	70	100

Majority cases had RASS MUSS EN SCORE 24, which were 30%, followed by score 25 in 25.7% cases, score 26, in 12.9% cases, score 23 and 28 in 8.6% cases, score 20, 27 in 4.3% cases, while score 21 and 22 in 2.9% cases.

Table 10: Distribution depending on complication

Complication	Frequency	Percentage
Knee	3	4.3
Knee Stiffness	4	5.7

Screw Pull Out	5	7.1
Wound	4	5.7
Wound Infection	3	4.3
No complication	51	72.9
Total	70	100

In our study, 72.9% cases had No Complications, 7.1% cases had Screw pull out, 5.7% cases had Knee Stiffness and Wound related problems, 4.3% cases had Knee pain and wound infection each.

Discussion

Age distribution

In our study, there were total 70 subjects, of which majority, i.e., 64.3% cases in the age group of 20 to 40 years of age, 31.4% cases were more than 40 years of age, while only 4.3% cases were less than 20 years of age. Mean age was 35.4 years with SD 8.1, while minimum age was 18 years and maximum age was 56 years. Study by Bhalotia AP et al ⁷ showed that mean age was 36 years.

Gender distribution

In our study, there were 90% Male cases, and 10% female cases. Study by Bhalotia AP et al ⁷ showed that 83% were males and 17% were females.

Mode of injury

Of total 70 cases, 90% cases had sustained RTA and 10% cases fall.

Side affected

Of total 70 cases, 54.3% cases had Right side affected, while only 45.7% cases had Left side affection.

Column involved

Of total 70 cases, majority cases 55.7% had both column involved, 34.3% cases had three columns involved, 5.7% cases had lateral side involved, while 4.3% cases had medial side involved.

Column fixed

Various columns were fixed, we noted the frequency of them in each case. Majority 35.7% cases had their Medial column fixed, 24.3% cases had their Lateral column fixed, 11.4% cases had Posterior column fixed, 8.6% cases had Medial and Lateral columns fixed together, another 8.6% cases had their Medial, Lateral and Posterior columns fixed, 4.3% cases had their Posterior and Lateral columns fixed, while another 4.3% cases had their Posterior and Medial Column fixed.

Implants used

Various implants were used as per the fracture configuration, we noted them in all specific cases. In 18.6% cases, LCP was used, second most common was T plate, which was 17.1% cases, while other implants were used as per cases demanded, like T buttress plate, 6.5mm CC screws, etc.

Follow up

Majority, i.e. 54.3% cases had more than 1 year followup, while 45.7% cases had followup of less than 1 year. Majority cases had RASSMUSSEN SCORE 24, which were 30%, followed by score 25 in 25.7% cases, score 26, in 12.9% cases, score 23 and 28 in 8.6% cases, score 20, 27 in 4.3% cases, while score 21 and 22 in 2.9% cases and mean score was 24.5 ± 1.8 . Mean Rasmussen's functional grading score at the final follow-up was 26.75.

Complications

In our study, 72.9% cases had No Complications, 7.1% cases had Screw pull out, 5.7% cases had Knee Stiffness and Wound related problems, 4.3% cases had Knee pain and wound infection each. Mal-union was seen in 1 case. There was no evidence of varus collapse as a result of polyaxial screw failure. Study showed complications in five patients. The rate of complications was 30.4%.

Complications included 1 case of shortening (1 cm) and 2 cases of mild malalignments (varus less than 10°).

Conclusion

Fracture of proximal tibia are the results of high-energy trauma. Treatment of intra-articular tibial plateau fractures is an unsolved problem. The Choice of surgical procedure and implant should be based on the patient bone quality, fracture pattern and intraoperative fracture reduction. Preoperative soft tissue status and their repair at right time significantly changes the outcome.

Tibial plate provide excellent fixation of intra-articular extension fractures and are most useful when the soft tissue environment is amenable to dissection in the area of the proximal tibia. The use of long plates spanning the length of the fracture also gives adequate stability to allowing for fractures union and soft tissue healing. Recent trend is to use 2.7 system locking T-plate of small size and more number of screws to hold multiple fragments.

The optimal method of treating a proximal tibial fracture with two columns involved is dual plating balancing soft-tissue management and fracture reduction & alignment.

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