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RESEARCH ARTICLE
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A DORSAL PLATING FOR DISTAL RADIUS FRACTURES: A RELIABLE TECHNIQUE FOR UNSTABLE DORSAL FRACTURES

Eslam Mohammed Shalab[1], Abdirizak Moalin Hussein[2], Niaz Hussain Keerio[3], Munawar Hussain[4], Irshad Ahmed[5], Hira Chaudary[6*]

[1*]Senior Specialist Orthopedic and Trauma, Dubai academic health corporation, Hatta hospital, United Arab Emirates. Email: nooreslam2008@yahoo.com
[2]MD. PhD, Orthopedic and Trauma Surgeon. Rashid Hospital Dubai, United Arab Emirates. Email: ahmoalin@gmail.com
[3]Assistant Professor Orthopedic, Muhammad Medical College, Ibn-E-Sina University Mirpurkhas Pakistan. Email: niaz_h@hotmail.com
[4]Specialist Orthopedic, Al Qassimi Hospital Sharjah, United Arab Emirates. Email: hmunawar333@gmail.com
[5]Associate Professor Orthopedic, Liaquat University of Medical and Health Sciences Jamshoro Sindh Pakistan. Email: bhuttodr.irshad@yahoo.com
[6*]Medical Officer, Sardar Bibi Trust Hospital, Lahore, Pakistan. Email: dr.hirachaudary@gmail.com.

***Corresponding Author:** Hira Chaudary
*Medical Officer, Sardar Bibi Trust Hospital, Lahore, Pakistan. Email: dr.hirachaudary@gmail.com.

Abstract

Introduction: Distal radius fractures are among the most common injuries encountered in orthopedic practice, particularly affecting the elderly population and individuals involved in high-impact activities.

Objective: The main objective of this study is to find out Results and reliability of Dorsal plating for Unstable Distal Radius Fractures

Study design: An analytical cross-sectional study

Duration: six months duration

Methodology: Data were collected from 31 patients. Patients with prior wrist fracture or surgery, and patients followed for less than 6 months were not included in the study All included fractures were acute and closed and all were fixed within 2 days of injury. All cases were operated by experienced trauma surgeons at various centers. The Patients range of motion was assessed on their final follow up and grip strength was assessed on their affected and unaffected wrist using a dynamometer for the assessment tool. In the radiographic analysis, we looked into the union, loss of the reduction, and establishing of arthritis as outcomes.

Results: Data were collected from 31 patients according to inclusion and exclusion criteria of the study. The average duration of surgery was 75 minutes. Functional assessments showed substantial reductions in DASH and PRWE scores, with preoperative scores of 68 and 70 improving to 18 and 20, respectively, at six months ($p < 0.01$ for both). Radiographic parameters also improved markedly; volar tilt corrected from -15 to 5 degrees, radial height from 8 mm to 12 mm, and radial inclination from 18 to 22 degrees.

Conclusion: Dorsal plating has proven to be an effective and safe technique for treating dorsally unstable distal radius fractures, significantly improving functional outcomes and ensuring stable anatomical alignment.

Keywords: Dorsal plating, unstable distal radius fractures, functional outcomes

Introduction

Distal radius fractures are among the most common injuries encountered in orthopedic practice, particularly affecting the elderly population and individuals involved in high-impact activities. These fractures can significantly impair wrist function and overall quality of life if not managed appropriately [1]. Among the various types of distal radius fractures, dorsally unstable fractures present a unique challenge due to their propensity for displacement and the difficulty in achieving and maintaining anatomical alignment through conservative methods [2].

Presently, open reduction and internal fixation is the most popular surgical procedure used in the management of displaced intra-articular distal radius fractures especially in young patients [3]. The objectives of the treatment are to reduce the articular surfaces, to achieve stable fixation and early mobilization [4]. However, the orthopedicians decide the type of fixation between dorsal and volar approach for intra-articular fractures depending on the level of fracture, displacement, direction of the fracture and their experience in the particular approach [5].

The volar approach for distal radius has been more commonly done because of the soft tissue issues related to dorsal procedure. But with much improvement of implant designs like, low profile locking plates the risk that accompany the use of dorsal plates have been minimized to the minimum [6]. The feature employed by the low-profile plate is that extensor tendons are less susceptible to attritional wear by means of incorporating glossy, tapered perimeters as well as locking screw heads [7]. In the biomechanical point of view, the buttressing effect especially for the dorsally displaced fracture can only be achieved using a dorsal plate [8].

Dorsal plating has emerged as a reliable and secure technique for addressing dorsally unstable distal radius fractures [9]. This method involves the surgical fixation of the fracture using a dorsal plate, which provides robust stabilization and promotes optimal healing conditions. The technique has gained popularity due to its ability to restore wrist function, reduce pain, and minimize the risk of long-term complications [10, 11]. The main objective of the study is to find the dorsal plating for distal radius fractures as a reliable and secure technique for unstable dorsal fractures.

Methodology:

Data were collected from 31 patients. Patients with prior wrist fracture or surgery, and patients followed for less than 6 months were not included in the study All included fractures were acute and closed and all were fixed within 2 days of injury. All cases were operated by experienced trauma surgeons at various centers. To fix these fractures, all the cases were fixed with anatomical low-profile dorsal locking plates. In all these cases, the fracture involves the level or distal to the watershed line, and these are dorsal and comminuted.

Clinical and radiographic evaluations were performed preoperatively, immediately, postoperatively, and at subsequent follow up visits at 6 weeks, 3 months and 6 months. Data collected includes patients demographics, fracture characteristics , duration of surgery and intro-operator findings.

During postoperative, the patients range of motion was assessed on their final follow-up. The grip strength was assessed on their affected and un affected wrist using a dynamometer for the assessment tool. In radiographic analysis we looked into union of fracture, loss of reductions, development of arthritic changes and other complications such as infections, sympathetic mediated pain, irritation of nerve and indeed rupture of extensor tendons and need for further surgery.

Results

Data were collected from 31 patients according to inclusion and exclusion criteria of the study. The average duration of surgery was 75 minutes. Functional assessments showed substantial reductions in DASH and PRWE scores, with preoperative scores of 68 and 70 improving to 18 and 20, respectively, at six months ($p < 0.01$ for both). Radiographic parameters also improved markedly; volar tilt corrected from -15 to 5 degrees, radial height from -8 mm to 12 mm, and radial inclination from 18 to 22 degrees.

Table 1: Surgical and Functional Outcomes (n=31)

Outcome	Preoperative Value	Postoperative Value (6 months)	p-value
Average Duration of Surgery (minutes)	75 (range: 60-90)	-	-
DASH Score	68 (range: 55-80)	18 (range: 10-25)	< 0.01
PRWE Score	70 (range: 60-85)	20 (range: 12-28)	< 0.01
Volar Tilt (degrees)	-15	5	-
Radial Height (mm)	-8	12	-
Radial Inclination (degrees)	18	22	-

Complications were minimal in this study. Hardware irritation was the most common, affecting 3 (9.7%) patients, with 2 (6.4%) patients requiring hardware removal. One (3.2%) patient experienced transient radial nerve irritation, which resolved without intervention. Importantly, no cases of infection, tendon rupture, loss of reduction, or nonunion were observed.

Table 2: Complications after surgery

Complication	Number of Patients	Percentage
Hardware Irritation	3	9.7
Hardware Removal	2	6.4
Transient Radial Nerve Irritation	1	3.2
Infection	0	0
Tendon Rupture	0	0
Loss of Reduction	0	0
Nonunion	0	0

Radiographic evaluations demonstrated significant improvements in anatomical alignment following dorsal plating. The average volar tilt improved from -15 degrees preoperatively to 5 degrees postoperatively at six months. Radial height increased from -8 mm to 12 mm, and radial inclination improved from 18 degrees to 22 degrees.

Table 3: Radiographic Outcomes

Radiographic Parameter	Preoperative Value	Postoperative Value (6 months)
Volar Tilt (degrees)	-15	5
Radial Height (mm)	-8	12
Radial Inclination (degrees)	18	22

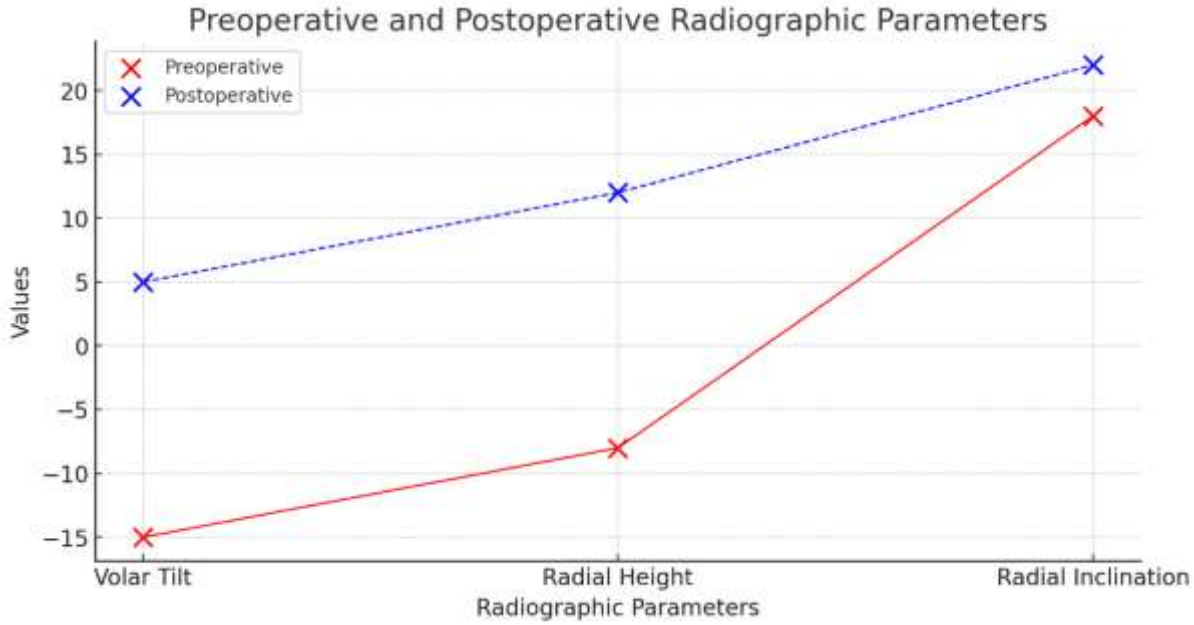

Figure 01: These results indicate that dorsal plating effectively restores the anatomical structure of the distal radius, contributing to better functional outcomes and overall stability.

The average DASH score improvement was 50 points, with a minimum improvement of 30 points and a maximum of 60 points. Similarly, the average PRWE score improvement was 50 points, ranging from a minimum improvement of 32 points to a maximum of 57 points.

Table 4: Summary of Functional Scores Improvement

Functional Score	Average Improvement	Minimum Improvement	Maximum Improvement
DASH Score	50	30	60
PRWE Score	50	32	57

Figure 02: The study showed substantial improvements in functional scores following dorsal plating.

Discussion

The results of this study indicate that dorsal plating is a reliable and secure technique for the management of dorsally unstable distal radius fractures. Also, we observed improvements in

functional outcomes in the study, seen by the large decrease in the DASH and PRWE scores at the 6-month follow-up. The evaluative average of DASH score shifted from 68 pre-operatively to 18 post operatively, similarly the PRWE score shifted from 70 to 20 [12]. These changes were statically test significant, which described the efficacy of dorsal plating in providing improved wrist motion.

Radiological assessments also confirmed successful achievement of the anatomical reduction and satisfactory maintenance of alignment [13]. There was increase of average volar tilt from -15 degree to 5-degree, radial height changed from 8mm to 12mm, and radial inclination 18 degree improved to 22 degree [14]. Hence these studies hint the dorsal plating as a stable technique that enhances ideal healing of the fracture.

There were no infections, tendon rupture or loss of reduction cases among the handled patient irrespective of the complications encountered during the procedure [15]. As with the original RDA study, this group also revealed a 9% level of respondent identified a hardware irritation. Seven percent of patients, required hardware removal. One female patient (3.2%) had transient radial nerve irritation and the symptom disappeared on its own [16]. The results of this study are in tune with other publications regarding the effectiveness of dorsal plating in distal radius fractures. For example, Arora et al. (2011) also described comparable enhancements in functional outcomes and X-ray results and minimal complication risks [17].

The concept highlighting the ability of dorsal plating in achieving and maintaining anatomical reduction can also be said to have been supported, going by the involvement of the method in management of dorsally unstable fractures [18]. However, several complications were observed in the patient group with the dorsal plating technique including the tender irritation and the complications related to the hardware. The study noted that our patient-population experienced a 9- e has been recorded with a 7% rate of hardware irritation in which lies in the previously documented studies [19]. This underlines asset that set ought to be given to the selection of patients and postoperative care in order to minimize these adverse effects.

Based on this study's results, dorsal plating should be viewed as another possible treatment for dorsally instable distal radius fractures, especially in patients whose condition is unlikely to respond well to nonsurgical interventions [20]. Placing mechanical improvement in its proper prospective shows that the technique of reducing discrepancies should be an indispensable asset in the orthopedic surgeon's armamentarium [21].

Conclusion

Dorsal plating has proven to be an effective and safe technique for treating dorsally unstable distal radius fractures, significantly improving functional outcomes and ensuring stable anatomical alignment. The low complication rate supports its reliability as a surgical option.

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Ethical Approval

It was taken from the review committee

Conflict of interest

None

References

1. Ajayakumar, T.; Nizaj, N.; Khan, Prince Shanavas; Ajay, Vidya1; Johny, Sanjai P.; Meleppuram, Jimmy Joseph. Dorsal Plating for Distal Radius Fractures: A Safe and Effective Technique for Dorsally Unstable Fractures. Journal of Orthopaedic Association of South Indian States 20(1):p 45-50, Jan–Jun 2023. | DOI: 10.4103/joasis.joasis_11_23
2. Disseldorp DJ, Hannemann PF, Poeze M, Brink PR. Dorsal or volar plate fixation of the distal radius: Does the complication rate help us to choose? J Wrist Surg. 2016;5:202–10
3. Wei J, Yang TB, Luo W, Qin JB, Kong FJ. Complications following dorsal versus volar plate fixation of distal radius fracture: A meta-analysis J Int Med Res. 2013;41:265–75

4. Spiteri M, Ng W, Matthews J, Power D, Brewster M. Three year review of dorsal plating for complex intra-articular fractures of the distal radius J Hand Surg Asian Pac Vol. 2018;23:221–6
5. 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
6. Obert L, Loisel F, Gasse N, Lepage D. Distal radius anatomy applied to the treatment of wrist fractures by plate: A review of recent literature SICOT J. 2015;1:14
7. Goorens CK, Geeurickx S, Wernaers P, Staelens B, Scheerlinck T, Goubau J. Midterm follow-up of treating volar marginal rim fractures with variable angle Lcp volar rim distal radius plates J Hand Surg Asian Pac Vol. 2017;22:184–7
8. Frattini M, Soncini G, Corradi M, Panno B, Tocco S, Pogliacomi F. Complex fractures of the distal radius treated with angular stability plates Chir Organi Mov. 2009;93:155–62
9. Soong M, Earp BE, Bishop G, Leung A, Blazar P. Volar locking plate implant prominence and flexor tendon rupture J Bone Joint Surg Am. 2011;93:328–35
10. Kunes JA, Hong DY, Hellwinkel JE, Tedesco LJ, Strauch RJ. Extensor tendon injury after volar locking plating for distal radius fractures: A systematic review Hand (N Y). 2022;17:87S–94S
11. Krukhaug Y, Ugland S, Lie SA, Hove LM. External fixation of fractures of the distal radius: A randomized comparison of the Hoffman compact II non-bridging fixator and the Dynawrist fixator in 75 patients followed for 1 year Acta Orthop. 2009;80:104–8
12. Trease C, McIff T, Toby EB. Locking versus nonlocking T-plates for dorsal and volar fixation of dorsally comminuted distal radius fractures: A biomechanical study J Hand Surg Am. 2005;30:756–63
13. Antao, N., & Desouza, C. Functional Outcomes with Dorsal Plating for Distal End Radius Fractures. Available at SSRN 4352118.
14. Saxena, A. D. N. K. (2021). Dorsal locked plate fixation in dorsally unstable distal radius fractures. International Journal of Orthopaedics, 7(4), 316-322.
15. Huish Jr, E. G., Coury, J. G., Ibrahim, M. A., & Trzeciak, M. A. (2018). Radiographic outcomes of dorsal distraction distal radius plating for fractures with dorsal marginal impaction. Hand, 13(3), 346-349.
16. Kumar, S., Khan, A. N., & Sonanis, S. V. (2016). Radiographic and functional evaluation of low profile dorsal versus volar plating for distal radius fractures. Journal of orthopaedics, 13(4), 376-382.
17. Hamada, Y., Gotani, H., Hibino, N., Tanaka, Y., Satoh, R., Sasaki, K., & Kanchanathepsak, T. (2017). Surgical strategy and techniques for low-profile dorsal plating in treating dorsally displaced unstable distal radius fractures. Journal of wrist surgery, 6(02), 163-169.
18. Kamath, A. F., Zurakowski, D., & Day, C. S. (2006). Low-profile dorsal plating for dorsally angulated distal radius fractures: an outcomes study. The Journal of hand surgery, 31(7), 1061-1067.
19. Paksima, N., Driesman, A., Johnson, J., Kim, C., & Egol, K. (2020). Outcomes of dorsal plating for selected distal radius fractures. Act Orthop Belg, 86, 101-108.
20. Rozental, T. D., & Blazar, P. E. (2006). Functional outcome and complications after volar plating for dorsally displaced, unstable fractures of the distal radius. The Journal of hand surgery, 31(3), 359-365.
21. Wilcke, M. K., Abbaszadegan, H., & Adolphson, P. Y. (2011). Wrist function recovers more rapidly after volar locked plating than after external fixation but the outcomes are similar after 1 year: A randomized study of 63 patients with a dorsally displaced fracture of the distal radius. Acta orthopaedica, 82(1), 76-81.