(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume4, Issue 2, Page No: 925-931
March-April 2021

A Comparative Study between Hybrid External Fixation and Open Reduction Internal Fixation by Plating in Fracture Proximal Tibia

Dr Swapan Mandal MS (ortho) Medical officer Baranagar S.G hospital, Dr Hiranmay Deb
Associate-professor, Medical college Kolkata, Prof Dilip kr Pal, M G M Medical college Kishanganj

***Corresponding Author:**
Dr Hiranmay Deb
Green Wood Park, Action Area 1A, Block AG, Flat NO HIG 1/2 4B, New-Town, Kolkata-700156

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

ABSTRACT

BACKGROUND-Tibial plateau fractures constitute approximately 1% of all fractures. These are intra-articular fractures caused by high-velocity trauma and they involve the knee joint and usually result from axial loading in combination with varus or valgus stress forces.[1]

MATERIAL AND METHODS-This is a prospective, comparative study on presentation at in-patient department at R.G. Kar Medical College, Kolkata in the year of 2016-17. Study was carried out after Institutional Ethical Committee permission with informed consent from patients. Total 40 patients (29 male and 11 female) with predominantly left sided injury pattern (Right side15 and 25 left sided injury) and mostly of Schatzker type VI (7 Schatzker type IV, Type V 12, Type VI 21) are treated with Hybrid External fixator 20 cases and rest 20 cases with Plating. Injury to surgery time interval 3-10days, with an average of 4.4 days and delay was due to un-favorable skin condition. Results were analyzed at 6months with WOMAC score and KS Score at 6 months and statistical analysis was done by SPSS Version 20 software.

RESULTS- Excellent results are found in 60% of cases, Good results are found in 35% of patients and in 5% fair results were found. Knee Range of Motion (ROM)in Hybrid fixator group was 0-135 degrees with standard deviation (SD) of 8.2 degrees and ROM of 0-119 with SD of 7.33 in open reduction and internal fixation (ORIF) by plating group.

CONCLUSION- Hybrid External Fixation is safe and effective treatment with reasonably better outcome in comparison to open reduction internal fixation by plates in proximal tibial fracture cases of Schatzker type IV, V and VI due to early intervention with Hybrid external fixation with huge swelling and compromised skin condition.

Keywords: Tibial plateau fracture, Schatzker type, Hybrid external fixation, plating, ORIF, ROM

INTRODUCTION

The management of proximal tibial fractures has always been a subject of debate because of their variety and complexity. In the search for perfection, any treatment modality that has a varied opinion is a subject for research and study. High energy intra-articular fractures of the tibial plateau cause ongoing management problems and remains challenging for orthopaedics surgeons even to date.

Keeping a high aim of the study, we presented the prospective clinical study of surgical treatment of 40 proximal tibial fractures. The analysis of the results were made in terms of age of the patient, sex distribution, analysis of the types of fractures, injury associated complications and the functional outcome.

MATERIAL AND METHOD:- This is a Prospective study conducted on the patients of closed fracture and open fractures type I of Schatzker type

IV,V,VI admitted through emergency and outpatient department.[2][4] After Pre-Anaesthetic evaluation of the patients,20 patient were operated by open reduction and internal fixation with plates and screws by standard Anterolateral, Medial, Postero-lateral and Combined Approaches according to fracture pattern on X-ray and CT scan. Another 20 patients underwent Hybrid External fixation under fluoroscopic guidance along with restoration of articular surface with minimal percutaneous fixation of the depressed fragment with cannulated cancellous screw. [3] In Hybrid fixation proximally 5/8th illizarov ring used, after reduction of the articular fragments under image intensifier and fragments secured with ilizarov wires (Bayonet/Trocar tipped, sometimes Olive wires). After satisfactory reduction of the proximal fragments of tibia, wires tightened with the ring using dynamic tensioner. Diaphyseal fragments secured with 4.5 Schanz screw. Reduction achieved with longitudinal traction under fluoroscopy and frame constructed using connecting rod and clamps.

Postoperative dressing changed according to standard protocol and active knee bending exercise encouraged. Parameters studied are time taken for union, WOMAC knee score, Knee society Score, Range of knee motion and Complication rate.

STATISTICAL ANALYSIS Statistical analysis was performed using SPSS version 20 software. Continuous variables are expressed as mean+/- SD and categorical variables as number and percentage. For all analysis 99 percent confidence interval and p values less than 0.01 considered as significant.

RESULTS

Forty patients (20 hybrid external-fixation, 20 plating) of proximal tibia fracture of type IV, V and VI with age 20 to 62 years, mean age 40.72 years had been studied.

Males were more frequently affected than females (Male : Female=5:2) Left side was found more frequently affected than right (Left : Right =3:2) Schatzker type VI (52.50%) was more frequently found, type V was 30% and type IV was 17.50%. Most of the patients underwent surgery after 3 to 5 days of injury.

Cannulated Cancellous Screw had been used in 2 cases of hybrid external fixation. Superficial skin infection found in 5 cases . Deep seated wound infection in 1 case which needed debridement and i.v. antibiotics in open reduction and internal fixation group. Pin track infection in 1 case had been found and were managed with regular pin-track dressing, adequate oral antibiotics. Fracture union in plating group was 12.45 weeks (mean) and in hybrid group it was 12.35 weeks (mean).

Results were analyzed with WOMAC KNEE SCORE and KS SCORE after 6 months of operation and statistical analysis done by SPSS VERSION 20 software. The results are analysed based on restoration of bone anatomy, infection rate, range of motion and functional integrity. Excellent result found among 60%, Good result found among 35% and in 5% fair result was found. Knee range of motion in hybrid-external fixation group was from 0 to 134.10 degree with standard deviation of 8.2 degrees. Knee range of motion from 0 to 118.50 with standard deviation of 7.33. in open reduction and internal fixation by plating group

DISCUSSION

Management of high energy intra-articular fracture of proximal tibia remains challenging to the orthopedic surgeon even to date. [5] In our present short-term study, we have undergone studies over 40 patients of different Age, Sex, Type of fracture, injury associated complication and functional outcome.

In our present study age varies from 20 years to 62 years with mean age 40.72 years. Studies by O. Lansinger et.al and P.S. Rasmussen showed that the mean age of patients with tibial plateau fracture was 55yrs.[6,7,8] In comparison to the western society our study population is relatively younger and shows male predominance as they are more active and are involved in outdoor activities.

Over the years many classification systems have been developed regarding fracture of proximal tibia, Hohl and Luck[9] (1956) classification, Moore[10](1979) classification, Schatzker[11](1979) and AO/ASIF(1990). Schatzker's classification amalgamated many of the previous classification system and is simple, easy to remember and relevant to treatment and outcome. In our series type VI fracture is common than other two subtypes (type IV&V).

Regarding time of surgery, in cases with healthy skin and soft tissue, ORIF done as early as possible is

Volume 4, Issue 2; March-April 2021; Page No 925-931
© 2021 IJMSCR. All Rights Reserved

preferred. [12] However in cases with swollen, un-favorable, skin condition with blisters and delayed presentation, ORIF may deteriorate the surgical wound[13] but closed reduction and external fixation with hybrid external fixation[14] can be done early. In our study closed reduction and external fixation was done within 3 to 7 days with a mean duration of 4.4 days. However on an average ORIF was done after 7 days. In study of Cole[15] duration of ORIF spans from 7 to 29 days. Unilateral or bilateral locking compression plates are used according to fracture geometry[16,17,18].

In our study in ORIF cases, Campbells[19] anterolateral and posteromedial approaches are done in bi-condylar fractures.

Standard ORIF has been proven to be successful in restoring osseous anatomy with substantial risk of soft tissue complication [20,21]. Using modern technique [19] delayed surgery at an average interval of 9 days, widely spaced incision, minimal soft tissue dissection and using low profile implants may improve results. On the contrary Hybrid external fixation in proximal tibial fractures in our study had only minimal pin track infection.

Regarding range of motion Watson et al(1998)[22]reported ROM 0-108^0,Koval et al[23] reported ROM 0-128^0,Canadian orthopaedic trauma association reported ROM 0-109+/- 33^0.In our study we found knee ROM in ORIF group 0-118.50 with standard deviation of 7.33. Catagni et ai(2007) and Canadian orthopaedic and trauma association(2006) reported 0-120^0 in Hybrid external fixation in proximal tibial fractures. In our study we achieved ROM 0-134.10^0 with standard deviation of 8.2^0 in Hybrid external fixation group of proximal tibial fracture.

Conclusion

The study confirms that the hybrid technique is safe and effective treatment method with relatively less complication rate. It produces good results in schatzker type IV, V and VI . The results are comparable with other reported study . Early and definitive fixation has been done with hybrid technique . Both techniques provided a reasonable quality of fracture reduction. Closed reduction and application of a hybrid fixator resulted in a shorter hospital stay, fewer and less severe complications, marginally faster return of function, and similar or superior clinical outcomes compared with conventional open reduction and internal fixation by plates. These benefits are obtained without compromising the quality of fracture reduction.

Limitation of our study was that it was not a long term follow-up study, so long term complications and outcome cannot be concluded from our study.

BIBLIOGRAPHY

1. Terry Canale S. Tibial Plateau Fractures. In: Campbell's Operative Orthopaedics. Pennsylvania: Mosby Elsevier; 1998, p. 2094-109
2. Schatzker J: Fractures of the tibial plateau. Edited by Schatzker J, Tile M.The Rationale of Operative Orthopaedic Care, Springer-Verlag, New York; 1988:279295.3
3. S. K. Venkatesh Gupta, Gottipati Sunil Management of Tibial Metaphyseal Fractures by Hybrid External Fixator Open Journal of Orthopedics, 2014, 4, 84-89
4. Honkonen SE, Jarvinen MJ. Classification of fracture of the tibial condyle.JBJS 1992; 74B: 840.
5. Rockwood and Greens Fracture in Adults,8th Edition
6. Katsenis D, A thanasiou V, Megas P, Tillianakis M, Lambiris reduction andinternal fixation versus hybrid fixation for bicondylar/severe tibial plateau fractures: a systematic review of the literature. J Orthop Trauma2005, 19:241-248.
7. Rasmussen PS: Tibial condylar fracture as a cause of degenerative arthritis: Acta Orthop Scan 43: 566-575; 1972.
8. Rasmussen DS. Tibial condylar fractures, Impairment of knee joint stability as an indication of surgical treatment. JBJS 1973; 55: 1331.
9. Hohl M, Luck JV. Fracture of the tibial condyle: A clinical and experimental study. JBJS 1956; 38: 1001-1018.
10. Moore TM, Patzakis MG, Harvey JB. Tibial plateau fracture definition, demographics,

Volume 4, Issue 2; March-April 2021; Page No 925-931
© 2021 IJMSCR. All Rights Reserved

treatment rationale, and long-term results of closed traction management or operative reduction. J Orthop trauma 1987; 1: 97-119.

11. Schatzker J, McBroom R, Bruce D. The tibial plateau fracture, the Toronto experience: 1968-1 975. CIin Orthop 1979; 138: 94-104.
12. Benirschke SK, Agnew SG, Mayo KA, Santoro VM, Henley MB. Immediate internal fixation of open, complex tibial plateau fractures: treatment by standard protocol. J Orthop Trauma. 1992;6:78-86.
13. Morris BJ, Unger RZ, Archer KR, Mathis SL, Perdue AM, Obremskey WT. Risk factors of infection afte r ORIF of bi-condylar tibial plateau fractures. J Orthop Trauma. 2013;27: e196–200.
14. Blake RB, Morandi M, Watson JT. Treatment of complex tibial plateau fractures with circular external fixators. J Orthop Trauma 1993; 17: 167- 168
15. Cole, Peter A. MD*; Zlowodzki, Michael MD†; Kregor, Philip J. MD†. Treatment of Proximal Tibia Fractures Using the Less Invasive Stabilization System: Surgical Experience and Early Clinical Results in77 Fractures. Journal of Orthopaedic Trauma, Issue: Volume 18(8), September 2004, pp 528-535
16. Goesling T, Frenk A, Appenzeller A, *et al*. LISS PLT: design, mechanical and biomechanical characteristics. Injury. 2003;34:A11–A15.
17. Higgins TF, Klatt J, Bachus KN: Biomechanical Analysis of Bi-condylar Tibial Plateau Fixation: How Does Lateral Locking Plate Fixation Compare to Dual Plate Fixation? J Orthop Trauma 2007, 21:301-306.
18. Vassilios S. Nikolaou & Hiang Boon Tan & George Haidukewych & Nikolaos Kanakaris & Peter V. Giannoudis. Proximal tibial fractures: early experience using polyaxial locking plate technology. International Orthopaedics (SICOT) (2011) 35:1215–1221
19. Campbells: Operative orthopaedics.11th edition ,Philadelphia: Mosby Elsevier;2007
20. Buckle R, Blake R, Watson JT, Morandi M, Browner BD. Treatment of the complex tibial plateau fractures with the Ilizarov external fixator. J Orthop Trauma. 1993;7:167-8.
21. Bennet WF, Browner B. Tibial plateau fractures: A study of associated soft tissue injuries. J Orthop Trauma 1994; 8: 183-188.
22. Watson JT. High -energy fractures of the tibial plateau. Orthop Clin North Am. 1994,25:723-52.
23. Covall DJ, Fowble CD, Foster TE, Whitelaw GP. Bi-condylar tibial plateau fractures: principles of treatment. Contemp Orthop. 1994;28:115-22. 2
24. Canadian Orthopaedic Trauma Society. Open Reduction and Internal Fixation Compared With Circular Fixator Application for Bi-Condylar Tibial Plateau Fracture. Results of Multicentric, Prospective Randomized Clinical Trial. J Bone Joint Surg Am 2006;88 :2613-23.

Volume 4, Issue 2; March-April 2021; Page No 925-931
© 2021 IJMSCR. All Rights Reserved

Table 1: Relation of post -operative wound complication with type ofoperation

		Hybrid / Plating		Total	Chi square test
		Hybrid	Plating		P Value
Complication	Nil	19	14	33	0.038
	Superficial Wound Infection	0	5	5	
	Pin Tract Infection	1	0	1	
	Deep Infection	0	1	1	
Total		20	20	40	

P value is statistically significant. There is statistically significant differencein wound infection in between two groups. Wound infection rate is greaterin plating group than hybrid – ex-fix group.

Table2: Statistical difference in WOMAC score among both groups

	Hybrid / Plating	N	Mean	Std. Deviation	Independent sample T test(P value)
WOMAC_ Score	Hybrid	20	84.90	9.862	0.285
	Plating	20	81.50	9.982	

P value is statistically not significant. There is no statistically significant difference of outcome as per WOMAC score, though mean WOMAC score is better in hybrid group than plating group.

Table3: Statistical difference in KS score among both groups

	Hybrid / Plating	N	Mean	Std. Deviation	Independent sample T test(P value)
KS Score	Hybrid	20	84.40	9.506	0.543
	Plating	20	82.50	10.081	

Volume 4, Issue 2; March-April 2021; Page No 925-931
© 2021 IJMSCR. All Rights Reserved

P value is statistically not significant. There is no statistically significantdifference of outcome as per KSS score.

Fig 1: Post Operative Clinical Photograph Showing Hybrin Externa Fixation.

Fig 2: Post Operative Radiograph In Hybrid External Fixation

Volume 4, Issue 2; March-April 2021; Page No 925-931

© 2021 IJMSCR. All Rights Reserved

Fig 3: Post Operative Radiograph Of Orif With Plate & Screw.

Volume 4, Issue 2; March-April 2021; Page No 925-931

© 2021 IJMSCR. All Rights Reserved