



OUTCOME OF HYBRID EXTERNAL FIXATOR IN PROXIMAL TIBIA FRACTURE USING LIGAMENTOTAXIS PRINCIPLE

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ABSTRACT The proximal tibial fractures are associated with high energy trauma and present with difficulty in treatment due to subcutaneous bone, frequent open fractures. In our study, we have operated 20 patients with hybrid external fixator for definitive treatment of these fractures. This technique gives good reduction, adequate stability, early mobilization and less complications. Prospective analysis of 20 patients was done with proximal tibial fractures classified according to AO classification in our institute who were treated by application of hybrid external fixator. In our study, Functional and radiological outcome was assessed using Knee society score at final followup. 12 patients had an excellent outcome and 5 patients had good outcome. Hybrid external fixator is a simple way to treat proximal tibial fractures with a low complication rate and good clinical outcomes.

KEYWORDS : Proximal tibia fracture, hybrid external fixator, ligamentotaxis principle.

1. Introduction

Tibial plateau fractures are the commonest intra-articular fractures. They occur as a result of indirect coronal or direct axial compressive forces. There is a considerable debate regarding the best method for treating proximal tibial fractures. Immediate stabilization has produced good short term results in regards to wound healing but gradually, complications like pin tract infection, fixator frame failure, malunion, non union, compartment syndrome, chronic Osteomyelitis, joint stiffness and necessity of secondary procedures etc. diverted many of the treating surgeons to find some other methods of fixation that would reduce these complications. Hybrid external fixation has recently been advocated. It relies on the periarticular ring construct for stable fixation of the tibial condyles and monolateral fixator for fixation on the shaft to provide a stable fixation block with ligamentotaxis principle for reduction of fractures.

2. Material and methods

The study was conducted in department of orthopedics, medical college, Baroda over a period of 10 months ranging from March 2016 to December 2016. A total of 20 patients who were operated with hybrid fixator for proximal tibial fractures were included in the study. All the relevant data was collected with regular followup of the patients. All patients with closed, open injury and injury with compartment syndrome, ipsilateral femoral fractures were included in the study. X-rays of the knee with upper tibia in both Antero-Posterior and lateral views were taken in all patients and were assessed for associated injuries. Pre operative workup included complete hemogram, blood sugar, electrolytes, chest x ray and viral markers (HIV, HBsAg, HCV) were done in all patients. Pre anaesthetic checkup was done in all patients one day prior to surgery. Pre-operative intravenous antibiotic (Inj. Ceftriaxone 1 gram) was given to all patients on day of surgery. All surgeries were performed under spinal anaesthesia. Intra-articular reduction was first done by closed method or by minimal incision 3 olive wires were inserted parallel to the joint line, one from posterolateral aspect and other from posteromedial aspect and third one between both of them from lateral aspect all of them forming an angle of 60 degrees between them. Half ring was attached to olive wires and then wires were tensioned with tensioner. 3 schanz pins were inserted in the tibial shaft and was attached to the ring in cantilever fashion to provide maximum stability. Whole procedure was done under fluoroscopy guidance. Knee bending and quadriceps exercises were started from 2-5 postoperative day. Sutures if any were removed on 10th postoperative day. Patients were kept non weight bearing till signs of union were visible on x-rays. The fixator was removed after 4 months. Patients were followed up for 6 months and were assessed by Knee society scoring.

3. Observation and results

There were a total of 20 patients in our study. The mean age of the patients was 42.35 years. There were 18 male patients (90%) in our study and 2 patients (10%) were females. 13 patients (65%) had an open injury among which 1 patient (5%) had open grade III injury as

per Gustilo-anderson classification. Road traffic accident was the most common mechanism of injury in our series with 19 patients (95%). 5 patients (25%) had associated compartment syndrome which was operated by fasciotomy at time of surgery by lateral and medial incision. 2 patients (10%) had ipsilateral femur fracture. AO classification was used to classify the fractures with 9 patients (45%) of type A, 11 patients (55%) of type C. Injury- surgery interval was <1 week in 13 patients (65%) with mean days of 5.2. 9 patients (45%) were discharged within 2 weeks and 3 patients (15%) required >3 weeks for discharge due to post-fasciotomy wound care. Weight bearing was started at around 3 months depending upon radiological union. Removal of fixator had a mean period of 16 weeks. Mean time taken for union was 14.2 weeks among which 14 patients (70%) had union time of < 4 months. 14 patients (70%) had full range of motion without any pain and were able to squat and sit crossed leg without any difficulty among which 13 patients (65%) were able to walk without limp & support with normal stair up & down. The functional assessment was done with help of Knee society scoring criteria, with 12 patients (60%) having excellent outcome, 5 patients (25%) had good outcome and 2 patients (10%) had fair outcome and 1 patient (5%) had poor outcome. Superficial pin tract infection was seen in none of our patients. Knee joint stiffness was observed in 5 patients & 7 patients had limping but none of the patients had knee instability. Varus malalignment was seen in 2 patients and 2 patients had valgus malalignment but all of them full range of motion.

Comparison of different factors with outcome

	Excellent	Good	Poor	Fair	Total
Male	11	4	2	1	18
Female	1	1	0	0	2
Close fracture	4	2	1	0	7
Open fracture	8	3	1	1	13
Classification as per AO classification					
A	7	2	0	0	9
B	0	0	0	0	0
C	5	3	2	1	11
Compartment syndrome					
Present	2	2	1	0	5
Absent	10	3	1	1	15

EXCELLENT RESULT



Immediate post-op lateral view



Immediate post-op AP view



Final follow up AP view



Final follow up
Lateral view

Full knee flexion

Full knee extension

4. DISCUSSION AND ANALYSIS

In this new era, high velocity trauma lead fractures of the proximal tibia which are quite challenging to manage.. As upper end tibia forms the knee joint it becomes must to have accurate reduction and excellent functional outcome for routine day to day activities. The study of fracture of proximal tibia is important due to chances of these fractures to go in malunion (in closed fracture) and non union (in open fractures) are more. The functional disability to the patient after these fractures is a hindrance in earning their daily living.

Advantages of conservative treatment are as follows:

- Simple and non-expensive
- Less hospital stay
- Risk of infection is avoided
- Risk of surgery is avoided

Disadvantages of conservative treatment are as follows:

- Difficult to achieve and maintain anatomical reduction.
- Not possible with poor skin conditions like blisters, abrasion and burns.
- Immobilisation required for a long time
- Increased chances of delayed union, malunion and non-union
- Knee and ankle joint stiffness.

Advantages of operative treatment are:

- Perfect anatomical reduction
- Stable fixation leading to early union.
- Early mobilization leading to decreased morbidity and disability.

Disadvantages are:

- Post operative infection.
- More expensive than conservative treatment.
- Implant failure especially in osteoporotic bones.
- Complication inherent with any surgery and anaesthetic risk.

Advantages of Hybrid external fixator

- Anatomical reduction can be achieved.
- Can be used in intra-articular fractures of proximal tibia.
- Early Mobilization leading to good functional outcome.
- No complication like suture site infection occurs.
- Short duration of hospital stay and early mobilization.

5. CONCLUSION

Our study includes 20 cases of fractures of proximal tibia treated by Hybrid external fixator. Patients were operated from March 2016 to December 2016 were taken in our study. At the end of study we concluded that Hybrid external fixator gives anatomical reduction and rigid fixation at fracture site hence leading to early mobilization of patients post-operatively. It gives advantage to achieve good articular congruity in intra articular fractures which gives excellent knee range of movement. By doing Hybrid external fixator in severe comminuted fractures, biology of fracture site remain unchanged so, good healing of fracture occurs in minimal time. Complication like infection seen with internal fixation with plating and unstable reduction seen with tibia interlock nail or ender's nail in proximal tibia fractures not seen with use of this fixator.

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