

Original Research Article

Functional outcomes of distal radial fractures by 5 pin technique

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ABSTRACT

Background: Distal radius fractures (DRF) are among the most common orthopaedic injuries. This study assesses the efficacy of a percutaneous five-pin fixation method for DRF, a procedure chosen for its minimal invasiveness and mechanical stability which promotes early postoperative wrist movement. We report on the clinical and functional results achieved with this technique in our patient cohort.

Methods: We prospectively followed 35 patients. At the 6-month postoperative mark, wrist function was quantified using the QuickDASH questionnaire, while radiographic alignment was assessed based on the criteria defined by Sarmiento's modification of Lindstrom.

Results: The mean age of patients was 45.2 years (range: 23-70 years), with a male predominance (71.4%). Road traffic accidents were the most common mode of injury (57.1%). The mean QuickDASH score at 6 months was 11.4, with 74.3% of patients achieving an excellent or good outcome. Radiological assessment showed excellent or good results in 80% of patients based on Sarmiento's criteria.

Conclusions: For displaced DRF with minimal fragmentation, the five-pin method offers a valuable treatment strategy that is not only successful but also economical and tissue-sparing. It provides stable fixation, enables early mobilization, and results in functional outcomes comparable to more invasive procedures like volar plating.

Keywords: Distal radius fracture, Five pin technique, Percutaneous pinning, Quick DASH score, Functional outcome

INTRODUCTION

Distal radius fractures (DRF) are a frequent presentation in emergency departments, constituting a significant proportion of all traumatic fractures.^{1,2} While casting was once the mainstay of treatment, the high incidence of malunion and stiffness led to the development of various surgical techniques, including percutaneous pinning and open reduction with internal fixation.³

The five-pin technique is a modification of standard percutaneous K-wire fixation. A critical modification involves the insertion of radioulnar pins to secure the distal radioulnar joint. This addition counteracts rotational forces, thereby augmenting overall construct stability and

mitigating the common problem of secondary fracture settlement during healing.⁴

This study analyses the functional and radiological outcomes of this technique in a cohort of 35 patients treated at our tertiary care centre.

METHODS

This prospective interventional study was conducted in the Department of Orthopaedics, Malabar Medical College, Ulliyeri, from January 2021 to December 2023. After obtaining institutional ethical committee approval, 35 patients with displaced DRF were enrolled based on predefined inclusion and exclusion criteria.

Inclusion criteria

The study cohort consisted of adults over 20 years of age who sustained closed, displaced fractures of the distal radius, including both intra-articular and extra-articular patterns were included.

Exclusion criteria

Patients aged less than 20 years, open fractures, associated ipsilateral upper limb injuries, Barton’s fractures and fractures with severe articular or metaphyseal comminution were excluded.

All patients underwent a detailed clinical examination and radiographic evaluation with standard anteroposterior and lateral views of the wrist. Following satisfactory closed reduction, fracture stabilization was achieved percutaneously using five smooth K-wires. Fixation was achieved using five K-wires inserted percutaneously at standardized points across the fracture fragments and the distal radioulnar joint to enhance rotational stability, as described in the five-pin technique literature.⁴

The 1.8 mm and 2.0 mm smooth K-wires were used, ensuring double cortical purchase. A below-elbow plaster slab was applied for 4-6 weeks, and pin removal was performed at 6 weeks post-operatively.

Patients were followed up at 2 weeks, 6 weeks, 3 months, and 6 months. Functional outcome was assessed at 6 months using the QuickDASH questionnaire.^{5,6} Radiological outcome was evaluated using established radiographic criteria (radial height, radial inclination, and volar tilt) as described by Sarmiento et al.⁷

Statistical analysis

Data were analyzed using SPSS statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics, including means, standard deviations, and percentages, were used to summarize the demographic, functional, and radiological data.

RESULTS

We prospectively evaluated thirty-five patients with distal radius fractures treated with the five-pin technique.

Table 1: Age distribution, (n=35).

Age group (in years)	N	Percentage (%)
20-29	5	14.3
30-39	8	22.9
40-49	9	25.7
50-59	7	20.0
60-70	6	17.1

The mean age of the cohort was 45.2 years, with the largest proportion of patients (25.7%) belonging to the 40-49 years age group (Table 1).



Figure 1 (A and B): Pre operative and post operative AP and lateral view X ray of a patient, demonstrating successful fracture reduction and fixation with the five-pin technique.



Figure 2 (A and B): Pre operative and post operative AP and lateral view X ray of another patient, further illustrating the radiological outcome achievable with this method.

Table 2: Sex distribution, (n=35).

Sex	N	Percentage (%)
Male	25	71.4
Female	10	28.6

There was a significant male predominance, with males constituting 71.4% of the study population (Table 2).

Table 3: Mode of injury, (n=35).

Mode of injury	N	Percentage (%)
RTA	20	57.1
Fall	15	42.9

Road traffic accidents were the most common mechanism of injury, accounting for 57.1% of cases (Table 3).

Table 4: Frykman classification, (n=35).

Frykman type	N	Percentage (%)
I	3	8.6
II	8	22.9
III	5	14.3
IV	4	11.4
V	4	11.4
VI	4	11.4
VII	4	11.4
VIII	3	8.6

The distribution of fracture types according to the Frykman classification is shown in Table 4, with type II fractures being the most frequent (22.9%).

Functional outcome (QuickDASH score at 6 months)

Functional assessment at 6 months revealed a mean QuickDASH score of 11.4.

The majority of patients (74.3%) achieved an excellent or good functional outcome (Table 5).

Table 5: QuickDASH score evaluation, (n=35).

QuickDASH score	Interpretation	N	Percentage (%)
0-10	Excellent	16	45.7
11-15	Good	10	28.6
16-20	Fair	6	17.1
> 20	Poor	3	8.6

Radiological outcome (Sarmiento's modification of Lindstrom criteria)

Radiological evaluation based on Sarmiento's criteria showed that 80% of patients had an excellent or good result, indicating satisfactory fracture healing and alignment (Table 6).

Table 6: Radiological outcome, (n=35).

Result	N	Percentage (%)
Excellent	18	51.4
Good	10	28.6
Fair	5	14.3
Poor	2	5.7

DISCUSSION

In our clinical experience with 35 patients, the five-pin technique demonstrated considerable reliability. The observed mean QuickDASH score of 11.4 suggests a functional restoration that aligns with outcomes documented in studies for other fixation methods, including volar plating.^{8,9}

The radiological parameters, crucial for long-term wrist function, were satisfactorily maintained. The 80% rate of excellent and good results (Table 6) indicates the technique's efficacy in preventing radial shortening and loss of palmar tilt, which are common causes of poor outcomes like ulnar-sided wrist pain and decreased grip strength.¹⁰

The complications observed in our study were minor and manageable. Three patients (8.6%) developed superficial pin tract infections, which resolved with oral antibiotics and local pin site care. Two patients reported transient irritation of the extensor pollicis longus tendon, which subsided completely upon K-wire removal. There was one case of minor loss of reduction (>2 mm settling) in an osteoporotic patient, which did not require revision surgery and resulted in a fair functional outcome (DASH score 18).

The technique offers several distinct benefits. The primary advantages of this technique stem from its percutaneous nature, which minimizes soft tissue damage and promotes biological healing. Furthermore, it is a cost-effective alternative to more expensive implant systems.³ The relative technical simplicity of the procedure and the sufficient stability it provides for early mobilization are also key benefits that contribute to positive patient outcomes.⁴

Limitations of the study include its relatively small sample size and the lack of a direct comparative group (e.g., volar plating). A larger, randomized controlled trial would provide stronger evidence.

CONCLUSION

In conclusion, our study supports the use of the five-pin technique as a dependable and efficient option for managing specific distal radius fractures. Its minimal tissue disruption, low cost, and ability to provide enough stability for early rehabilitation make it a particularly suitable choice in our clinical setting.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Ando J, Takahashi T, Ae R, Ota S, Ninomiya S, Sasaki S, et al. Epidemiology of distal radius fracture: a regional population-based study in Japan. *BMC Musculoskelet Disord.* 2023;24(1):478.
2. Corsino CB, Reeves RA, Sieg RN. Distal Radius Fractures. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2024.
3. Mauck BM, Swigler CW. Evidence-Based Review of Distal Radius Fractures. *Orthop Clin North Am.* 2018;49(2):211-22.
4. Markiewitz AD, Gellman H. Five-pin external fixation and early range of motion for distal radius fractures. *Orthop Clin North Am.* 2001;32(2):329-35.
5. Germann G, Wind G, Harth A. The DASH (Disability of Arm-Shoulder-Hand) Questionnaire--a new instrument for evaluating upper extremity treatment outcome. *Handchir Mikrochir Plast Chir.* 1999;31(3):149-52.
6. Hosokawa T, Tajika T, Suto M, Chikuda H. The Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) scores in 961 Japanese volunteers. *J Orthop Surg (Hong Kong).* 2020;28(3):2309499020970656.
7. Sarmiento A, Latta LL. The evolution of functional bracing of fractures. *J Bone Joint Surg Br.* 2006;88(11):141-8.
8. Rhee SH, Kim J, Lee YH, Gong HS, Lee HJ, Baek GH. Factors Affecting Late Radiographic Outcomes after Volar Locking Plate Fixation for Distal Radius Fractures. *J Hand Surg Am.* 2017;42(3):188-95.
9. Ippolito E, Ponte M, Marsiolo M, Sica A, Spoliti M, Gumina S, et al. Epidemiology of distal radius fractures: a detailed survey on a large sample of patients in a suburban area. *Eur J Orthop Surg Traumatol.* 2022;32(5):925-32.
10. Chhabra AB, Yildirim B. Adult Distal Radius Fracture Management. *J Am Acad Orthop Surg.* 2021;29(22):e1105-6.

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