

Closed Reduction and K-Wire Fixation of Intra Articular Distal Radius Fracture Versus Volar Plating: A Prospective Comparative Study

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Abstract

Background and objectives: Common injuries that often call for surgery are displaced intra-articular distal radius fractures. Two common treatment methods are volar plate fixation and percutaneous k-wire. This study compared the clinical, functional, radiological, and postoperative results of open reduction and internal fixation using a volar plate with closed reduction with percutaneous K-wire fixation in adult patients with displaced intra-articular distal radius fractures.

Methods: A prospective, non-randomized comparative study was conducted between October 2025 and October 2026 in public and private hospitals in Erbil City, Iraq. Forty adult patients with displaced intra-articular distal radius fractures were included and allocated to either closed reduction with percutaneous K-wire fixation (n = 20) or open reduction and internal fixation using a volar plate (n = 20). Clinical, radiological, and functional outcomes were assessed.

Results: Baseline characteristics were comparable between the groups. Operative time was significantly shorter in the K-wire group than in the volar plate group (30 vs. 62 minutes, $P = 0.001$). The volar plate group demonstrated significantly greater flexion, extension, and supination at 6 weeks and 3 months (all $P < 0.05$), although these differences were no longer significant at 6 months. No significant differences were observed in postoperative radial height, volar tilt, radial inclination, overall radiological outcomes, Gartland and Werley scores, PRWE pain, PRWE function, or total PRWE scores. Postoperative complication rates were low and comparable between the groups.

Conclusion: Both volar plate fixation and percutaneous K-wire fixation provided satisfactory radiological and functional outcomes for displaced intra-articular distal radius fractures. Volar plate fixation facilitated faster early recovery of wrist motion, whereas K-wire fixation offered the advantage of a significantly shorter operative time.

Keywords: Distal radius fracture; Volar locking plate; Kirschner wire; Open reduction and internal fixation; Percutaneous pinning; Wrist function; PRWE; Gartland and Werley score.

Introduction

One of the most frequent fractures of the upper extremity, distal radius fractures account for a significant percentage of orthopedic trauma cases and ER visits globally. Particularly when they affect the articular surface, these injuries can seriously reduce hand function, wrist motion, grip strength, and general quality of life.¹ Because restoration of joint congruity and secure fixation are necessary to reduce the likelihood of post-traumatic arthritis, chronic pain, stiffness, and functional impairment, intra-articular distal radius fractures pose a unique treatment challenge. As a result, treatment selection is crucial for both immediate recovery and long-term functional results.¹

There is a bimodal age distribution in the incidence of distal radius fractures. These fractures most frequently happen in children and teenagers during puberty, a time of rapid skeletal growth and comparatively low bone mineralization.² Distal radius fractures are less common in young people, who typically sustain injuries from high-energy trauma such as car accidents or sports-related injuries.^{2,3} However, the prevalence increases once again in older persons, especially women, primarily due to osteoporosis and heightened vulnerability to low-energy falls.^{2,3} The most frequent cause of injury, regardless of age, is a fall onto an outstretched hand, which can result in both intra-articular and extra-articular fracture patterns due to axial and bending pressures.^{2,3}

Restoring normal anatomy, achieving stable fixation, allowing early mobilization, and maximizing functional recovery while reducing complications are the primary goals of treatment. Closed reduction, immobilization with a back slab and then a full cast, and serial radiological evaluation in the initial weeks to guarantee reduction maintenance are frequently effective treatments for stable distal radius fractures.⁴ However, because loss of palmar tilt, radial height, or radial inclination may impair wrist biomechanics and functional results, fractures exhibiting considerable displacement, metaphyseal instability, or intra-articular extension may necessitate surgical intervention.⁴

One of the most popular surgical procedures for unstable distal radius fractures is still closed reduction followed by percutaneous Kirschner wire (K-wire) fixation. K-wires are percutaneously placed after anatomical reduction to minimize soft tissue disruption and preserve fracture alignment.⁴ The method is especially appealing to younger patients with good bone quality and fractures

that can be indirectly reduced because it is quite easy, affordable, and minimally intrusive. However, K-wire fixation can lead to problems such as pin tract infection, secondary displacement, and loss of reduction and typically necessitates additional immobilization until the fracture heals.⁴

Over the past 20 years, volar locking plate fixation has become widely accepted due to its ability to offer rigid internal fixation, restore articular morphology, and enable early postoperative wrist movement. When compared to dorsal plating, external fixation, and percutaneous pinning, volar plating has been shown in several clinical investigations to provide better functional recovery and better radiographic alignment maintenance.⁴ Volar plating does have several drawbacks, nonetheless. Tendon irritation and tendon rupture are among the most serious issues, with an overall complication rate of about 15% recorded. Flexor tendon problems may be minimized by properly installing a low-profile volar plate at the metaphyseal area.⁴ Displaced extra-articular or minimally comminuted intra-articular fractures with a sufficient distal fragment to allow surgical fixation are the main indications for volar locking plates. While traditional screws might be enough in younger patients with healthy bone stock, locking plates are particularly helpful in osteoporotic bone.⁵ Many surgeons sometimes use a splint or cast in the early postoperative phase for extra safety and patient comfort, even though rigid fixation usually removes the need for extended immobilization.⁵ The best surgical strategy for displaced unstable intra-articular distal radius fractures in younger individuals is still up for debate, despite the widespread use of both volar locking plate fixation and percutaneous K-wire fixation. K-wire fixation is less intrusive and more economical than volar plating, which provides stable fixing and early mobilization. There is still scarce comparative data on radiographic restoration, functional recovery, and procedure-related problems in this patient group. Thus, in patients with displaced unstable intra-articular distal radius fractures, this prospective comparative study aimed to assess and compare the functional outcomes, radiographic outcomes, and postoperative complications between closed reduction with percutaneous K-wire fixation and volar locking plate fixation.

Patients and Methods

Between October 2025 and October 2026, this prospective, non-randomized comparative study was carried out in public and private hospitals in Erbil City, Iraq's Kurdistan Region. In adult patients with displaced intra-articular distal radius fractures, the study evaluated the clinical, functional, and radiological results of closed reduction using percutaneous Kirschner wire (K-wire) fixation with open reduction using volar locking plate fixation.

Forty patients in total were included in the study; twenty underwent closed reduction and percutaneous K-wire fixation, while the other twenty underwent open reduction and internal fixation with a volar locking plate. With a statistical power of 80% at a significance level of 5%, this sample size was deemed suitable to detect high effect sizes (Cohen's $d \geq 0.8$) and to provide preliminary data for future comparison studies with sufficient power.

Those included were patients between the ages of 18 and 65 who had closed intra-articular distal radius fractures that were categorized as type B1, B2, B3, or C1 by the AO/OTA. The study excluded patients with open fractures, a history of poor compliance with postoperative rehabilitation, serious medical comorbidities including uncontrolled diabetes mellitus or severe peripheral vascular disease, or prior surgery affecting the afflicted wrist.

Because the trial was non-randomized, patients were assigned to either treatment group based on the clinical assessment of the treating orthopedic surgeon and fracture characteristics. The K-wire group had closed manipulation under fluoroscopic guidance to reduce fractures, and then numerous Kirschner wires were used for percutaneous fixation to preserve anatomical alignment. The volar plating group used a volar locking plate for internal fixation and a typical volar technique for open reduction. Experienced orthopedic surgeons carried out all surgical procedures utilizing standard operating procedures, and the institutional protocol was followed for postoperative care and rehabilitation.

To evaluate fracture healing and functional recovery, all patients were monitored clinically and radiographically. Fracture stability, wrist range of motion, grip strength, and operating time were the main outcome measures. To evaluate fracture union and reduction maintenance during the follow-up period, radiographic assessment was carried out. At every follow-up visit, functional outcomes were assessed, and postoperative complications were documented and compared between the two treatment groups. These complications included infection, tenosynovitis, complex regional pain syndrome, superficial radial nerve injury, loss of reduction, implant-related complications, and the need for reoperation. At six months, the wrist and forearm range of motion was assessed and compared to the normal contralateral side. The Demerit point system of Gartland & Werley modified by Sarmiento et al. was used to do a functional analysis of the data.⁶ The Patient-Rated Wrist Evaluation (PRWE) questionnaire was used to evaluate functional results 12 months after surgery. The 15-item PRWE is a validated patient-reported outcome measure that is specific to the wrist. Ten measures measure disability during activities of daily life, while the first five items gauge the intensity and frequency of wrist discomfort. Greater pain and functional disability are indicated by higher total scores, which range from 0 to 100. The PRWE was chosen because it was created especially for patients with distal radius fractures and has been demonstrated to be a valid, responsive, and dependable tool for evaluating pain and wrist-related impairment after therapy.⁵ Radiological outcomes were assessed using standard posteroanterior (PA) and lateral radiographs of the affected wrist obtained

with the forearm in a neutral rotation. Radiographs were evaluated immediately after surgery and at each follow-up visit to assess fracture alignment, maintenance of reduction, and fracture union. Anatomical outcomes were assessed using Sarmiento's modification of the Lindström criteria, which evaluates radial height, radial inclination, volar (palmar) tilt, and ulnar variance. Based on these parameters, the radiological results were classified as excellent, good, fair, or poor according to the established criteria.⁷

Prior to recruitment, all subjects provided written informed consent following an explanation of the study's goals, surgical procedures, possible risks, and anticipated benefits. Participants were made aware that their involvement in the study was entirely voluntary and that leaving it at any time would not have an impact on the standard of their medical care. Prior to the start of patient recruitment, the Kurdistan Higher Council of Medical Specialties Medical Research Ethics Committee authorized the study protocol.

Data were analyzed using IBM SPSS Statistics software (or R statistical software). Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range according to data distribution, whereas categorical variables were presented as frequencies and percentages. Comparisons between the two treatment groups were performed using the independent-samples t-test or Mann–Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. A two-sided P value of <0.05 was considered statistically significant.

Results

Table (1) shows that the mean age was 33.1 ± 9.8 years in the Volar Plate group and 32.5 ± 7.6 years in the K-wire group ($P = 0.84$). In the Volar Plate group, 45.0% were male and 55.0% were female, whereas the K-wire group consisted of 50.0% males and 50.0% females ($P = 0.75$). The right limb was affected in 65.0% and 70.0% of patients in the Volar Plate and K-wire groups, respectively ($P = 0.74$). The dominant limb was the right side in 90.0% of the Volar Plate group and 95.0% of the K-wire group ($P = 0.55$). AO/OTA type 23-A3 fractures were more frequent than type 23-A2 in both groups (65.0% vs. 35.0% and 55.0% vs. 45.0%, respectively; $P = 0.51$). The median operative time was 62 minutes in the Volar Plate group and 30 minutes in the K-wire group ($P = 0.001$). The mean time from injury to operation was 3.2 ± 2.0 days in the Volar Plate group and 2.2 ± 1.5 days in the K-wire group ($P = 0.08$). Falls were the most common cause of injury in both groups, followed by road traffic accidents and physical assault ($P = 0.77$).

Table (1): Descriptive Data of the study groups

Variable	Volar Plate (n=20)	K-wire (n=20)	P-value
Age (years), mean $\pm$ SD	33.1 ± 9.8	32.5 ± 7.6	0.84
Gender			0.75
Male	9 (45.0%)	10 (50.0%)	
Female	11 (55.0%)	10 (50.0%)	
Affected limb			0.74
Right	13 (65.0%)	14 (70.0%)	
Left	7 (35.0%)	6 (30.0%)	
Dominant limb			0.55
Right	18 (90.0%)	19 (95.0%)	
Left	2 (10.0%)	1 (5.0%)	
AO/OTA classification			0.51
B1	7 (35.0%)	9 (45.0%)	
B2	6 (30.0%)	7 (35.0%)	
B3	4 (20%)	2 (10%)	
C1	3(15%)	2 (10%)	
Median operative time (min)	62 (10.8)	30 (7.0)	0.001
Time from injury to operation (days), mean $\pm$ SD	3.2 ± 2.0	2.2 ± 1.5	0.08
Cause of injury			0.77
Fall	14 (70.0%)	13 (65.0%)	
RTA	5 (25.0%)	5 (25.0%)	
Physical assault	1 (5.0%)	2 (10.0%)	

Table (2) presents the postoperative complications in both groups. Superficial wound infection occurred in 5.0% of the Volar Plate group and 10.0% of the K-wire group ($P = 1.000$). No cases of deep wound infection were observed in either group. Loss of reduction occurred in one patient (5.0%) in the K-wire group and in none of the Volar Plate group ($P = 1.000$). Complex regional pain syndrome was observed in 5.0% and 10.0% of the Volar Plate and K-wire groups, respectively ($P = 1.000$). Tenosynovitis occurred in 10.0% of the Volar Plate group and 5.0% of the K-wire group ($P = 1.000$). One patient (5.0%) in the K-wire group underwent reoperation, while no reoperations were required in the Volar Plate group ($P = 1.000$). Carpal tunnel syndrome occurred in one patient (5.0%) in each group ($P = 1.000$), and superficial radial nerve injury was reported in 5.0% of the Volar Plate group and 10.0% of the K-wire group ($P = 1.000$).

Table (2): Rate of complications among the study groups

Complication	Category	Volar Plate (n=20)	K-wire (n=20)	P-value
Superficial wound infection	No	19 (95.0%)	18 (90.0%)	1.000
	Yes	1 (5.0%)	2 (10.0%)	
Deep wound infection	No	20 (100%)	20 (100%)	N.A.
	Yes	0 (0%)	0 (0%)	
Loss of reduction	No	20 (100%)	19 (95.0%)	1.000
	Yes	0 (0%)	1 (5.0%)	
Complex regional pain syndrome	No	19 (95.0%)	18 (90.0%)	1.000
	Yes	1 (5.0%)	2 (10.0%)	
Tenosynovitis	No	18 (90.0%)	19 (95.0%)	1.000
	Yes	2 (10.0%)	1 (5.0%)	
Reoperation	No	20 (100%)	19 (95.0%)	1.000
	Yes	0 (0%)	1 (5.0%)	
Carpal tunnel syndrome	No	19 (95.0%)	19 (95.0%)	1.000
	Yes	1 (5.0%)	1 (5.0%)	
Superficial radial nerve injury	No	19 (95.0%)	18 (90.0%)	1.000
	Yes	1 (5.0%)	2 (10.0%)	

Table (3) shows the postoperative radiological measurements. The mean radial height was 11.94 ± 1.16 mm in the Volar Plate group and 12.18 ± 1.02 mm in the K-wire group ($P = 0.411$). The mean volar tilt was $8.38 \pm 2.10^\circ$ in the Volar Plate group and $7.81 \pm 1.45^\circ$ in the K-wire group ($P = 0.272$). The mean radial inclination was $23.08 \pm 1.69^\circ$ in the Volar Plate group and $22.11 \pm 1.53^\circ$ in the K-wire group ($P = 0.184$).

Table (3): Postoperative Radiological Measurements of the study group

Measurement	Volar Plate (n=20)	K-wire (n=20)	P-value
Radial height (mm)	11.94 ± 1.16	12.18 ± 1.02	0.411
Volar tilt ($^\circ$)	8.38 ± 2.10	7.81 ± 1.45	0.272
Radial inclination ($^\circ$)	23.08 ± 1.69	22.11 ± 1.53	0.184

Table (4) summarizes the overall radiological outcome according to Sarmiento's modification of the Lindström criteria. Excellent residual deformity was observed in 75.0% of the Volar Plate group and 70.0% of the K-wire group ($P = 0.96$). Excellent loss of palmar tilt was reported in 65.0% and 55.0% of the Volar Plate and K-wire groups, respectively ($P = 0.82$). Excellent radial shortening was observed in 70.0% of the Volar Plate group and 65.0% of the K-wire group ($P = 0.48$). For loss of radial deviation, 50.0% of patients in each group had excellent results ($P = 0.97$). The overall mean radiological score was excellent in 65.0% of the Volar Plate group and 60.0% of the K-wire group ($P = 0.39$).

Table (4): Overall Radiological Outcome According to Sarmiento's Modification of the Lindström Criteria

Variable	Outcome	Volar Plate (n=20)	K-wire (n=20)	P-value
Residual deformity	Excellent	15 (75.0%)	14 (70.0%)	0.96
	Good	3 (15.0%)	4 (20.0%)	
	Fair	2 (10.0%)	1 (5.0%)	
	Poor	0	1 (5.0%)	

Loss of palmar tilt	Excellent	13 (65.0%)	11 (55.0%)	0.82
	Good	5 (25.0%)	6 (30.0%)	
	Fair	2 (10.0%)	2 (10.0%)	
	Poor	0	1 (5.0%)	
Radial shortening	Excellent	14 (70.0%)	13 (65.0%)	0.48
	Good	6 (30.0%)	5 (25.0%)	
	Fair	0	1 (5.0%)	
	Poor	0	1 (5.0%)	
Loss of radial deviation	Excellent	10 (50.0%)	10 (50.0%)	0.97
	Good	8 (40.0%)	7 (35.0%)	
	Fair	2 (10.0%)	2 (10.0%)	
	Poor	0	1 (5.0%)	
Mean score	Excellent	13 (65.0%)	12 (60.0%)	0.39
	Good	6 (30.0%)	6 (30.0%)	
	Fair	1 (5.0%)	1 (5.0%)	
	Poor	0	1 (5.0%)	

Table (5) presents the functional outcomes according to the Gartland and Werley score. Excellent functional results were achieved in 55.0% of patients in the Volar Plate group and 50.0% in the K-wire group. Good results were observed in 30.0% and 25.0% of patients, respectively, while fair results were reported in 15.0% and 20.0%. One patient (5.0%) in the K-wire group had a poor outcome, whereas no poor outcomes were reported in the Volar Plate group ($P = 0.57$).

Table (5): Functional Evaluation of the study groups by Gartland and Werley Score

Score	Volar Plate (n=20)	K-wire (n=20)	P-value
Excellent	11 (55.0%)	10 (50.0%)	0.57
Good	6 (30.0%)	5 (25.0%)	
Fair	3 (15.0%)	4 (20.0%)	
Poor	0	1 (5.0%)	
Total	20 (100%)	20 (100%)	

Table (6) compares wrist range of motion between the two groups at different follow-up periods. At 6 weeks and 3 months, the Volar Plate group demonstrated higher mean flexion, extension, and supination than the K-wire group, with P-values of 0.028 and 0.005 for flexion, 0.012 and 0.004 for extension, and 0.011 and 0.009 for supination, respectively. At 6 months, the differences in flexion ($P = 0.19$), extension ($P = 0.09$), and supination ($P = 0.34$) were not statistically significant. Mean pronation, ulnar deviation, and radial deviation measurements were comparable between the two groups at all follow-up visits, with all P-values greater than 0.05.

Table (6): Comparison of Wrist Range of Motion Between the Volar Plate and K-wire Groups at Different Follow-up Periods

Variable	Time	Volar Plate (Mean $\pm$ SD)	K-wire (Mean $\pm$ SD)	P-value
Flexion	6 weeks	49.12 $\pm$ 10.08	41.28 $\pm$ 12.87	0.028
	3 months	66.18 $\pm$ 8.74	58.25 $\pm$ 9.14	0.005
	6 months	72.08 $\pm$ 5.12	69.84 $\pm$ 6.48	0.19
Extension	6 weeks	52.05 $\pm$ 6.44	47.63 $\pm$ 4.25	0.012
	3 months	63.42 $\pm$ 5.34	58.46 $\pm$ 6.05	0.004
	6 months	65.74 $\pm$ 3.65	62.18 $\pm$ 4.38	0.09
Supination	6 weeks	59.15 $\pm$ 8.02	52.03 $\pm$ 4.11	0.011
	3 months	70.02 $\pm$ 8.35	63.54 $\pm$ 6.71	0.009
	6 months	77.84 $\pm$ 7.21	75.88 $\pm$ 4.35	0.34
Pronation	6 weeks	60.08 $\pm$ 9.92	57.12 $\pm$ 7.41	0.29
	3 months	63.08 $\pm$ 4.28	62.46 $\pm$ 4.58	0.68
	6 months	72.04 $\pm$ 3.42	70.12 $\pm$ 4.18	0.11
	6 weeks	16.64 $\pm$ 3.18	15.42 $\pm$ 3.46	0.23

Ulnar deviation	3 months	25.42 ± 3.08	23.58 ± 3.26	0.08
	6 months	29.52 ± 2.48	28.76 ± 2.81	0.33
Radial deviation	6 weeks	10.04 ± 3.08	9.46 ± 2.41	0.49
	3 months	12.92 ± 2.64	12.18 ± 2.84	0.41
	6 months	17.08 ± 2.26	16.58 ± 2.54	0.44

Table (7) presents the PRWE scores at 12 months. The mean PRWE pain score was 16.9 ± 5.3 in the Volar Plate group and 21.8 ± 6.1 in the K-wire group ($P = 0.08$). The mean PRWE function score was 16.1 ± 6.0 and 18.5 ± 6.4 in the Volar Plate and K-wire groups, respectively ($P = 0.17$). The mean final PRWE score was 33.0 ± 9.4 in the Volar Plate group and 40.3 ± 10.2 in the K-wire group ($P = 0.07$).

Table (7): PRWE Score at 12 Months for both groups

Measurement	Volar Plate (Mean ± SD)	K-wire (Mean ± SD)	P-value
PRWE Pain	16.9 ± 5.3	21.8 ± 6.1	0.08
PRWE Function	16.1 ± 6.0	18.5 ± 6.4	0.17
Final PRWE	33.0 ± 9.4	40.3 ± 10.2	0.07

Discussion

Both k-wire and Volar plate techniques are widely practiced, no single method has been universally accepted as the gold standard.⁸ Stable, undisplaced fractures generally achieve satisfactory outcomes with conservative treatment, whereas displaced or unstable fractures often require surgical fixation to restore anatomical alignment and facilitate early functional recovery.^{9,10} In the present study, there were no statistically significant differences between the Volar Plate and K-wire groups regarding baseline demographic or injury characteristics, including age, sex, affected limb, dominant limb, AO/OTA fracture classification, time from injury to surgery, or mechanism of injury. These comparable baseline characteristics reduced the likelihood of selection bias and allowed a reliable comparison of the two fixation methods.

The functional outcomes demonstrated that both fixation techniques achieved comparable overall results at the final follow-up. According to the Gartland and Werley score, the majority of patients in both groups had excellent or good outcomes, with no statistically significant difference between the groups. Similarly, the PRWE pain, function, and total scores were lower in the Volar Plate group, indicating slightly better patient-reported outcomes; however, these differences did not reach statistical significance. These findings are comparable to those reported by Costa et al.,¹¹ who found no significant differences in overall long-term patient-reported functional outcomes between patients treated with volar locking plates and those treated with percutaneous K-wires, concluding that K-wire fixation represents an equivalent long-term treatment option despite its shorter operative time and lower cost.¹¹ In contrast, Wretö L, and Fornander L found patients treated with K-wires had significantly better Quick-DASH scores ($p < 0.05$) and a lower degree of pain (PRWE pain scale) ($p < 0.05$) than patients treated with volar locking plates.¹²

Recovery of wrist motion was faster in patients treated with volar plate fixation. Significantly greater flexion, extension, and supination were observed in the Volar Plate group at both 6 weeks and 3 months after surgery, whereas these differences were no longer significant at 6 months. In contrast, pronation, ulnar deviation, and radial deviation were comparable between the two groups throughout the follow-up period. These findings agree with those of Goehre et al.¹³ and Karantana et al.,¹⁴ who also reported earlier functional recovery following volar plate fixation. Tariq et al.¹⁵ similarly found superior functional recovery in the plate fixation group during the early postoperative period.

Radiological assessment demonstrated that both fixation methods achieved satisfactory anatomical restoration. There were no statistically significant differences between the groups regarding postoperative radial height, radial inclination, or volar tilt. Likewise, radiological outcomes based on Sarmiento's modification of the Lindström criteria showed comparable distributions of excellent, good, fair, and poor results for residual deformity, loss of palmar tilt, radial shortening, loss of radial deviation, and overall radiological score. Only one patient in the K-wire group experienced loss of reduction, while none occurred in the Volar Plate group. These findings are largely consistent with the recent meta-analysis by Tariq et al., which demonstrated that both volar locking plate fixation and percutaneous K-wire fixation effectively maintain fracture reduction, with no significant differences in radial length or radial inclination at final follow-up, although a small advantage in volar tilt was observed in favor of volar plating.¹⁵

The median operative time was significantly longer in the Volar Plate group (62 minutes) than in the K-wire group (30 minutes), indicating that percutaneous K-wire fixation required approximately half the operative time of open reduction and internal fixation with a volar plate. Similar findings were reported in the UK DRAFFT randomized controlled trial by Costa et al., in which

K-wire fixation required a median operative time of 31 minutes compared with 66 minutes for volar locking plate fixation, highlighting the practical advantage of the shorter surgical duration associated with K-wire fixation.¹¹

The overall complication rates were low in both groups. No cases of deep wound infection were observed in either group. Superficial wound infection, complex regional pain syndrome, superficial radial nerve injury, tenosynovitis, carpal tunnel syndrome, loss of reduction, and reoperation occurred infrequently, and none of these complications differed significantly between the two treatment groups. The most commonly encountered complications were superficial wound infection, tendon irritation (tenosynovitis), and superficial radial nerve injury, findings that are comparable with those reported by Tariq et al., who found no significant difference in the overall complication or reoperation rates between volar locking plate and K-wire fixation, although superficial infections occurred more frequently following K-wire fixation.¹⁵

Conclusion

The findings of the present study suggest that both volar locking plate fixation and percutaneous K-wire fixation provide satisfactory clinical, radiological, and functional outcomes in the management of extra-articular distal radius fractures. Volar plate fixation offers the advantage of faster early recovery of wrist motion, whereas K-wire fixation requires a significantly shorter operative time. However, by the final follow-up, both techniques achieved comparable radiological alignment, functional outcomes, patient-reported wrist function, and complication rates. This indicates that either technique can be considered an effective treatment option when selected according to fracture characteristics, patient factors, and surgeon experience.

Conflict of Interest: The Authors declare no conflict of interest.

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