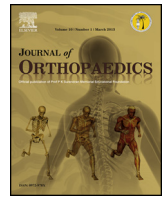




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Original Article

Radiographic and functional evaluation of low profile dorsal versus volar plating for distal radius fractures

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ABSTRACT

Introduction: Fracture of the distal radius is a common clinical problem. Complex fracture requires open reduction and stabilization with plating to restore anatomy. Dorsal plating has advantages of buttressing the fracture better but often complicated with tendon problems as per literature. The rate of complications however, was not compared between the low-profile dorsal and the volar plates.

Methodology: This was a retrospective study on seventy one patients with dorsally angulated or displaced distal radius fractures, who underwent fixation of fractures with either dorsal or volar locking plate from Jan – Nov 2012. Preoperative radiographs were classified based on Universal and Fernandez classification. Postoperative radiographs were assessed for anatomical restoration of Radial length, radial inclination and volar tilt. Tendon and nerve related complications were assessed and functional evaluation was performed on the basis of PRWE (Patient related wrist evaluation) score.

Results: Both groups were matched for their demographic profile and fracture types ($p < 0.033$). Dorsal plating group had 89% excellent/good restoration and fair in 11%. Volar group had 96% excellent/good restoration and fair in 4%. Statistical analysis was performed with unpaired t test for radiographic parameters.

Three patients had tendon related complications in dorsal plating group; two patients in volar group had nerve related complications. Functional outcome with PRWE was comparable between two groups.

Conclusion: Results with low profile dorsal plating were comparable to volar plating. Therefore dorsal plating can be used as an alternative method when dorsal buttressing of comminuted fracture is required, especially with concomitant osteoporosis.

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1. Introduction

The fracture of distal radius is the commonest fracture seen in emergency, constitute 17% of all fractures.¹ The fracture with dorsal displacement and angulation is usually caused by fall on the outstretched hand. There is little or no evidence based guidelines for the treatment. The outcome of these fractures is not uniformly good.²

Complex fracture requires open reduction and surgical stabilization to restore anatomy. Volar plating for dorsally displaced fractures has the problem that plate lying at the opposite site than the direction of displacement. The plate does not act as a buttress and the poor quality of bone in this area does

not give much grip for the screws to act as pulling screws, resulting in loss of reduction.² Volar plates are also complicated by neuropathic problems.⁵

Dorsal plating has advantages of buttressing the fracture but often complicated with tendon problems. Extensor tendons run directly over the implant and tendon problems with adherence and even rupture.³ However newer low profile plates with smooth titan polishing reduce the risk of tendon irritation. There is limited published evidence on this.

The biomechanical studies⁴ especially one published recently in 2012 does show some advantages with dorsal plate, while most previous studies with dorsal plate were associated with higher tendon related complications.⁵ These were performed using different types of plates, not necessarily low profile plates with smooth titan polish and mostly on small number of patients.^{6–9} I believe this perception will change with my study as there are lower complications with newer low profile dorsal plating.

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2. Aims

This is a study on dorsally displaced distal radius fracture fixed with either dorsal or volar plating to assess their clinical outcome, radiological assessment for anatomical reduction and complications.

3. Material and methods

3.1. Methodology

This is a retrospective study carried out on the patients with dorsally angulated or displaced distal radius fractures, who underwent fixation of their fractures with either dorsal or volar locking plate. Seventy one patients with fractures of the distal radius meeting above criteria were included in the study.

The important exclusions from the study were

- (1) Volar angulated and displaced distal radius fractures
- (2) Conservatively treated distal radius fractures
- (3) Paediatric age group
- (4) Associated radius ulna shaft fracture.

The decision to choose either dorsal or volar locking plate was taken by operating surgeon based on their preference, training and belief to give best possible results. The decision was based on their previous experience and was irrespective of fracture configuration and dorsal comminution. All surgeries were performed on scheduled trauma lists by experienced surgeon. Standard volar and dorsal approaches were used for reduction and fixation of fragments with low profile volar and dorsal locking plates. In the dorsal plating group the surgical approach involved a dorsal incision immediately ulnar to Lister's tubercle. The dorsal retinaculum was opened with a longitudinal incision. The fracture was exposed and stabilized provisionally with k wire after elevating the metaphyseal fragment. The low profile, anatomically contoured locking plate was then used to fix the fracture with appropriately sized screws. Reduction of fracture fragments was confirmed with image intensifier and images saved.

The modified Henry approach is performed through the flexor carpi radialis sheath utilizing the interval between Flexor carpi radialis tendon and radial artery. The extended carpal tunnel approach develops the interval between the finger flexor tendons and the flexor carpi ulnaris. This last approach allows for improved visualization of the ulnar side of the radius and is useful for reduction of unstable ulnar fragments. Postoperatively limb was elevated and active finger and wrist mobilization commenced earliest possible.

Radiographic evaluation of the postero-anterior and lateral views was performed for preoperative and postoperative films. Preoperative radiographs were assessed based on articular involvement, angulations and radial length.

Universal and Fernandez classification system was used to classify fractures into different types based on articular involvement.

- Type I: Non articular, non displaced
 Type II: Articular, non displaced
 Type III: Non articular, displaced
 Type IV: Articular, displaced.

Postoperative radiographs were assessed for anatomical restoration of Radial length, radial inclination and volar tilt in postoperative films.

3.2. Radial length

Radial length is measured on the Postero-anterior radiograph. It represents the distance between a line drawn at the tip of styloid process, perpendicular to the long axis of the radius and a second perpendicular line at the level of the distal articular surface of ulnar head. The average radial length is 11–12 mm.

3.3. Radial angulation or inclination

On the Postero-anterior view, inclination of distal radius is represented by a line drawn from the tip of the radial styloid to the ulnar corner of the articular surface of the distal end of the radius and a line perpendicular to the longitudinal axis of the radius. The average inclination is 21°.

3.4. Volar/dorsal inclination

On the lateral view, a line is drawn connecting the distal most point of the dorsal and volar rims. The angle that this line creates with a line perpendicular to the longitudinal axis of the radius reflects volar inclination. Average volar inclination is 11°.

Quality of reduction was classified based on Sarmiento et al.¹⁰ anatomical criteria radiographically. This scoring was based on comparing postoperative results to average parameters¹³ for good radiographic outcome i.e. radial length of 11 mm, radial inclination of 22° and volar angle of 11°.

Sarmiento's modification of Lindstrom criteria for anatomical evaluation (Table 1).¹⁰

Patients were followed for skin, tendon or nerve irritation and rupture related complications. Functional outcome evaluation was performed on the basis of PRWE (patient related wrist evaluation)¹² and Mayo wrist score.¹¹

4. Observations and results

4.1. Demographics

The study comprised a total of seventy one patients of dorsally displaced and angulated distal radius underwent open reduction and internal fixation with dorsal or volar locking plate from 1 January 2012 to 30 November 2012.

The mean age of the patients for the study was 58 years with the youngest patient being 17 years and the oldest being 91 years. Dorsal plating group had mean age of 60 years (range 17–86 years) and volar plating group with mean age of 54 years (range 23–91 years). There were 8 males and 36 females in the dorsal plating

Table 1
Sarmiento classification.

	Residual deformity	Loss of palmer tilt (°)	Radial shortening (mm)	Loss of radial deviation (°)
Excellent	Insignificant	0	<3	5
Good	Slight	1–10	3–6	5–9
Fair	Moderate	11–14	7–11	10–14
Poor	Severe	At least 15	At least 12	>14

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