

# A comparative study on surgical management of distal end radius fracture with ulnar styloid fracture with and without ulnar styloid fixation

T Koner Rao<sup>1</sup>, M Nagendra Babu<sup>2</sup>, R Karthik Reddy<sup>3</sup>, V Krishna Kumar<sup>4</sup>

<sup>1</sup> Associate Professor, <sup>2</sup>Professor & HOD, <sup>3,4</sup>Post graduate students, Department of Orthopedics, Prathima Institute of Medical Sciences, Karimnagar, Telangana, India.

Address for correspondence: Dr T Koner Rao, Associate Professor, Department of Orthopedics, Prathima Institute of Medical Sciences, Karimnagar, Telangana, India.

Email: konerrao@gmail.com

## ABSTRACT

### INTRODUCTION

Fractures of the distal radius are the most common fractures of the upper extremity and account for 17% of all fractures treated in the emergency room. Initially thought to be simple fractures, they are now recognized as complex injuries with a high percentage of long term complications.

**Aims and objectives :** To Observe the results and assess the Functional outcome of the management of Distal End Radius Fractures by plating, with and without ulnar styloid fixation with Tension Band Wiring (TBW) and to know the complications associated.

**Materials and methods :** This is a prospective study from January 2015 to December 2017. Out of 40 patients of this study, radius was fixed by volar plating in all patients, where as ulnar styloid - fixed by TBW in 20pts and in remaining left without fixation at Department of orthopedics, Prathima Institute of Medical Sciences, Karimnagar. All patients were selected among admissions, operated and results were assessed clinically and radiographically. Clinical evaluation was done using modified Demerit score system of Gartland and Werely. Perioperative complications recorded. Mean followup period was 6months.

**Results :** We had 10(50%) in ulnar styloid fixation and 9(45%) in ulnar styloid non fixation cases rated as excellent, as they had no deformity of the wrist and there was no pain. None of the patient had poor modified Demerit score system of Gartland and Werely. Complications like irritation of EPL due to K-wire(25%), loosening of K-wire(5%), stiffness (5%) seen in patients with ulnar styloid fixation. Ulnar sided wrist pain is seen in 20% of cases without ulnarstyloid fixation.

**Conclusion :** In fixation group of ulnar styloid, excellent to good results were seen in 90% of patients, In non fixation of ulnar styloid group, excellent to good results were seen in 80% of patients suggesting that stabilizing the distal radius fracture fragments with volar plate and screws, is only required

method [in both groups] to maintain the anatomical reduction which is crucial in maintaining stability of DRUJ, till union and to prevent collapse of the fracture fragments.

**Keywords :** Distal radius fracture, Ulnar styloid fixation, TBW-tension band wiring, Volar plating

### INTRODUCTION

Fractures of the distal radius are the most common fractures of the upper extremity and account for 17% of all fractures treated in the emergency room. Initially thought to be simple fractures, they are now recognized as complex injuries with a high percentage of long term complications. Distal radial fractures have a bimodal age distribution, consisting of a younger group who sustains relatively high-energy trauma to the upper extremity and an elderly group who sustains both high-energy injuries and insufficiency fractures. Incidence of distal end radius fracture in the elderly correlates with osteopenia and raise in incidence with increase in age, other risk factors are decreased bone mineral density, female sex, white race, family history and early menopause. Eighty percent of axial load is supported by the distal radius and 20% by the ulna and the triangular fibrocartilage complex. Reversal of the normal palmar tilt results in load transfer onto the ulna and TFCC and the remaining load is then borne eccentrically by the distal radius and is concentrated on the dorsal aspect of the scaphoid fossa.

The optimal management of distal radius fractures has changed dramatically over the previous two decades from almost universal use of cast immobilization to a variety of highly sophisticated operative intervention. Open reduction and internal fixation is indicated to address the unstable distal radius fracture and those with articular incongruity that cannot be anatomically reduced and maintained through external manipulation and ligamentotaxis, provided sufficient bone stock is present to permit early range of motion.

More than 40% (range 21–61%) of distal radius fractures have an associated ulnar styloid fracture<sup>1</sup> [This

increases to 86% if the radial fracture is intra-articular]<sup>2</sup>. Usually occurs due to fall on out stretched hand. The distal ulna represents the fixed point around which the radius and the hand acts in daily living.

The management of acute ulnar styloid fractures is based on the long-term effect that they may have on the stability of the distal radioulnar (DRU) joint. Some studies have found that ulnar styloid fractures are associated with distal radioulnar joint instability<sup>3</sup> because the triangular fibrocartilage complex (TFCC) inserts into base of the ulnar styloid.<sup>4,5</sup> Others have found no difference when comparing the overall functional results with or without an ulnar styloid fracture<sup>6,7</sup>. There are two possible reasons for this (1) The ulnar styloid fracture may be distal to the true stabilising insertion at the fovea and does not affect the stabilizing properties of the ulno-radial ligament. (2) It is possible to have a destabilizing tear of the ulno-radial ligament in the absence of ulnar styloid fractures<sup>8</sup>. This may explain why late instability has been found if the ulnar styloid fracture is associated with a distal radius fracture, the ulnar styloid fracture will reduce with reduction of the distal radius in many cases. In such circumstances, there will be no DRUJ instability. They can be treated with an above elbow cast for 6 weeks. Obviously, exact restoration of the radius fracture around the sigmoid notch is of paramount importance for DRUJ stability. Assessment of DRUJ stability following DRF are best done intraoperatively after fixation of the radius fracture by translation of the ulna in a dorsopalmar direction, without ulnar styloid fractures or non-unions.<sup>9</sup>

Fall on the outstretched hand with a hyperextended wrist is the usual cause of distal radial fractures. About half of distal radius fractures occur in association with ulnar styloid fractures. The mean force to cause a fracture is 195kg in women and 282kg in men. Fractures occur when the wrist is at 40 to 90° of dorsiflexion with lesser amount of force needed at smaller angles.

## MATERIALS AND METHODS

As soon as patient comes with pain, swelling and deformity of wrist following injury, Tenderness could be elicited over the lower end of radius and ulnar styloid process. Piano key sign and localized tenderness at DRUJ is elicited. All the patients were evaluated with X-rays in two standard views Anteroposterior [A.P] and Lateral views and looked for distal radius fracture along with fracture displacement of base of ulnar styloid of more than 2mm, with increased DRUJ space on AP view. With these features of distal end radius associated with ulnar styloid fracture, DRUJ instability is considered and included in this study. We did not taken MRI for the patients to confirm the ligamentous injury.

Out of 40 patients of this study, radius was fixed by volar plating in all patients, where as ulnar styloid - fixed by TBW in 20pts and in remaining left without fixation to know and compare the functional and clinical outcome of DRUJ as well as complications involved. Mean followup period was 6 months.

Adults (aged over 20 years), Both male and female, Unstable, comminuted or intra articular fractures of distal end radius, displaced ulnar styloid fracture of more than 2mm and base of ulnar styloid fracture were included. Patients aged below 20 years, Fracture reduced after admission, Compound fractures associated with neurovascular injuries, Fracture with diaphyseal extension, undisplaced ulnar styloid fracture and tip of ulnar styloid fractures, isolated ulnar styloid fractures or distal radius fractures were excluded.

## SURGICAL PROCEDURE :

40 cases were treated with volar plating [ellis plate or locking plate] for distal radius fractures by volar Henry approach and ulnar styloid fracture by incision between ECU and FCU.

## OPERATIVE TECHNIQUE – PLATING (by volar plate) [Figure 1]

The incision for volar fixation of the distal radius is typically performed through the distal extent of the Henry approach. An incision is made between the flexor carpi radialis (FCR) tendon and the radial artery. This interval is developed revealing the flexor pollicis longus (FPL) muscle at the proximal extent of the wound and the pronator quadratus muscle more distally. The radial artery is carefully retracted radially, while the tendons of the FCR and FPL are retracted ulnarly. The pronator quadratus is divided at its most radial aspect, leaving a small cuff of muscle for later reattachment. Any elevation of the muscle of the FPL should be performed at its most radial aspect, as it receives its innervation from the anterior interosseous nerve on its ulnar side. After the pronator quadratus has been divided and elevated, the fracture is readily visualized and reduction maneuvers can be accomplished under direct vision. After exposure and debridement of the fracture site, the fracture is reduced and provisionally fixed under fluoroscopy with K-wires, reduction forceps or suture fixation. Reduction aids should be placed so as not to interfere with placement of the plate.

## Ellis plate:

The fracture is reduced and a special plate (Ellis plate) is placed closed to articular margin, fluoroscopically confirm plate position in both proximal-distal and radio ulnar direction. Drill and insert provisional screw in oblong hole in ellis plate. Additional proximal screw applied, apply counter force through clamp in dorsal direction. This reduces distal fragment

to radius. Distraction and ulnar deviation correct the radial collapse and inclination. Drill holes in distal fragment, and place ulnar screws followed and proceed radially and proximally. Subsequently insert remaining proximal screw. Repair pronator Quadratus followed by skin closure. After radius fracture fixation, DRUJ is assessed for stability by compressing ulna towards radius, while forearm passively put through full pronation and supination, if palpable clunk is heard, then DRUJ instability is considered.

**TENSION BAND WIRING TO ULNAR STYLOID [Figure 2]**

Incision over distal end of ulna on medial aspect between flexor carpi ulnaris and extensor carpi ulnaris is given, plane between FCU and ECU is entered, periosteum stripped, fracture site identified, displaced ulnar styloid fragment identified, reduced and 2 k wires retrogradely passed from distal to proximal fragment, drill hole through ulna from dorsal to palmar direction. Pass ss-wire through the hole and apply it in the form of 8 and tension and cut it. K wire bent through 180degrees and cut. wound closed in layers.

**VOLAR PLATING**



**Figure 1 : TBW to ulnar styloid**



**Figure 2 : FOLLOW UP & EVALUATION**

Post operative care included analgesia, limb elevation, antibiotics (ceftriaxone / amikacin and metrogyl) for three days. Primary dressing on second day. Physiotherapy which includes, finger movements at the time of discharge (on 3rd day). Slab applied for 10 days till suture removal and graded physiotherapy started after the suture removal. The check x-ray taken after 2 days and the follow up x-rays after 3 weeks, 3 months and final movement evaluation at 6 months. [Figure 3]

**PREOP XRAY XRAY AT 6 MONTHS**



**Figure 3 : The Results of this study is evaluated by Clinician based Functional outcomes: Modified Gartland and Werley demerit scoring system.**

**RESULTS**

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

Result	No. of Cases with ulnar styloid fixation	%	No. of Cases without ulnar styloid fixation	%
Excellent	10	50	9	45
Good	8	40	7	35
Fair	2	10	4	20
Poor	0	0	0	0

Using the modified Demerit score system of Gartland and Werley, we had 10(50%) in ulnar styloid fixation and 9(45%) in ulnar styloid non fixation cases rated as excellent, as they had no deformity of the wrist and there was no pain. Limitation of motion of the wrist and forearm was less than 20% to that of normal with no complications. 8(40%) patients in ulnar styloid fixation and 7(35%) in ulnar styloid non fixation cases had no deformity of the wrist. Occasional pain and some limitation of motion were present initially. The limitation of motion of wrist and forearm was less than 20% to that of normal. Hence the result was rated as good.

2 patients (10%) with ulnar styloid fixation and 4 patients (20%) without ulnar styloid fixation had pain, limitation of motion and restricted activities around the wrist. The range of motion of wrist and forearm had limitation to less than 50% to that of normal and the result was rated as fair in both fixation and non fixation of ulnar styloid.

## DISCUSSION

This present comparative study was undertaken with 40 cases to assess clinical outcome after surgical management of distal radial fractures using volar plating and TBW to ulnar styloid in 20 cases and volar plating of radius without ulnar styloid fixation in remaining 20 cases. In our study, distal radial fracture was more common in the 3rd to 5th decade with an average of 51.5 yrs in with ulnar styloid fracture fixation cases and 49.7 yrs in without ulnar styloid fixation cases. Our study had a male preponderance with 14 male patients and 6 female patients in ulnar styloid fixation cases and 16 male patients and 4 female patients in cases without ulnar styloid fixation. The right side (dominant wrist) was involved in 12 patients with ulnar styloid fixation cases and 14 patients without ulnar styloid fixation cases in our study. In our study 70% of the patients had road traffic accident and remaining had a fall on the outstretched hand.

Patients with ulnar styloid fracture had complications like irritation of EPL due to K wire (25%), loosening of K wire (5%). Stiffness is seen in 5% of cases as patient did not follow instruction and did not mobilize the wrist and also due to lack of physiotherapy. Patients without ulnar styloid fracture fixation had complication like ulnar sided wrist pain in 20% cases. Malunion is seen in both ulnar styloid fixation and non fixation cases. Non union of ulnar styloid is more in non fixation of ulnar styloid cases i.e., 45% when compared to fixation of ulnar styloid (15%).

Using the modified Demerit score system of Gartland and Werley, we had 50% excellent results, 40% good results and 10% fair results in ulnar styloid fixation group and 45% excellent results, 35% good results and 20% fair results in non fixation group respectively. No poor results in both groups.

## CONCLUSION

In this study, we observed that - In fixation group of ulnar styloid, excellent to good results were seen in 90% of patients, in non fixation of ulnar styloid group, excellent to good results were seen in 80% of patients suggesting that stabilizing the distal radius fracture fragments with volar plate and screws, is only required method [in both groups] to maintain the anatomical reduction which is crucial in maintaining stability of DRUJ, till union and to prevent collapse of the fracture fragments, even when the fracture is grossly comminuted/intra-articular/unstable and/or the bone is osteoporotic.

## REFERENCES:

1. May MM, Lawton JN, Blazar PE. Ulnar styloid fractures associated with distal radius fractures: Incidence and implications for distal radioulnar joint instability. *J Hand Surg* 2002;27A(6):965–971.
2. Knirk JL, Jupiter JB. Intra-articular fractures of the distal end of the radius in young adults. *J Bone Joint Surg* 1986;68A(5):647–659.
3. Hauck RM, Skahan IIIJ, Palmer AK. Classification and treatment of ulnar styloid nonunion, *J Hand Surg* 21-A:418 - 422, .
4. Kihara H, Short WH, Werner FW, Fortino MD, Palmer AK. The stabilizing mechanism of the distal radioulnar joint during pronation and supination, *J Hand Surg* 20-A:930-936, .
5. Haugstvedt JR, Berger RA, Nakamura T, Neale P, Berglund L, An KN. Relative contributions of the ulnar attachments of the distal radioulnar joint. *J Hand Surg* 31-A:445\_451.
6. Roysam GS. The distal radioulnar joint in Colles' fractures. *J Bone Joint Surg* 1993;75B(1):58–60.
7. Stewart HD, Innes AR, Burke FD. Factors affecting the outcome of Colles' fracture: an anatomical and functional study. *Injury* 1985;16(5):289–295. doi: 10.1016/0020-1383(85)90126-3.
8. Lindau T, Arner M, Hagberg L. Intraarticular lesions in distal fractures of the radius in young adults. A descriptive arthroscopic study in 50 patients. *J Hand Surg* 1997;22B(5):638–643.
9. Lindau T, Adlercreutz C, Aspenberg P. Peripheral tears of the triangular fibrocartilage complex cause distal radioulnar instability after distal radius fractures. *J Hand Surg* 2000;25A(3):464–468.

**How to cite this article :** Koner Rao T, Nagendra Babu M , Karthik Reddy R, Krishna Kumar V. A comparative study on surgical management of distal end radius fracture with ulnar styloid fracture with and without ulnar styloid fixation. *Perspectives in Medical Research* 2019; 7(1):14-17.

**Sources of Support:** Nil, Conflict of interest: None declared.