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Study of results of operative management of intra-articular fractures of upper end tibia

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Abstract
Intra- Articular Fracture of upper end of Tibia occurring with increased frequency because of high velocity injuries as a result of growth of no. of vehicles & increased speed on expressways. Management of such high velocity trauma to joint is still a challenge to Orthopaedic surgeons. This study carried out to analyze various Operative methods of treatment of tibial plateau fractures. This is a prospective study of 22 cases of Tibial Plateau fractures treated operatively. Patients were followed from 6 months to 2 years. All fractures were classified with Schatzgar classification and treated with various operative methods like close reduction & percutaneous fixation, Open reduction & Internal Fixation (ORIF) or Minimally Invasive Plate Osteosynthesis (MIPO). All patients were assessed with Lansinger Criteria. Results suggests of operative treatment in displaced fractures of Tibial Plateau. Aim is Anatomical reduction, stable fixation & soft tissue preservation. MIPO technique is favored in fractures where closed reduction method achieves near anatomical reduction of fracture fragments. Open reduction is preferred in displaced and depressed Tibia Plateau fractures.

Keywords: Upper end Tibia Fracture, Schatzgar Classification, Tibial Plateau Fracture

Introduction
"The contentions of lane are sound and proved that when indicated and well done operative treatment of fractures has given the best results"

'O'Neill Sherman'

Intra-articular fractures of upper end tibia are occurring with increased frequency because of high velocity injuries as a result of growth of no. of vehicles & increased speed on expressways. The management of such a high velocity Intra-articular fractures is still a challenge to orthopaedic surgeons. This study is carried out to analyze various operative methods of treatment of Tibial Plateau fractures. This is prospective study of 22 cases of tibial plateau fractures treated operatively. Intra-articular fractures of upper end tibia are treated either by conservative or operative methods depending on fracture configuration, age of patient, amount of comminution and neurovascular status. The ultimate aim is to achieve knee joint congruity, axial alignment, stability as well as satisfactory range of motion. More and more surgeons prefer operative management for intra-articular fractures of upper end tibia.

Material and Methods
This is a prospective study of 22 cases of tibial plateau fractures operatively at VS Hospital treated and followed from minimum of 6 months to maximum of 2 years. In this study there are 19 male & 3 female patients and average age of patients was 34 years. Common mode of injury was road traffic accident followed by fall from height. Patients with vascular injury were excluded from study

Soon after admission all patients were subjected to check of vital signs, examination of fractured limb & other parts of body. Above knee (AK) slab was applied. X-ray of injured part was taken with Anteroposterior (AP), lateral, oblique views in all patients and Tunnel & Tibial Plateau view in few patients. In selected patients CT scan advised to look for fracture geometrical configuration and extent of comminution in 3 dimensions. Then patients classified with schatzgar classification. Skeletal traction was applied through lower tibial region.

Operative treatment considered in following tibial plateau fractures

- In unstable fractures when there is comminution with or without depression of articular surface.
- Joint depression of more than 5mm or more than 5 degrees of malalignment
- Instability is major indication of operative management

Various implants used were Buttress Plates, Lateral Condyle Plate and CC Screws (16mm & 32mm). Operative techniques used in treatment are as follows.

1. Close reduction & percutaneous fixation: This method is considered in split undisplaced & comminuted fractures with minimal depression with poor skin condition where open reduction is not possible. Under IITV guidance and ligamentotaxis by traction, reduction achieved. Guide pins followed by appropriate sized pins passed under IITV guidance.

2. Open reduction & Internal Fixation (ORIF): ORIF is indicated in split or split depressed, medial condyle (Schatzker type IV), or whenever indirect reduction of fracture is not achieved. Pre-requisite for ORIF is acceptable soft tissue condition. An inverted 'L' or 'S' shaped incision made. Depressed fragments elevated and supported with bone graft. Choice of plate is fixed to bone with cancellous screw proximally & cortical screws distally. Plate is fixed medially or laterally depending on configuration of fracture.

3. Minimally Invasive Plate Osteosynthesis: It is based on principle of preserving soft tissue in and around fracture site after achieving reduction by indirect method. MIPO is indicated in those intra-articular fractures of upper end tibia where acceptable reduction by indirect method is achieved.

Post operatively padded plaster slab applied with limb elevation. Primary aim of post-operative management is early mobilization of knee joint. Once pain and swelling subsides, patients are encouraged for active & passive exercises. Check x-rays done at follow up. Partial weight bearing started only after appearance of callus on X-ray at average period of 8 to 10 weeks. FWB was allowed at average period of 12 to 16 weeks once fracture has consolidated.

Results and Discussion

In our Indian culture squatting and sitting cross legged sitting occurs several times a day as a part of daily activity. In cases of intra-articular fractures of knee it is desirable to gain anatomical reduction of the articular surface so that it minimizes the chances of post traumatic Osteoarthritis.

90% of patients were below age of 50 & average age of patients treated was 34 years. 96% patients had high velocity injury like RTA or fall from height. Fractures were classified according to Schatzker Classification. Split fractures were observed in only 9% of cases. Highest % of cases was of type VI (32%) followed by type II (27%) & type IV and V (13% each). 60% of cases were operated within first 2 weeks of injury.

Depending upon type of fracture and local skin condition the fractures were treated by following method

- Closed CC screw under IITV
- ORIF(Open Reduction & Internal Fixation)
- MIPO (Minimally Invasive Plate Osteosynthesis)

CC Screws were generally preferred in grossly comminuted fracture with poor skin condition where open reduction is not possible and also in split fractures, however post op traction was continued with intermittent knee mobilization. Wherever a good reduction was possible under IITV by indirect method in type I, II, IV, & V, there we have fixed the fracture by MIPO by sliding the plate across fracture site and fixing it proximally & distally without opening the fracture site. The basic advantage of non-operative treatment in form least soft tissue injury is retained. Prerequisite for MIPO is that fracture should be reducible by indirect method. None of the patients treated with MIPO had post-operative infection. Whenever indirect reduction of fracture was not possible or in fractures with significant depression ORIF was preferred. Three patients with ORIF had primary bone grafting done.

Post operatively all patients were encouraged for active knee mobilization in bed. One patient with ORIF had deep infection which required plate removal after 3 months when fracture united. Only one patient had screw backout, while in rest of the patients there was no implant related problems. None of the patients treated with either ORIF or MIPO had shortening of more than 1 cm. but one patient operated with C.C. screw for grossly comminuted type VI fracture with poor skin condition was having shortening of 2 cms.

All fractures united within 12 weeks time on an average. Average union time with C.C. screw was 10 weeks while with ORIF it was 12 weeks and for MIPO 13 weeks. This is because only simple split fractures were preferably treated with CC screw while more comminuted fractures were treated by MIPO. Partial weight bearing started at average period of 8 to 10 weeks and full weight bearing was started at average period of 12 to 14 weeks.

Range of motion of knee joint in all patients was more than 120 degree except in one patient who was immobilized in plaster for 3 weeks. Thus falling in line of Mason Hohl that post operatively protected early mobilization of knee joint should be done under supervision. Range of motion was not dependent on type of fracture or type of fixation. There were 5 patients showing lateral instability, 2 each of MIPO & ORIF and 1 patient of CC screw. Instability was found more common in highly comminuted bicondylar fracture of type V & VI.

All patients were able to walk without support but limp while walking persisted for 5 months in 5 patients which improved with physiotherapy. All patients returned to occupation within an average period of 18 to 20 weeks.

There were 17 Excellent, 4 Good result & 1 fair result. We have used Lansinger Assessment table for evaluation of patients.

Table 1: Age Incidence

Age(yrs)	No of patients	Percentage
20-30	7	33
30-50	13	57
>50	2	10

Table 2: Fracture classification (Schatzker)

Type	Patients	Percentage
I	2	9
II	6	27
III	1	5
IV	3	13
V	7	32
VI	3	13

Table 3: Operative method used Vs. Fracture type

Fracture type	ORIF	MIPO	CC Screw
I	-	-	2
II	3	2	3
III	-	-	1
IV	2	1	-
V	2	5	-
VI	1	-	-
Total	8	8	5

Table 4: Operative Method Used

Operative Method	No. of Patients	Percentage
ORIF	8	38
MIPO	8	38
CC Screw	6	24

Table 5: Range of motion Vs. Operative method used

Range of motion	ORIF	MIPO	CC screw
<120	1	-	-
120-130	4	5	2
>130	3	3	3

Table 6: Union time Vs. Type of Operation

Union time (months)	ORIF	MIPO	CC screw
<2	-	1(12.5%)	1(20%)
2-3	3(33%)	3(37.5%)	3(60%)
3-4	5(67%)	3(37.5%)	1(20%)
>4	-	1(12.5%)	-

Table 7: Type of Fracture Vs. Ability to walk

Type of fracture	Limp	Walk with support	Normal
I	0	-	1
II	1	-	6
III	1	-	-
IV	-	-	3
V	3	-	2

Table 8: Results

Operative Method Used	Excellent	Good	Fair
ORIF	7	1	-
MIPO	6	2	-
CC Screw	4	1	1

Conclusion

The study suggests considering surgical options in management of displaced intra-articular fractures of tibial plateau with or without depression of articular surface. Majority of tibial plateau fractures are unstable along with varying degrees of comminution and displacement of articular fracture fragments which are required to be aligned and stabilized for a better end result. Whereas stable fractures with minimal displacement do not require surgical intervention. Good condition of soft tissue is an important pre-requisite for surgical reconstruction of the tibial plateau fractures.

The type and time of surgery and implants used should be planned considering the local skin and soft tissue condition, fracture configuration including comminution and depression, associated ligamentous or meniscal injury as well as age of patient and density of fractured bone. We feel that results of MIPO are better as compared to conventional open reduction and internal fixation techniques for management of intra-articular tibial plateau fractures whenever closed indirect reduction of fracture fragments is feasible. Conventional open reduction and internal fixation of such displaced and depressed tibial plateau fractures should be considered whenever close indirect reduction is not achieved.

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