



Comparison of Functional Outcome of Distal End Radius Articular Fractures Treated with Below Elbow Cast and Volar Plating in Patients More Than 60 Years Old: A Prospective Comparative Study

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Background: Distal radius fractures are among the most common osteoporotic fractures encountered in elderly individuals. Management of intra-articular distal radius fractures in patients older than 60 years remains controversial. Conservative management using below elbow cast immobilization has traditionally been preferred for elderly low-demand patients, whereas advances in fixation techniques have popularized volar locking plates for achieving anatomical reduction and early mobilization.

Methods: This prospective comparative study was conducted in the Department of Orthopaedics at Government Medical College, Patiala. Sixty patients aged more than 60 years with intra-articular distal radius fractures were included. Patients were divided into two groups: Group A (n=30), treated with below elbow cast immobilization following closed reduction, and Group B (n=30), treated with open reduction and internal fixation using volar locking plates. Functional outcome was assessed using Disabilities of Arm, Shoulder and Hand (DASH) score, Patient Rated Wrist Evaluation (PRWE) score, grip strength, wrist range of motion, and radiological parameters at regular follow-up.

Results: Patients treated with volar plating demonstrated significantly superior DASH and PRWE scores compared to the cast group. Better maintenance of radial height, radial inclination, and volar tilt was observed in the plating group. Grip strength and wrist range of motion improved significantly in the plating group. Malunion and secondary displacement were more common in the cast group.

Conclusions: Volar locking plate fixation provides superior functional recovery, improved radiological alignment, and earlier mobilization compared with below elbow cast treatment in elderly patients with intra-articular distal radius fractures.

Keywords: Distal Radius Fracture, Colle's Fracture, Osteoporosis, Radius Fracture, Volar Locking Plate

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Introduction

Distal radius fractures constitute one of the most common fractures encountered in orthopedic practice and account for nearly one-sixth of all fractures treated in emergency departments.(1,2,10) The incidence of distal radius fractures increases significantly with advancing age due to osteoporosis, reduced bone mineral density, and increased fall risk.(10,20) Elderly women are particularly predisposed due to postmenopausal osteoporosis.(10)

Historically, distal radius fractures in elderly patients have been managed conservatively using closed reduction and cast immobilization because elderly individuals were considered low-demand patients with limited functional requirements.(19,27) However, conservative treatment is frequently associated with secondary loss of reduction, malunion, residual deformity, stiffness, and prolonged immobilization.(14,15,19)

The introduction of volar locking plates has revolutionized the management of distal radius fractures, especially unstable intra-articular fractures.(8,9,16) Volar plating provides stable fixation, allows early wrist mobilization, restores anatomy, and minimizes secondary collapse even in osteoporotic bone.(8,9,16) Several randomized controlled trials and systematic reviews have compared conservative treatment and volar plating in elderly patients, with most studies showing superior radiological outcomes and improved short-term function with operative treatment.(4,5,6,7,22,24)

Despite improved radiological outcomes, controversy still exists regarding whether better radiological alignment translates into significantly improved long-term function in elderly individuals.(4,24,29) Therefore, this study was conducted to compare the functional outcome of intra-articular distal radius fractures treated with below elbow cast immobilization and volar locking plate fixation in patients older than 60 years at Government Medical College, Patiala.

Aims and Objectives

Primary Objective

To compare the functional outcome of distal end radius intra-articular fractures treated with below elbow cast and volar plating in patients older than 60 years.(4,6,7)

Secondary Objectives

To compare radiological parameters between the two groups.(8,16)

To assess grip strength and range of motion.(5,7)

To evaluate complications associated with both treatment modalities.(14,26)

Materials and Methods

This prospective comparative study was conducted in the Department of Orthopaedics at Government Medical College, Patiala over a period of 18 months after obtaining institutional ethical committee approval. A total of 60 patients with distal radius intra-articular fractures were enrolled in the study.

Patients were divided into two groups consisting of 30 patients each.

Inclusion Criteria

- Patients aged more than 60 years.(10,20)
- Closed intra-articular distal radius fractures.(13)
- AO type B and C fractures.(13)
- Patients willing to participate and comply with follow-up.

Exclusion Criteria

- Open fractures.
- Associated neurovascular injury.
- Pathological fractures.
- Previous wrist deformity or surgery.
- Polytrauma patients.

After detailed clinical examination and radiological evaluation, patients were assigned to treatment groups. Group A underwent closed reduction under hematoma block or sedation followed by below elbow cast immobilization. Adequacy of reduction was confirmed on post-reduction radiographs.(19)

Group B underwent open reduction and internal fixation using a volar locking plate through the modified Henry approach.(8) Postoperative rehabilitation included early finger mobilization followed by wrist mobilization after wound healing.(8,16)

Patients were followed at 2 weeks, 6 weeks, 3 months, and 6 months. Functional outcome was assessed using DASH and PRWE scoring systems.(12,17)

Grip strength was measured using a dynamometer and compared with contralateral side. Wrist flexion, extension, pronation, supination, radial deviation, & ulnar deviation were measured using a goniometer.

Radiological parameters assessed included:

- Radial height
- Radial inclination
- Volar tilt
- Articular step-off (13)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Quantitative variables were expressed as mean + standard deviation. Student's t-test and chi-square test were used for comparison. A p-value <0.05 was considered statistically significant.

Results

The mean age of patients in Group A was 66.8 + 4.9 years and in Group B was 67.3 + 5.1 years. Females predominated in both groups due to osteoporosis-related fractures.(10,20) Fall on outstretched hand was the most common mechanism of injury.(20)

At presentation, both groups demonstrated poor functional scores. At six months follow-up, Group B patients treated with volar plating showed significantly superior functional outcomes compared with Group A.(4,6,7)

The mean DASH score at six months was 18.6 + 5.2 in the plating group compared with 36.8 + 7.9 in the cast group.(4,6,7) Similarly, PRWE scores were significantly lower in the plating group.(6)

Wrist range of motion improved significantly in the plating group:(5,7)

Flexion: 71° versus 55°
Extension: 69° versus 52°
Supination: 82° versus 70°

Grip strength recovered to 86% of the contralateral side in the plating group compared with 68% in the cast group.(5,7)

Radiologically, volar plating maintained better radial height, radial inclination, and volar tilt.(4,8,16) Secondary displacement and malunion were common in the cast group. (14,15)

Complications in Group A included malunion, wrist stiffness, and residual deformity. (14,26) Group B showed minimal complications, including transient median nerve symptoms and superficial wound infection.(16)

Discussion

The present study demonstrated that volar locking plate fixation provides superior functional and radiological outcomes compared with below elbow cast immobilization in elderly patients with intra-articular distal radius fractures. (4,6,7,22)

Martinez-Mendez et al. demonstrated significantly improved DASH and PRWE scores with volar plating in elderly patients. (6) Similarly, Arora et al. found better radiological restoration and early functional recovery in patients managed operatively. (4)

Volar locking plates provide angular stability and maintain reduction even in osteoporotic bone. (8,9,16) This permits early mobilization, reduces stiffness, and improves grip strength. (12) Conservative treatment, although less invasive, frequently results in collapse of fracture fragments due to osteoporosis and inability to maintain reduction. (14,15,19)

The present study found superior wrist flexion, extension, and supination in the plating group, which correlates with findings by Sharma et al. and Stephens et al.(5,7) Meta-analyses have consistently demonstrated better early functional outcomes with volar plating, although long-term differences may diminish.(22,24)

The study findings support the increasing trend toward operative fixation in active elderly individuals with unstable distal radius fractures.(30) Restoration of anatomy and early rehabilitation appear to improve independence and quality of life in elderly patients. (12,17)

The limitations of the study include relatively small sample size, single-center design, and short-term follow-up. Long-term studies evaluating development of arthritis and sustained functional outcomes are required.(29)

COMPARATIVE REVIEW OF LITERATURE

Study comparisons from previously published literature demonstrated similar findings favoring volar plating over conservative treatment in elderly patients.(4,5,6,7,22,24)

Multiple randomized controlled trials have shown improved DASH scores, better maintenance of reduction, and faster return to activities with operative fixation. (4,6,7)

Studies by Arora et al., Martinez-Mendez et al., and Ju et al. concluded that volar locking plates provide significantly better short-term outcomes and improved radiological restoration compared with cast immobilization. (4,6,22)

Conclusion

Volar locking plate fixation provides superior functional outcome, improved grip strength, earlier mobilization, and better radiological restoration compared with below elbow cast immobilization in elderly patients with intra-articular distal radius fractures.(4,6,7,22)

Operative fixation should be considered in active elderly individuals with unstable distal radius fractures to optimize recovery and maintain anatomical alignment.(8,16)

LIMITATIONS

The present study had certain limitations.

The sample size was relatively small and represented a single tertiary care center.

Follow-up duration was limited to six months and therefore long-term complications such as post-traumatic arthritis could not be assessed. (29)

Patient activity levels and rehabilitation compliance may also have influenced functional outcomes.

ETHICAL CONSIDERATIONS

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki and was approved by Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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References

- Colles A. On the fracture of the carpal extremity of the radius [1814]. *Injury*. 1970, 2(1): 48-50. [Article] [DOI:10.1016/s0020-1383(70)80114-0] [PubMed] [Google Scholar]
- Jupiter J. Fractures of the distal end of the radius.. *The Journal of Bone & Joint Surgery*. 1991, 73(3): 461-469. [Article] [DOI:10.2106/00004623-199173030-00019] [PubMed] [Google Scholar]
- Chung K, Shauver M, Birkmeyer J. Trends in the United States in the Treatment of Distal Radial Fractures in the Elderly. *The Journal of Bone and Joint Surgery-American Volume*. 2009, 91(8): 1868-1873. [Article] [DOI:10.2106/jbjs.h.01297] [PubMed] [Google Scholar]
- Arora R, Gabl M, Gschwentner M, Deml C, Krappinger D, Lutz M. A Comparative Study of Clinical and Radiologic Outcomes of Unstable Colles Type Distal Radius Fractures in Patients Older Than 70 Years: Nonoperative Treatment Versus Volar Locking Plating. *Journal of Orthopaedic Trauma*. 2009, 23(4): 237-242. [Article] [DOI:10.1097/bot.0b013e31819b24e9] [PubMed] [Google Scholar]
- Sharma H, Khare G, Singh S, Ramaswamy A, Kumaraswamy V, Singh A. Outcomes and complications of fractures of distal radius (AO type B and C): volar plating versus nonoperative treatment. *Journal of Orthopaedic Science*. 2014, 19(4): 537-544. [Article] [DOI:10.1007/s00776-014-0560-0] [PubMed] [Google Scholar]
- Martinez-Mendez D, Lizaur-Utrilla A, de-Juan-Herrero J. Intra-articular distal radius fractures in elderly patients: a randomized prospective study of casting versus volar plating. *Journal of Hand Surgery (European Volume)*. 2017, 43(2): 142-147. [Article] [DOI:10.1177/1753193417727139] [PubMed] [Google Scholar]
- Stephens A, Presson A, McFarland M, Zhang C, Sirniö K, Mulders M, Schep N, Tyser A, Kazmers N. Volar Locked Plating Versus Closed Reduction and Casting for Acute, Displaced Distal Radial Fractures in the Elderly. *Journal of Bone and Joint Surgery*. 2020, 102(14): 1280-1288. [Article] [DOI:10.2106/jbjs.19.01442] [PubMed] [Google Scholar]

8. Orbay J. THE TREATMENT OF UNSTABLE DISTAL RADIUS FRACTURES WITH VOLAR FIXATION. *Hand Surgery*. 2000, 05(02): 103-112. [Article] [DOI:10.1142/s0218810400000223] [PubMed] [Google Scholar]
9. Drobetz H, Kutscha-Lissberg E. Osteosynthesis of distal radial fractures with a volar locking screw plate system. *International Orthopaedics*. 2003, 27(1): 1-6. [Article] [DOI:10.1007/s00264-002-0393-x] [PubMed] [Google Scholar]
10. Nellans K, Kowalski E, Chung K. The Epidemiology of Distal Radius Fractures. *Hand Clinics*. 2012, 28(2): 113-125. [Article] [DOI:10.1016/j.hcl.2012.02.001] [PubMed] [Google Scholar]
11. Lichtman D, Bindra R, Boyer M, Putnam M, Ring D, Slutsky D, Taras J, Watters W, Goldberg M, Keith M, Turkelson C, Wies J, Haralson R, Boyer K, Hitchcock K, Raymond L. Treatment of Distal Radius Fractures. *American Academy of Orthopaedic Surgeon*. 2010, 18(3): 180-189. [Article] [DOI:10.5435/00124635-201003000-00007] [PubMed] [Google Scholar]
12. Rozental TD, Blazar PE. Functional outcome after volar plating. *J Hand Surg Am*. 2006. [Crossref] [PubMed] [Google Scholar]
13. Knirk J, Jupiter J. Intra-articular fractures of the distal end of the radius in young adults.. *The Journal of Bone & Joint Surgery*. 1986, 68(5): 647-659. [Article] [DOI:10.2106/00004623-198668050-00003] [PubMed] [Google Scholar]
14. MACKENNEY P, MCQUEEN M, ELTON R. PREDICTION OF INSTABILITY IN DISTAL RADIAL FRACTURES. *The Journal of Bone and Joint Surgery-American Volume*. 2006, 88(9): 1944-1951. [Article] [DOI:10.2106/00004623-200609000-00006] [PubMed] [Google Scholar]
15. Lafontaine M, Hardy D, Delince P. Stability assessment of distal radius fractures. *Injury*. 1989, 20(4): 208-210. [Article] [DOI:10.1016/0020-1383(89)90113-7] [PubMed] [Google Scholar]
16. Wei D, Raizman N, Bottino C, Jobin C, Strauch R, Rosenwasser M. Unstable Distal Radial Fractures Treated with External Fixation, a Radial Column Plate, or a Volar Plate. *The Journal of Bone and Joint Surgery-American Volume*. 2009, 91(7): 1568-1577. [Article] [DOI:10.2106/jbjs.h.00722] [PubMed] [Google Scholar]
17. Wilcke M, Abbaszadegan H, Adolphson P. Patient-perceived Outcome after Displaced Distal Radius Fractures. *Journal of Hand Therapy*. 2007, 20(4): 290-299. [Article] [DOI:10.1197/j.jht.2007.06.001] [PubMed] [Google Scholar]
18. Diaz-Garcia R, Chung K. Common Myths and Evidence in the Management of Distal Radius Fractures. *Hand Clinics*. 2012, 28(2): 127-133. [Article] [DOI:10.1016/j.hcl.2012.02.005] [PubMed] [Google Scholar]
19. Handoll H, Madhok R. Surgical interventions for treating distal radial fractures in adults. *The Cochrane Database of Systematic Reviews*. 2003. [Article] [DOI:10.1002/14651858.cd003209] [PubMed] [Google Scholar]
20. Koval K, Harrast J, Anglen J, Weinstein J. Fractures of the Distal Part of the Radius. *The Journal of Bone and Joint Surgery-American Volume*. 2008, 90(9): 1855-1861. [Article] [DOI:10.2106/jbjs.g.01569] [PubMed] [Google Scholar]
21. Ezzat A, Baliga S, Carnegie C, Johnstone A. Volar locking plate fixation for distal radius fractures: Does age affect outcome?. *Journal of Orthopaedics*. 2016, 13(2): 76-80. [Article] [DOI:10.1016/j.jor.2016.01.001] [PubMed] [Google Scholar]
22. Ju J, Jin G, Li G, Hu H, Hou R. Comparison of treatment outcomes between nonsurgical and surgical treatment of distal radius fracture in elderly: a systematic review and meta-analysis. *Langenbeck's Archives of Surgery*. 2015, 400(7): 767-779. [Article] [DOI:10.1007/s00423-015-1324-9] [PubMed] [Google Scholar]
23. Ma C, Deng Q, Pu H, Cheng X, Kan Y, Yang J, Yusufu A, Cao L. External fixation is more suitable for intra-articular fractures of the distal radius in elderly patients. *Bone Research*. 2016, 4(1). [Article] [DOI:10.1038/boneres.2016.17] [PubMed] [Google Scholar]
24. Bartl C, Stengel D, Bruckner T, Gebhard F. The Treatment of Displaced Intra-articular Distal Radius Fractures in Elderly Patients. *Deutsches Ärzteblatt international*. 2014. [Article] [DOI:10.3238/arztebl.2014.0779] [PubMed] [Google Scholar]

25. Costa M, Achten J, Parsons N, Rangan A, Griffin D, Tubeuf S, Lamb S, on behalf of the DRAFFT Study Group. Percutaneous fixation with Kirschner wires versus volar locking plate fixation in adults with dorsally displaced fracture of distal radius: randomised controlled trial. *BMJ*. 2014, 349(aug05 2): g4807-g4807. [Article] [DOI:10.1136/bmj.g4807] [PubMed] [Google Scholar]

26. Grewal R, MacDermid JC. Adverse outcomes in distal radius fractures. *J Hand Surg Am*. 2007. [Crossref] [PubMed] [Google Scholar]

27. Cooney W. Management of Colles' Fractures. *Journal of Hand Surgery*. 1989, 14(2): 137-139. [Article] [DOI:10.1016/0266-7681_89_90112-5] [PubMed] [Google Scholar]

28. Ahmed O, Balakrishnan P, Perumal R, Agraharam D, Velmurugesan P, Jayaramaraju D, Rajasekaran S. A prospective randomized control trial comparing outcomes of casting, pinning, and plating for distal end of radius fractures (AO type A2, A3, C1, or C2) in the elderly population. *European Journal of Orthopaedic Surgery & Traumatology*. 2024, 34(5): 2473-2482. [Article] [DOI:10.1007/s00590-024-03949-z] [PubMed] [Google Scholar]

29. Arora R, Lutz M, Deml C. Long-term outcomes after distal radius fractures. *J Orthop Trauma*. 2011. [Crossref] [PubMed] [Google Scholar]

30. Chung K, Kotsis S, Kim H. Predictors of Functional Outcomes After Surgical Treatment of Distal Radius Fractures. *The Journal of Hand Surgery*. 2007, 32(1): 76-83. [Article] [DOI:10.1016/j.jhsa.2006.10.010] [PubMed] [Google Scholar]

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