

Outcomes of closed distal radius fracture treated with closed reduction and cast immobilization at Viet Tiep Friendship Hospital

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ABSTRACT

Objectives: To evaluate the radiographic and functional outcomes of closed distal radius fractures treated with closed reduction and cast immobilization at Viet Tiep Friendship Hospital. **Materials and methods:** A retrospective and prospective descriptive study was conducted on 80 patients with closed distal radius fractures treated with closed reduction and cast immobilization between April 2025 and April 2026. Clinical characteristics, AO fracture classification, radiographic parameters, maintenance of reduction, and functional outcomes assessed using the Mayo Wrist Score were evaluated. **Results:** Patients aged ≥ 60 years accounted for the largest proportion of cases (43.7%). Domestic falls (45.0%) and traffic accidents (40.0%) were the most common mechanisms of injury. AO type A2 fractures accounted for the highest proportion (42.5%). Radiographic parameters improved significantly after treatment (all $p < 0.001$). Satisfactory maintenance of reduction was achieved in 80.0% of patients, whereas 6.2% required surgical intervention because of secondary displacement. Of the 80 enrolled patients, five underwent surgical fixation and were excluded from final functional assessment. Among the remaining 75 patients, excellent and good functional outcomes accounted for 88.0% of cases. **Conclusion:** Closed reduction and cast immobilization may provide satisfactory radiographic and functional outcomes in carefully selected minimally displaced and stable distal radius fractures. Regular radiographic follow-up remains important for detecting secondary displacement and optimizing treatment outcomes.

Keywords: distal radius fracture, cast immobilization, conservative treatment, closed reduction, Mayo Wrist Score.

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INTRODUCTION

Distal radius fractures are among the most common fractures of the upper extremity, accounting for approximately 15–20% of all fractures in adults and representing a major cause of wrist dysfunction worldwide [1]. These injuries occur across a broad age spectrum, ranging from high-energy trauma in younger individuals to low-energy falls in older adults [2]. If inadequately treated, distal radius fractures may result in residual

deformity, restricted wrist motion, reduced grip strength, chronic pain, and impaired quality of life [3].

Current treatment options for distal radius fractures include both conservative and surgical approaches. Closed reduction and cast immobilization remains a widely accepted treatment method for minimally displaced fractures and fractures that achieve acceptable alignment after reduction [4]. This approach offers several advantages, including technical simplicity, low cost,

avoidance of surgical risks, and broad applicability in various healthcare settings [5]. Nevertheless, conservative treatment is associated with potential complications such as loss of reduction, malunion, residual deformity, and impaired wrist function, particularly in fractures with unfavorable characteristics [6].

Previous studies have demonstrated that treatment outcomes are influenced by several factors, including patient age, fracture pattern, initial displacement, and maintenance of reduction after casting [7]. In carefully selected patients with minimally displaced or stable fractures, conservative treatment may provide satisfactory radiographic and functional outcomes while avoiding surgery-related complications [8]. Furthermore, some studies have suggested that functional outcomes following conservative treatment may be comparable to those achieved with surgical intervention in selected elderly patients or individuals with lower functional demands [9].

Although distal radius fractures have been extensively studied, data regarding the outcomes of conservative treatment in Vietnamese clinical practice remain limited. In particular, studies evaluating radiographic restoration, maintenance of reduction, and functional recovery following closed reduction and cast immobilization are still scarce at major trauma centers. Such information is important for assessing the effectiveness of conservative treatment and optimizing patient selection.

Viet Tiep Friendship Hospital is a major trauma center that manages a substantial number of distal radius fractures annually. Evaluation of fracture characteristics, radiographic outcomes, maintenance of reduction, and functional recovery after conservative treatment may provide

valuable evidence for clinical decision-making and patient management.

Therefore, this study was conducted to evaluate the radiographic and functional outcomes of closed distal radius fractures treated with closed reduction and cast immobilization at Viet Tiep Friendship Hospital.

MATERIALS AND METHODS

Study Design and Subjects

This was a retrospective and prospective descriptive study conducted at Viet Tiep Friendship Hospital between April 2025 and April 2026. The study was approved by the Ethics Committee and written informed consent was obtained from all participants in the prospective phase, while informed consent was waived for retrospective data because of the observational nature of the study. A total of 80 patients with closed distal radius fractures treated with closed reduction and cast immobilization were included.

Inclusion criteria

- Closed distal radius fractures indicated for conservative treatment.
- Minimally displaced fractures or fractures considered stable after closed reduction.
- Complete clinical records and radiographic data.
- Minimum follow-up period of 6 months.

Stable distal radius fractures were defined as fractures maintaining acceptable alignment after closed reduction without progressive displacement during follow-up. Stability criteria included dorsal tilt $<10^\circ$, radial inclination $>15^\circ$, radial shortening <5 mm, and intra-articular step-off <2 mm, based on commonly accepted radiographic criteria and the modified Lafontaine criteria for distal radius fracture stability [4].

Exclusion criteria

- Open fractures.

- Pathological fractures.
- Associated vascular or nerve injuries requiring emergency surgery.
- Previous fracture or deformity of the affected wrist.
- Incomplete follow-up data.

Study Variables

The following variables were collected and analyzed:

- Demographic characteristics: age, sex, injured side, and mechanism of injury.
- Fracture characteristics according to the AO classification.
- Radiographic parameters before and after reduction, including radial height, radial inclination, volar tilt, and ulnar variance.
- Maintenance of reduction and occurrence of secondary displacement.
- Functional outcomes assessed using the Mayo Wrist Score.

Treatment Procedure and Follow-up

Closed reduction was performed under appropriate analgesia, followed by below-elbow cast immobilization with the wrist maintained in a functional position.

Patients were scheduled for clinical and radiographic follow-up evaluations immediately after reduction and at 1 week, 4 weeks, and 6 weeks after treatment.

Secondary displacement was defined as loss of acceptable radiographic alignment during follow-up. Patients who developed unacceptable secondary displacement were subsequently treated surgically.

Outcome Assessment

Radiographic outcomes were evaluated using the following parameters:

- Radial height (mm)
- Radial inclination (degrees)
- Volar tilt (degrees)
- Ulnar variance (mm)

Functional outcomes were assessed at 6 months after injury using the Mayo Wrist Score and classified as:

- Excellent (90–100 points)
- Good (80–89 points)
- Fair (65–79 points)
- Poor (<65 points)

Statistical Analysis

Data were analyzed using IBM SPSS Statistics software. Continuous variables were expressed as mean $\pm$ standard deviation (SD), whereas categorical variables were presented as frequencies and percentages. Paired Student's t-test was used to compare radiographic parameters before and after reduction. Statistical significance was defined as $p < 0.05$.

RESULTS

A total of 80 patients with closed distal radius fractures were included in the study. During follow-up, five patients developed unacceptable secondary displacement and subsequently underwent surgical fixation. Therefore, functional outcomes were evaluated in the remaining 75 patients who completed conservative treatment.

Table 1. General characteristics of the study ($n = 80$)

Age group	No.	%
< 40 years	18	22.5
40–59 years	27	33.8
≥ 60 years	35	43.7
Sex		
Male	45	56.3
Female	35	43.7

Affected side		
Right wrist	42	52.5
Left wrist	38	47.5
Total	80	100

Patients aged ≥ 60 years accounted for the largest age group (43.7%). Male patients represented 56.3% of the study population. The right wrist was slightly more commonly affected than the left wrist (52.5% vs. 47.5%).

Table 2. Causes of injury and AO fracture classification

Cause of injury	No.	%
Domestic falls	36	45.0
Traffic accidents	32	40.0
Occupational accidents	8	10.0
Others	4	5.0
AO fracture classification		
A2	34	42.5
A3	22	27.5
C1	16	20.0
C2	6	7.5
C3	2	2.5
Total	80	100

Domestic falls (45.0%) and traffic accidents (40.0%) were the two most common mechanisms of injury. AO type A2 fractures accounted for the highest proportion of cases (42.5%), followed by AO type A3 fractures (27.5%). Most fractures included in the study were minimally displaced or remained stable after reduction, making them suitable for conservative treatment.

Table 3. Changes in radiographic parameters before and after closed reduction and casting

Radiographic parameters	Before reduction	After reduction	p
Radial height (mm)	7.8 ± 2.4	10.6 ± 1.8	<0.001
Radial inclination ($^{\circ}$)	16.5 ± 4.6	21.8 ± 3.5	<0.001
Volar tilt ($^{\circ}$)	-4.2 ± 7.8	6.5 ± 5.4	<0.001
Ulnar variance (mm)	2.6 ± 1.8	0.8 ± 1.1	<0.001

Significant improvements were observed in all radiographic parameters following closed reduction and cast immobilization. Radial height, radial inclination, and volar tilt increased significantly after treatment, whereas ulnar variance decreased significantly (all $p < 0.001$).

Table 4. Maintenance of reduction after casting

Post-casting outcomes	No.	%
Good maintenance of reduction	64	80.0
Mild secondary displacement	11	13.8
Severe secondary displacement requiring surgery	5	6.2
Total	80	100

Most patients maintained satisfactory fracture reduction throughout the immobilization period (80.0%). Mild secondary displacement occurred in 13.8% of patients, whereas five patients (6.2%) developed unacceptable secondary displacement and required subsequent surgical treatment.

Table 5. Functional outcomes according to the Mayo Wrist Score among patients completing conservative treatment (n = 75)

Functional outcomes	No.	%
Excellent	32	42.7
Good	34	45.3
Fair	7	9.3
Poor	2	2.7
Total	75	100

Among the 75 patients who completed conservative treatment, excellent and good functional outcomes accounted for 88.0% of cases. Fair and poor outcomes were observed in 9.3% and 2.7% of patients, respectively.

DISCUSSION

In the present study, patients aged ≥ 60 years accounted for the largest proportion of cases (43.7%), while male patients represented 56.3% of the study population. Domestic falls and traffic accidents were the two most common mechanisms of injury. These findings are generally consistent with previous reports showing that distal radius fractures commonly occur following low-energy falls in older adults and high-energy trauma in younger individuals [1–3]. The relatively high proportion of male patients in our study may reflect local epidemiological characteristics and the frequency of traffic- and work-related injuries in Vietnam.

According to the AO classification, type A2 fractures accounted for the highest proportion of cases (42.5%), followed by type A3 fractures (27.5%). Most fractures included in the study were minimally displaced or remained stable after reduction, making them suitable for conservative treatment. Similar findings have been reported by Mulders et al. [4], who suggested that stable extra-articular distal radius fractures may achieve

satisfactory outcomes with nonoperative management.

Radiographic parameters improved significantly following closed reduction and cast immobilization. Radial height, radial inclination, and volar tilt increased significantly after reduction, whereas ulnar variance decreased significantly (all $p < 0.001$). These findings suggest that closed reduction and casting can effectively restore distal radius anatomy in appropriately selected patients. Restoration of anatomical alignment has been reported to play an important role in wrist biomechanics, grip strength, and overall functional recovery [5]. Most patients maintained satisfactory fracture reduction throughout treatment, with only 6.2% requiring surgical intervention because of secondary displacement. The relatively low conversion-to-surgery rate may be explained by the predominance of stable AO type A2 and A3 fractures in the study population. Functional outcomes assessed using the Mayo Wrist Score showed that excellent and good results accounted for 88.0% of cases. These findings are consistent with previous studies reporting favorable

outcomes of conservative treatment in appropriately selected distal radius fractures [6–8]. Conservative treatment offers several advantages, including technical simplicity, low cost, minimal invasiveness, and avoidance of surgery-related complications. However, careful patient selection and regular radiographic follow-up remain essential to detect secondary displacement and optimize treatment outcomes.

This study has several limitations. First, the sample size was relatively small and derived from a single institution, which may limit the generalizability of the findings. Second, the retrospective–prospective design may introduce selection bias. Third, only short-term outcomes were evaluated at six months after injury. Further studies with larger sample sizes and longer follow-up periods are needed to confirm these findings and evaluate long-term functional outcomes.

CONCLUSION

Closed reduction and cast immobilization may provide satisfactory radiographic and functional outcomes in carefully selected minimally displaced and stable distal radius fractures. In this study, most patients maintained acceptable fracture reduction, and 88.0% achieved excellent or good functional outcomes according to the Mayo Wrist Score.

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