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Dr. Niranjana Tadvi
Associate Professor, Department
of Orthopaedics, PIMSR Parul
Institute of Science and
Research, Vadodara, Gujrat,
India

Dr. Arvind Kumar
Associate Professor, Department
of Orthopaedics, PIMSR Parul
Institute of Science and
Research, Vadodara, Gujrat,
India

Functional outcome of extra articular, displaced lower end of radius fracture treated with ORIF + volar locking plating in elderly patients

Dr. Niranjana Tadvi and Dr. Arvind Kumar

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Abstract

Objective: The aim of the study was to evaluate short and medium term functional outcome of extra articular displaced lower end of radius fracture treated with open reduction with internal fixation (ORIF) using a volar locking plate in older adults (≥ 60 years of age).

Materials and Methods: Prospective study was conducted in our department of Orthopaedics in our medical institution PIMSR (Parul Institute of Science and Research), Vadodara, between 2017 and 2019. Inclusion criteria included extra articular lower end of radius fracture in elderly patients (≥ 60 years of age).

During the follow-up, radiological and functional parameters were assessed and Gartland and Werley scoring was done.

Results: Total 34 patients were operated with volar plate fixation. All patients in duration of follow up had a good functional outcome as per functional parameter with good radiological parameter and had less significant, very minimal complications.

Conclusions: Volar locking plating in older adults (≥ 60 years of age) provide better restoration of radial length, radial inclination, volar angle with significant P value and its construct have good strength and stability which allow early mobilization of wrist, fingers and hand which avoid stiffness which provide better functional outcomes with very minimal complications and thereby is an upcoming method of choice for fracture distal end of radius.

Keywords: Volar locking plate fixation, extra articular distal radius fractures, open reduction, geriatric

Introduction

Fracture of distal end of radius is very common skeletal injuries in elderly patient who fall on outstretched hand, which require accurate reduction and fixation to allow a good outcome. Otherwise intra-articular and extra-articular malalignment can lead to various complications such as posttraumatic osteoarthritis, decreased grip strength and endurance, as well as limited motion, and carpal instability.

The treatment of distal end of radius fracture in elderly patients is always challenging due to poor bone quality which lead to various complications.

There are various types of techniques /methods for treatment of distal end of radius fracture which include closed reduction cast/percutaneous k wire fixation and external fixation, dorsal plating and volar locking plating.

Among all above mentioned method/techniques there are some special benefits of volar locking plating like

- Less soft tissue and tendon impingement in compare to dorsal plating and external fixator
- It permits direct fracture reduction and early active wrist mobilizations.
- volar fixed angle plating have better outcome in elderly osteopenic patients.
- On biomechanical strength, as per data when loaded to failure volar angled plate have significant strength advantages over dorsal plating.
- With conventional plates and screws, stability is achieved by compression of the plate to a bone by bi-cortical screws. With volar locking plates, the locking screws support subchondral bone and resist axial forces. Compression of locking compression plate to bone is unnecessary and preserves periosteal blood supply

Corresponding Author:
Dr. Niranjana Tadvi
Associate Professor, Department
of Orthopaedics, PIMSR Parul
Institute of Science and
Research, Vadodara, Gujrat,
India

- Volar plate application provides the advantage of placing the plate on the tensile side of the radius while also utilizing greater soft tissue coverage to decrease hardware prominence and irritation

We assessed the outcome of volar plate osteosynthesis to confirm satisfactory reduction and functional outcomes.

Aim of Study

The aim of the study was

- To Evaluate short and medium term functional outcome
- To evaluate complications and their management of extra

articular lower end of radius fracture treated with open reduction with internal fixation (ORIF) using a volar plate in older adults (≥ 60 years of age).

Materials and methods

Prospective study was conducted in our Department of Orthopaedics in our medical institution PIMSR (Parul Institute of Science and Research), Vadodara, between 2017 and 2019.

Inclusion criteria included extra articular lower end of radius fracture in elderly patients (≥ 60 years of age) (figure 1).

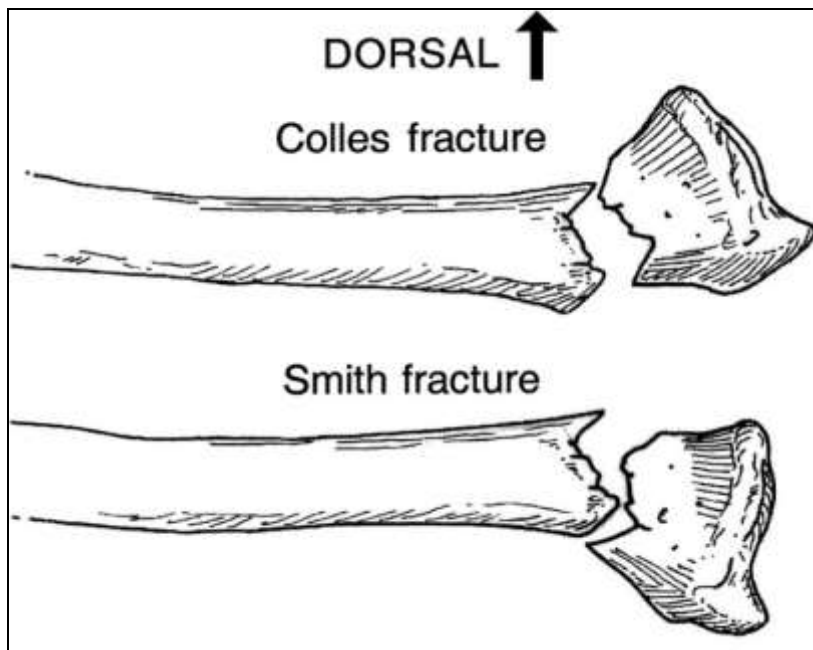


Fig 1: Extra articular distal end of radius fracture (dorsal and volar tilt)

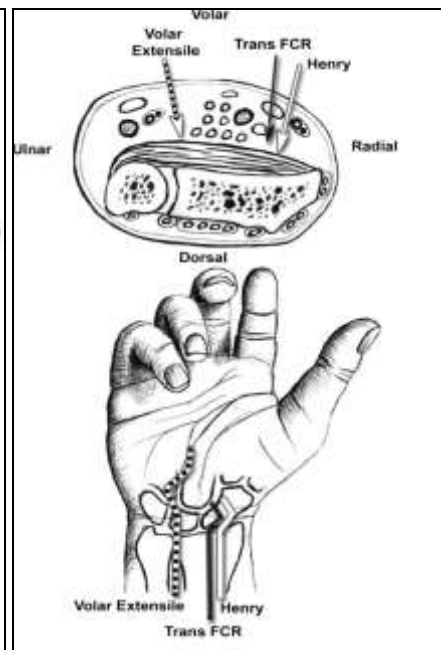


Fig 2: Various types of volar approach

Exclusion criteria severely comminuted, intra articular distal end of radius fractures, medically unfit patients for surgery due to comorbidities.

All patients were admitted in from OPD and from casualty to our department of orthopaedics, PIMSR. After x ray done, patient were given primary treatment and slab immobilizations. After getting medical fitness, all patients were posted for surgery under brachial block and under tourniquet in supine position.

The volar approach can be accomplished through three different intervals: (1) the Henry approach, (2) the trans-FCR approach, and the (3) volar-extensile approach (Figure. 2) we have used the Henry approach with interval will lie between the flexor carpi radialis tendon and the radial artery. The pronator quadratus is released along its radial border of the distal radius and raised ulnar side .After adequate exposure direct reduction of fracture done, and temporarily fixed with 1.8 or 1.5 mm k wire followed by volar locking plate insertion done after confirming reduction in all views of

C- Arm insertion of screws done and slab re- applied. After removal of stiches on 12th to 15th post op day they have started passive gradual wrist and fingers, thumb mobilization followed by active

physiotherapy.

During the follow-up, radiological and functional parameters were assessed and Gartland and Werley scoring was done.

All the patients were subjected to clinical examination and on last follow-up they were assessed according to the demerit point system of Gartland and Werley with Sarmiento *et al.*'s modification [Table 1].

Radiographic evaluation was also assessed on the basis of criteria for the anatomical result after Sarmiento [Table 2]

Results and analysis

In our study inclusion criteria included extra articular lower end of radius fracture in elderly patients (≥ 60 years of age) with an average of 64.2 years in our study had a male 25(73.5%) and female 9(26.4%) patients, male were preponderance. Affected side in our study were right side was involved in 21(61.7%) patients and the left side was 13(38.2%) of extra articular fracture. The present study comprised of 34 patients. The minimum follow-up was 16 weeks, and the maximum was 48 weeks.

Table 1: Clinical and functional assessment Functional evaluation of the patients was done at the last follow-up according to the demerit point system of Gartland and Werley with Sarmiento *et al.*'s modification

Points		
Residual Deformity	Prominent ulnar styloid	1
	Residual dorsal tilt	2
	Radial deviation of hand	2-3
	Point range	0-3
Subjective evaluation	Excellent: No pain, disability or limitation of motion	0
	Good: Occasional pain, slight limitation of motion, no disability	2
	Fair: Occasional pain, some limitation of motion, feeling of weakness in wrist, no particular disability if careful, activities slightly restricted	4

	Poor: Pain, limitation of motion, disability, activities more or less markedly restricted	6
	Point range	0-6
Objective evaluation*	Loss of dorsiflexion	5
	Loss of ulnar deviation	3
	Loss of supination	2
	Loss of palmar flexion	1
	Loss of radial deviation	1
	Loss of circumduction	1
	Loss of pronation	2
	Pain in distal radioulnar joint	1
	Grip strength - 60% or less of opposite side	1
	Point range	0-5
Complications	Arthritic change	
	Minimum	1
	Minimum with pain	3
	Moderate	2
	Moderate with pain	4
	Severe	3
	Severe with pain	5
	Nerve complications (median)	1-3
End result point ranges	Excellent	0-2
	Good	3-8
	Fair	9-20
	Poor	≥21

The average range of movement at the wrist as per Gartland and Werley out of 34 patient, we had 25 (73.5%) excellent results, well results in volar plating, 6 (17.6%) in cast, fair results 2 (5.8%) in cast, There was only 1 (2.9%) patient with poor result Complication

such as irregular articular surface, wrist pain, finger wrist stiffness was observed. Restoration of radial length, radial inclination, and volar angle was best achieved in volar plating.

Table 2: Radiological criteria for anatomical results after Sarmiento

Result	Criteria
Excellent	No or insignificant deformity Dorsal angulation ≤0° Shortening <3 mm Loss of radial deviation <4°
Good	Slight deformity Dorsal angulation 1-10° Shortening 3-6 mm Loss of radial deviation 5-9°
Fair	Moderate deformity Dorsal angulation 11-14° Shortening 7-11 mm Loss of radial deviation 10-14°
Poor	Dorsal angulation >15° Shortening ≥12 mm Loss of radial deviation >15°



Fig 3: Pre op and post op, x -ray images

Discussion

Among the varied fractures encountered in orthopedic care, distal radius fracture are common in the elderly population. Older adults have osteoporotic bones, making it difficult for surgeons to manage such injuries. However due to advancement of technology in

imaging method ,implant and surgical techniques,there are also improvement occurred in understanding of fractures and elucidation of the effects of the injury type on fracture formation and factors that lead to instability. It is, however, imperative that these fractures are managed

adequately as outcomes will immensely impact the overall functioning and quality of life. Among the available treatment options are closed reduction and casting, stabilization using K-wire (Kirschner wire), external fixation, and open reduction and internal fixation (ORIF) with volar locking plates.

Initial treatment with closed reduction and casting is simple and convenient and usually suffices for stable fractures. However, surgical intervention may be additionally needed in cases of unstable fractures.

In recent years, ORIF with volar plating has emerged as a preferred treatment option because of lower risk of tendon irritation and rupture.

In our study Inclusion criteria included extra articular lower end of radius fracture in elderly patients (≥ 60 years of age) with an average of 64.2 years in our study had a male 25(73.5%) and female 9(26.4%) patients, male were preponderance, probably due to their involvement in outdoor activities, riding vehicles, and heavy manual labor. Affected side in our study were right side was involved in 21(61.7%) patients and the left side was 13(38.2%) of extra articular fracture.

The volar locking plate group had a significantly better restoration of radial length, radial inclination, volar angle with significant P value with less complications and its construct have good strength and stability which allow early mobilization of wrist, fingers and hand which avoid stiffness.

The final assessments of results were made using the demerit score system of Gartland and Werley based on objective and subjective criteria, residual deformity, and complications.

Radiographic evaluation was also assessed on the basis of criteria for the anatomical result after Sarmiento The average range of movement at the wrist as per Gartland and Werley out of 34 patient, we had 25 (73.5%) excellent results, good results in volar plating, 6 (17.6%) in cast, fair results 2 (5.8%) in cast, There was only 1 (2.9%) patient with poor result Complication such as irregular articular surface, wrist pain, finger wrist stiffness was observed

Conclusion

In elderly patient who had osteoporotic bone quality, volar locking plating in extra articular distal end of radius fracture provides a stable construct that helps in early mobilization, thereby better functional outcomes and minimizes chances of delayed/malunion. The present study comprised of 34 patients. The minimum follow-up was 16 weeks, and the maximum was 48 weeks. This study was undertaken to assess the functional outcome of operative management of distal radial fractures and the following conclusions were drawn – In our study Inclusion criteria included extra articular lower end of radius fracture in elderly patients (≥ 60 years of age) with an average of 64.2 years. In our study had a male 25(73.5%) and female 9(26.4%) patients, male were preponderance, right side was involved in 21(61.7%) patients and the left side was 13(38.2%) of extra articular fracture. The average range of movement at the wrist as per Gartland and Werley out of 34 patient, we had 25 (73.5%) excellent results, good results in volar plating, 6 (17.6%) in cast, fair results 2 (5.8%) in cast, There was only 1 (2.9%) patient with poor result. Complication such as wrist pain, finger wrist stiffness was observed which were very less.

Thus, based on this study, we conclude that functional outcome of extra articular displaced lower end of radius fracture treated with open reduction with internal fixation (ORIF) using a volar locking plate in older adults (≥ 60 years of age) were better and with very minimal complications and thereby is an upcoming method of choice for fracture distal end of radius.

References

- Colles A. On the fracture of the carpal extremity of the radius. *Edinb Med Surg.* 1814;10:182-6.
- Fitoussi F, Ip WY, Chow SP. Treatment of displaced intra-articular fractures of the distal end of the radius with plates. *J Bone Joint Surg Am* 1997;79:1303-12.
- Mallmin H, Ljunghall S. Incidence of Colles' fracture in Uppsala. A prospective study of a quarter-million population. *Acta Orthop Scand.* 1992;63:213-5.

- Dóczy J, Renner A. Epidemiology of distal radius fractures in Budapest. A retrospective study of 2,241 cases in 1989. *Acta Orthop Scand.* 1994;65:432-3.
- Solgaard S, Petersen VS. Epidemiology of distal radius fractures. *Acta Orthop Scand.* 1985;56:391-3.
- Larsen CF, Lauritsen J. Epidemiology of acute wrist trauma. *Int J Epidemiol.* 1993;22:911-6.
- Bacorn RW, Kurtzke JF. Colles' fracture; a study of two thousand cases from the New York State Workmen's Compensation Board. *J Bone Joint Surg Am.* 1953;35-A:643-58.
- Cao J, Ozer K. Failure of volar locking plate fixation of an extraarticular distal radius fracture: A case report. *Patient Saf Surg.* 2010;4:19.
- Gerostathopoulos N, Kalliakmanis A, Fandridis E, Georgoulis S. Trimed fixation system for displaced fractures of the distal radius. *J Trauma.* 2007;62:913-8.
- Crenshaw AH Jr. Fractures of shoulder, arm, and forearm. In: *Campbell's Operative Orthopaedics.* Part XV. 11th ed., Philadelphia: Mosby Inc. 2008;3(54):3447-9.
- Cognet JM, Geanah A, Marsal C, Kadoch V, Gouzou S, Simon P. Plate fixation with locking screw for distal fractures of the radius. *Rev Chir Orthop Reparatrice Appar Mot* 2006;92:663-72.
- Adani R, Tarallo L, Amorico MG, Tata C, Atzei A. The treatment of distal radius articular fractures through lcp system. *Hand Surg.* 2008;13:61-72.
- Pichon H, Chergaoui A, Jager S, Carpentier E, Jourdel F, Chaussard C *et al.* Volar fixed angle plate LCP 3.5 for dorsally distal radius fracture. About 24 cases. *Rev Chir Orthop Reparatrice Appar Mot.* 2008;94:152-9.
- Leung F, Zhu L, Ho H, Lu WW, Chow SP. Palmar plate fixation of AO type C2 fracture of distal radius using a locking compression plate – A biomechanical study in a cadaveric model. *J Hand Surg Br.* 2003;28:263-6.
- Chen NC, Jupiter JB. Management of distal radial fractures. *J Bone Joint Surg Am* 2007;89:2051-62.
- Cooney WP 3rd. Fractures of distal radius: A modern treatment – Based classification – Distal radius fractures. *Orthop Clin North Am* 1993;24:211-6.
- Kiliç A, Kabukcuoglu Y, Ozkaya U, Gül M, Sökücü S, Ozdogan U. Volar locking plate fixation of unstable distal radius fractures. *Acta Orthop Traumatol Turc.* 2009;43:303-8.
- Othman AY. Fixation of dorsally displaced distal radius fractures with volar plate. *J Trauma.* 2009;66:1416-20.
- Anakwe R, Khan L, Cook R, McEachan J. Locked volar plating for complex distal radius fractures: Patient reported outcomes and satisfaction. *J Orthop Surg Res.* 2010;5:51.
- Kiernan C, Brennan S, McInerney N, Judzan M, Kearns S, Sullivan MO. Volar Locking Plate Versus K-Wiring Fixation of Distal Radius Fractures in 20-65 Year Olds. In: *Irish Journal of Medical Science.* Grays Inn Rd, 6th Floor, London Wc1x 8HL, England: Springer London Ltd. 2012;181(236):S189.
- Rizzo M, Katt BA, Carothers JT. Comparison of locked volar plating versus pinning and external fixation in the treatment of unstable intraarticular distal radius fractures. *Hand (N Y)* 2008;3:111-7.
- Orbay J, Badia A, Khoury RK, Gonzalez E, Indriago I. Volar fixed-angle fixation of distal radius fractures: The DVR plate. *Tech Hand Up Extrem Surg.* 2004;8:142-8.
- Ruch DS, Papadonikolakis A. Volar versus dorsal plating in the management of intra-articular distal radius fractures. *J Hand Surg Am.* 2006;31:9-16.
- Simic PM, Robison J, Gardner MJ, Gelberman RH, Weiland AJ, Boyer MI. Treatment of distal radius fractures with a low-profile dorsal plating system: An outcomes assessment. *J Hand Surg Am.* 2006;31:382-6.
- Sarmiento A, Pratt GW, Berry NC, Sinclair WF. Colles' fractures. Functional bracing in supination. *J Bone Joint Surg Am.* 1975;57:311-7.
- Gartland JJ Jr, Werley CW. Evaluation of healed Colles' fractures. *J Bone Joint Surg Am.* 1951;33-A:895-907.