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Effect of Postoperative Immobilization Following Volar Plate Fixation of Distal Radius Fractures on Functional Outcomes and Wrist Stiffness: A Retrospective Cohort Study

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Abstract

Background: Distal radius fractures are the most common upper limb fractures specifically in the elderly population. Open Reduction Internal Fixation with Volar plating remains the preferred method for Surgical Fixation in unstable fractures. There is a common practice to keep the fracture immobilized to ensure comfort and stability. This study evaluates postoperative patient-reported outcomes and stiffness in patients undergoing ORIF who experienced prolonged casting (>14 days) in the peri operative period.

Methods: This retrospective cohort study was conducted at DGH in UK. A total of 150 patients who underwent volar plate fixation for distal radius fractures between July 2024 and December 2025 were included. Patient demographics, fracture characteristics, and operative details were extracted from electronic medical records. Functional outcomes were assessed using the Patient-Rated Wrist Evaluation (PRWE) score at ≥6 months, and wrist stiffness was assessed from clinic documentation at 3 months.

Results: PRWE data were available for 115 patients. Patients managed without postoperative backslab immobilisation demonstrated significantly lower PRWE scores compared with those treated with backslab immobilisation (13.47 ± 17.20 vs 21.50 ± 23.21, p = 0.036). Stiffness rates at 3 months were similar between groups (31.3% vs 34.3%, p = 0.692).

Conclusions: Our Study findings support timely surgical fixation in line with BOAST guidance and advocate early postoperative mobilization without routine casting to improve outcomes & reduce healthcare burden.

Keywords: Distal Radius Fracture; ORIF; PRWE SCORE; Outcomes; mobilse vs immobilise

Introduction

Distal radius fractures are among the most common upper limb fractures sustained worldwide and account for a significant proportion of orthopedic trauma presentations [1]. Distal radius fractures occur more commonly in females, largely due to the higher prevalence of osteoporosis and low-energy falls [2]. Management depends on fracture characteristics and patient factors [3]. Non-operative treatment typically involves immobilization in a below-elbow cast [4] , whereas operative management most commonly consists of open reduction and internal fixation (ORIF) using a volar locking plate [4,5]. The aim of volar plate fixation is to restore radial height, radial inclination, and volar tilt in order to optimize functional outcomes [6].

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Current guidelines from the British Orthopedic Association (BOA) recommend early surgical fixation to minimize complications, with intra-articular fractures ideally treated within three days and extra-articular fractures within seven days [7]. Despite stable fixation achieved with modern volar locking plate systems, postoperative immobilization remains common practice to provide comfort and support during the early recovery period [8]. However, the role and duration of postoperative immobilization remain controversial. Several studies have suggested that early mobilization following volar plate fixation may be safe and may facilitate earlier functional recovery, while prolonged immobilization may contribute to wrist stiffness and delayed rehabilitation [9,10]. Nevertheless, evidence evaluating the impact of postoperative immobilization on patient-reported outcomes remains limited. The aim of this study was therefore to evaluate the effect of postoperative immobilization following volar locking plate fixation of distal radius fractures, with particular focus on the development of wrist stiffness at three months and patient-reported wrist evaluation (PRWE) scores at six months.

Methods

A retrospective cohort study was conducted at the Department of Trauma and Orthopedics at a DGH in London, United Kingdom, following approval from the institutional audit and research governance department (Project number: T&O2526-4). A total of 150 patients who underwent open reduction and internal fixation (ORIF) using a volar locking plate for distal radius fractures between July 2024 and December 2025 were included in the study. Patients with open fractures, neurovascular compromise, or incomplete follow-up data were excluded.All procedures were performed using a volar approach with volar locking plate fixation (Acu-Loc or Synthes systems). Surgeries were performed by orthopedic registrars under consultant supervision or by consultants themselves. Post-operatively, patients were assigned into two groups based on the immobilization protocol used. Soft dressing group: Patients received padded dressing with wool and crepe bandage without rigid immobilization (n = 80). Back slab group: patients received below-elbow back slab immobilization for approximately two weeks postoperatively (n = 70). Patient data were extracted retrospectively from electronic medical records. Variables collected included age, gender, ASA grade, body mass index (BMI), smoking status, date of injury, date of surgery, AO fracture classification, plate type, surgeon grade, tourniquet duration, postoperative instructions, 3-month follow-up documentation, patient-reported wrist evaluation (PRWE) score at ≥6 months follow-up. The mean age of the cohort was 57.7 years (SD ±18.2). The primary outcome measure was PRWE score at 6-9 months postoperatively. The secondary outcome was wrist stiffness at 3 months, defined as documentation of stiffness or reduced wrist range of motion in clinic follow-up letters. PRWE scores were available for 115 patients. A PRWE score <15 was defined as a good functional outcome. Statistical analysis was performed using IBM SPSS Statistics. Continuous variables were analyzed using independent sample t-tests, while categorical variables were analyzed using chi-square tests. A p-value <0.05 was considered statistically significant.

Results

A total of 150 patients underwent volar locking plate fixation for distal radius fractures during the study period. Of these, 70 patients received postoperative backslab immobilisation and 80 patients were managed with soft padded dressing without rigid immobilisation. The mean age of patients in the backslab group was 57.6 ± 17.7 years, compared with 57.1 ± 17.4 years in the no-backslab group, with no statistically significant difference between groups ($p = 0.874$, independent t-test). Gender distribution was also comparable between the groups. In the no-backslab cohort, 24 patients (30.0%) were male and 56 (70.0%) were female, while in the backslab cohort 20 patients (28.6%) were male and 50 (71.4%) were female, with no significant difference observed ($\chi^2 = 0.037$, $p = 0.848$). Body mass index (BMI) was similar between groups, with a mean BMI of 26.47 ± 4.72 in the backslab group and 26.22 ± 5.82 in the no-backslab group ($p = 0.787$). Distribution of ASA grade was also comparable between groups, with no statistically significant difference ($\chi^2 = 1.887$, $p = 0.596$). Plate type used during fixation (Synthes vs AcuLoc) did not differ significantly between the immobilisation groups ($\chi^2 = 0.349$, $p = 0.554$). Overall, baseline demographic and operative characteristics were comparable between the two cohorts. PRWE outcome data at ≥6 months follow-up were available for 115 patients. Among these, 49 patients were treated with postoperative backslab immobilisation, while 66 patients were managed without rigid immobilisation. The mean PRWE score was 21.50 ± 23.21 in the backslab group and 13.47 ± 17.20 in the no-backslab group (figure 1). Patients managed without postoperative backslab immobilisation demonstrated significantly better functional outcomes, with lower PRWE scores compared with those treated with backslab immobilisation ($p = 0.036$, independent samples t-test). Documentation of wrist stiffness at 3-month follow-up was identified from clinic records. In the no backslab group, 25 of 80 patients (31.3%) were documented to have wrist stiffness, compared with 24 of 70 patients (34.3%) in the back-slab group. Chi-square analysis demonstrated no statistically significant difference in stiffness rates between groups ($\chi^2 = 0.156$, $p = 0.692$). Overall, patients managed without rigid postoperative immobilisation demonstrated significantly lower PRWE scores at six months ($p = 0.036$), indicating improved functional outcomes. However, no statistically significant difference was observed in the incidence of wrist stiffness at three months between the immobilization strategies.

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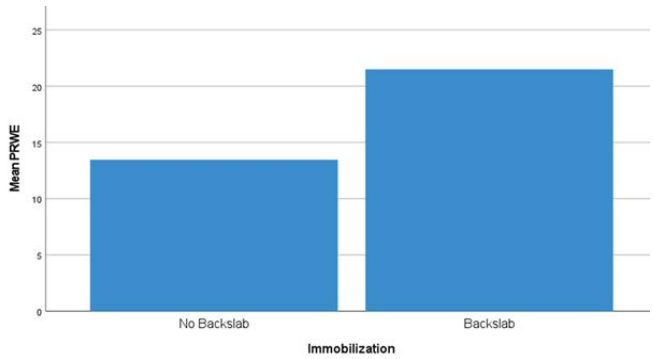

Figure 1: Mean PRWE Score at >6 Months.

Table 1: Baseline characteristics of patients undergoing volar plate fixation.

Variable	Backslab (n=70)	No Backslab (n=80)	p value
AGE (years, mean ± SD)	57.6 ± 17.7	57.1 ± 17.4	0.874
Gender			0.848
Male, n (%)	20 (28.6%)	24 (30.0%)	
Female, n (%)	50 (71.4%)	56 (70.0%)	
BMI (mean ± SD)	26.47 ± 4.72	26.22 ± 5.82	0.787
ASA GRADING			0.596
ASA I	37 (52.9%)	46 (57.5%)	
ASA II	30 (42.9%)	28 (35.0%)	
ASA III	3 (4.3%)	5 (6.3%)	
ASA IV	0 (0%)	1 (1.3%)	
PLATE TYPE			0.554
Plate type – Synthes	39 (57.4%)	42 (52.5%)	
Plate type – AcuLoc	29 (42.6%)	38 (47.5%)	

Table 2: Postoperative outcomes between immobilization groups.

Outcome	Backslab	No Backslab	p value
PRWE score- 6 months (mean ± SD)	21.50 ± 23.21	13.47 ± 17.20	0.036
3 Months Clinic Outcome			0.692
Stiffness n (%)	24 (34.3%)	25 (31.3%)	
No stiffness n (%)	46 (65.7%)	55 (68.7%)	

Discussion

This Study demonstrates that patients managed with soft padded dressing without rigid immobilization demonstrated significantly better PRWE score at 6 months and trend towards lower stiffness at 3 months when compared to patients managed with immobilization with a cast. These findings are consistent with studies showing early mobilization following Distal Radius ORIF is safe and facilitate effective patient recovery [11,12]. Unnecessary immobilization post operatively leads to increase stiffness due to contractures and scar formation [13]. Additionally delay in Surgery leads to increase in post operative complications, increase clinic follow ups and rehabilitation with poor patient satisfaction [14]. In contrast to our findings, some studies have reported no significant difference in functional outcomes between early mobilization and immobilization protocols [15]. This study included a large cohort of patients showing visible difference in outcomes when measured via clinicians' assessment at 3 months' time through clinic letters and when assessed through patient reported outcomes at 6 to 9 months. Our findings suggest that routine postoperative backslab immobilisation following volar plate fixation may not be necessary in many cases and that early mobilisation may improve functional outcomes. This study has several limitations. First, it represents a single-centre retrospective cohort. Second, PRWE scores were available for only 115 patients. Third, the documentation of stiffness at three months was based on clinic notes and may vary between clinicians. We Suggest a multi–Centre Randomized Control Trial with a larger cohort to further consolidate these findings.

Conclusion

Prolonged casting may delay early mobilisation, contributing to stiffness & increased follow-up requirements, with functional implications. Our Study findings support timely surgical fixation in line with BOAST guidance and advocate early postoperative mobilisation without routine casting to improve outcomes & reduce healthcare burden.

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Ethical approval

Institutional approval was obtained prior to the conduct of this study. The study was conducted in accordance with institutional governance guidelines. (Project Registration number: T&O2526-4).

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