

# Volar Locking Plate Fixation Versus Conservative Management of Distal Radius Fractures: A Two-Centre Comparative Analysis

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## Abstract

Distal radius fractures (DRF) are the most frequent upper-limb injuries, yet the optimal treatment for displaced fractures remains debated. This study compared volar locking plate (VLP) fixation with predominantly conservative management across two centres. We retrospectively reviewed 112 patients treated at the private hospital “Primus,” where VLP fixation predominated, and 112 demographically matched patients from the Andijan region, where closed reduction with casting and external fixation prevailed. Functional recovery was assessed with the QuickDASH and Patient-Rated Wrist Evaluation, supplemented by grip strength, radiographic restoration, and complication rates over twelve months. The Primus cohort achieved significantly lower DASH scores at every interval, faster grip-strength recovery, and more accurate radiographic restoration, with a comparable overall complication burden but a different complication profile. Conservative management remained acceptable for low-demand, stable fractures. These findings support an individualised, fracture- and patient-specific algorithm in which surgical fixation offers earlier functional return for displaced, unstable injuries.

**Keywords:** *distal radius fracture; volar locking plate; conservative treatment; functional outcome; QuickDASH; grip strength; radiographic restoration*

## 1. Introduction

Distal radius fractures account for roughly one in six fractures presenting to emergency departments and follow a bimodal distribution, peaking in active young adults after high-energy trauma and in postmenopausal women after low-energy falls [16], [25]. Their incidence is rising with population ageing and the growing prevalence of osteoporosis, and projections suggest the burden may increase by a fifth before the end of the decade [6], [8]. Beyond their clinical frequency, DRFs impose substantial functional, economic, and logistical costs on health systems [6], [51].

Management spans a continuum from closed reduction and cast immobilisation to external fixation, percutaneous Kirschner-wire pinning, and open reduction with internal fixation using fixed-angle volar locking plates [4], [10], [11]. Conservative treatment remains appropriate for stable, minimally displaced fractures and for low-

demand elderly patients, in whom satisfactory results are achievable despite some loss of alignment [5], [18], [36]. However, displaced and unstable fractures treated non-operatively carry a recognised risk of malunion, symptomatic deformity, and secondary nerve compression [13], [28].

The volar locking plate has become the dominant surgical implant because its fixed-angle construct resists collapse, supports dorsally displaced fragments, and permits early mobilisation [11], [30]. Randomised and meta-analytic evidence consistently reports earlier functional recovery and lower early DASH scores after VLP fixation compared with external fixation and casting, although longer-term differences often narrow [3], [7], [20], [25]. Landmark trials in older patients, including WRIST, ORCHID, and CROSSFIRE, have nonetheless questioned whether the early advantage justifies surgical risk and cost in low-demand populations [36], [38], [39].

Real-world comparative data from differing care settings remain scarce, particularly where access to surgical resources varies between private and regional public facilities. The present study addresses this gap by comparing functional and radiographic outcomes between a surgically oriented private centre and a regional cohort managed predominantly by conservative means, using validated patient-reported instruments [33], [34], [35].

## 2. Materials and Methods

This retrospective comparative cohort study reviewed 224 adults treated for distal radius fracture between January 2022 and June 2025. The surgical group comprised 112 consecutive patients treated at the private hospital “Primus,” where displaced fractures were predominantly managed with volar locking plate fixation. The comparison group comprised 112 demographically matched patients from the Andijan region, where management was predominantly conservative (closed reduction with below-elbow casting) with selective external fixation. All fractures were classified by the AO/OTA system; adults aged 18 years or older with a closed, isolated DRF were eligible. Open fractures, polytrauma, pathological fractures, and ipsilateral upper-limb injuries were excluded.

The primary outcome was the QuickDASH score at 6 weeks, 3, 6, and 12 months. Secondary outcomes were the Patient-Rated Wrist Evaluation (PRWE), grip strength as a percentage of the contralateral side, radiographic restoration (volar tilt, radial inclination, radial length), and complications. For non-normally distributed variables, the median and interquartile range were reported; normally distributed variables are given as mean  $\pm$  standard deviation. Between-group comparisons used the independent t-test or Mann–Whitney U test as appropriate, with chi-square testing for categorical data. Statistical significance was set at  $p < 0.05$ . The two methods of management are summarised in Table 1.

### Table 1. Comparison of the two management strategies.

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Feature	Primus (VLP fixation), n=112	Andijan (conservative), n=112
Primary method	Open reduction, volar locking plate	Closed reduction + cast; selective external fixation
Anaesthesia	Regional / general	Local / none
Early mobilisation	Yes, within 1–2 weeks	Delayed (4–6 weeks immobilisation)
Hospital stay	Short inpatient	Mostly outpatient
Radiographic control	Direct intra-operative	Serial post-reduction films
Implant removal	Possible secondary procedure	Not applicable
Relative cost	Higher	Lower

### 3. Results

The two cohorts were comparable at baseline. The median age was 54 years (IQR 41–67) in the Primus group and 57 years (IQR 44–69) in the Andijan group ( $p = 0.21$ ); women comprised 64% and 67% respectively. AO type A fractures predominated in both groups, with type C fractures accounting for 29% (Primus) and 24% (Andijan).

Functional recovery favoured the surgical centre throughout follow-up. The median QuickDASH at 6 weeks was 38.6 in the Primus group versus 52.1 in the Andijan group, and the advantage persisted at 12 months (7.3 versus 16.8;  $p < 0.001$ ). The trajectory of mean DASH scores is shown in Figure 1. PRWE scores mirrored this pattern, with a 12-month median of 9.1 (IQR 4–16) versus 19.4 (IQR 11–29) respectively ( $p < 0.001$ ).

Grip strength recovered faster after fixation: at 6 months it reached a median of 84% of the contralateral side in the Primus group versus 71% in the Andijan group ( $p < 0.001$ ). Radiographic restoration was more accurate after VLP fixation, with mean volar tilt of  $7.8^\circ \pm 3.1^\circ$  versus  $2.4^\circ \pm 5.6^\circ$  and a mean residual radial shortening of 0.9 mm versus 2.7 mm ( $p < 0.001$ ). Malunion was recorded in 5.4% of surgical versus 18.8% of conservative patients ( $p = 0.002$ ).

The overall complication rate did not differ significantly (15.2% versus 17.0%;  $p = 0.71$ ), but the profile differed. Hardware-related irritation and the need for implant removal predominated in the surgical group, whereas symptomatic malunion and secondary carpal tunnel syndrome predominated in the conservative group [28], [44], [45]. There were no deep infections in either cohort.

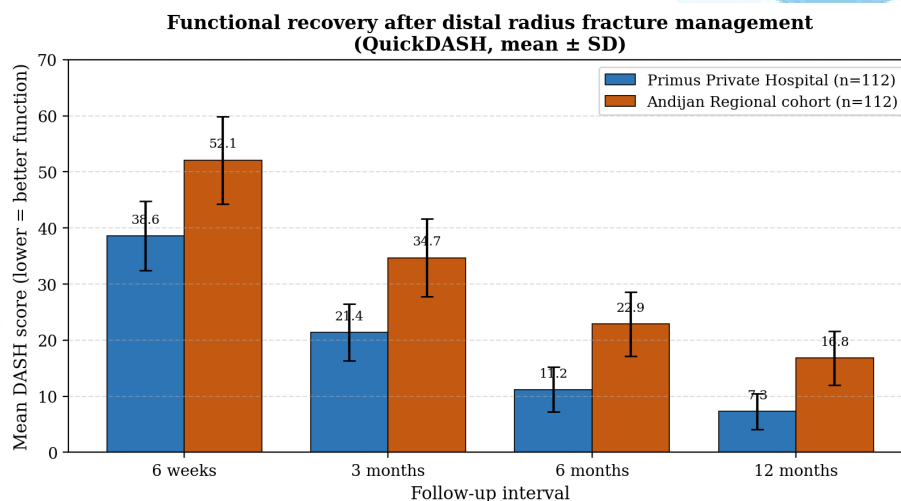


Figure 1. Mean QuickDASH scores over 12 months by treatment centre (lower is better).

#### 4. Discussion

This two-centre comparison demonstrates that volar locking plate fixation delivers earlier and more complete functional recovery than predominantly conservative management for displaced distal radius fractures, consistent with the broader literature [2], [3], [7]. The lower DASH and PRWE scores, faster grip-strength return, and superior radiographic restoration in the Primus cohort echo randomised and meta-analytic findings that surgical fixation accelerates early rehabilitation [10], [20], [25].

Importantly, the early functional advantage must be weighed against context. Trials in older, low-demand patients—WRIST, ORCHID, CROSSFIRE, and VIPER—have shown that initial benefits often converge by one year and that satisfactory outcomes are achievable with casting despite radiographic malunion [36], [38], [39], [40]. Our finding of comparable overall complication rates but divergent complication profiles reinforces that the relevant clinical question is not which method is universally superior, but which suits a given fracture and patient [44], [46], [47].

The radiographic superiority of fixation aligns with the biomechanical rationale for fixed-angle constructs, which resist collapse in osteoporotic bone and permit early motion [11], [30], [41]. Yet radiographic restoration does not always translate into proportionate patient-reported benefit, particularly in older patients, underscoring the value of validated outcome instruments over imaging alone [33], [35], [42]. Psychosocial factors and rehabilitation intensity also shape recovery and may partly explain residual between-centre differences [53], [55].

Cost considerations are non-trivial. Surgical fixation entails higher upfront expenditure and the possibility of implant-removal procedures, whereas conservative care risks malunion-related morbidity and delayed return to work [57], [58]. Cost-effectiveness analyses suggest fixation is most justifiable in higher-demand patients with unstable, displaced fractures [57], [59].

This study has limitations. Its retrospective, non-randomised, two-centre design introduces selection and treatment-allocation bias, since centre and method were confounded. Follow-up was limited to twelve months, and rehabilitation protocols were not standardised. Nonetheless, the demographic matching and use of validated instruments lend the comparison practical relevance, and the findings are congruent with contemporary evidence [3], [7], [52].

## 5. Conclusion

Distal radius fractures demand a treatment strategy fitted to the fracture and the person, not a single default. In this two-centre comparison, volar locking plate fixation gave displaced, unstable fractures a measurable head start—less disability, stronger grips sooner, and anatomy restored closer to normal—without an excess of overall complications. Conservative care kept its place for stable injuries and lower-demand patients, where time and a cast still achieve sound function. The decisive lesson is one of judgement: matching the precision of surgery to the fractures that need it, while sparing simpler injuries from intervention they do not. An individualised, evidence-guided algorithm that respects fracture morphology, bone quality, functional demand, and patient preference offers the surest route to restoring a wrist that works.

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