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Original Research Paper

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OUTCOME OF MINIMALLY INVASIVE PLATE OSTEOSYNTHESIS (MIPO) USING LOCKING COMPRESSION PLATE (LCP) IN PROXIMAL TIBIAL FRACTURE MANAGEMENT - A PROSPECTIVE STUDY

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ABSTRACT Proximal tibial fractures are difficult to manage because of subcutaneous nature of anteromedial surface of tibia. Proximal tibial fractures are associated with significant soft tissue injury to surrounding structures which results in open fracture, compartment syndrome, neurovascular injury, delayed union, infection, skin dehiscence, bone or implant exposure, subsequently delay in rehabilitation and stiffness of knee joint. Minimally Invasive Plate Osteosynthesis (MIPO) is biology preserving technique of fracture fixation with less iatrogenic soft tissue injury. Locking Compression Plate (LCP) is latest implant for fracture fixation with less implant failure especially in osteoporotic bone. This study is intended to evaluate the functional and radiological outcome of MIPO using LCP in management of proximal tibial fracture with the help of modified Rasmussen criteria for knee injuries. From this study we concluded that MIPO using LCP in management of proximal tibial fracture is one of the good treatment modality.

KEYWORDS : Minimally Invasive Plate Osteosynthesis (MIPO), Locking Compression Plate (LCP).

INTRODUCTION:

The Arbeitsgemeinschaft für Osteosythese (AO) technique is started in 1958 by M. E. Müller and his colleagues. They emphasized on precise reduction and fixation using mainly compression. Absolute stability of fixation achieved by using implants allowed the fractures to unite solidly [1]. What is more, an extensive surgery is usually required according to AO rules, consequently enhancing the risk of necrosis and delayed healing. However, precise reduction and absolute stable fixation has its biological price such as extensive soft tissue stripping and disruption of periosteal blood supply [2,3]. Gerbe [4] Palmar [5] have proposed a new concept of biological osteosynthesis (BO) since the early 90s of last century. BO rules pay more attentions to the biological characteristics of the bone instead of destroying the normal physiological environment of bone growth and development. After that, the concept of biological internal fixation is rapidly developing. The basic idea of BO is, during fracture reduction and the process of fixation, maximized protection should be done to preserve the regional blood supply therefore healing of fractures becomes faster and prevent many complications. In recent years, minimally invasive plate osteosynthesis (MIPO), a new technology developed under the guidance of BO rules [6] has become widely accepted for treatment of periarticular fractures, metaphyseal fractures, and certain diaphyseal fractures where intramedullary nailing (IMN) is not indicated [7]. There has been evidence showing the superiority of biological fixation over a stable mechanical fixation [8].The use of MIPO prevents- large surgical approach, extensive soft tissue stripping and disruption of periosteal blood supply [6]. LCP offers potential biomechanical advantage over other devices by- Better distribution of forces along the axis of bone, can be applied using MIPO, substantially reducing failure of fixation in osteoporotic bones[9] as LCP reduces the risk of a secondary loss of intraoperative achieved reduction by locking screws to the plate, unicortical fixation option, better preservation of blood supply to the bone as a locked plating does not rely on plate bone compression., provide stable fixation by creating a fixed angle construct and angular stability, results in early mobilization [10,11,12].In the present study we decided to evaluate outcome of MIPO with LCP in proximal tibial fractures.

MATERIAL AND METHOD:

This clinical, prospective study conducted in 30 cases of proximal tibial fractures, managed with MIPO using LCP. Before subjecting the patients for investigations and surgical procedure written and informed consent was obtained from each patient/ legal guardian of patient. The fractures were classified according to the AO/OTA Schatzeker and Gustilo-Anderson systems. The range of movement of the knee was measured with a goniometer. Varus and valgus instability was measured in extension and at 20 degree of knee flexion and compared with that of the normal side. PACS (Picture achieving Communication System) was used for radiographs assessment of degree of joint depression and frontal angulation. Healing was judged by both clinical (pain & motion at fracture site) and radiological (bridging callus filling the fracture site or trabeculations across the fracture site).. All the patients were operated over radiolucent table in supine position under image intensifier guidance. Wound check done on 2nd post of day. Patients were discharged on the 3rd to 5th post-operative day. Stitch removed at 2 weeks. All patients were followed for minimum period of 6 months at 2 weeks, 6 weeks, 12 weeks and 6 months interval post-operative. At the end of follow up clinical and radiological outcome evaluated using modified Rasmussen clinical and radiological criteria [13] for knee injury assessment. The data collected was transferred into a master chart which was subjected to statistical analysis. Outcome was compared with previous reported series for the management of proximal tibial fractures.

RESULTS AND DISCUSSION:

In our series of 30 patients, 21 were males and 9 were females. The mean age of presentation was 35.6 (19-67) years. The most common mechanism of injury was a road traffic accident in both males and females. Schatzcker type 2 fractures were common. There were 21excellent, 7 Good and 2 Fair functional outcome. 1 case had varus union of 5 degrees and 1 case had valgus union of 5 degrees, 1 patient had superficial infection and 1 patient developed metal allergy. All fractures united well without need for reoperation. The mean modified Rasmussen clinical score 27.5 and radiological score 8.4 was observed at their final follow up. Significant association between fracture pattern and functional modified Rasmussen score with p value 0.034 in Schatzker fracture classification and p value of 0.010 in AO/OTA classification observed.

Table No.1 Association among study group between Type of fracture (Schatzker) MRS Functional

Type of Fracture (Schatzker)		MRS Functional			Total
		Excellent	Good	Fair	
Type1	No	2	0	0	2

	%	100%	0.0%	0.0%	100%
Type2	No	9	0	0	9
	%	100%	0.0%	0.0%	100%
Type3	No	3	0	0	3
	%	100%	0.0%	0.0%	100%
Type 4	No	2	1	0	3
	%	66.7%	33.3%	0.0%	100%
Type 5	No	2	4	0	6
	%	33.3%	66.7%	0.0%	100%
Type 6	No	2	3	2	7
	%	28.6%	42.9%	28.6%	100%
Total	No	20	8	2	30
	%	66.7%	26.7%	6.7%	100%

Chi-Square test	Value	Df	P. Value
Pearson Chi- Square	19.500	10	0.034

a.17 cells (94.4%) have expected count less than 5.

Table No.2 Association among study group between Type of fracture (AO/OTA) MRS Functional

Type of fracture (AO/OTA)		MRS Functional			Total
		Excellent	Good	Fair	
41 B1	No	2	0	0	2
	%	100%	0.0%	0.0%	100%
41 B2	No	3	0	0	3
	%	100%	0.0%	0.0%	100%
41 B3	No	11	1	0	12
	%	91.7%	8.3%	0.0%	100%
41 C1	No	2	4	0	6
	%	33.3%	66.7%	0.0%	100%
41 C2	No	2	0	1	3
	%	66.7%	0.0%	33.3%	100%
41 C3	No	0	3	1	4
	%	0.0%	75%	25.0%	100%
Total	No	20	8	2	30
	%	66.7%	26.7%	6.7%	100%

Chi-Square test	Value	Df	P. Value	Association
Pearson Chi- Square	23.125	10	0.010	Sig

a.17 cells (94.4%) have expected count less than 5.

Correlations
Table no 3

	N	Mean	Std . Deviation
MRS Functional	30	27.40	2.673
MRS Radiological	30	8.43	1.194
Age	30	37.47	2.569
Time to Unite Fracture (Wks	30	13.47	2.569
Range of knee motion	30	127.46	154.91

Correlations
Table no 4

		MRS Functional	MRS Radiological
MRS Functional	Pearson Correlations		0.873
	P Value		0.000
	Correlation is		Sig
MRS Radiological	Pearson Correlation	0.873	
	P Value	0.000	
	Correlation is	Sig	
Age	Pearson Correlation	-0.160	-0.280
	P Value	0.397	0.134
	Correlation is	Not Sig	Not Sig
Time to Unite fracture (Wks)	Pearson Correlation	-0.781	-0.754
	P Value	0.000	0.000
	Correlation is	Sig	Sig
Range of knee motion	Pearson Correlation	0.946	0.822
	P Value	0.000	0.000
	Correlation is	Sig	Sig

**. Correlation is significant at the 0.01 level (2-tailed).

Fig no1 Preop proximal tibial fracture.

Fig No. 2 6 Months follow up.

Fig no 3 intra operative bilateral mipo plating.

Fig no 4 intraop Femoral distractor use

Fig no 5 and 6 Knee range of motion after mipo with lcp patient.

CONCLUSION:

From this study we concluded that Minimally Invasive Plate Osteosynthesis (MIPO) using Locking Compression Plate (LCP) in management of proximal tibial fracture is one of the good treatment modality in selected patients of proximal tibial fractures where intraoperative proximal tibia good articular

congruency, alignment and reduction is achieved with indirect mean of reduction under image intensifier.

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