ORIGINAL RESEARCH PAPER

Volume-8 | Issue-2 | February-2019 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF LOCKING COMPRESSION PLATE FOR DISTAL RADIUS FRACTURES IN POSTMENOPAUSAL WOMEN

Orthopaedics

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ABSTRACT

One of the most common injuries in postmenopausal and older women is osteoporotic fracture of the distal radius.In majority of cases, satisfactory reduction by casting is lost, resulting in a poor functional outcome. The present study was undertaken to assess the functional outcome of operative management of distal radial fractures in postmenopausal women by volar locking compression plate and assessing the functional outcome using modified mayo wrist score. The study was a prospective study with a sample size of 15 in numbers, conducted in the department of orthopaedics, Coimbatore medical college and hospital during the period 2011-2013. In our series, we had 46.6% excellent, 39.9% good, 13.3%, fair and no poor results. Its concluded that volar locking plate is a safe and effective treatment for undisplaced and displaced unstable fractures of distal end of radius in postmenopausal women.

KEYWORDS

Distal Radius, locking compression plate, postmenopausal women, Osteoporosis, Functional outcome.

INTRODUCTION :

Distal radius fractures are common and produce a major orthopaedic injuries because of the advancing population age and increase in physical activity. Distal radius fractures constitute up to 15% of all extremity fractures. In females the incidence rises sharply. In the age of 40 it is approximately 36.8/10,000. It is estimated at the age 70 years to be 115/10,000. Distal radius is the most common osteoporotic fracture in elderly females it has been linked to estrogen withdrawal. These injuries are sustained overwhelmingly from low energy falls in an increasingly osteoporotic population. This group of patients expect increased functional demands since they are independent and active. Treating the growing number of these difficult injuries presents a particular challenge for orthopaedic surgeons. Locking compression plate (LCP) is a new generation plate and screw system for internal fixation of fractures.The LCP with combi holes have additional dynamic compression holes providing options for axial compression in addition to locking mechanism. The LCP can be used as a compression plate, a locked internal fixator, or a combination of both, depending on the situation . The use of locked volar plates for distal radius fractures is increasingly popular. Proposed advantages of locked volar plating include improved pull out strength even in osteoporotic bone and a volar surgical approach that avoids the need for an extensive dorsal dissection. The plate is positioned in a well padded area beneath pronator quadratus to avoid flexor tendon irritation and it is thought that patients tolerate volar wrist scars better than dorsal ones. Internal fixation has the advantage of allowing early mobilisation but its application is limited by the degree of comminution and osteoporosis. Loss of reduction and fixation is common due to poor purchase of screws on osteoporotic bone with the conventional plates, delay in postoperative mobilization results in stiffness of the joint which is an indicator of poor outcome. Screws used in distal radial fractures (3.5mm cortical screws) can also be used in addition to locking screws. Locking plates have advantages such as a decreased incidence of loss of reduction secondary to screw toggling and there is improved bone healing. A locking plate decreases the screw-plate toggle and motion at bone-screw interface and provides more rigid fixation. Rigid fixation is felt to be one key to the successful treatment of these fractures. But fixation in osteoporotic and comminuted fractures is difficult to obtain anatomical reduction and adequate purchase. So now with the evolution of locking compression plating for osteoporotic and peri-articular fractures especially for the comminuted intra–articular fractures restoring the anatomical congruity and providing stable fixation with resulting increased stability allowing for early mobilization .

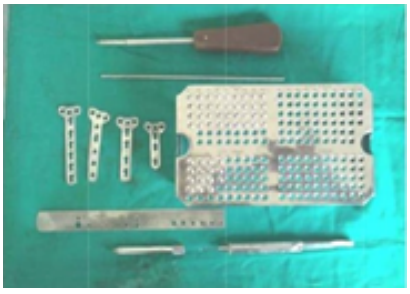
MATERIALS AND METHODS:

The study was conducted in the department of orthopaedics, Coimbatore medical college and hospital, Coimbatore. The number of patients in the study group was fifteen. The period of study was between July 2011- May 2013. All the postmenopausal women with distal fractures were investigated for our study. The age group was between 47 to 75 years. Minimal period of study was 6 months. Functional outcome was evaluated using modified mayo wrist score.

Inclusion criteria: 1. Fracture distal radius in the Postmenopausal women. 2. All the women in the study group was independent to take care of their activities of daily living. 3. Fractures occurring at or within 2cms of distal radius.

Exclusion criteria: 1. women in menstrual age group 2. Undisplaced distal radial fractures 3. Patients not willing for internal fixation. Patients admitted with distal radius fractures will be classified under AO and Gartland and Werley classfication. Detailed informed consent was obtained from all the persons in the study group. The procedure performed under supraclavicular block/axillary block. Our standard practice, preoperative prophylactic intravenous cefotaxime and bipolar diathermy for haemostasis.

INSTRUMENTS AND IMPLANTS USED: • Locking compression plates of varying length • 3.5mm LCP drill bit and sleeve system • Hand drill / power drill • Tap for 3.5mm cortical screws and 3.5mm depth gauge • Hexagonal screw driver for 3.5mm cortical screws and locking screw driver • General instruments like retractors, periosteal elevators, reduction clamps, bone levers etc. • Pneumatic tourniquet.



OPERATIVE PROCEDURE

Description: By volar Henry approach: The radial styloid fragment was approached initially using an incision centered longitudinally over the flexor carpi radialis tendon and then dissected between the flexor carpi radialis tendon and radial artery. The parona's space underneath the flexor tendons developed and the distal and radial borders of pronator quadratus were lifted and retracted ulnarly. Image intensifier used in theatre to assist the evaluation of fracture reduction and fixation. Patients with unstable fractures, the wrist immobilised in a below elbow splint for 2 weeks. Volar Henry approach 1.Skin incision(Fig.1) 2.Flexorcarpi radialis retracted medially and radial artery laterally to expose pronator quadrates (Fig. 2) 3.Pronator quadratus erased, elevated medially and distal radius exposed (Fig. 3)

4.Sleeve fixed in the threads of locking compression plate after temporary stabilizing of plate with K-wires(Fig. 4, Fig. 5) 5. Fracture reduced and LCP fixed (Fig. 6)


Fig 1


Fig 2


Fig 2


Fig 4


Fig 5


Fig 6

Per Operative Protocol: Unstable fractures were immobilized with plaster of paris support for a period of 2 weeks.

Post Operative Protocol: Post operative data will include time to full wrist movements, post operative complications such as median nerve compression symptoms, malunion, failure of fixation, wound infections and complex regional pain syndrome (CRPS). Patients will be allowed to start wrist movements at an average of three weeks post operatively. After the discharge, patient will be followed at regular intervals 6weeks , 6 months and 1year. Subjective and objective functional results were graded using modified mayo scoring system.

RESULTS

Fifteen cases of postmenopausal women with distal radius fractures were treated surgically by locking compression plate in Coimbatore medical college Hospital treated between July 2011 to may 2013. All cases were followed up periodically during the period July 2011 to may 2013. Average age in our study was 59.9 years. We evaluated our results and compared the functional outcome with various other studies.

Involved side : The right side (dominant wrist) was involved in 8 (53.4%) of the cases in our study series and 7 (46.6%)involved in left side(see table 1)

Table 1

Mode of injury	No. of cases	Percentage
RTA	4	26.6%
House hold fall	11	73.3%

Mode of injury : In our study 4 (26.6%) of the patients had road traffic accident and 11 (73.3%) had a house hold fall.(see Table 2)

Table 2

Side	No. of cases	Percentage
Right	8	53.4%
Left	7	46.6%

Type of fracture: Based on AO and Gartland and Werley classification.AO Type A2 (9), A3(1), B2 (2),B3 (1),C1 (1), C2 (1). Groups as per Gartland and Werley classification Group I (8),Group II (1),Group III (4),Group IV (2). Out of 15 cases,Extra articular fractures 10 (66.66%) and intra articular fracture 5 (33.34%). (see table 3)

Table 3

Type of fracture	No. of cases	
AO A2	9	15
AO A3	1	
AO B2	2	
AO B3	3	
AO C1	1	
AO C2	1	
Gartland I	8	15
Gartland II	1	
Gartland III	4	
Gartland IV	2	
Extra articular fractures	10	15
Intra articular fracture	5	

Associatedinjuries: In our study group were 8 out of 15 cases which include Ipsilateral fracture both bone leg 2 (13.3%), Head injury 1 (6.6%), Ipsilateral distal ulna fractures 5(33.3%).(see table 4) .

Table 4

Associated injuries	No of cases	Percentage
Ipsilateral fracture of both bone	2	13.3%
Head injury	1	6.6%
Ipsilateral distal Ulna fractures	5	33.3%

Surgical waiting period : Surgery was done between 1-5 days in 8 (53.3%) patients as an elective procedure. Surgery was delayed upto the 14th day in 7 (46.6%) because those patients had history of ischaemic heart disease, diabetes mellitus, associated head injury and surgery was done after clearance from respective specialities.(see table 5).

Table 5

Duration	No. of cases	Percentage
1-5 days	8	53.3%
6-15 days	7	46.6%

Fracture union data: The present study 12 (79.9%) patients had union within 2-3 months and 03(19.9%) patients had union in 3-4 months. There was no case of delayed union.(see table 6) .

Table 6

Time of union	No. of cases	Percentage
2- 3 months	12	79.9%
3-4 months	3	19.9%

Range of movements: In our study, 14 (93.2%) patients had dorsiflexion within the normal functional range, 14 (93.2%) had palmar flexion within the normal functional range, 13 (86.5%) had pronation within the normal functional range, 14 (93.2%) had supination within the normal functional range, 13 (86.5%) had radial deviation within the normal functional range and 12(79.9%) patients had ulnar deviation within the normal functional range. 13(86.5%) patients had grip strength more than 60% compared to the opposite side. 2(13.3%) had significant loss of grip strength. 3 (19.9%) patients had pain in the distal radioulnar joint. (see table 7)

Table 7

Movements (within normal functional range)	No. of cases	Percentage
Dorsi flexion	14	93.2%
Palmar flexion	14	93.2%
Pronation	13	86.5%
Supination	14	93.2%
Radial deviation	13	86.5%
Ulnar deviation	12	79.9%
Pain in distal radioulnar joint	03	19.9%
Grip strength	02	13.3%

Complications in our study: We encountered a complication rate of 20%, out of which 1 (6.6%) was due to infection (stich abscess) and another 1(6.6%) developed reduced range of movements and another 1(6.6%) developed complex regional pain syndrome (CRPS).(see table 8)

Table 8

Complications	No. of cases	percentage
Stich abscess	1	6.66%
Reduced range ofmovements	1	6.66%
CRPS	1	6.66%

Evaluation of results: The assessment of results were made using the modified mayo wrist score based on pain, activity, range of motion (supination & pronation)and hand grip strength. In our series, we had 46.6% excellent,39.9% good, 13.3%, fair and no poor results.(see table 9).

Table 9

Results	No. of cases	percentage
Excellent	7	46.6%
Good	6	39.3%
Fair	2	13.3%
Poor	0	0 %

DISCUSSION

A combination of an improved understanding of distal radial anatomy, patient demands and the new fixation devices have changed the management of distal radial fractures. Locking plates are preferred in osteoporotic and in multiple complex fractures. During the recent years, volar approach has become more popular. Use of locking compression plate was first published by Chan KW in HongKong, in 2003 for distal radius fractures. In India, the locking compression plate for distal radius fractures was published in 2007[7]. Our results are compared with various other studies, in various parameters like involved side, mode of injury, type of fractures etc.,

1) Involved side: In our study the right side (dominant wrist) was involved in 8 of the cases and left side involvement was 7. In Arora Rohit et al., 2007[18] right side involvement was 70 and left was 44, R.E. Anakwe et al.,2010[19] right side involvement was 15 and left side was 6, Sanjay Agarwala ,2012[26] right side involvement was 11 and left side was 14. All the above series had increased involvement of the right wrist in their series which was also the case in our series.

2) Mode of injury: In our study 26.6% (4 cases) of the patients had road traffic accident and 73.3%(11 cases) had a house hold fall. Arora Rohit et al 2007[18] road traffic accident was 40 and house hold fall was 60, R.E. Anakwe et al.,2010[19] road traffic accident was 14 and house hold fall was 7and Sanjay Agarwala ,2012[26] road traffic accident reported was 7 and house hold fall was 17. All the above series had increased house hold fall than road traffic accidents. In our series also house hold fall is the more common mode of injury.

3) Type of fracture: Based on AO classification, we had 9(59.4%) cases were A2(Extraarticular fracture of radius, simple & impacted) type fractures,1(6.6%) was A3(Extraarticular fracture of radius, multifragmentary), 2(13.2%) cases were B2(Partial articular fracture of radius, dorsal rim), 1(6.6%) case was B3(, Partial articular fracture of radius, volar rim), 1(6.6%) case was C1(Complete articular fracture of radius, articular and metaphyseal simple), and 1(6.6%)case was C2 (Complete articular of radius, articular simple and metaphyseal multifragmentary) fractures. Based on AO classification Arora Rohit et al., 2007[18] reported 39 cases by A2, 16 cases by A3, 24 cases by C1, 30 cases and by C2, 5 cases by C3. Based on AO classification R.E. Anakwe et al., 2010[19] reported 4 cases by C1, 8 cases by C2 and 9 cases by C3. Based on AO classification Sanjay Agarwala, 2012 [26] reported 1 case by A1, 5 cases by A2, 7 cases by A3, 7 cases by B2, 3 cases by B3, 1 case each by C2 and C3. In our series the majority of the cases were of A2(extraarticular) type.

4) Complications: We encounterd three complications (20%) in our study. One being stich abscess, another developed reduced range of movements and another developed CRPS. Arora Rohit et al., 2007[18] reported a complication rate of 57%.. R.E. Anakwe et al., 2010 [19] reported a complication rate of 4.8% and Sanjay Agarwala, 2012[26] reported a complication rate of 4%.

5) Results compared with other studies: In our series, we had 46.6% excellent, 39.9% good, 13.3%, fair and no poor results. Patients, who obtained excellent results, had normal regular activities or no pain. Range of motion was within the normal functional range. Radial length, volar tilt and articular step-off were within acceptable limits. They underwent earlier physiotherapy. Patients with good results had minimal residual deformities, pain and slight limitation. Patients with fair results, along with residual deformity, pain and limitation also had pain in the distal radio-ulnar joint and minimal complications. Few of their movements were less than that required for normal function. Arora Rohit et al., 2007 [18] had 31 excellent, 54 good , 23 fair and 6 poor results based on functional outcome. R.E. Anakwe et al., 2010 [19] system outcome was assessed using clinical examination grip strength measures, radiographs and PRWE (patient related wrist evaluation) scoring. In his series 95% patient very high level of satisfaction, good functional outcome and increased grip strength. Sanjay Agarwala 2012 [26] used mayo modified wrist score for interpreting results, which showed 100% of excellent results after one year followup..

CONCLUSION

In India, osteoporosis is an epidemic problem. Hence the women in the postmenopausal age will have fractures due to trivial injury. A fall on a outstretched hand is the common mode of injury causing distal radius fractures among postmenopausal women. Distal radial fractures which occur due to road traffic acidents (high energy trauma) are mostly intraarticular, displaced and unstable Gartland and Werley group II and III and AO type B2, B3, C1 and C3. The results are evidence that locked plates are good implant in the treatment of intra-articular unstable fractures of distal radius. It allows effective anatomic realignment and early wrist mobilization. It is biomechanically superior due to closer joint interface placement and better screwing capability in different orders. A successful anatomic alignment was made possible regardless of the direction of fracture angulation with volar locking plate. 90% the patients went back to their daily activities with good recovery. Use of locked compression plates in distal radius fractures provide good to excellent results and are effective in the correction and maintenance of distal radius anatomy. By using these plates, joint motions and daily functioning is recovered in a shorter time. Hence locking compression plate is a useful implant in stabilizing in osteoporotic distal radius fractures in postmenopausal women. Our study is the first study of distal radius among postmenopausal women in India. Our study is a smaller one in terms of number of cases. A large multicentric study is needed to confirm our results.

DECLARATION:
Funding: None.
Conflict of interest: None declared.
Ethical approval: Obtained .

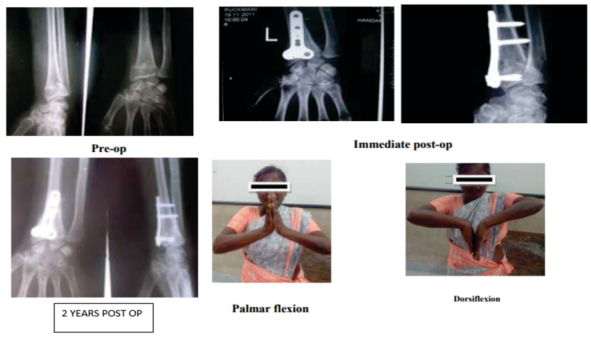
CASE : 1 H/O House hold Fall and injured her left wrist

RANGE OF MOVEMENTS - 2 YEARS FOLLOW UP

CASE :2 H/O House hold Fall and injured her left wrist

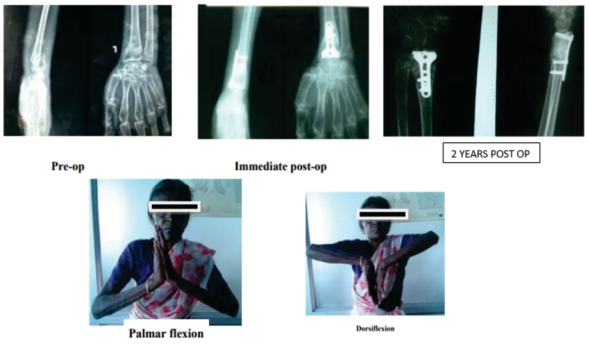
RANGE OF MOVEMENTS - 2 YEARS FOLLOW UP

CASE : 3 H/O House hold Fall and injured her left wrist.



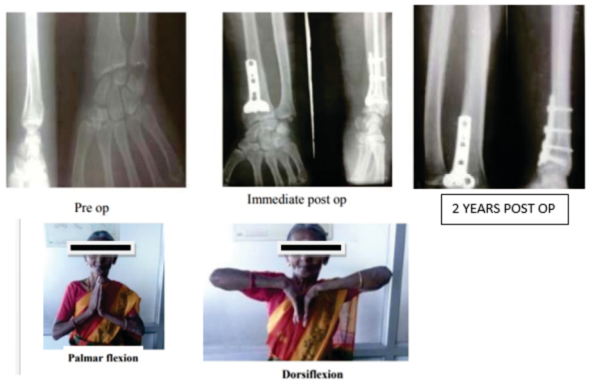
RANGE OF MOVEMENTS - 2 YEARS FOLLOW UP

CASE 4 : H/O House hold Fall and injured her left wrist.



RANGE OF MOVEMENTS - 2 YEARS FOLLOW UP

CASE : 5 H/O House hold Fall and injured her right wrist



RANGE OF MOVEMENTS - 2 YEARS FOLLOW UP

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