RESEARCH PAPER

Comparative Outcomes of Volar Locking Plate Versus Percutaneous Kirschner Wire Fixation in Closed Frykman Type IV Distal Radius Fractures: A Two-Case Report with Short-Term Follow-up

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ABSTRACT

Background

Frykman type IV distal radius fractures involve radiocarpal intra-articular disruption with an associated ulnar styloid fracture and may result in instability and functional impairment. Surgical options include volar locking plate fixation and percutaneous Kirschner wire (K-wire) pinning. This report compares clinical and radiological outcomes of two patients treated using different techniques.

Case Report

Case 1 was a 30-year-old male with a displaced intra-articular distal radius fracture (radial inclination 2°, radial height 1 mm). Open reduction and internal fixation with a volar locking plate restored alignment and enabled early mobilization. Case 2 was a 51-year-old female with acceptable post-reduction parameters (radial inclination 20°, radial height 10 mm) treated with percutaneous K-wire fixation. Both patients underwent postoperative immobilization followed by supervised rehabilitation. At 12-week follow-up, both demonstrated maintained radiographic alignment, satisfactory wrist range of motion, good intervention adherence, and no major complications.

Conclusion

Both volar plating and percutaneous pinning produced satisfactory short-term outcomes. Treatment selection should be individualized based on fracture displacement, stability, patient functional demands, and overall clinical condition.

Keywords: Distal Radius Fracture, Frykman Type IV, Volar Locking Plate, Kirschner Wire, Percutaneous Fixation

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INTRODUCTION

Distal radius fractures account for approximately 8–15% of adult fractures and represent one of the most common orthopedic injuries worldwide[1]. Intra-articular fractures, particularly those classified as Frykman type IV, carry a higher risk of instability, post-traumatic arthritis, and functional limitation if anatomical restoration is not achieved[2].

Although volar locking plates are widely used for unstable intra-articular fractures, percutaneous pinning remains a viable alternative in selected cases. The comparative rationale between these two approaches in similar fracture classifications remains clinically relevant. This case report highlights two Frykman type IV fractures treated with different fixation strategies and discusses their early clinical and radiological outcomes.

CASE REPORT

Case 1

A 30-year-old male, right-hand dominant, presented after a motorcycle fall onto an outstretched left hand, otherwise healthy. Physical examination showed a wrist deformity with dorsal angulation, swelling, and severe pain. Palpation elicited localized tenderness, with limited range of motion (ROM) due to pain. Distal

neurovascular status was intact. Wrist radiology revealed a distal radius fracture Frykman Classification type IV with radial inclination of 2°, radial height of 1 mm and neutral ulnar variance. We performed surgical treatment open reduction and internal fixation (ORIF) using volar locking plate. Postoperatively, the patient's pain was controlled using NSAID and was immobilized using short-arm splint for 2 weeks and underwent physiotherapy after that.

Figure 1. Clinical picture and radiograph of patient 1

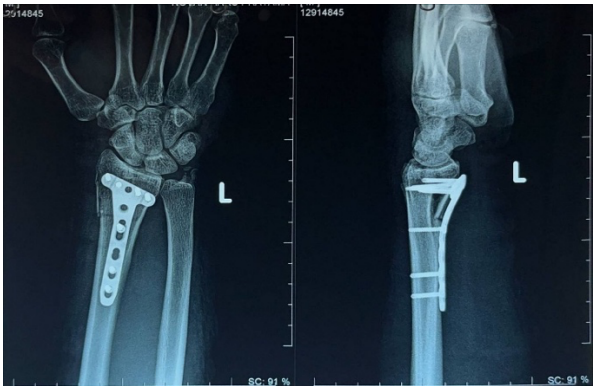

Figure 2. Postoperative radiograph of patient 1

Case 2

A 51-year-old female, right-hand dominant, had a polytrauma following a motor vehicle collision. The physical examination of the wrist showed that the right wrist swelled without any open wound, tenderness, and limited ROM due to pain. No prior wrist pathology was found. The patient also had associated injuries of metacarpal fractures, tibia-fibula fracture, and mild head injury. Radiology, the patient was diagnosed with Fracture of Distal Radius Frykman Classification Type IV with radial inclination of 20°, radial height of 10 mm and neutral ulnar variance. Due to polytrauma setting, we only done minimally invasive surgical fixation using closed reduction with percutaneous K-wire and immobilized using long arm cast for about 4 weeks. The patient was educated to keep actively move her finger and shoulder. Physical physiotherapy for the wrist was done after the long arm cast removed.

Figure 3. Clinical picture and radiograph of patient 2

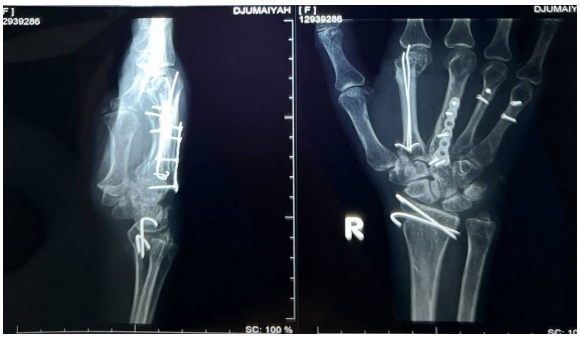

Figure 4. Postoperative radiograph of patient 2

Both patients were followed up regularly every one to two weeks for 12 weeks, with pain in both patients were controlled in 6th week postoperatively. Postoperative wound was excellent without any complication. Both patients complied with immobilization and rehabilitation protocols. Patient one and two could perform daily activities in 10 and 12 weeks postoperatively, respectively. Both patients did not have any major functional complaints and progressive improvement in wrist range of motions. Both cases also assessed radiologically with the alignment was maintained and no secondary displacement was found. Three months post-operatively, both patients were independent in daily activities.

DISCUSSION

The management of Frykman Classification Type IV distal radius fractures aims to restore anatomical alignment and prevent long-term degenerative changes[2]. Literature supports volar locking plate fixation in displaced intra-articular fractures due to superior biomechanical stability and earlier mobilization[3]. Conversely, percutaneous pinning remains effective for selected fractures with limited comminution[4]. Strengths of this report include direct comparison of two fixation methods in the same fracture classification. Limitations include short follow-up duration and absence of validated functional scoring (e.g., DASH).

Recent literature suggests that while volar plating allows earlier functional recovery, long-term outcomes between plating and pinning may be comparable when reduction is maintained[3–5]. Our findings align with these observations. For distal radius fracture, especially with minimal comminution, treatment should be individualized based on fracture displacement, stability predictors, patient age, bone quality, and overall trauma context.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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INFORMED CONSENT

Written informed consent for publication of clinical details and radiological images was obtained from both patients. Institutional review board approval was not required for this single-case observational report according to local policy.

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