

Original Research Article

A prospective comparative study of internal fixation of diaphyseal forearm fractures with LCP and DCP in above 50 year age group

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ABSTRACT

Background: In orthopedic practice forearm bone fracture is commonly encountered fracture. Forearm plays a vital role in day to day activities without which a person is unable to perform his role in his own life. It has been estimated that around 31% of the total fractures of the upper limb are of forearm fractures. The objective of the study was to study and compare internal fixation of diaphyseal forearm fractures with LCP and DCP in above 50 year age group

Methods: Present study was hospital based study. This was a prospective study. A total of 50 patients with fracture of both bones in the forearm were included in the present study. They were divided randomly as 25 patients in each group. They were followed for about eight months.

Results: Both the groups in the present study were found to be comparable in terms of age, sex, mode of injury, type of injury and level of fracture. It took only 13.83 weeks for radiological union in LCP group and it took a longer in DCP group of 15.33 weeks. This difference was found to be statistically significant. Overall functional results were almost same in both the groups. Excellent in 36 cases (19 in LCP, 17 in DCP), Good in 10 cases (4 in LCP, 6 in DCP), fair in 4 cases (2 in each group).

Conclusions: It has been concluded from the present study that union of fracture after LCP had taken significantly lesser time as compared to the DCP technique. Hence especially in persons above 50 years, LCP should be used.

Keywords: Fracture, Forearm bones, Comparison, Outcome

INTRODUCTION

In orthopedic practice forearm bone fracture is commonly encountered fracture. Forearm plays a vital role in day to day activities without which a person is unable to perform his role in his own life. It has been estimated that around 31% of the total fractures of the upper limb are of forearm fractures. Compared to legs, forearm is unique in terms of mobility freedom a person gets due to forearm. Role of orthopedic surgeon in restoring forearm functions in case of forearm fracture is very vital. Timely management and appropriate treatment is crucial in restoring the functions in case of forearm fractures.¹

If not treated properly, there can be severe function loss in case of forearm fractures. Severe function loss can

even be seen in cases where the fracture healed nicely. Therefore the role of orthopedic surgeon in appropriate management of forearm fractures becomes more and more vital. They must adopt a proper treatment method. Reduction by closed method may not work properly and it is difficult to maintain it.²

In case there is fracture of radius and ulna, then it should be managed by open reduction only. Plate fixation can be done depending upon the fracture. If there is bone loss, then bone grafting should be done. If the patient is seen within first two days of fracture, then open reduction can be done. Safest procedure is "AO (Arbeitsgemeinschaft für Osteosynthesefragen)/Association for the study of internal fixation (ASIF)", "dynamic and locking

compression plate.” The method has several advantages including small size incision.³

“The dynamic compression plate (DCP)” method requires small incision. This plate was developed by AO School from Switzerland. It produces very effective rigid internal fixation. It also restores the functioning post operatively.⁴

Latest plate technique is “the LCP (locking compression plate)” which needs very small incision and also does not interfere with blood supply of the bone. It won't disturb blood supply to nearby soft tissues. It gives very good stability post operatively.⁵

There have been only a few studies till date in review of literature comparing both “Locking compression plate and dynamic compression plate.” Present study was conducted to analyse the comparative study of dynamic compression plating (DCP) and locking compression plating (LCP) in fractures of forearm bone in patients more than 50 years.

METHODS

Present study was hospital based study. This was a prospective study. A total of 50 patients with fracture of both bones in the forearm were included in the present study. They were divided randomly as 25 patients in each group. They were followed for about eight months. Time period is from December 2014 to June 2016, and followed up to November 2016 at Narayana hospital attached to Narayana Medical College, Nellore. All the 50 patients (LCP-25, DCP-25) were available for the study and follow-up for minimum of 6 months and maximum duration is 18 months. The average period of follow up was 8 months.

Inclusion criteria

- Age between 50 to 90 years.
- “Fresh cases of diaphyseal both bones forearm fractures which are of closed type.”
- “A3, B3 and type C fractures excluding single bone fractures.”

Exclusion criteria

- Open fractures
- If only one bone was fractured in the forearm.
- Pathological fractures
- Associated neurovascular injuries

Detailed history was recorded as per the study questionnaire designed for the present study. Clinical assessment of skeletal and soft tissue injuries and general condition was done.

Distal neurovascular status was assessed by palpating the radial and ulnar artery and motor and sensory sensations

of the palm and wrist done to evaluate the radial, median and ulnar nerve status. All patients were selected in such way that they were fractures occurred within a week duration. Forearm bone x-ray was taken. The fracture was classified based on AO classification.

Slab was applied above the level of elbow to immobilize the injured limb. This was done for all patients. To relieve pain, analgesics in the injectable form were given.

The mode of injury was road traffic accident in 35 patients, fall in 15 patients. All these injuries were managed according to standard treatment protocol followed in our institution.

Surgical profile was carried out for all patients. Pre anesthetic check-up was done. 25 patients were operated by LCP technique and 25 patients were operated by DCP technique. The results were compared between these two groups.

General anaesthesia was used in 12 cases and brachial plexus block was used in 36 cases. Surgery was done 2 days to 10 days after admission at an average of 5 days. Average duration of surgery was 65 minutes for LCP group and 72 minutes for DCP group. No complications had occurred intra operatively. There was one case in each group with superficial infection and it was controlled by higher antibiotics and regular dressings.

The data was analyzed using proportions and appropriate statistical test.

RESULTS

Table 1 shows age distribution of study subjects. Both the groups have almost equal study subjects as the p value is not significant. The average age was 64.9 years for (LCP) and 63.25 years for (DCP)

Table 2 shows sex distribution of study subjects. In both the groups there was almost equal distribution with male preponderance. And there was no statistically significant difference between the two groups in terms of gender distribution.

Table 3 shows mode of injury among the study participants. Most of the cases were due to road traffic accidents in both the groups and the difference was not found to be significant. Thus both the groups were comparable.

Table 4 shows distribution of study subjects as per side affected. Both the groups were comparable in terms of side affected as the p value was more than 0.05.

Table 5 shows fracture classification among the study subjects. Both the groups were comparable in terms of fracture type as the p value was more than 0.05.

Table 1: Age distribution of study subjects.

Age group (in years)	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
50-54	2	8	9	36
55-59	4	16	2	8
60-64	7	28	2	8
65-69	2	8	6	24
70-74	6	24	2	8
75-80	2	8	4	16
Total	25	100	25	100

$\chi^2=6.17$; $p=0.27$ (nil significant).

Table 2: Sex distribution of study subjects.

Sex	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
Male	19	76	17	68
Female	6	24	8	32
Total	25	100	25	100

Fisher exact $p=0.50$ (nil significant).

Table 3: Mode of injury among the study participants.

Mechanism of injury	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
Road traffic accident	16	64	19	76
Fall	9	36	6	24
Total	25	100	25	100

Fisher exact $p=0.50$ (nil significant).

Table 4: Distribution of study subjects as per side affected.

Side of fracture	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
Right	13	52	19	76
Left	12	48	06	24
Total	25	100	25	100

Fisher exact $p=0.20$ (nil significant).

Table 5: Fracture classification among the study subjects.

Type of fracture	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
A 3	19	76	17	68
B 3	4	16	6	24
C 3	2	8	2	8
Total	25	100	25	100

$\chi^2=0.26$; $p=0.87$ (nil significant).

Table 6: Level of fracture among the study subjects.

Level of fracture	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
Upper one third	4	16	6	24
Middle one third	17	68	15	60
Lower one third	4	16	4	16
Total	25	100	25	100

Table 7: Associated injuries among the study subjects.

Associated injuries	LCP group		DCP group	
	Number	Percentage (%)	Number	Percentage (%)
Head injury	1	4	0	0
Both bones leg fracture	0	0	1	4
Blunt injury abdomen	0	0	1	4
Pubic rami fracture	1	4	1	4
Total	2	8	3	12

Table 8: Comparison of healing time in weeks.

Group	Mean	SD	T value	P value
LCP	13.83	1.33	2.34	0.02
DCP	15.33	1.77		

Significant in LCP group.

Table 9: Comparison of functional results in two groups.

Functional group	LCP group	DCP group
Excellent	19	17
Good	4	6
Fair	2	2
Poor	0	0

$\chi^2=0.26$; $p=0.87$ (nil significant).

Table 6 shows level of fracture among the study subjects. Majority of cases had fracture in the middle third. Both the groups were comparable.

Table 7 shows associated injuries among the study subjects. One patient had head injury in LCP group. One patient had both bones leg fracture in DCP group. Blunt injury abdomen was seen in one patient from DCP group. Both the groups had one case each of pubic rami fracture.

It took only 13.83 weeks for radiological union in LCP group and it took a longer in DCP group of 15.33 weeks. This difference was found to be statistically significant.

Table 9 shows comparison of functional results in two groups. The functional results were almost same in both the groups, inspite of different rates of radiological union.

DISCUSSION

There are no studies mentioning average age involved in fractures of both bones in the age group of more than 50 years. The mean age of cases was 64.9 years for LCP group and 63.25 years for DCP group. Fractures were common in the age group of 50 to 70 years.

Leung et al concluded that efficacy of LCP method in the treatment of simple fractures needs to be proved.⁷

Augusto et al in a preliminary report of forearm fractures, early functional bracing, and shown wonderful series of cast bracing.⁸ They avoided below and above joint

immobilization and still documented excellent functional results.

Anderson et al found that the overall union rate was 97.9% for the radius and 96.3% for the ulna.⁹ He achieved excellent functional results in acute diaphyseal fractures of forearm and advised minimal stripping of periosteum before plate application.

Hadden et al conducted a study on the animals to know the effect of compression on bone with the help of measuring device that measured compression as bone healing progressed, they noted that there was loss of compression as the fracture heals, some amount of compression persisted even after bony union.¹⁰ The fall in compression was due to the Haversian remodelling. They concluded that compression and absolute rigidity of fracture ends that results from the force applied is highly favourable for fracture healing.

Allgower et al in a study which consisted of 1903 radial shaft fractures, 666 ulnar shaft fractures, for 97% of cases narrow DCP was used.¹¹ They noted that there were 3.2% non-union and rest of them had good functional outcome. They recommended the 3.5 mm DCP for fixation of forearm fractures.

Perren designed the dynamic compression unit (DCU), precursor of LC-DCP.¹² They modified the plate holes, the lower side of the plate (oblique undercuts) and the distribution of the plate holes (even distribution).

Stern et al in a study outlined the complication of forearm fractures in 87 diaphyseal radius/ulna fractures.¹³ Major complications occurred in 28% of cases. Non-union occurred in 93% of cases, noted in fractures treated with only 4 screws. They concluded that (i) plating with 4 screws may be inadequate fixation for forearm fractures and at least 5 screws must be used to affix the plate to either radius/ulna, (ii) the ulna remains the most difficult bone to achieve primary healing. This may be due to torsional stresses that increase during pronation and supination, (iii) synostosis appears to be more common in patients who sustain concomitant head injury and hence heterotrophic ossification.

Perren proposed the use of biodegradable polymeric materials, so that the implant dissolves after a certain time in the body avoiding a second operation for removal of implant.¹⁴ No such material has yet made available for use with conventional techniques of internal fixation, which combines adequate strength, ductility, maintenance of compression and degradability without marked tissue reaction. Tissue tolerance and local effects on infection are still unsolved problems.

Henle et al conducted a study in 53 patients with forearm fractures. In these 39 radius and 45 ulna fractures were fixed with 3.5 mm LCP. Mean follow up period was 23.3 weeks and the results assessed with DASH score. Fixed connection between plate and screws in LCP implants adds stability in osteoporotic bone or severely comminuted fractures. This added stability might offer clinical advantage. Bending of plate for anatomic precontouring can damage plate locking mechanism. Rigidity of plate vary with number and placement of screws. No clear benefits were found in terms of fracture union or outcome when comparing LCP data with DCP and LC DCP control groups.

Nasab et al studied 77 patients with forearm fractures treated with DCP plating.¹⁶ ORIF of adult forearm fractures using DCP was associated with higher rate of success results are comparable with newer and expensive implants like LC DCP, LCP.

CONCLUSION

We recommend use of LCP technique than the DCP technique especially in patients above 50 years of age.

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