COMPARISON OF CLOSED EXPERT TIBIA NAILING WITH OPEN PLATE&SCREW FIXATION IN THE TREATMENT OF PROXIMAL TIBIA EXTRAARTICULAR FRACTURES.

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Abstract

This study conducted at Index Medical College Hospital & Research Centre, Indore during the study period of 02 years. Patients were followed up for 01 year, evaluated radiologically and clinically with Tegnerlysholm knee scale, outcomes were used for comparison.

Malreduction was defined as a deformity of 5 degree in any plane. Out of a total of 22 patients, 01 (1 in the plating group) was excluded from the study as pt was absent for follow-up, meaning that 21 patients were included in the final study

Baseline data of 21 patients.

Use of PTLCP is associated with more intra operative blood loss, higher postoperative infection rate and longer duration of hospital stay, whereas use of IMN associated with higher rates of malunion and nonunion. However there is no difference in functional outcome between IMN and PTLCP. But it is the surgical skill that is required in such fractures.

To validate this issue further a large sample size of matching severity multicentric study done by equal level skill cadre is recommended. Overall proximal one third extraarticular tibia fracture is complicated and problematic fracture to deal with and is commonly associated with significant soft tissue damage. High grade of surgical skills are required to deal these fractures as fixation of proximal one third extraarticular tibia fracture is technically demanding surgery regardless of the implant.

Introduction

Extra-articular proximal tibia fractures account for 5–10 % of all tibia shaft fractures commonly results from high-velocity trauma. They lead to complex injuries of bone and surrounding soft tissues.[1]

Management by cast has resulted in mal-union, non-union, rotational deformity, or stiffness of adjacent joints, hence there is a shift towards operative management of these fractures in recent times. However, surgically treating these fractures remains debatable. Options include half-pin external fixation, intramedullary implant, hybrid or thin-wire external fixation, plate fixation, or a combination of these techniques. In recent years, closed reduction with minimally invasive plating and locked intramedullary nailing have both become widely used treatment modalities for these fractures.[2]

This study was intended to compare these options in terms of operative time, duration of hospital stay, period of non-weight bearing, degree of reduction,

union rate and malunion rate, infection rate, and rates of other possible complications which could possibly affect decision-making in relation to such fracture patterns.[3,4]

Materials and Methods:

22 patients studied in Index Medical College Hospital & Research Centre, Indore during the study period of 02 years (Nov 2017 to Oct 2019). Patients were followed up for 01year, evaluated radiologically and clinically with Tegnerlysholm knee scale, outcomes were used for comparison.

Included in the study were pt age group 18-65 years having closed Proximal one third tibia extraarticular fracture (defined as roughly to proximal 30% of the entire tibia.)

Excluded from study were intraarticular fracture, pathological fracture, fracture with vascular complications.

Group A patients were treated with Expert nail and group B patients received Percutaneous tibia plating.

In group A The patient was positioned supine on the operation table. Temporary anatomical reduction was achieved by closed manipulation before nailing. An incision by splitting patellar tendon extending from lower pole of patella to tibial tuberosity was used to open the joint. Antero-posterior or medio-lateral blocking screws were also used only in few cases. The surgical wound closure was done in layers. The intramedullary nail had a proximal Herzog band and four multilevel, multi-planar, and multidirectional screws.

In group B using curvilinear incision over the lateral aspect of the proximal tibia. Indirect reduction was achieved using axial traction and/or the application of a reduction clamp or distractor. Internal fixation was then achieved with a proximal tibial lateral locking compression plate (LCP). A minimum of six cortex were used on both sides of the fracture, and plating was done using a minimally invasive technique.

Figure 1: INTRAOPERATIVE EXPERT NAIL FIXATION

Figure 2: PRE-OPERATIVE X RAYS

Figure 3: POST-OPERATIVE EXPERT NAIL FIXATION X RAYS

Figure 4: CT SCAN OF PROXIMAL TIBIA FRACTURE AND POST OP EXPERT NAIL FIXATION

Postoperatively, patients of both groups were given i.v third generation antibiotics for 5days. Ankle pumps and isometric quadriceps strengthening exercises were started on the first postoperative day, followed by active and assisted knee bending and partial weight bearing started on the second Postoperative day depend on stability construct, whereas full weight-bearing was allowed after complete clinical and radiological union. Patients were followed up at 2 and 6 weeks, 3 and 6 months, and 1 year postoperatively.

Both the immediate postoperative and the final follow-up radiographs compared to assess the accuracy of reduction and final alignment. Measurements of coronal and sagittal plane deformities using Freedman and Johnson technique[10]

Results

Malreduction was defined as a deformity of 5 degree in any plane. Out of a total of 22 patients, 01 (1 in the

plating group) was excluded from the study as pt was absent for follow-up, meaning that 21 patients were included in the final study
Baseline data of 21 patients.

Table 1: Table showing cause of injury type of injury and fractures associated with proximal tibia in group A and group B

Parameter	n
Injury cause	
Car accident	8
Falling down	6
Fall from height	5
Others	2
Fracture type	
Open	5
Close	16
Combine injury	
Clavicle fracture	2
Rib fracture	1
Humerus fracture	0

All data were entered into a proforma. A statistical analysis was performed by using the Statistical Package. The parameters were compared between the groups A and group B.

Table 2: Table showing comparison between Group A and Group B under various parameters

Parameter	Group A	Group B
Age(Average)	39 year (19-65)	36 year (19-62)
Sex		
Male	8	5
Female	6	2
Mode of trauma		
Road traffic accident	5	3
Fall from height	3	2
Falling down	4	2
Other	2	0
Fracture type extraarticular		
41A2	3	5
41A3	8	5
Injury operation interval (in days)	7.4	7.06
Average operative time (in minutes)	61.25	72.8
Open reduction	None	47%
Blood loss (average)	50-100ml	100-200ml
Infection	1	2

Nonunion	1	0
Duration of hospital stay	4.1(2-8)	5.3(3-10)
Union time (Weeks)	18.26(10-30)	22.84(16-34)
Range of motion of knee	119.7(90-150)	115.2(80-150)
Distribution of malunion	2	0
Anterior angulation	0	0
Posterior angulation	0	0
Valgus malunion	1	1
Varus malunion		

Summary

1. **Age** Incidence ranged from 19 to 65 years with the combined average age was 38 years.

2. **Sex :-M:F** in the study 13:8

• **Mode Of Injury** In both the group road traffic accident followed by fall from height was the two most common mode of trauma.

1. **Classification of fracture** majority of fracture were of type A33, significant comminution was present in these type of fractures.

• **Duration after injury:** Most of the cases in both the group were operated within ten days of injury.

• **Operating time:** In most of the cases 96.77% (60/62) operative time is < 2 hours.

• One case in each group required more than 2 hour. According to data, PTLCP fixation takes more time than intramedullary fixation.

1. **Blood loss:** There was no heavy blood loss in any of the case, because all the fixations are done under tourniquet. Less blood loss occurred during intramedullary nailing as compared to locking plate fixation.

2. **Postoperative hospital stay, time period to full weight-bearing and union time** were significantly less in the IMN group as compared to the PTP group.

3. Surgical site infections (SSIs) were seen in two patients in the Proximal Tibia plating, one of which was resolved with debridement while the other necessitated implant removal due to infection.

4. Delayed union occurred in two patients in the IMN group, for which dynamization was performed by removing the distal screw.

5. Nonunion occurred in One case in the nailing group presented which ultimately required exchange nailing with bone grafting and fibular osteotomy. There was nonunion in one patient in the PTP group;

bone grafting was done in that case, which eventually led to fracture healing.

Discussion:

Extra articular Proximal Tibia fractures usually associated with individuals belonging to young active age group. In this study, the overall mean age was 38 years (range 19 to 65 years). Schultz M. et al [6,7,10] has shown mean age of 42 years in their study. While Cole, et al[11] have shown mean age of 45 years in their study. 90.3% of the patients in present study were male and only 9.7% were females. Thus results of this study were well similar with results of previous studies.

In this study, road traffic accidents were found to be the major cause of this kind of fracture. In 80.6% of the cases, mode of trauma was road traffic accident and in 16% of the cases, mode of trauma was fall from height while 3.2% of the cases had history of assault by hard and blunt object. Various previous studies have also shown similar distribution of mode of injury [8,9].

Most common type of fracture observed in present study was 41A3. 77.41%. Patients in study had 41A3 type of fracture while rest 22.59% patients had 41A2 type of fracture.

In this study, the average injury operation delay was 7.23 days. In study of Cole et al average, Poor soft tissue condition associated medical illnesses, associated injuries, feasibility of implant and many other factors were responsible for this delay in fixation in present study.

There is no significant data available in literatures about the duration of surgery for both the treatment modality. In this study, most of the fixations took on an average 2 hours.

Table 4: Comparison of malunion in various studies

Study	Extra articular proximal tibia fracture	Malunion (>50 degree)	No. of cases of malunion
Lange et al	32	23	16-apex ant. 13 valgus (6 with both plane)
Tornetta et al.	30	7	4 apex ant. 3 coronal
Nork et al	30-33	3	1 Varus
Lindvall et al	22	9	8 apex anterior 2 valgus
Present Study	14	3	2 anterior angulation 1 varus

Study	Extra articular proximal tibia fracture	Malunion (>50 degree)	No. of cases of malunion
Cole et al	28	08	1 valgus 6 apex ant 1 apex posterior
Ricci et al	18	05	2 valgus 2 apex ant. 1 apex post
Lindvall et al	34	07	5 apex anterior with 1 varus 2 apex post.
Vidhyadhar S. et al	45	07	4 apex anterior, 3 valgus
Present study	7	01	1 varus

At present, the rate of malunion was greater after intra-medullary nailing (3/14,21.4%) than after plating (1/7,14.28%).

Anterior curvature mal-alignment is encouraged by a tibial plateau that is directed posteriorly between 3° to 7° and also by the pull of the patellar ligament which is inserted on to the tibial tuberosity [12]. To avoid this complication in nailing of this type fracture, some specific additional techniques can be used. These include:

1. Adjusting the proximal starting point.
2. Nailing in semi-extended position.
3. Using an adjuvant plate and placing blocking screw before nailing.

In present study only interfragmentary screws were used as additional technique in 1/7 patients of Group II.

In present study rate of mal union was found to be higher in Group I treated with Expert nail as compared to the Group II treated with PTP 14.8% (1/7) cases develop malunion in followup. This study reported that malunion is more prevalent in the sagittal plane than the coronal plane for both implants. (10,11,12)

Table 5: Comparison of infection rate in various studies

Study	IMN group	PTLCP group
Bhandari et al.	2.5%	14%
Lindvallet al.	28%	24%
Oh C W. et al.	0%	-
Present Study	7.14	28.5

Over all higher rate of infection in PTLCP group may be attributable to large incision, soft tissue damage, shortcomings in addressing these soft tissue injuries, additional co morbidities. In various studies of extra articular proximal tibia fractures treated with IMN, full weight bearing has ranged from 8-16 weeks depending upon the fracture location, fracture pattern and surgeon preference (12,5). Studies often state “weight bearing advanced as tolerated” but this does not accurately define when full weight bearing actually occurred and therefore can’t be used to determine if either technique allow for earlier full weight bearing without implant failures.

Table 6: Comparison of nonunion rate in various studies

Study	IMN	Plate
Bhandari et al.	3.51% (7/199)	1.35% (1/74)
Lindvall et al	23% (5/22)	6% (2/34)
Present study	7.14%(1/14)	0%(0/7)

This prospective comparative study concludes that in treatment of extra articular proximal tibia fracture use of IMN and PTLCP gives comparable results.

Conclusion:

Use of PTLCP is associated with more intra operative blood loss, higher postoperative infection rate and longer duration of hospital stay, whereas use of IMN associated with higher rates of malunion and nonunion. However there is no difference in functional outcome between IMN and PTLCP. But it is the surgical skill that is required in such fractures.

To validate this issue further a large sample size of matching severity multicentric study done by equal level skill cadre is recommended. Overall proximal one third extraarticular tibia fracture is complicated and problematic fracture to deal with and is commonly associated with significant soft tissue damage. High grade of surgical skills are required to deal these fractures as fixation of proximal one third extraarticular tibia fracture is technically demanding surgery regardless of the implant.

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