



THE ROLE OF LOCKING COMPRESSION PLATE IN FOREARM FRACTURES-A PROSPECTIVE STUDY

Orthopaedics

Dr. Yatin Tayal	Department Of Orthopaedic , Muzaffarnagar Medical College And Hospital , Muzaffarnagar U. P.
Dr. Gaurav Jindal	Department Of Orthopaedic , Muzaffarnagar Medical College And Hospital , Muzaffarnagar U. P.
Dr. Ayushman Singh	Department Of Orthopaedic , Muzaffarnagar Medical College And Hospital , Muzaffarnagar U. P.
Dr. Gaurav Jain	Department Of Orthopaedic , Muzaffarnagar Medical College And Hospital , Muzaffarnagar U. P.

ABSTRACT

Introduction: Forearm fractures are one of the most common fractures seen today as a result of both high intensity as well as low intensity trauma. Multiple modalities of fixation are available each with its own advantages and disadvantages. The accepted mode of management is open reduction and internal fixation using dynamic compression plating. The current study is done to evaluate the advantages and disadvantages of locking compression plate over conventional dynamic compression plate. **Objective:** The objective of the study is to evaluate the functional outcome of forearm fractures treated with open reduction and internal fixation using locking compression plate. **Methods:** The study was carried out in Orthopaedics department, Muzaffarnagar Medical College, Muzaffarnagar, UP. This is a hospital based prospective study. The data of the patients were collected in the case record form and they were put into a Microsoft excel spreadsheet. Functional outcome was assessed using DASH Score. **Result:** In this study, majority of patients were male, in third and forth decade of life, with RTA as the most common cause of fracture. Middle 1/3rd shaft fractures were more common. 100% union rate was seen with minimal disability in 25 patients (83.3%) and moderate disability was seen in 5 patients (16.7%). Mean DASH Score was found to be 14.4 with range of 8-32. **Conclusion:** Open reduction and internal fixation with LCP produced excellent postoperative results. Early mobilization and stable fixation and better retainment of reduction in osteoporotic bones are advantages of LCP. LCP being a combi-hole plate gives advantage of using both cortical as well as locking screws.

KEYWORDS

Open reduction and internal fixation, Locking compression plate, both bone forearm fractures, Dynamic compression plate, Ulna, Radius.

INTRODUCTION:

Adult bone forearm fractures account for over 31% of all upper limb fractures, making them the most frequent fractures seen in daily practice. Forearm injuries with isolated fractures of the radial or ulnar shaft are frequent.⁽¹⁾ Fractures of the forearm shaft can be defined as articular injuries that impact the interosseous membrane's mechanics. It is extremely difficult to maintain an acceptable alignment in these fractures with non-operative means. Treatment options include bracing, casting, intramedullary fixation, or compression plating, depending on the stability of the fracture and the surgeon's decision.^(2,3) The usual technique for both solitary radius/ulna fractures and both bone forearm fractures in adults is Open reduction and internal fixation (ORIF) with plating, with or without bone grafting. Internal fixation with a dynamic or locking compression plate provides stiff fixation, impaction, and compression at the fracture site as advised by the AO association.⁽⁴⁻⁸⁾

The groundbreaking new feature of the locking compression plate (LCP) is the integration of two entirely distinct anchorage systems into a single implant.

The LCP with combination holes allows surgeons to combine the concepts of dynamic compression and locking principle, depending on bone quality. Depending on the specific needs of the patient, the LCP can be utilized as a locked internal fixator, a compression plate, or a combination of the two.⁽⁹⁾

Method:

The study was conducted in Department of Orthopaedic, Muzaffarnagar Medical College and hospital to evaluate the role of locking compression plate in forearm fractures.

Inclusion Criteria:

1. Fractures of both bones of forearm in adults >16 years
2. Diaphyseal fractures of both bones of forearm
3. Isolated fractures of ulna
4. Isolated fractures of radius
5. Patients willing and fit for surgery
6. Non complex fractures

Exclusion Criteria:

1. Compound fractures
2. Malunited fractures
3. Patients unfit and not willing for surgery
4. Patients with neurovascular involvement
5. Non-union fractures
6. Patients <16 years
7. Patients with head injury
8. pathological fracture
9. complex fractures

Data Collection Procedure

Monthly followup for first 6 months was done on OPD basis to assess for signs of inflammation, infection at operative site and to assess range of motion of elbow and wrist. Xray's of operated limb were done and findings were recorded.

The data of the patients were collected in Case Record Form and the collected data was recorded into Microsoft Excel Sheet.

Clinical And Functional Outcome Evaluation

DASH score was used to assess the outcome.

DISABILITIES OF THE ARM, SHOULDER AND HAND

Please rate your ability to do the following activities in the last week by circling the number below the appropriate response.

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. Open a light jar or can	1	2	3	4	5
2. Walk	1	2	3	4	5
3. Stop a car	1	2	3	4	5
4. Prepare a meal	1	2	3	4	5
5. Pick up a heavy box	1	2	3	4	5
6. Place an object on a shelf above your head	1	2	3	4	5
7. Do heavy household chores (e.g., wash walls, wash floor)	1	2	3	4	5
8. Climb on the yard wall	1	2	3	4	5
9. Make a bed	1	2	3	4	5
10. Carry a shopping bag or basket	1	2	3	4	5
11. Carry a heavy object (over 10 lbs)	1	2	3	4	5
12. Change a lightbulb overhead	1	2	3	4	5
13. Walk on level dry pavement	1	2	3	4	5
14. Walk over curb	1	2	3	4	5
15. Put on a pullover sweater	1	2	3	4	5
16. Use a knife to cut food	1	2	3	4	5
17. Recreational activities which require both effort (e.g., swimming, tennis, etc.)	1	2	3	4	5
18. Recreational activities in which you take some stress or effort through your arm, shoulder or hand (e.g., golf, basketball, tennis, etc.)	1	2	3	4	5
19. Recreational activities in which you move your arm freely (e.g., playing football, basketball, etc.)	1	2	3	4	5
20. Manage transportation needs (getting from your place to another)	1	2	3	4	5
21. Sexual activities	1	2	3	4	5

DISABILITIES OF THE ARM, SHOULDER AND HAND

	NOT AT ALL	SLIGHTLY	MODERATELY	QUITE A BIT	EXTREMELY
22. During the past week, to what extent has your arm, shoulder or hand problem interfered with your normal social activities with family, friends, neighbours or groups? (circle number)	1	2	3	4	5
23. During the past week, were you limited in your work or other regular daily activities as a result of your arm, shoulder or hand problem? (circle number)	1	2	3	4	5

Please rate the severity of the following symptoms in the last week. (circle number)

	NONE	MILD	MODERATE	SEVERE	EXTREME
25. Arm, shoulder or hand pain	1	2	3	4	5
25. Arm, shoulder or hand pain when you performed any specific activity	1	2	3	4	5
26. Tingling (pins and needles) in your arm, shoulder or hand	1	2	3	4	5
27. Weakness in your arm, shoulder or hand	1	2	3	4	5
28. Stiffness in your arm, shoulder or hand	1	2	3	4	5

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	NO MUCH DIFFICULTY CAN'T SAY
29. During the past week, how much difficulty has you had sleeping because of the pain in your arm, shoulder or hand? (circle number)	1	2	3	4	5

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
30. I feel less capable, less confident or less useful because of my arm, shoulder or hand problem. (circle number)	1	2	3	4	5

DASH DISABILITY/SYMPTOM SCORE = $\frac{((\text{sum of responses}) \times 1) \times 25}{n}$, where n is the number of completed responses.
A DASH score may also be calculated if there are greater than 3 missing items.

DISABILITIES OF THE ARM, SHOULDER AND HAND

WORK MODULE (OPTIONAL)

The following questions ask about the impact of your arm, shoulder or hand problem on your ability to work (including housework) if that is your main work role.
Please indicate what your job/work is: _____
(If I do not work, (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty?

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual techniques for your work?	1	2	3	4	5
2. doing your usual work because of arm, shoulder or hand pain?	1	2	3	4	5
3. doing your work as well as you would like?	1	2	3	4	5
4. spending your usual amount of time doing your work?	1	2	3	4	5

SPORTS/PERFORMING ARTS MODULE (OPTIONAL)

The following questions relate to the impact of your arm, shoulder or hand problem on playing your musical instrument or sport or both.
If you play more than one sport or instrument (or play both), please answer with regard to that activity which is most important to you.
Please indicate the sport or instrument which is most important to you: _____
(If I do not play a sport or an instrument, (You may skip this section.)

Please circle the number that best describes your physical ability in the past week. Did you have any difficulty?

	NO DIFFICULTY	MILD DIFFICULTY	MODERATE DIFFICULTY	SEVERE DIFFICULTY	UNABLE
1. using your usual technique for playing your instrument or sport?	1	2	3	4	5
2. playing your musical instrument or sport because of arm, shoulder or hand pain?	1	2	3	4	5
3. playing your musical instrument or sport as well as you would like?	1	2	3	4	5
4. spending your usual amount of time practicing or playing your instrument or sport?	1	2	3	4	5

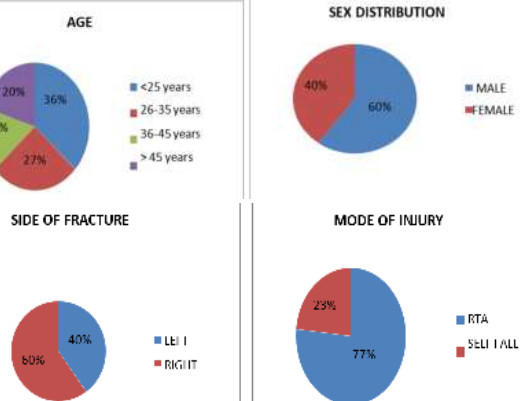
SCORING THE OPTIONAL MODULES: Add up assigned values for each response. Divide by a number of items. Subtract 1. Multiply by 25.
An optional module score may also be calculated if there are any missing items.

Interpretation of scores

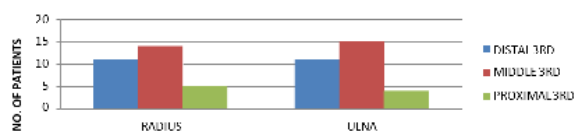
0% to 20%: minimal disability:	The patient can cope with most living activities. Usually no treatment is indicated apart from advice on lifting, sitting and exercise.
21%-40%: moderate disability:	The patient experiences more pain and difficulty with sitting, lifting and standing. Travel and social life are more difficult and they may be disabled from work. Personal care, sexual activity and sleeping are not grossly affected and the patient can usually be managed by conservative means.
41%-60%: severe disability:	Pain remains the main problem in this group but activities of daily living are affected. These patients require a detailed investigation.
61%-80%: crippled:	Back pain impinges on all aspects of the patient's life. Positive intervention is required.
81%-100%:	These patients are either bed-bound or exaggerating their symptoms.

RESULTS:

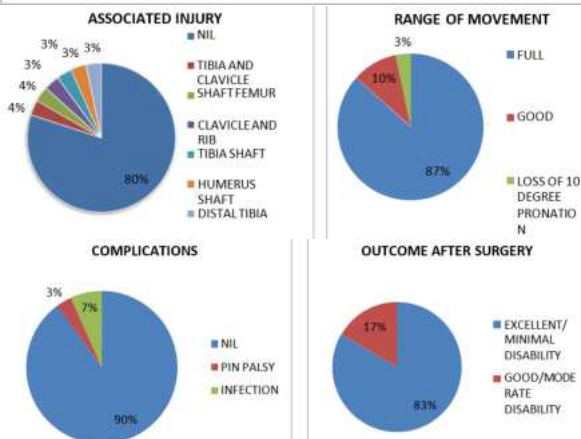
30 cases of forearm fractures were included in our study after fulfilling inclusion criteria.



SITE OF FRACTURE



TIME OF UNION



Case 1



Case 2



DISCUSSION:

Anatomical alignment of proximal and distal fractured segments gets disrupted due to acting muscular forces, therefore ORIF with plate fixation is preferred for better functional outcome. The goal of the current study is to ascertain if LCP is effective in treating forearm fractures and their functional outcome. 30 patients with forearm fractures were treated with 3.5mm LCP open reduction and internal fixation. We assessed our findings and contrasted them with those of numerous other researches that used distinct treatment techniques. In our analysis we found that maximum patients were aged <25 (36%) with male predominance (60%). Majority of them had right side (60%) of injury which was due to self fall (77%). Most common site of fracture amongst both bones was middle 3rd of shaft with average duration of union around 14-15 weeks. Majority patients had no associated injury (80%) however few of them showed associated fracture of clavicle, humerus, tibia. Range of movement was full in 87% of cases and loss of pronation was seen in 3% of cases. Complications were not seen in 90% of cases and 2 pt's (6.7%) had superficial infection and 1 patient had PIN neuropathy which resolved spontaneously. Excellent functional outcome/ minimal disability was seen in 83% cases and 16.7% cases had good functional outcome/moderate disability. Mean DASH Score was found to be 14.4 with range of 8-32.

CONCLUSION:

To assess the functional outcome of fixation of forearm fractures with LCP's was the objective of current study. Forearm fractures are more common in people involved in outdoor activities. The majority of the

fractures were caused from car accidents or falls. Tourniquet helps reduce intra-operative bleeding but should be used cautiously and deflated before closure of incision. The 3.5mm LCP offers excellent results in all age groups whether old or young. LCP is more suitable than DCP for fixation in osteoporotic bones and gives better hold of reduction and fixation as it has better axial and angular stability due to locking mechanism of threaded locking head screw into screw slot. LCP gives more technical freedom to the surgeon as it has less limitations due to presence of combi holes which can fit both conventional screws as well as locking screws and therefore both compression and locking can be given by using single plate. LCP has lesser contact with bone as compared to other alternatives, therefore periosteal blood supply disruption is less which in turn helps reducing the incidences of non union. Unless surgery is contra-indicated or patient is unwilling, Open reduction and internal fixation with plates gives better post fracture functional outcome than conservative approach or intramedullary nailing. Each fracture fragment requires the fixing of a minimum of six cortices. We observed two cases of superficial infection and one case of neuropraxia which recovered. Majority patients had minimal disability and could perform daily tasks with no difficulty and had good recovery of range of motion. Arm pouch can be given to patient and used when necessary but limb elevation and early mobilization and maintaining hygiene of operated site are crucial for better outcome.

REFERENCES

1. Black WS, Becker JA. Common forearm fractures in adults. *American family physician*. 2009 Nov 15;80(10):1096-102.
2. Hughston JC. Fracture of the distal radial shaft: mistakes in management. *JBJS*. 1957 Apr 1;39(2):249-402.
3. Knight RA, Purvis GD. Fractures of both bones of the forearm in adults. *JBJS*. 1949 Oct 1;31(4):755-64.
4. Anderson LD, Bacastow DW. Treatment of forearm shaft fractures with compression plates. *ContempOrthop*. 1984;8(6):17.
5. Anderson LD, Sisk D, Tooms RE, Park 3rd WI. Compression-plate fixation in acute diaphyseal fractures of the radius and ulna. *JBJS*. 1975 Apr 1;57(3):287.
6. Burwell HN, Charnley AD. Treatment of forearm fractures in adults with particular reference to plate fixation. *The Journal of Bone & Joint Surgery British Volume*. 1964 Aug 1;46(3):404-25.
7. Leung F, Chow SP. Locking compression plate in the treatment of forearm fractures: a prospective study. *Journal of orthopaedic surgery*. 2006 Dec;14(3):291-4.
8. Hertel R, Pisan M, Lambert S, Ballmer FT. Plate osteosynthesis of diaphyseal fractures of the radius and ulna. *Injury*. 1996 Oct 1;27(8):545-8.
9. Perren SM. Backgrounds of the technology of internal fixators. *Injury*. 2003 Nov 1;34:1-3.