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A Study on Management of Proximal –Third Tibia Fractures by Biological Plating in Adults

Authors

¹Dr. Sunil Kumar P, ²Dr. K. V. Ramana Kumar

^{1,2}Assistant Professor, Department of Orthopaedics
Konaseema Institute of Medical Sciences and Research Foundation

Abstract

Fractures of the proximal –third tibia are a serious injury with ever increasing incidence in modern day life styles. Bridging osteosynthesis done by means of a plate is called bridge plating or biological plating. Biological plating is also referred as minimally invasive percutaneous plate osteosynthesis. Aims and objectives: to study fractures of proximal-third tibia and results of biological plating in those fractures. Materials and Methods: This was a two year prospective study. A series of 30 cases of proximal third tibia fractures were taken in this study. Results: Excellent results were shown in 14 cases (46.6%) and good results were shown in 11 cases (36.6%) and only one case showed poor result (3.3%). More than 80% of cases showed good to excellent results. Conclusion: Biological plating is a safe and reliable modality for the treatment of fractures of the proximal-third tibia.

Key Words : Tibia Fracture, Biological Plating, Bridge Plating.

INTRODUCTION

In 1845, fractures involving the knee joint were separated from non-articular fractures of proximal tibia by Bonnet. The first accurate description of the fractures of proximal tibia was given by Walther in 1852. Heidenreich, 1877 first classified proximal tibial fractures based on autopsy findings [1].

In 1852, Thamhain provided the first case report of treatment of tibial plateau fractures using leeches and traction [1]. Duplay and merot in 1876 performed first closed reduction under anesthesia. Dobelle M, in 1941 proposed a new method of closed reduction and hinged cast with hinges placed anteriorly and posteriorly to control varus and valgus alignment [2].

Brunner and Weber described the bridge plating technique in 1981. Heiteneyer et al showed beneficial effects of bridge plating not only regarding union but also regarding major complications and functional outcome [3]. The technique of indirect reduction combined with minimally invasive plating or biologic approach has since been described in detail by Mast and coworkers [4].

Fractures of the proximal third tibia are a serious injury with ever increasing incidence in modern day life styles. There are many modalities that have evolved through time and experience to treat these complex fractures. Biological plating is also referred as minimally invasive percutaneous plate

osteosynthesis, bridge plate osteosynthesis. The aim of the present study is to study fractures of proximal third tibia and to discuss the surgical techniques and results of biological plating in those fractures.

MATERIALS AND METHODS

This was a two year prospective study. A series of 30 cases of proximal third tibia fractures were taken in this study which included both intraarticular and extraarticular fractures. All the patients were hospitalized and managed according to a standard protocol. All cases were classified according to the AO / ASIF classification of proximal tibial fractures. In case of compound fractures the grade of injuries was ascertained as per Gustillo and Anderson classification of open fractures. Primary immobilization was done by an above knee posterior plaster of paris slab. Other associated injuries were also treated appropriately.

Materials used and Implants considered:

1. Buttress plate (lateral tibial head buttress plate)
2. Dynamic compression plate (4.5mm narrow)
3. Cancellous screws 6.5mm (partial threaded and full threaded)
4. Cortical screws 4.5 mm
5. Fracture table
6. IITV (Image Intensifier Television)

7. General surgical tray
8. Distractors
 - a. Femoral distractor
 - b. Articulated tension device
 - c. AO fixator set
 - d. Ilizarov set

Post operatively all the patients were advised for regular follow up atleast once in six weeks till there was evidence of union.

We have used a 100 point rating system devised by Mason Hohl [1] in the assessment of our results. The results were classified as excellent (91-100), good (81-90), fair (71-80), poor (<70), according to the score taken by 100 point rating system. The patient with excellent results has

essentially normal knees for all practical purposes with no significant pain or functional impairment. Good results satisfy most of the patients and restore them to activity. These patients often lack complete knee extension or full flexion, and their knees may be slightly malaligned or unstable and mildly painful at times. Fair results are the one where the knee is fairly functional but has limited use.

OBSERVATIONS AND RESULTS

Maximum number of cases and the peak incidence were seen in the age group of 31-40 years (36.66%). A high male predominance was noted. Mode of injury was shown in [table 1]. Road Traffic Accidents was the commonest mode of injury

Table 1

Mode of Injury	Number of cases	Percentage
Road Traffic Accidents	25	83.33%
Fall from height	2	6.66%
Direct trauma	3	10
TOTAL	30	100

Out of 30 cases, three –fourth of the cases (23 cases) in the series were closed fractures and remaining 7 cases were compound fractures. More than half of the closed fractures showed grade 0.

The grading of the closed fractures were shown in [table 2]. Four cases were among grade I according to Guistillo and Anderson classification.

Table 2

Grade	Number of cases	Percentage
0	13	43.33
I	6	20
II	4	13.33
III	0	0
TOTAL	23	76.66

Type of fracture according to AO/ASIF classification was shown in table 3

Table 3

Fracture type	Number of cases	Percentage
A2.1	1	3.33
A2.2	1	3.33
A3.2	8	26.66
A3.3	9	30
B1.3	2	6.66
B3.2	1	3.33
C2.1	2	6.66
C2.2	1	3.33
C2.3	4	13.33
C3.3	1	3.33

In all the 29 cases type of implant used was lateral tibial head buttress plate and in one case dynamic compression plate was used. In one more case an AO monolateral fixator was used in addition to

the lateral tibial buttress plate (composite fixation). The period of union in weeks was shown in [table 4]. Only 3 cases(10%) showed delayed union.

Table 4

Period in weeks	Number of cases	Percentage
8	6	20
10	10	33.33
12	10	33.33
14	1	3.33
16 and above	3	10

Excellent results were shown in 14 cases (46.6%) and good results were shown in 11 cases (36.6%) and only one case showed poor result (3.3%). More than 80% of cases showed good to excellent results.

DISCUSSION

The proximal third tibia comprising of the tibial condyles and the upper end of the diaphysis of tibia is peculiar in the contest of forming an end of major levers of the body acting over and important weight bearing joints. This present study includes the series of 30 cases of which 11 cases are tibial fractures and 19 cases of extraarticular fractures of proximal tibia. All the cases were treated by methods of indirect

reduction and percutaneous fixation of articular fractures and plating by biological methods.

All the fractures were classified according to AO/ASIF classification for proximal tibia, because of its wide acceptability and accuracy in describing most of the fractures of this region which include extraarticular and intraarticular fractures. The metaphyseal and epiphyseal segments are considered one segment because the morphology of the fractures in metaphysic influences the treatment and prognosis of articular fracture [5].

Male predominance was seen in the present study, as the mechanism / mode of injury were a high velocity injury. Since males are more susceptible due to their activity. Bolhofner too has shown

male predominance in his study with 77% of cases. The peak incidence was observed in the age group of 30-40 years (36.66%) which can be explained, as in these age group activities of livelihood, job opportunities and vehicular mobility predispose them to high energy vehicular accidents. The average age was 42 years in present study. The average age in Bolhofner study was 38 years. [6].

Radziejowski et al [7] used tibial head buttress plate in his cases. Bolhofner had used lateral plate and medial fixation. The plate was a pre bended LC –DCP. In our study only in one case an additional monolateral fixator was used. The union of fractures was defined by radiological union of atleast three cortices and clinically absence of pain, tenderness and ability to bear

weight. Bolhofner study had an average healing time of 12.1 weeks [6]. Bilemma et al had an average union time of 22 weeks [8]. In our present study it was 17.1 weeks and in compound fractures slightly increased to 19.7 weeks.

All the cases in our study were evaluated according to a 100 points rating scale devised by Hohl [1]. We could achieve excellent results in 14 cases accounting to 46.6 % and good results in 11 cases (36.6%), fair in 4 cases (13.3%) and poor in 1 case. Collinge at al had obtained good results with closed fractures by these techniques but noticed similar complication as in other techniques in cases of compound injuries.[9]. The results were compared with other studies were shown in table 5

Table 5

Studies	Collinge et al	Present study
Number of cases	17	30
Open	9	7
Closed	5	23
Infection	1 (deep)	3 (superficial)
Delayed union	3	3
Non union	4	0

Biological plating techniques offer surgeons a good method of bone stabilization in patients with complex tibial fractures, fractures with severely compromised soft tissues and injuries with intraarticular or periarticular extensions. Biological plating minimizes soft tissue stripping, preserves vascular pedicles and allows the osteogenic fracture haematoma to remain essentially undisturbed. The objective of biological fracture fixation is to assist the physiological process of fracture healing wisely and optimally by a minimal amount of operative intervention.

CONCLUSION

Biological plating is a safe and reliable modality for the treatment of fractures of the proximal-third tibia. The healing time is faster, the rate of delayed union is less and non union are rare because the technique aims at not disturbing the fracture haematoma, minimal soft tissue injury and preservation of vascularity. It is relatively a stable fixation and allows for rapid mobilization of the limb and the patient.

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