# CONCOMITANT DISTAL RADIOULNAR JOINT DISRUPTION IN DISTAL END RADIUS FRACTURE CASES ADMITTED TO EMERGENCY WARD HASAN SADIKIN HOSPITAL JANUARY 2013 – DECEMBER 2015

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**Abstract: The distal end radius and ulna is an integral part of the wrist joint and preservation of its normal anatomy is essential for the mobility of the wrist.** The most common cause of residual wrist disability after distal end radius fractures is the disruption of distal radioulnar joint (DRUJ). Early recognition and management in the acute stage aim at the anatomic reconstruction of the DRUJ in an effort to reduce incidence of chronic pain and loss of wrist motion. The purpose of this study is to identify the prevalence of accompanying DRUJ in distal end radius fracture cases, highlighting its significance in occurance. This was a retrospective study with an analytic descriptive method and data from January 2013-December 2015 taken from medical records of Dr. Hasan Sadikin Hospital. From research, we found 74 cases of distal end radius fracture. The most common injured wrist were dominant hand as 46 cases (62,2%), and non-dominant hand as 28 cases (37,8%). From all data, DRUJ disruption were marked as 37 cases (50%). Extraarticular fracture with concomitant DRUJ disruption were marked in 3 cases (8,1%) and in intraarticular involvement were 34 cases (91,9 %). From this study, we can conclude that half of the distal end radius fracture cases, especially intraarticular, were accompanied by DRUJ disruption. This should be an issue to be concerned by the physician when evaluating distal end radius fracture cases and to perform proper treatment.

**Keywords:** Distal end radius fracture, distal radioulnar joint (DRUJ) disruption

## INTRODUCTION

A fracture of the distal end radius is a very frequent fracture, estimated at up to 20% of all cases of fractures handled at the emergency department.[1-4] This fracture can occur in all age groups, both old and young. The cause of this fracture also varies, not necessarily caused by traffic accidents (high energy), but a person who fell from a height equivalent to a standing position can experience this fracture. Radius plays an important role in wrist stability, thus maintaining wrist and biomechanical ligaments from radiocarpals and radiouls, reducing anatomically as possible and correction of incongruence of the articular surface will decrease the degeneration process and accelerate the healing process.[5]

Distal radioulnar joint (DRUJ) has an important role in arm rotation, in collaboration with the proximal radioulnar joint (PRUJ).[6] The stability of DRUJ is obtained through the congruence of the articular surface and the function of triangular fibrocartilage complex. Ulnar heads articulate with sigmoid notch distal radius and the congruence between the two provide stability for DRUJ, but this articulation is very shallow and requires additional stability derived from soft tissue to maintain its position.[6-8]

Triangular fibrocartilage complex is the main structure that provides stability for DRUJ. It consists of triangular fibrocartilage (articular disc), meniscal homologue, ulnolunate and ulnotriquetral ligament, dorsal and volar radioulnar ligaments, ulnar collateral ligament, and extensor carpi ulnaris tendon sheath. Dorsal and volar radioulnar ligaments play the most important role for DRUJ stability. Both of these structures are highly susceptible to injury in cases of distal radius fracture, and unfortunately this is often overlooked.[7-9]

Fractures of the distal end radius are often accompanied by several complications. One of the most common complications is injury to TFCC and DRUJ instability.[6,10] DRUJ instability is a frequent clinical condition, but very often it is not well diagnosed.[11] In some studies the incidence of the occurrence of DRUJ instability accompanying the radius distal fracture is 10-19%.[5,12,13] DRUJ instability will alter the biomechanics of the wrist joint and result in chronic pain and decreased motion function of the radiocarpal and radioulnar.[12-14]

DRUJ disruption was diagnosed by assessing distal radioulnar distalness of more than 4 mm and an ulnar variance of more than 2 mm assessed from plain anteroposterior x-ray of the wrist, and the presence of a dorsal dislocation or subluxation of the ulnar head judged by plain x-rays lateral wrist, and a fracture that shifts on the base ulnar syloid.

## RESEARCH METHOD

This study was carried out retrospectively and processed in the form of descriptive and analytical in the period January 2013 to December 2015 the number of cases as many as 74 cases are getting treatment in the emergency department Hasan Sadikin General Hospital Bandung.

The research material was taken from medical records of all patients with distal radius fracture case that came to emergency department of Hasan Sadikin General Hospital Bandung during January 2013 until December 2015 period.

The inclusion criteria of this study were all patients with distal end radius fractures who come to the emergency department Hasan Sadikin General Hospital Bandung during the period January 2013 to December 2015 and treated with conservative treatment or operative. While the authors do not include exclusion criteria.

This study was conducted by looking at x-ray wrists in patients with distal radius fractures. DRUJ disruption diagnosed by assessing the widening distance distal

radioulnar more than 4 mm and the ulnar variance greater than 2 mm are rated from x-ray plain anteroposterior wrist, as well as the dislocation or subluxation to the dorsal ulnar head assessed from x-ray plain lateral wrist, and a displaced fracture of the ulnar base styloid.

## RESULTS AND DISCUSSION

From all the patients who entered and received treatment in the emergency department of Hasan Sadikin General Hospital from January 2013 to December 2015, 74 cases were obtained. From 74 patients included in the study, 48 patients (64.8%) were men and 26 (35.2%) were female.

Table 1. Distal End Radius Fracture Distribution by Affected Wrist

| | Cases | Percentage |
|---|---|---|
| Dominant-hand | 46 | 62,2 % |
| Non-dominant hand | 28 | 37,8 % |
| Total | 74 | 100% |

From table 1, we can see that in distal radius end radius patients who come to the emergency department Hasan Sadikin General Hospital period January 2013 - December 2015 at most about dominant wrists as many as 46 patients. Patients with distal radius fractures coming to the emergency department Hasan Sadikin General Hospital period January 2013 - December 2015 is mostly caused by motor accidents as many as 50 patients. This is associated with the cause of the fracture is due to high energy injury.

Table 2. Patient Distribution Based on Group Age

| | Cases | Percentage |
|---|---|---|
| 15 – 24 y.o | 24 | 32,4% |
| 25 –44 y.o | 24 | 32,4% |
| 45–64 y.o | 18 | 24,3% |
| > 65 y.o | 8 | 10,8% |
| Total | 74 | 100% |

Table 2 shows that in distal radius end radius patients who come to emergency installation Hasan Sadikin General Hospital period January 2013 - December 2015 most aged between 15 - 24 years and 25 - 44 years as many as 24 patients. This can be interpreted that the case of fractures, especially distal end radius often occurs in the age of productive age. This correlates with injury mechanisms that are more dominated by high energy injury.

Table 3. DRUJ Disruption by Affected Wrist

| | Total | Dominant Hand | Non-Dominant Hand | p Value |
|---|---|---|---|---|
| Positive | 37 | 27 | 10 | $p = 0.055$ |
| Negative | 37 | 19 | 18 | $(p < 0.05)$ |
| Total | 74 | 46 | 28 | |

DRUJ disruption were marked in 37 cases from total 74 cases of distal end radius fracture, and mostly occurs in dominant hand (27 cases) compared to non dominant hand (10 cases), but this finding is not statistically significant ($p > 0.05$).

Table 4. DRUJ Disruption by Articulation Involvement

| | Cases | Intra-articular | Extra-articular | p Value |
|---|---|---|---|---|
| Positive | 37 | 34 | 3 | $p = 0.017$ |
| Negative | 37 | 26 | 11 | $(p < 0.05)$ |
| Total | 74 | 60 | 14 | |

From the table above we can see that in patients with distal end radius fractures that come to the emergency department Hasan Sadikin General Hospital period January 2013 - December 2015 often have articular involvement, as many as 60 patients, and from all distal end radius fracture with intraarticular involvement, DRUJ disruption were marked as 34 cases. This findings is statistically significant ($p < 0.05$). This has implications for the handling of the case, where in the case of intraarticular fracture of the distal end radius, the key to obtaining good operating outcomes and preventing complications is success in restoring the distal end radius positions anatomically as possible.

Acute disruption of the distal radioulnar joint may affect joint surfaces (cartilage), supporting ligament structures, secondary stabilizers (extensor carpi ulnaris, retinaculum extensor, pronator quadratus, and interosseous membrane) and bone (sigmoid notch, distal ulna).[12] If the association of radioulnar instability and fracture reduction in the sigmoid notch of the distal radius is not immediately assessed after the reduction and fixation of the radius fracture, the dorsal subluxation of the ulna and / or joint incongruence with the limitation of active supination will occur.[12] In this study, 74 cases of distal radius fracture, 37 cases (50%) with DRUJ disruption, and from 37 cases, 34 cases of DRUJ disruption (91.9%) occurred in fractures involving intraarticular. In an intrarticular fracture, the key to good management results depends on the restoration of the joint's anatomical position (bone, joint surface, ligament), which must be maintained during the healing process of fracture and soft tissue.[12] To achieve an anatomical reduction, non-operative and operative methods may be used. Anatomical reduction of the radius will usually return the ulnar head position into the sigmoid notch, followed by immobilization with a long-arm cast for 6-8 weeks. From this study, it was found that the incidence of DRUJ disruption accompanying distal radius fracture is quite high and should be of concern to all physicians when confronted with distal radius fracture.

Radiologic anteroposterior (AP) and lateral examination of the wrist should be performed well. Direct radiologic signs indicating instability of DRUJ are a distillation of radially distal radioulnar greater than 4 mm and an ulnar variance greater than 2 mm assessed from plain anteroposterior x-ray of the wrist, as well as degradation of the ulnar head from the dorsal of the ulnar head x-ray plain lateral wrist, and the presence of fractures that shift in the base ulnar syloid. If conventional radiological examination results are still questionable to establish a diagnosis of DRUJ instability, CT is the best modality for evaluating bone structure in the DRUJ area. While MRI would be the best modality to evaluate a TFCC tear that could potentially lead to instability of DRUJ.[15,16] In our department, we rarely perform a CT or MRI to diagnose DRUJ disruption in acute phase.

Although most cases of DRUJ disruption can be dealt with by non-operative methods, an orthoped must be able to determine when an operative action is performed. In the case of unstable DRUJ disruption, it may be advisable to consider an operative management. Called unstable if there is an avulsion from the base of the ulnar styloid or there is a significant shift, then an ORIF action needs to be considered. It is important to reduce as much anatomically as possible from the distal radius fracture, before assessing the stability of the DRUJ. In our department, we have 14 cases that undergo conservative treatment (closed reduction & cast) from total 74 cases. Most of that 14 cases were case not involving intraarticular and in closed fracture condition.

A distal radius fracture that is not returned to the anatomical position may lead to malunion, which in malunion can cause angulation and shortening in the metaphysical area, and will result in a

structural incongruence on the surface of the DRUJ joints in the sagittal, coronal and axial plane. Shortening of the radius will result in impingement of triangular fibrocartilage. In the active rotation process, the triangular ligament will move above the joint surface of the ulnar head. With the ulnar variance post traumatic, the triangular ligament will tighten. The tension and impingement of the triangular ligament will limit the rotation of the forearm. The anteroposterior instability of the ulnar head may occur simultaneously with a malunion of the distal radius, due to changes in joint surface congruence between the ulna and the distal radius and the secondary traumatic rupture or traumatic elongation of the triangular ligament. Changes in the joint surface of DRUJ occur after a fracture heals without the congruence of the sigmoid notch. This will result in the limitations of pronation and supination.[12]

## CONCLUSION

Good clinical examination and rigorous radiological assessment should be performed in each case of distal radius fracture, to find out whether there is an accompanying abnormality in the DRUJ, because most of the distal end radius fracture especially involving intraarticular were accompanied with DRUJ disruption. A successful handling of DRUJ disruption is affected by the restoration of the DRUJ anatomy, so a good initial identification of DRUJ abnormalities accompanying distal end radius fractures, residual instability assessment, and preliminary handling will determine management choices that may affect the outcome. From this study, it was found that the incidence of DRUJ disruption accompanying distal end radius fracture is quite high especially if involved intraarticular and should be of concern to all physicians when confronted with distal end radius fractures. We hope this result can be a reminder for medical practitioners to avoid complications in the disregarded DRUJ disruption.

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