



# Clinical Evaluation of Treatment Approaches in Distal Radioulnar Joint Dislocations

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## Abstract

**Objective:** The ideal treatment is DRUJ stabilization by repairing or strengthening the normal anatomical structure. Reconstruction of normal anatomy not only restores function but also delays the osteoarthritis process. Posttraumatic distal radio-ulnar joint problems (DRUJ) begin with pain during pronation and supination movements of the wrist, weakness in grip, and noticeable crepitation. As the degree of damage caused by trauma increases, radioulnar instability becomes more pronounced. Untreated cases with severe cartilage-ligament injury result in osteoarthritis. In the presence of severe ligament injuries, incompatible joints and osteoarthritis, pain is relieved and wrist function is tried to be increased in the presence of severe ligament injuries that cannot be applied anatomical repair and strengthening procedures.

**Material and Methods:** Ten patients were treated DRUJ instability 1997-2020 included this study. Demographic facts: two females, eight males, between the ages of 19-36, mean age: 22.2, mean follow-up time: 8.5 months (6-12 months). Cases were included in the study as either poorly treated or healed with complications of radius and wrist fractures.

**Result:** Nine out of 10 patients benefited from the treatment at the end of six months. During the preoperative planning of the fifth case, despite the preoperative presence of ulnar collateral and TFC calcification, Bower's hemiarthroplasty was performed due to the existing carpal instability. According to the Demerit scoring system, one of the six subjects who underwent Bower's score achieved an excellent, four good, and one moderate function score. While two of the three patients who underwent Milch shortening osteotomy gave excellent and one good functional result, the postoperative scores of the patient who underwent Darrach were reduced from 27 to 9 and moderate functional recovery was achieved.

**Conclusion:** In distal ulna resections (like Darrach), completely loss of Radioulnar and Ulnocarpal articular surfaces. With the Bower procedure, the radioulnar problematic joint is removed, while the wrist carpal alignment and ulnar column and collateral complex are preserved. This provides near-normal functional and high patient satisfaction. Bowers procedure is an efficient surgical method of the treatment of DRUJ instability.

## Materials and Methods

Ten patients were treated DRUJ instability 1997-2020 included this study. Two patients who were treated in Ankara Etimesgut State Hospital between August 1997 and July 1999 and eight patients treated at Erzurum Mareşal Çaknak Military Hospital were

included in the study. Demographic facts: two females, eight males, between the ages of 19-36, mean age: 22.2, mean follow-up time: 8.5 months (6-12 months). Cases were included in the study as either poorly treated or healed with complications of radius and wrist fractures (Figure 1,2).

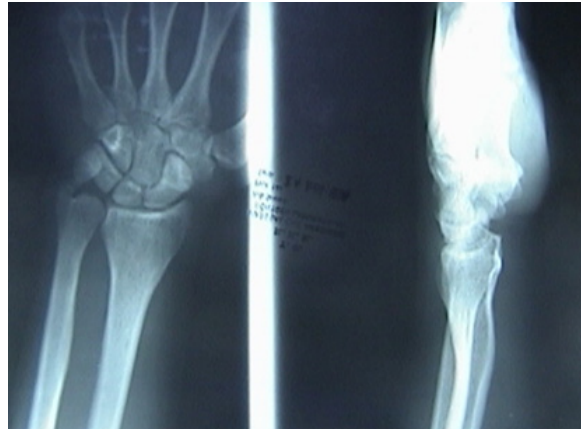


Figure 1:



Figure 2:

All patients presented with complaints of wrist pain during activity, limitation of movement, and inability to adapt to heavy sports activities. While nine cases described distal radius fractures

of childhood in their histories, eight out of nine cases had stinger's intervention. One patient's complaint was attributed to the short radius that developed as a result of a gunshot injury (Figure 3,4).



Figure 3:



**Figure 4:**

The Demerit scoring system of Garthland and Werley, modified by Sarmiento et al., Was used for the functional evaluation of the cases before and after the surgery (Table-I). The snuff pit area was recorded, and wrist movements were measured with a goniometer. In the examination, instability was investigated with the piano key test, wrist movements and click during clenching fist. With radiologically neutral anteroposterior, neutral, pronation and supination lateral radiographs; Radio-ulnar and ulno-carpal relationship disorders, radio-ulnar difference, joint spaces, osteophytes and ulna styloid fracture were noted. Bower's hemiresection arthroplasty was performed in 6 cases, Milch shortening osteotomy in three cases, and Darrach resection arthroplasty in one case. Postoperative 3-month follow-ups were evaluated according to the modified Sarmiento scoring system.

## Result

Nine out of 10 patients benefited from the treatment at the end of six months. During the preoperative planning of the fifth case, despite the preoperative presence of ulnar collateral and TFC calcification, Bower's hemiarthroplasty was performed due to the existing carpal instability. In the sixth month, she was transferred to the physical therapy service due to supination-pronation limitation. While the preoperative total score of the relevant case was 29, it was observed that functions improved, pain decreased, dorsiflexion and radial-ulnar deviation increased, supination and pronation, and the total score was 12. In the sixth month examination of the same patient, despite severe sports-activity limitation, dorsiflexion limitation and pain were detected, and he was transferred to the physical therapy service. He was rehabilitated for 15 days, and the total score was reduced to 12 and he was discharged. Table-III: Functional evaluation of the cases before and after surgery (3rd and 6th month controls). (Figure 1A and B). According to the Demerit scoring system, one of the six subjects who underwent Bower's score achieved an excellent, four good, and one moderate

function score. While two of the three patients who underwent Milch shortening osteotomy gave excellent and one good functional result, the postoperative scores of the patient who underwent Darrach were reduced from 27 to 9 and moderate functional recovery was achieved.

## Discussion

Postramatic distal radio-ulnar joint problems (DRUJ) begin with pain during pronation and supination movements of the wrist, weakness in grip, and noticeable crepitation. As the degree of damage caused by trauma increases, radioulnar instability becomes more pronounced. Untreated cases with severe cartilage-ligament injury result in osteoarthritis [1-3].

The ideal treatment is DRUJ stabilization by repairing or strengthening the normal anatomical structure. Reconstruction of normal anatomy not only restores function but also delays the osteoarthritis process [1,4,5]. In the presence of severe ligament injuries, incompatible joints and osteoarthritis, pain is relieved and wrist function is tried to be increased in the presence of severe ligament injuries that cannot be applied anatomical repair and strengthening procedures [2,6,7,8].

The radioulnar joint basically provides complex movements such as dorsal-volar displacement and slippage of the radius and ulna in the forearm axis during wrist pronation-supination movements. It occurs in some axial movement during the movement of the radius around the ulna. Despite the cylindrical articular surface of the ulna, which is not fully compatible with the sigmoid surface of the radius, DRUE performs these movements by preserving the relationship between the articular surfaces. In the neutral position, the sigmoid pit can cover 60-80 degrees of the 130-degree ulna joint surface. In full pronation, the ulna moves dorsally and rests on the dorsal wall of the sigmoid pit. This time the palmar wall limits the volar displacement of the ulna in supination. DRUE 180-degree rotation

provides 150 degrees of movement. The remaining 30 degrees is the result of lateral movement of the radius with the hand [1,3,8].

Drue joint surfaces are geometrically incompatible, and their contact is limited. This geometric mismatch of the joint surfaces is eliminated by supporting intrinsic and extrinsic structures. Intrinsic support is provided by the Triangular Fibrocartilage system (TFC) formed by ligament and cartilage structures between the radius and ulna joints. TFK; It extends from the distal ulnar edge of the radius from the palmar and dorsal sides to the ulna styloid and wraps the joint. Dorsal and palmar ligaments take equal load on pronation and supination. Therefore, in dorsal or palmar instability, both ligaments may be part of the pathology. Its close relationship with the surrounding extrinsic structures (extensor carpi ulnaris tendon sheath on the dorsal side, ulnocarpal ligament and meniscal structure on the palmar side, radiocarpal dorsal-volar ligaments) is the basis of the anatomical complex structure. TFK basically adheres to the ulna in the form of two strong fibrous bands from the dorsal and palmar face, one ends at the fovea in the ulnar head of the ulna, the other at the ulna styloid, which is the rotation axis of the forearm.

The extrinsic support dynamically provides the tendon sheath of the extensor carpi ulnaris, the pronator quadratus and the interosseous membrane. The extensor carpi can be evaluated together with intrinsic structures due to the close relationship of the sheath of the ulnaris, which is different from the other extensors and independent of the retinaculum, with the TFC dorsally. Considering the proximal axial movement of the radius, the radiocapitellar (radiohumeral) takes an important place in extrinsic support in the joint. Longitudinal radioulnar instability should definitely be evaluated in cases such as Essex-Lomprest and capitellum fractures [9-11].

Radioulnar instabilities are the result of the disruption of the bone roof of the joint and the disruption of the integrity of the

intrinsic and extrinsic connective structures. Radius fractures involving the sigmoid pit, Galeazzi fracture, ulna styloid and ulna head fractures, intrinsic TFC injuries can be listed. Axial changes as a result of forearm fractures, short radius due to fractures involving the radial growth cartilage, Essex-Lomprest fracture can be counted as extrinsic reasons. Radioulnar negative and positive differences can be examined within extrinsic instability [8-10].

Patients with radioulnar instability, severe radiocarpal arthritis and ulnar positive variance of more than 10 mm were planned for Bower's hemoresection surgery instead of Milch shortening osteotomy, while Darrach resection arthroplasty was applied to a patient with advanced ulnocarpal arthritis in which TFC was completely destroyed during the operation [11-17].

In addition, the trilonate fibrocartilage (TFK) works together with the interosseous membrane in wrist load transfer. While these importance of the radioulnar joint and TFC complex have been neglected in wrist injuries, it has been understood that today it has an important place in the sequelae of wrist trauma. In wrist injuries, the indications for surgical treatment of distal radius fractures, accompanying TFC injury, are very clear compared to ulna styloid fractures. Radioulnar joint incompatibilities and TFK problems in conservatively treated radius fractures are often overlooked.

Ulnar side pain, whether traumatic or nontraumatic, is mostly a symptom of ulnocarpal joint arthritis. Traumatically, as a result of styloid fracture, ulnocarpal dislocations, TFK tear or radial shortening, weight sharing in the ulna head may cause progressive traumatic arthritis. Causes such as positive and negative ulnar variance, abutment syndrome, nontraumatic degenerative arthropathies may also present the same symptoms. In our study, all cases were evaluated with a diagnosis of traumatic progressive ulnocarpal arthritis, and their treatments were planned [14,16,17,18] (Table 1-3).

**Table 1:** Gartland ve Werley Demerit Score Sarmiento modification.

Residual Deformity Range (0-3 points)	Point
Prominent ulnar Styloid	1
Residual dorsal tilt	2
Radial deviation of hand	3-Feb
Subjective Evaluation (0-6 points)	
<b>Excellent:</b> no pain, disability or limitation of motion	0
<b>Good:</b> occasional pain, slight limitation of motion and no disability	2
<b>Fair:</b> Occasional pain, some limitation, of motion, feeling of weakness in wrist no particular disability if careful and activities restricted	4
<b>poor:</b> pain, limitation of motion, disability and activities more or less markedly restricted	6
Objective Evaluation (Range 0 to 5 points)	
Loos of dorsiflexion	5
Loss of ulnar deviation	3
Loss of supination	2
Loss of flexion	1
Loos of radial deviation	1

Pain in distal radio-ulnar joint	1
Grip strenght loss %60 opposite site	1
Loos of pronation	2
<b>Complications (range 0-5 points)</b>	
Arthritic Changes	
Minimum	1
Minimum with pain	3
Moderate	2
Moderate with pain	4
Severe	3
severe with pain	5
Nerve complications (median)	3-Jan
Poor Finger function due to cast	2-Jan
<b>Final Results</b>	
excelent	0-2
Good	8-Mar
Fair	20-Sep
Poor	>21

**Table 2:** Preoperative Functional Evaluation.

Total Score	Case	Average score
<b>Excellent (0-2)</b>	0	-
<b>Good (3-8)</b>	0	-
<b>Fair (9-20)</b>	5	13
<b>Poor</b>	5	24.6

**Table 3:** The evaluation of the patient's 3<sup>rd</sup> and 6<sup>th</sup> months.

S. No	Cases	Surgery	Preop	3 <sup>th</sup> Month	6 <sup>th</sup> Month
1	18 E	Bower's	15	6	2
2	19 E	Bower's	23	12	7
3	19 E	Darrach	27	17	9
4	20 E	Milch	10	4	2
5	21E	Bower's	29	12	17*
6	18 E	Milch	10	4	2
7	29 K	Bower's	19	10	7
8	36 K	Bower's	23	10	8
9	22 E	Milch	11	5	3
10	18 E	Bower's	21	12	8

## Conclusion

In distal ulna resections (like Darrach), completely loss of Radioulnar and Ulnocarpal articular surfaces. With the Bower procedure, the radioulnar problematic joint is removed, while the wrist carpal alignment and ulnar column and collateral complex are preserved. This provides near-normal functional and high patient satisfaction. Bowers procedure is an efficient surgical method of the treatment of DRUJ instability.

## Acknowledgement

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## Conflicts of Interest

No conflicts of interest.

## References

- Spies CK, Langer M, Muller LP, Oppermann J, Unglaub F (2020) Distal radioulnar joint instability: current concepts of treatment. Arch Orthop Trauma Surg 140(5): 639-650.

2. Boyd B, Adams J (2021) Distal Radioulnar Joint Instability. *Hand Clin* 37(4): 563-573.
3. Carr LW, Adams B (2020) Chronic Distal Radioulnar Joint Instability. *Hand Clin* 36(4): 443-453.
4. Qazi S, Graham D, Regal S, Tang P, Hammarstedt JE (2021) Distal Radioulnar Joint Instability and Associated Injuries: A Literature Review. *J Hand Microsurg* 13(3): 123-131.
5. Mares O (2017) Distal radioulnar joint instability. *Hand Surg Rehabil* 36(5): 305-313.
6. Tan DMK, Lim JX (2019) Treatment of Carpal Instability and Distal Radioulnar Joint Instability. *Clin Plast Surg* 46(3): 451-468.
7. Poppler LH, Moran SL (2020) Acute Distal Radioulnar Joint Instability: Evaluation and Treatment. *Hand Clin* 36(4): 429-441.
8. Mesplie G, Grelet V, Leger O, Lemoine S, Ricarrere D, et al. (2017) Rehabilitation of distal radioulnar joint instability. *Hand Surg Rehabil* 36(5): 314-321.
9. Oskam J, Bongers KM, Karthaus AJ, Frima AJ, Klasen HJ (1996) Corrective Osteotomy for malunion of the distal radius: the effect of concomitant ulnar shortening osteotomy. *Arch Orthop Trauma Surg* 115(3-4): 219-22.
10. Arslan H, Subasi M, Kesemenli C, Kapukaya A, Necmioglu S (2003) Distraction osteotomy for malunion of the distal end of radius with radial shortening. *Acta Orthop Belg* 69(1): 23-28.
11. Massart P, Merloz P (1982) Segmental shortening of the ulna in some malunions of the distal radius. *Ann chir Main* 1(1): 65-70.
12. Brown JN, Bell MJ (1994) Distal radial osteotomy for malunion of wrist fractures in young patients. *J Hand Surg* 19(5): 589-593.
13. Fricker R, Pfeiffer KM, Troeger H (1996) Ulnar shortening osteotomy in posttraumatic impaction syndrome. *Arch Orthop Trauma Surg* 115(3-5): 158-161.
14. Perchlaner S (1998) Decompression of the ulnar wrist joint compartment by decompression osteotomy of the head of Ulna. *Handchir Mikrochir Plast Chir* 30(6): 375-378.
15. Oskam J, Kingma J, Klasen HJ (1993) Ulnar-shortening osteotomy after fracture of distal radius. *Arch Orthop Trauma Surg* 112(4): 198-200.
16. Hove LM, Molster AO (1994) Surgery for posttraumatic wrist deformity. Radial osteotomy and/or ulnar shortening in 16 Colles' fractures. *Acta Orthop Scand* 65(4): 434-438.
17. Fricker R, Pellegrino A, Pfeiffer KM, Troeger H (1997) Wrist impaction syndrome after distal or forearm fractures in treated by ulnar osteotomy. Surgical techniques and results in 26 cases. *Ann Chir Main Memb Super* 16(4): 285-291.
18. Fernandez DL (1988) Radial osteotomy and Bowers arthroplasty for malunited fractures of the distal end of the radius. *J Bone Joint Surg Am* 70(10): 1538-1551.