

Comparative Study on Functional and Radiological Outcome of Intraarticular Fracture Distal End of Radius Treated With External Fixator Vs Internal Fixation With Plating

DR. VARUN MAURYA.R¹, DR.S. UDHAYAPRAKASH²,
DR.MOHAMMED ATIF³

¹ (Senior resident, Department of orthopaedics, Annapoorana medical college and hospital, Salem)² (Senior resident, Department of orthopaedics, Annapoorana medical college and hospital, Salem)³ (Senior resident, Department of orthopaedics, Annapoorana medical college and hospital, Salem)

Abstract:

INTRODUCTION: Fracture distal end of radius contribute to about 16% of fractures seen on orthopedics casualty with bimodal age distribution. The cause of fracture for distal end of radius in elderly is trivial trauma because of osteoporotic bone and in the young cause of high velocity injuries. **Aim:** To analyze and compare the functional and radiological outcome of fracture intra articular distal radius treated with external fixation versus open reduction and internal fixation with volar locking compression plate. **Materials and methods:** This comparative study was conducted in Govt. Stanley Medical College from December 2019 to December 2020. About 40 patients with intraarticular distal radius fractures were selected and randomly divided into 2 groups. One treated with external fixator and other with plating. **Results:** After proper analysis and doing statistical comparison we got p- value of 0.701 for functional outcome and 0.560 for anatomical outcome which is insignificant. (significance is <0.05).

Conclusion: We conclude that there are no major differences in the functional outcome of both the techniques in treating comminuted intra articular distal radius fractures. Though there is no statistical difference in the functional outcome, volar locking compression plate is better in certain radiological parameters like volar tilt, radial inclination and radial length and also successful in achieving patient's satisfaction.

Keywords: Intraarticular distal radius fractures, locking compression plate, ligamentotaxis, volar approach to distal end of radius.

Date of Submission: 20-06-2023

Date of Acceptance: 02-07-2023

I. INTRODUCTION

Fracture distal end of radius contribute to about 16% of fractures seen on orthopedics casualty with bimodal age distribution. The cause of fracture for distal end of radius in elderly is trivial trauma because of osteoporotic bone and in the young cause of high velocity injuries¹.

Abraham Colles (1814)² described that there is good outcome for fracture distal end of radius, from his statement —Once the nature of injury is ascertained, it becomes very easy to explain the different phenomena attendant on it and come to a conclusion on method of treatment which will prove completely successful. Even as 1mm of articular incongruity will deprive the functional outcome³ as reported by Fernandez and Tumble. Our aim of the study is to compare the functional and radiological outcome of unstable distal radius fractures treated with volar locking compression plate and closed reduction external fixator^{4,5,6,7}.

II. AIM OF THE STUDY

To analyze and compare the functional and radiological outcome of fracture distal end of radius treated with closed reduction with external fixator versus open reduction and internal fixation with volar locking compression plate.

III. MATERIALS AND METHODS

Study design: Comparative study.

Study subjects: 40 cases will be studied.

Study setting: Department of Orthopaedic Surgery Govt. Stanley Medical College Hospital from December

2019 to December 2020.

Inclusion Criteria:

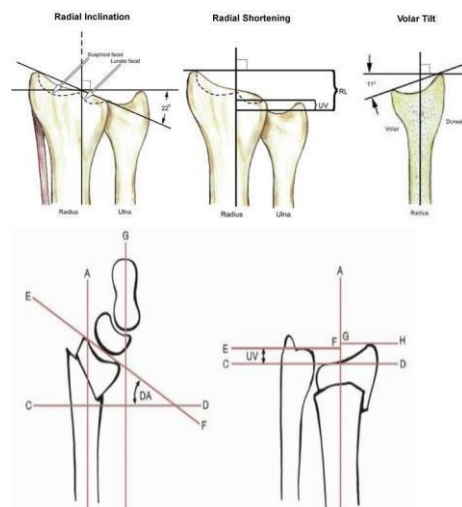
- Patients with the age group >18 years
- Patients with distal end radius fractures with intraarticular extension after RTA or slip or fall on outstretched hand or assault
- Closed fractures
- Comminuted fractures with or without bone loss

Exclusion Criteria:

- Open/ compound fractures
- Patients associated with head injuries and who are comatose
- Patient associated with ulnar diaphyseal fractures or carpal bone fractures
- Patient associated with neurovascular injuries

Study Procedure: A total of 40 patients will be taken for study as per inclusion criteria. Patients with intraarticular distal end of radius fractures were randomly selected into two different groups. One group was treated with fixed angled locking compression plate by volar approach and other by the application External fixator⁸ with or without K-wire augmentation. Careful evaluation of the features of impending or established compartment syndrome was done for ruling out those fractures from the study. Specialist opinion to rule out other injuries was got. All eligible patients fulfilling our inclusion criteria were subjected to further radiological evaluation.

X-rays and CT scans were used for the radiological assessment of the post-operative fixation of fractures. Standard AP and lateral views were taken to assess fracture pattern to assess the parameters like radial height, palmar tilt, Radial inclination, displacement and involvement of radioulnar and distal carpal joints.



DORSAL ANGLE AND CARPALALIGNMENT

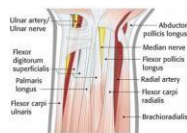
APPROACHES OF DISTAL RADIUS

1) *The Modified Henry approach to the radius⁹*

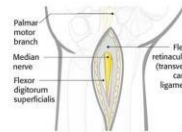


**PLANE OF
APPROACH
BETWEEN FCR AND
RADIAL ARTERY**

2) *Extended carpal tunnel approach¹⁰*



This approach uses plane between palmaris longus and FDS medially and FCR laterally.



Superficial surgical dissection involves division of the deep fascia and medial retraction of the palmaris longus muscle.

MODALITIES OF DISTAL RADIUSFIXATION

I) Volar LCP Fixation



II) Bridging External Fixator





POSTOPERATIVE PROTOCOL:

Patients were advised for gentle active finger movements with limb elevation for 3 days. The distal neuro vascularity was assessed regularly, IV antibiotics was given for 3 days followed by which it was converted to oral antibiotics till the suture removal. Patients were discharged on the 4- 5th postoperative day and the suture removal done on the 11th post-operative day. Patient was advised about the weekly visit, the pin site cleaning and care and physiotherapy was done. During each visit proper pin site care, loosening of clamps or pins and fracture healing were checked by taking fresh Xray. The external fixator was removed at 6-8 weeks after clinically and radiographically assessment of the fracture healing. Follow up X rays were done at recommended hospital visits on immediate post-operative 6 weeks, 3 months, 6 months and 9 months interval.

POSTOP RADIOLOGICAL EVALUATION:

The Standard anteroposterior and lateral views were taken to assess fracture pattern and to assess the parameters like radial height, radial inclination, palmar tilt and residual deformity¹¹.

Cases Illustrations: CASE 1: VOLAR LOCKING COMPRESSION PLATE



PRE-OP



AND

IMMEDIATE POST OP
12 WEEKS POST-OP



9 MONTHS AND 12 MONTHS POST OPERATIVE OF MOVEMENTS



CASE:1 EXTERNAL FIXATOR



PRE-OP

IMMEDIATE POST-OP

6 WEEKS POST OP AND IMPLANT EXIT



RANGE OF MOVEMENTS:



III. RESULTS

In our comparative study about 40 patients were included in the study, 20 in each group of which one patient from exfix group lost follow-up.

In our study, around 35% of patients are due to RTA and nearly 65% of patients had self-fall. The exact incidence and demography of distal end radius intra-articular fractures have not been cited yet in the literature. In our study 32.5% of fractures are of AO type B and 67.5% fractures AO type C distal radius fractures¹².

The average mean age of our study was 47 years.

Our study's male predisposition is 62.5%. The higher incidence among the males could be attributed to a highly active work group with a higher involvement in high energy trauma and high velocity injuries of RTA.

Our study the non-dominant Left-side predisposition was 37.5%. The frequency of trauma for dominant hand was more with 90% when compared to non-dominant hand which was 10%¹³.

Total of 12 patients were diabetic, 2 patients had hypothyroidism, 9 patients had hypertension and 2 patients had COPD.

Our study the RTA trauma predisposition is 35% and self-fall with predisposition of 65%. Nearly 60% of study population underwent surgery after 5 days of injury.

In our study both the exfix and VLCP group had satisfactory outcome. However, the VLCP had slightly better radiological outcome¹⁴.

However the functional outcome in terms of range of movements was better with VLCP group.

In our study the VLCP group had slightly better functional outcome when compared to EXFIX group.

None of the patients in the present in the study population presented with iatrogenic neurovascular injury or an implant breakage during the period of follow-up period.

TABLE 1: Comparison of age groups with VLCP and EXFIX (N=40)

Age group	Treatment		Total
	VLCP	EXFIX	
<30	2 (10%)	1 (5%)	3 (7.5%)
31-40	4 (20%)	8 (40%)	12 (30%)
41-50	6 (30%)	7 (35%)	13 (32.5%)
51-60	5 (25%)	3 (15%)	8 (20%)
>60	3 (15%)	1 (5%)	4 (10%)
Total	20 (100%)	20 (100%)	40 (100%)

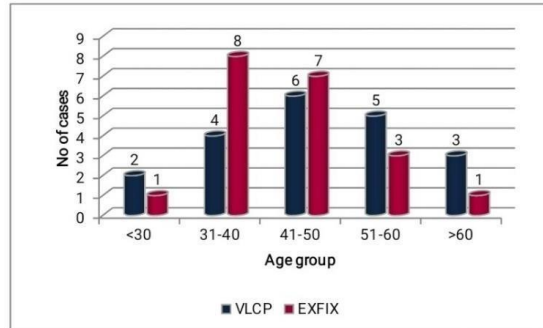


TABLE 2: Comparison of gender with VLCP and EXFIX groups (N=40)

Gender	Treatment		Total
	VLCP	EXFIX	
Male	13 (65%)	12 (60%)	25 (62.5%)
Female	7 (35%)	8 (40%)	15 (37.5%)
Total	20 (100%)	20 (100%)	40 (100%)

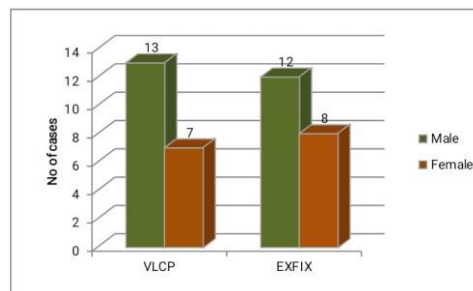


TABLE 3: Comparison of mode of injury in VLCP and EXFIX group (N=40)

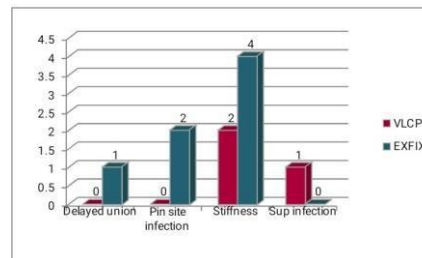
Mode of injury	Treatment		Total
	VLCP	EXFIX	
SF	14 (70%)	12 (60%)	26 (65%)
RTA	6 (30%)	8 (40%)	14 (35%)
Total	20 (100%)	20 (100%)	40 (100%)

TABLE 4: Comparison of mean functional outcome with VLCP and EXFIX group (N=40)

Functional Outcome	Treatment		Unpaired t test P value
	VLCP (N=20)	EXFIX (N=19)	
Palm	74 ± 13.14	71.58 ± 10.15	0.525
Dors flx	72 ± 11.52	68.42 ± 8.98	0.285
Sup	73.00 ± 15.93	72.63 ± 9.34	0.930
Prontn	71 ± 12.091	70 ± 8.82	0.769

TABLE 5: Comparison of complication with VLCP and EXFIX group

Complication	Treatment		Total	Chi square	P value
	VLCP	EXFIX			
Delayed union	0 (0%)	1 (14.3%)	1 (10%)	3.65	0.302
Pin site infection	0 (0%)	2 (28.6%)	2 (20%)		
Stiffness	2 (66.7%)	4 (57.1%)	6 (60%)		
Sup infection	1 (33.3%)	0 (0%)	1 (10%)		
Total	3 (100%)	7 (100%)	10 (100%)		



IV. CONCLUSION

From our study, we conclude that Early Primary fixation of the distal end radius fractures with volar LCP is very essential for good functional outcome as to avoid complication of prolonged immobilization and stiffness.

With the above results, the fracture fixation with volar plate and screw system in the management of distal radius articular fractures, especially in type C (Complete intra articular fractures) is a superior method to maintain the reduction till union and prevent the collapse of the fracture fragments, even in grossly comminuted, unstable and osteoporotic bones; as compared with external fixator augmented with K-wires.

Ligamentotaxis by external fixation provided favorable results in younger age group and in partial intra-articular type of distal radius fractures and requires at least 4 cortical purchases on each side for effective stability¹⁵.

We conclude finally that there are no major differences in the functional outcome of both the techniques in terms of pain, range of movements with no statistical difference in the functional outcome. However, Volar locking compression plate plays a better role than the external fixator in radiological parameters like volar tilt, radial inclination and radial length and also successful in achieving patient's satisfaction with limited number of minor complications and early return to work.

BIBLIOGRAPHY

- [1]. Owen R. A, Melton L. J, Johnson K. A, Ilstrup D. M, Riggs B. L. Incidence of colliers' fracture in a north American community. Am J Public Health, 72:605- 607, 1982.
- [2]. Winner S. J, Morgan C. A, Evans J. G. Perimenopausal risk of falling and incidence of distal forearm fracture. BMJ, 298:1486-1488, 1989.
- [3]. Young BT, Rayan GM. Outcome following nonoperative treatment of displaced distal radius fractures in low-demand patients older than 60 years. J Hand Surg [Am] 2000 Jan;25(1):19-28.
- [4]. Garcia-Elias M, Folger MA. The management of wrist injuries: an international perspective. Injury 2006 Nov;37(11) :1049-56. 80.
- [5]. Shin EK, Jupiter JB. Current concepts in the management of distal radius fractures. Acta Chir Orthop Traumatol Cech 2007 Aug;74
- [6]. Keast-Butler O, Schemitsch EH. Biology versus mechanics in the treatment of distal radial fractures. J Orthop Trauma 2008 Sep;22(8 Suppl):S91- S95.
- [7]. Fernandez DL. Should anatomic reduction be pursued in distal radial fractures? J Hand Surg [Br] 2000 Dec;25(6):523-7.
- [8]. Agee JM: External Fixation: Technical advances based upon multiple planar ligamentotaxis. Orthop Clin North Am 1993; 24:265- 274

- [9]. Fernandez DL. Fractures of the distal radius: operative treatment. Instr Course Lect 1993;42:73-88.
- [10]. Dennison DG. Open reduction and internal locked fixation of unstable distal ulna fractures with concomitant distal radius fracture. Journal of Hand Surgery. 2007 Jul- Aug;32(6):801-5.
- [11]. James A. Shaw, Anthony Bruno, Emmanuel M. Paul. Ulnar styloid fixation in the treatment of posttraumatic instability of the radioulnar joint: A biomechanical study with clinical correlation. Journal of Hand Surgery. Sep 1990;15(5): 712- 720
- [12]. Haugstvedt JR, Berger RA, Nakamura T, Neale P, Berglund L, An KN. Relative contributions of the ulnar attachments of the triangular fibrocartilage complex to the dynamic stability of the distal radioulnar joint. Journal of Hand Surgery 2000 Mar;31(3):445-51.
- [13]. Weber ER: A rationale approach for the recognition and the treatment of Colles' fracture. Hand Clin 1987;3:3 – 21.
- [14]. James A. Shaw, Anthony Bruno, Emmanuel M. Paul. Ulnar styloid fixation in the treatment of posttraumatic instability of the radioulnar joint: A biomechanical study with clinical correlation. Journal of Hand Surgery. Sep 1990;15(5): 712- 720
- [15]. Ring D, McCarty LP, Campbell D, Jupiter JB. Condylar blade plate fixation of unstable fractures of the distal ulna associated with fracture of the distal radius. J Hand Surg Am. 2004 Jan;29(1):103-9.