COMPARISON BETWEEN VOLAR LOCKING PLATE AND PERCUTANEOUS K-WIRE FIXATION IN THE MANAGEMENT OF EXTRA-ARTICULAR DISTAL RADIUS FRACTURES

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Introduction

Extra-articular distal radius fractures constitute a significant proportion of upper limb injuries, yet optimal management for unstable variants remains debated. This study aimed to compare functional and radiological outcomes of volar locking plate (VLP) fixation versus percutaneous K-wire fixation in treating unstable extra-articular distal radius fractures.

Aim of the work

The aim of this study was to compare the outcome of volar locking plate versus percutaneous K-wire fixation in the management of extra-articular distal radius fractures.

Patients and Methods

A prospective randomized trial was conducted on 40 patients aged 20–65 years presenting with unstable extra-articular distal radius fractures at El-Hadra University Hospital between March 2024 and February 2025. Patients were randomized into two equal groups: Group A received volar locking plate fixation, and Group B underwent percutaneous K-wire fixation. Indications for surgery included dorsal angulation >10°, radial shortening >3 mm, metaphyseal comminution, or radiocarpal malalignment. Outcomes were assessed using the QuickDASH, Modified Mayo Wrist Score (MMWS), Visual Analogue Scale (VAS), grip strength, and range of motion (ROM). Radiographic evaluation included time to union, radial length, radial inclination, and palmar tilt. Patients were followed for six months postoperatively.

Results

Demographics were comparable across groups in terms of age, gender, hand dominance, and mechanism of injury. The VLP group demonstrated significantly superior functional outcomes: higher MMWS (85.0 ± 10.3 vs. 73.8 ± 5.1; p < 0.001), lower QuickDASH scores (3.5 ± 2.2 vs. 5.6 ± 2.8; p < 0.001), and stronger grip strength (32.0 ± 7.3 kg vs. 26.2 ± 5.1 kg; p = 0.012). ROM analysis revealed better wrist flexion and supination in the VLP group (p < 0.05). VAS scores were similar between groups (p = 0.771).

Table (1): Comparison of MMWS Results Between the Study Groups.

Results of MMWS	Group A (n = 20)		Group B (n = 20)		Test of sig.	p
	No.	%	No.	%		
Poor	1	5.0	1	5.0	$\chi 2$= 9.229*	FET <0.001*
Fair	3	15.0	14	70.0		
Good	4	20.0	5	25.0		
Excellent	12	60.0	0	0.0		
Min. – Max.	60.0 – 95.0		60.0 – 80.0		U= 67.50*	<0.001*
Mean ± SD	85.00 ± 10.26		73.75 ± 5.10			
Median (IQR)	90.0 (80.0 – 90.0)		75.0 (70.0 – 78.75)			

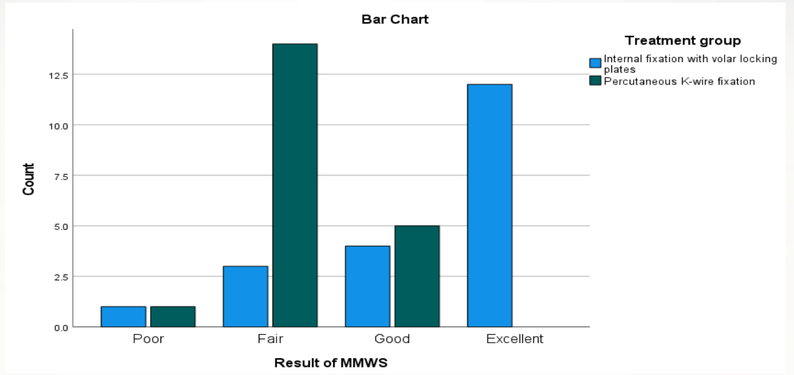

Table (2):Comparison of QuickDASH Scores Between the Study Groups

QuickDASH	Group A (n = 20)	Group B (n = 20)	U	p
Min. - Max.	2.30 - 11.40	2.30 - 11.40	78.50*	<0.001*
Mean ± SD.	3.52 ± 2.15	5.57 ± 2.81		
Median (IQR)	2.30 (2.30 - 4.54)	4.54 (4.54 - 6.82)		

Radiographically, the VLP group had superior radial length (10.7 ± 1.2 mm vs. 8.9 ± 1.6 mm; p < 0.001), radial inclination (21.2° ± 2.4 vs. 19.2° ± 1.2; p = 0.021), and palmar tilt (8.5° ± 3.2 vs. 7.2° ± 1.4; p = 0.025). Time to union was significantly shorter in the VLP group (10.1 ± 1.2 weeks vs. 11.6 ± 1.2 weeks; p < 0.001).

Complication rates were similar between groups. Reflex sympathetic dystrophy occurred in 15% of patients in both groups. Infection was slightly more common in the K-wire group (15% vs. 10%), while iatrogenic nerve injury occurred only in the VLP group (10%), though differences were not statistically significant.

Conclusion

Volar locking plate fixation offers superior functional and radiological outcomes with earlier fracture union compared to percutaneous K-wire fixation in unstable extra-articular distal radius fractures. It enables earlier mobilization and may be preferred in high-demand patients. However, K-wire fixation remains a viable, cost-effective alternative with similar safety and eventual fracture healing. Treatment selection should be individualized based on patient needs, fracture characteristics, and resource availability.