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Assessment of proximal tibial fractures managed with locking compression plate

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Abstract
Background: Proximal tibial fractures refer to fractures that occur in the upper part of the tibia, which is the larger bone in the lower leg. The present study was conducted to assess management of proximal tibial fractures by locking compression plate.
Materials & Methods: 70 proximal tibial fractures of both genders were treated with MIPO and ORIF. Parameters such as side, type of fracture, type of reduction, principal, operative time, blood loss, hospital stay, healing time etc. were recorded.
Results: Out of 70 patients, males were 40 and females were 30. Side was left in 32 and right in 38. Type of fracture was pure cleavage in 29, cleavage with depression in 15, central depression in 5 cases, medial condyle fracture in 6, bicondylar fracture in 8 and metaphysio diaphyseal dissociation in 7 cases. Method of reduction was MIPO in 48 and ORIF in 22. Principle of reduction was compression in 42, bridging in 18 and combined in 10 cases. The difference was significant (p<0.05). The mean operative time (min) was 92.3, blood loss (ml) was 121.5, hospital stay (days) was 11.4, healing time (weeks) was 9.2 and time of recovery to work (days) was 11.4 days. Common complications were infection in 4, varus deformity in 2, knee instability in 1 and knee joint stiffness in 3 cases. The difference was significant (p<0.05).
Conclusion: Open reduction and internal fixation with LCP is an excellent technique for treatment of proximal tibia fractures.

Keywords: Proximal tibial fractures, MIPO, weight-bearing bone

Introduction
Proximal tibial fractures refer to fractures that occur in the upper part of the tibia, which is the larger bone in the lower leg. These fractures can range from minor fractures, such as stress fractures, to severe injuries that involve multiple breaks in the bone. The proximal tibia is an important weight-bearing bone, and fractures in this area can have a significant impact on a person's ability to walk and perform daily activities. Treatment of proximal tibial fractures depends on the severity and location of the fracture, as well as the patient's overall health and activity level.

Nonsurgical treatment options for minor proximal tibial fractures may include immobilization with a cast or brace, nonsteroidal anti-inflammatory drugs (NSAIDs) for pain management, and physical therapy to maintain range of motion and strengthen the muscles around the knee joint. More severe proximal tibial fractures may require surgical intervention, such as open reduction and internal fixation (ORIF), which involves realigning the broken bones and securing them with plates, screws, or other hardware. In some cases, a bone graft may also be necessary to help the fracture heal. Recovery time for proximal tibial fractures can vary depending on the severity of the fracture and the treatment method used. In general, it may take several months to fully recover from a proximal tibial fracture, and rehabilitation may be necessary to regain strength, flexibility, and mobility in the affected leg. The minimally invasive plate osteosynthesis (MIPO) technique has gained prevalence in recent years. This percutaneous plating technique uses indirect reduction methods and allows stabilisation of distal tibia fractures while preserving the vascularity of the soft tissue envelope [6]. The present study compared hybrid external fixation and MIPO in management of proximal tibial fracture.

The present study was conducted to assess management of proximal tibial fractures by locking compression plate.

Materials & Methods

The present study consisted of 70 proximal tibial fractures of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. A thorough clinical examination was carried out. All patients were treated with MIPO and ORIF. Parameters such as side, type of fracture, type of reduction, principal, operative time, blood loss, hospital stay, healing time etc. were recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table 1: Distribution of patients

Total- 70		
Gender	**Male**	**Female**
Number	40	30

Table I shows that out of 70 patients, males were 40 and females were 30.

Table 2: Assessment of parameters

Parameters	Variables	Number	P value
Side	Left	32	0.92
	Right	38	
Type of fracture	Pure cleavage	29	0.01
	Cleavage with depression	15	
	Central depression	5	
	Medial Condyle fracture	6	
	Bicondylar fracture	8	
	Metaphysio diaphyseal dissociation	7	
Method of reduction	MIPO	48	0.02
	ORIF	22	
Principle	Compression	42	0.03
	Bridging	18	
	Combined	10	

Table II shows that side was left in 32 and right in 38. Type of fracture was pure cleavage in 29, cleavage with depression in 15, central depression in 5 cases, medial condyle fracture in 6, bicondylar fracture in 8 and metaphysio diaphyseal dissociation in 7 cases. Method of reduction was MIPO in 48 and ORIF in 22. Principle of reduction was compression in 42, bridging in 18 and combined in 10 cases. The difference was significant (p<0.05).

Table 3: Other parameters

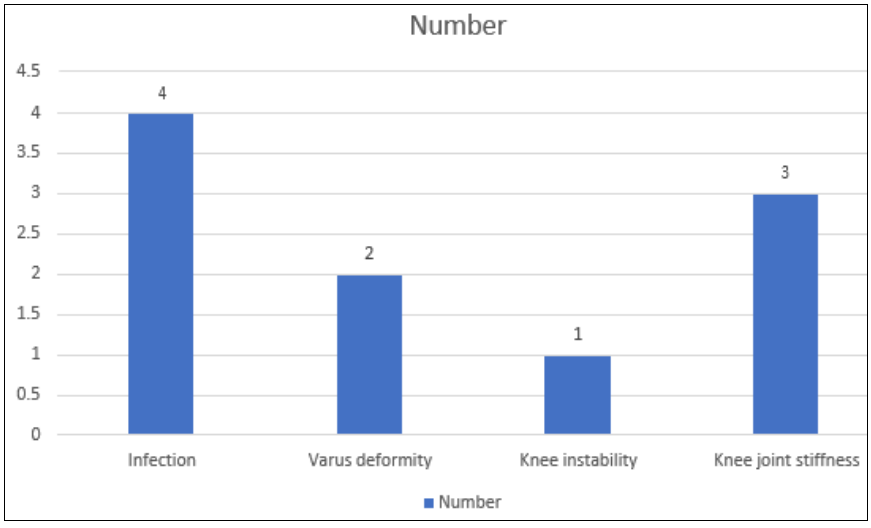
Parameters	Mean	SD
Operative time (min)	92.3	8.2
Blood loss (ml)	121.5	14.6
Hospital stay (days)	11.4	2.4
Healing time (weeks)	9.2	1.6
Time of recovery to work (days)	11.4	4.2

Table III shows that mean operative time (min) was 92.3, blood loss (ml) was 121.5, hospital stay (days) was 11.4, healing time (weeks) was 9.2 and time of recovery to work (days) was 11.4 days.

Table 4: Assessment of complications

Complications	Number	P value
Infection	4	0.87
Varus deformity	2	
Knee instability	1	
Knee joint stiffness	3	

Table IV, graph I shows that common complications were infection in 4, varus deformity in 2, knee instability in 1 and knee joint stiffness in 3 cases. The difference was significant (P<0.05).



Graph I: Assessment of complications

Discussion

Fixation of proximal third tibia fractures with the locking plates has demonstrate excellent results. External fixation has a long history; it was first documented by Hippocrates when he used a splint for tibial fractures. The development of external fixation devices that were directly attached to the bone started in the mid-19th century. The present study was conducted to assess management of proximal tibial fractures by locking compression plate.

We found that out of 70 patients, males were 40 and females were 30. Kommuru *et al*. in their study 30 subjects attending the study site scheduled to undergo the defined surgery were enrolled. A total of 30 patients with proximal tibia fractures were enrolled. Majority of cases were due to RTAs, with a higher incidence of types IV, V and VI. Average time for union of fracture ranged from around 16-24 weeks. 23 patients were treated with ORIF and 7 patients were treated with MIPO technique. Three different principles of fixation were done using the LCP, *viz*. compression, bridging and combined. Functional outcome was evaluated, which revealed excellent results in 53.33% patients, good results in 30% patients, fair results in 13.33% results, while 3.33% had poor outcomes.

We found that side was left in 32 and right in 38. Type of fracture was pure cleavage in 29, cleavage with depression in 15, central depression in 5 cases, medial condyle fracture in 6, bicondylar fracture in 8 and metaphysio diaphyseal dissociation in 7 cases. Method of reduction was MIPO in 48 and ORIF in 22. Principle of reduction was compression in 42, bridging in 18 and combined in 10 cases. Honkonen *et al*. [12] conducted 130 tibial plateau fractures taking into consideration of condylar widening of >5 mm, lateral condyle step off >3 mm, all medial condylar fracture. In our series the indications for surgery were the same standard indications as for the tibial plateau fractures.

We found that mean operative time (min) was 92.3, blood loss (ml) was 121.5, hospital stay (days) was 11.4, healing time (weeks) was 9.2 and time of recovery to work (days) was 11.4 days. Singla *et al*. [13] compared the results of expert tibial nailing with results of distal tibial plating in patients with distal 1/3rd extraarticular tibial fractures. The mean age of the patients of the expert tibial nailing group and distal tibial plating group was 48.12 years and 49.71 years respectively. Mean operative time among the patients of the expert tibial nailing group was 83.15 minutes and was significantly lower in comparison to the patients of the distal tibial plating group (101.2 minutes). Mean intraoperative blood loss was compared between expert tibial nailing and distal tibial plating. Torniquet was used in all the cases. Mean intraoperative blood loss among the patients of the expert tibial nailing group was 51.6 ml and was significantly lower in comparison to the patients of the distal tibial plating group (89.1 ml). Mean postoperative weight-bearing time among the patients of expert tibial nailing was 8.95 weeks and was significantly lower in comparison to the patients of the distal tibial plating (14.35 weeks).

We found that common complications were infection in 4, varus deformity in 2, knee instability in 1 and knee joint stiffness in 3 cases. Cheng *et al*. [14] compared the results between two surgical options for distal tibia fracture, i.e. minimally invasive plate osteosynthesis (MIPO) vs. open reduction and internal fixation (ORIF), and explore the benefits and defects of these two techniques. Thirty cases of distal tibia fracture (15 pairs of ORIF and MIPO) were submitted for pair comparison with consistence of gender, age and AO fracture classification. Indexes for evaluation included operative time, blood loss, healing time, time of recovery to work, implant irritation symptoms, and union status. Mazur grading standard was introduced for functional evaluation. No malunion occurred and one case of osteomyelitis developed in the ORIF group. In the ORIF group, ten cases were evaluated as excellent, three as good, one as fair and one as poor. In the MIPO group, ten cases were excellent and five good. The MIPO technique is not distinctively superior to ORIF in treatment of distal tibia fracture. The limitation the study is small sample size.

Conclusion

Authors found that open reduction and internal fixation with LCP is an excellent technique for treatment of proximal tibia fractures.

Conflict of Interest

Not available

Financial Support

Not available

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