

Role of Locking Compression Plate in Long Bone Fractures Especially of Metaphyseal Region

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ABSTRACT

Background: The goal of fracture treatment is to obtain union of the fracture in the most compatible anatomical position which allows maximal functional restoration of the extremity. The aim of this study to evaluate the efficacy of locking compression plate in the treatment of long bone fractures especially of metaphyseal region.

Materials & Methods: This is a prospective study conducted in Department of Orthopaedic, SMS Medical College and attached Hospital, Jaipur. All patients were evaluated clinically at the time of admission and first aid treatment was given. Skiagrams were done to assess the type of fractures and displacement and plan of the treatment. After surgical procedure with various approaches, patient was called for follow up after 2 weeks for suture removal and wound examination. Than after six weeks of operation the patient was assessed clinically & radiologically, thereafter were assessed every four weekly.

Results: Our study showed that the majority of cases were seen in 31-40 years of age group. 63.3% of cases were male and 36.67% were females. 15 cases (50%) were of fracture distal femur, 6 cases (20%) were of proximal humerus & shaft humerus each & 3 cases (10%) were of shaft femur. Maximum cases (50%) were follow up between 3-6 months period. Out of 30 cases, 15 cases were fracture in distal end of femur. Of 13 cases had excellent to fair results (55.55%+33.33% respectively) and 2 cases had poor results, one had deep infection and one had non union at distal femur and shortening & deformity at ipsilateral leg.

Conclusion: We concluded that locking compression plate is a good implant with improve stability especially angular. However in simple Diaphyseal fracture in non-osteoporotic bone, to apply LCP will only add to the cost without any extra advantage.

KEYWORDS: Locking Compression Plate, Distal End of Femur, Proximal Humerus, Fracture.

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INTRODUCTION

In the modern world the increase in speed and number of fast moving vehicles there is great increase in number & severity of fractures. Fractures may be associated with multiple system injuries and polytrauma.

The goal of fracture treatment is to obtain union of the fracture in the most compatible anatomical position which allows maximal functional restoration of the extremity. Long term disability following a fracture is almost never the result of damage to the bone itself; it is the result of damage to the soft tissues and of stiffness of neighbouring joints.¹

Locking plates are fracture fixation devices with threaded screw holes, which allow screws to thread to the plate and function as a fixed-angle device. These

plates may have a mixture of holes that allow placement of both locking and traditional nonlocking screws.²

This biomechanical prerequisite of conventional plates is associated with biological pitfalls due to compression of periosteal blood supply and compromise of the vascularity of the fracture. Thus, conventional plate osteosynthesis with rigid fixation has been associated with a substantial complication rate, including infection, hardware failure, delayed union & nonunion.

In contrast, locking plates follow the biomechanical principle of external fixators and do not require friction between the plate and bone. They are considered to be internal fixators from a biomechanical standpoint since the angular stable interface between the screws and the

plate without any contact to the bone. In essence, however, locking plates can be considered to be external fixators placed underneath the skin envelope, although they are more stable as a result of the shorter distance between the plate and the bone.²The increase in stability provided by locking plates is most helpful to surgeons treating a fracture in poor quality bone, a comminuted bicondylar fracture for which a single plate may not provide adequate stability. Also, since only a single plate is needed and the plate does not depend on a tight fit to the bone for stability, substantially less soft tissue dissection may be required, thus preserving the local blood supply and enhancing fracture healing. The aim of this study to evaluate the efficacy of locking compression plate in the treatment of long bone fractures especially of metaphyseal region admitted in the department of Orthopaedic, SMS Hospital, Jaipur.

MATERIALS & METHODS

This is a prospective study conducted in Department of Orthopaedic, SMS Medical College and attached Hospital, Jaipur. All patients were evaluated clinically at the time of admission and first aid treatment was given. Skiagrams were done to assess the type of fractures and displacement and plan of the treatment.

Preoperative Preparation

Preoperative counseling & informed consent of the patient and relatives regarding the method of treatment and prognosis was done. Appropriate broad spectrum antibiotic coverage was given.

Surgical Procedure

For proximal humerus anterior approach was used. Deltopectoral plane dissected. Fracture was reduced. Interfragmentary screw was applied in some cases. Proximal humerus plate was hold with K wires. Locking screws were applied in proximal metaphyseal area & distally in diaphysis of humerus.

For fracture shaft humerus anterior approach was used with brachialis splitting. Fracture reduced. Plate applied with simple cortical screw applied first for compression at fracture site. Locking screw applied after simple cortical screw are applied. Bone grafting was done in 2 cases of non-union & one fracture with previous implant breakage.

In fracture of distal femur a lateral incision applied fracture site exposed. Intercondylar fragments were first reduced and hold with K-wires. Reduction of supracondylar fragments were achieved and metaphyseal a plate applied. Locking screw applied in distal metaphyseal portion & proximal diaphysis. K-wires used for holding the intercondylar portion were removed.

Postoperative Care

Broad spectrum antibiotics was administered as per standard regime. Splintage & immobilization was applied as per fixation achieved. After discharge from hospital patient was called for follow up after 2 weeks for suture removal and wound examination. Than after six weeks of operation the patient was assessed clinically & radiologically, thereafter were assessed every four weekly.

Table 1: Age Incidence

Age (in years)	Number of patients	Percentage
11-20 yrs	02	6.67%
21-30 yrs	05	16.67%
31-40 yrs	09	30%
41-50 yrs	07	23.3%
51-60 yrs	04	13.33%
Above & more than 60 yrs	03	10%
Total	30	100%

Table 2: Type of fractures

Type of Fracture	Number of patients	Percentage
Distal femur	15	50%
Shaft Femur	3	10%
Proximal humerus	6	20%
Shaft humerus	6	20%
Total	30	100%

Table 3: Follow Up Period (Months)

No. of months	Number of patients	Percentage
<3	1	3.33%
3-6	15	50%
7-9	3	10%
10-12	8	26.67%
>12	3	10%

Table 4: Evaluation of result (Mehrotra's) of distal femur (N=15)

End Result	Number of patients	Percentage
Excellent	8	53.33%
Fair	5	33.33%
poor	2	13.33%

Table 5: Evaluation of result (Neer's Criteria) of proximal humerus (N=6)

End Result	Number of patients	Percentage
Excellent	3	50%
Satisfactory	1	16.67%
Unsatisfactory	1	16.67%
Failure	1	16.67%

RESULTS

Our study showed that the majority of cases were seen in 31-40 years of age group (table 1). 63.3% of cases were male and 36.67% were females. 15 cases (50%) were of fracture distal femur, 6 cases (20%) were of proximal humerus & shaft humerus each & 3 cases (10%) were of shaft femur (table 2). Maximum cases (50%) were follow up between 3-6 months period (table 3).

Out of 30 cases, 15 cases were fracture in distal end of femur. Out of which 13 cases had excellent to fair results (55.55%+33.33% respectively) and 2 cases had poor results, one had deep infection and one had non union at distal femur and shortening & deformity at ipsilateral leg (table 4). Out of 30 cases, 6 cases were fracture in proximal humerus. Out of which 3 cases had excellent result & one case had failure (table 5).

DISCUSSION

The age of patient in this study was varied from 20-70 years and most of cases were of fourth & fifth decade of life and out of which 63.33% were male & 36.7% were female. This results consisted with Olerud (1972)³, Schatzker (1979)⁴, Mize & Benzal (1982)⁵. On the contrary Shelbourne (1982)⁶ Schatzker (1989)⁷ & Silisky (1989)⁸ and reported higher incidences in 6th decade and also higher average age (above 50 years). Males were predominantly affected in the present series (80%) which is similar to Neer (1967)⁹, Olerud (1972)³, Zickel (1977)¹⁰, Shelbourne (1982).⁶ This male preponderance in this series may be due to outdoor life led by men in this country (India).

In our study showed that out of 30 cases, 15 cases were fracture in distal end of femur. Out of which 13 cases had excellent to fair results (55.55%+33.33% respectively) and 2 cases had poor results, one had deep infection and one had non union at distal femur and shortening & deformity at ipsilateral leg. This is similar to Chiron (1974)¹¹ and Zickle (1977)¹⁰ who reported 82.5% and 82.3% excellent to good results, 17.5% & 17.7% unsatisfactory to poor results respectively. Functional assessment at the end of follow up fracture humerus treated by LCP was made, all cases had full

range of movement at proximal and distal joint. 2 cases with radial nerve palsy recovered uneventful. Our result consisted with Moda et al (1990)¹² found overall results were good or satisfactory (84%). Another study done by Robinson & Christie (1993)¹³ found in elderly age group results was satisfactory functional score (69.52%).

In a country like India with most of the people with rural background, poor socioeconomic status, illiterate, less demanding, less frequent availability of infrastructure for physiotherapy, it is very difficult to plan a good rehabilitation programme in patients. In our study there were 30 cases out of which 21 cases of fracture at meta-epiphyseal region. Of these 21 cases there were 3 cases with poor results and 1 case of proximal humerus fracture with unsatisfactory results as per Neer's criteria (but patient was satisfied). The cost of imported implant used, many a times not in economic limits of patient. Patients most of the times in our study opted for low cost implant manufactured by Indian manufacturers which are not to the standards expected. All these points influenced very much to end results of the study.

CONCLUSION

We concluded that locking compression plate is a good implant with improve stability especially angular. Locking compression plate can also be used in osteoporotic bones, non-union and fractures with intramedullary implant in situ. However in simple Diaphyseal fracture in non-osteoporotic bone, to apply LCP will only add to the cost without any extra advantage.

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