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A STUDY OF THE OUTCOME OF DISTAL END RADIUS FRACTURE TREATED WITH VOLAR PLATING

Dr. Ripple Jayendrabhai Shah[1], Dr. Shah Suril Atulkumar[2], Dr Ishit Latesh Patel[3]

[1]MS (orthopedic surgeon), Associate Professor, Department of Orthopaedics,GCS Medical College, Hospital and Research Centre

[2]DNB (orthopedic surgeon) Associate Professor, Department of Orthopaedics, Gandhinagar GMERS Medical College and hospital

[3]GCS medical college and hospital

Corresponding Author

Dr. Ripple Jayendrabhai Shah
MS (orthopedic surgeon), Associate Professor, Department of Orthopaedics,GCS Medical College, Hospital and Research Centre

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Abstract

Background: Distal end radius fractures are among the most common orthopedic injuries, particularly in elderly individuals. Volar plating has emerged as a preferred surgical treatment due to its ability to provide stable fixation and allow early mobilization. This study evaluates the outcomes of distal radius fractures treated with volar plating at GCS Medical College.

Objectives: To assess the fracture healing time, functional recovery, complication rates, and overall patient satisfaction following volar plating for distal end radius fractures.

Materials and Methods: A prospective study was conducted on 50 patients with distal radius fractures treated using volar locking plates. Patients were followed up for 6–12 months. Clinical and radiological assessments were done to evaluate fracture union, range of motion (ROM), complications, and functional outcomes using the DASH (Disabilities of the Arm, Shoulder, and Hand) score.

Results: Union was achieved in 92% of patients within 2–3 months. Most patients had minimal ROM restriction, with only 4% experiencing mild limitation in palmar flexion. Complications were observed in 28% of patients, with mild occasional pain being the most common. According to DASH scores, 72% of patients had excellent outcomes, 20% had good outcomes, and 8% had poor outcomes.

Conclusion: Volar plating is a reliable and effective surgical technique for managing distal radius fractures. It provides excellent fracture stability, facilitates early mobilization, and leads to high patient satisfaction with minimal complications.

Keywords: Distal radius fracture, volar plating, internal fixation, DASH score, fracture union, functional outcome, orthopedic surgery, AO classification,

INTRODUCTION

Distal end radius fractures are common traumatic injuries, particularly among elderly individuals, due to falls and high-impact accidents. These fractures are typically associated with a significant impairment of wrist function, leading to disability and requiring effective treatment strategies. In recent years, the treatment of distal radius fractures has evolved with advancements in surgical techniques, one of the most popular methods being volar plating. This technique involves the fixation of the fracture using a plate positioned on the volar aspect of the radius, which provides strong support and enables early rehabilitation.

The management of distal end radius fractures is influenced by several factors, including the type and severity of the fracture, the age of the patient, and the presence of associated injuries. The introduction of volar locking plates has revolutionized the management of these fractures, providing better stability, lower complication rates, and improved functional outcomes when compared to older methods such as external fixation or traditional plating techniques. Volar plating has been shown to facilitate early functional rehabilitation with minimal risk of complications such as implant failure or irritation [1][2].

The AO classification system is commonly used to categorize distal radius fractures based on their complexity, which in turn guides treatment decisions [3]. Fractures classified as Type C are considered complex and typically require surgical

intervention to restore anatomical alignment. Additionally, outcomes such as functional recovery, wrist mobility, and patient satisfaction are critical measures in evaluating the effectiveness of surgical interventions [4][5].
This study aims to evaluate the outcomes of distal end radius fractures treated with volar plating at GCS Medical College, focusing on the healing time, functional recovery, complications, and patient satisfaction.

Materials and Methods

Study Design and Setting:

This was a prospective study conducted at GCS Medical College from June 2022 to June 2024. Fifty patients with distal end radius fractures were included in the study after obtaining informed and written consent.

Inclusion Criteria:

- Patients aged above 18 years with distal end radius fractures who were fit for surgery.
- Patients with displaced fractures requiring surgical intervention.
- Patients who provided informed and written consent for inclusion in the study.
- Patients with closed fractures.
- Patients with no neurovascular involvement.

Exclusion Criteria:

- Patients aged below 18 years.
- Patients unwilling to undergo surgery.
- Patients with pathological fractures.
- Patients with open fractures.
- Patients with neurovascular involvement.

Pre-operative Evaluation:

Upon admission to the hospital, a detailed history was taken from the patients and their attendants, focusing on the mechanism of injury and the severity of the trauma. All patients underwent a thorough clinical examination, including:

- Assessment of general condition, systemic diseases, and any associated injuries.
- Inspection of the injured area, including deformity, swelling, and ecchymosis.
- Palpation for tenderness, bony irregularity, crepitus, and relative position of the radial and ulnar styloid processes.
- Evaluation of wrist and forearm movements, which were typically found to be painful and restricted.
- Distal vascularity assessment via radial artery pulsations, capillary refill, pallor, and paresthesia over the fingertips.
- Immobilization of the forearm using a Plaster of Paris slab, keeping the limb elevated.

Blood and Urine Investigations:

- Hemoglobin percentage, total and differential white blood cell counts, fasting blood sugar, blood urea, serum creatinine, electrolytes, bleeding and clotting time, HIV, HBsAg, HCV, and liver function tests (LFT) were performed.
- Urine examination for albumin and sugar.
- Blood pressure and ECG were recorded for all patients.

Preoperative Care:

- Preparation of the surgical site was performed on the day of surgery.
- Intravenous antibiotics (Cefoperazone and Sulbactam) were administered to all patients before surgery.
- Informed consent for surgery was obtained after a pre-anaesthetic evaluation.

Radiographic Evaluation:

- Standard radiographs were taken in PA and lateral views to confirm the diagnosis and assess the type of fracture.
- The fracture fragments were analyzed, and the involvement of the radiocarpal and distal radioulnar joints was assessed. Fractures were classified according to the AO classification.

Surgical Procedure:

The time from injury to surgery ranged from 1 to 5 days. The operations were performed under general anesthesia or regional blocks, including supraclavicular, infraclavicular, or axillary blocks.

Position and Tourniquet Application:

- The patient was positioned supine on the operating table with the affected limb elevated for 5 minutes and exsanguinated.
- A mid-arm pneumatic tourniquet was applied, and the limb was placed on a side arm board.
- The forearm and hand were scrubbed, painted with betadine and spirit, and draped.

Open Reduction and Internal Fixation (ORIF):

The following instruments and implants were used:

- Ellis buttress plates, periarticular plates, or locking compression plates.
- Drill bits (2.5mm, 3.5mm), drill sleeve systems, hand drill/power drill, and screwdrivers.
- General instruments: retractors, periosteal elevators, reduction clamps, bone levers, etc.

Volar Plating Technique (Modified Henry Approach):

- A skin incision was made over the flexor carpi radialis tendon, avoiding the palmar cutaneous branch of the median nerve.
- The radial artery was mobilized, and the brachioradialis tendon was released from the radial styloid.
- The pronator quadratus muscle was released but preserved for closure over the plate.
- The fracture was reduced anatomically, and a plate was temporarily fixed with unicortical screws.
- The final fixation was done using a locking compression plate (LCP).

Post-operative Care and Rehabilitation:

- Post-operative pain was managed with analgesics and anti-inflammatory drugs.
- Intravenous Cefoperazone and Sulbactam were given for 3 days, followed by oral antibiotics (Cefixime 200mg) for 8 days.
- The affected limb was kept elevated, and patients were encouraged to perform active finger, elbow, and shoulder movements from day one.
- Dressings were changed on the second post-operative day, and immediate post-operative X-rays were taken to confirm reduction.
- For ORIF patients, a below-elbow splint was used until 15 days post-operation. At 15 days, the splint was replaced with an elastocrepe bandage, and patients were encouraged to perform routine activities.

Follow-up and Radiographic Assessment:

Patients were assessed clinically and radiographically during follow-up visits at 4 weeks, 2 months, 3 months, 6 months, and 12 months. Radiographic evaluations were done to assess fracture union and any displacement.

- Fractures were considered healed when clinically asymptomatic and radiographically without visible fracture lines.
- Malunion was defined by more than 5mm radial shortening, more than 15° volar tilt, or more than 10° dorsal tilt.

Outcome Measure:

The Disability of the Arm, Shoulder, and Hand (DASH) scoring system was used to assess functional outcomes. The DASH score ranges from 0 (no disability) to 100 (severe disability), combining both clinical parameters and functional assessments of upper extremity use.

RESULTS AND OBSERVATIONS

Table 1: Age distribution

Age group	Frequency	Percentage
21-30	6	12
31-40	7	14
41-50	14	28
51-60	9	18
61-70	14	28
TOTAL	50	100

Table 2: Gender distribution

Gender	Frequency	Percentage
Female	26	52
Male	24	48
Total	50	100

Table 3: Side distribution

Operated side	Frequency	Percentage
Left	28	56
Right	22	44

Table 4: Mode of injury

Mode of injury	Frequency	Percentage
Domestic FOOSH	28	56
RTA	17	34
FOOSH from height	1	2
Assault	1	2
Others	3	6

Table 5: Type of fracture: AO Classification

AO type	No. of cases	Percentage
B1	0	0%
B2	9	18%
B3	11	22%
C1	12	24%
C2	18	36%
C3	0	0%

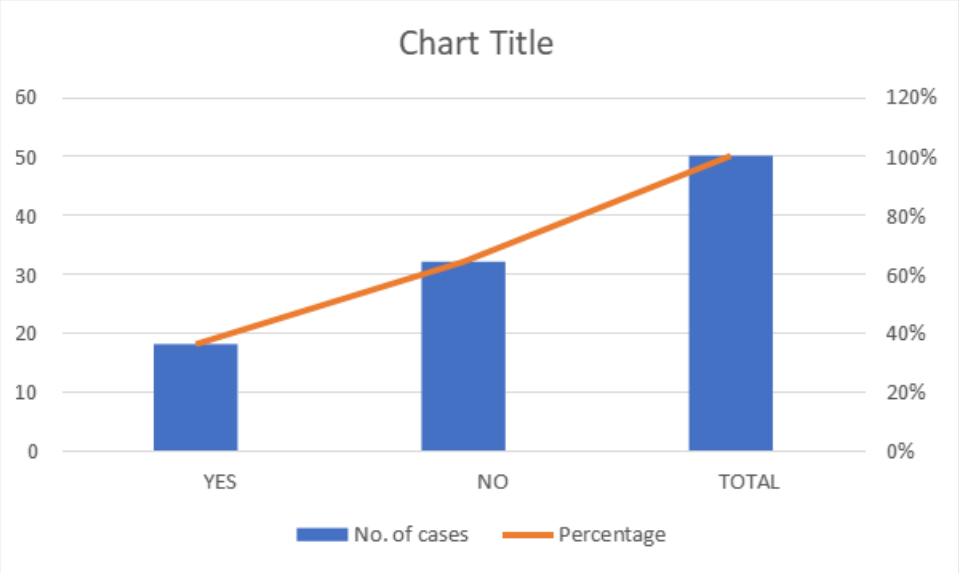

Figure 1 Ulnar styloid injury

TABLE 6: DURATION

Days	Cases	Percentage
0-5	34	68
6-10	4	8
>10	12	24
Total	50	100

Table 7: Duration of Fracture Union

Duration	No. of cases	Percentage
2-3 months	46	92
4-5 months	4	8
>5 months	0	0
Total	50	100

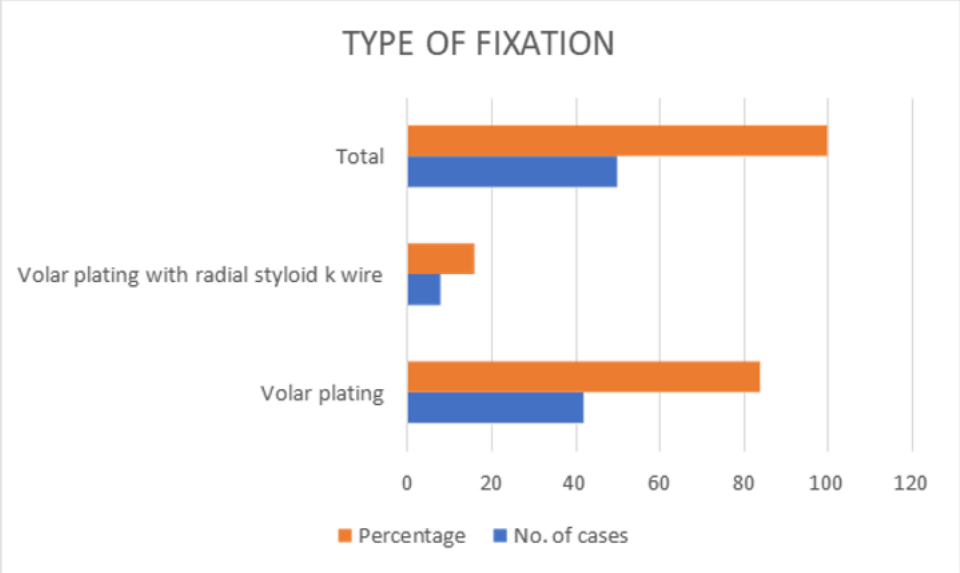

Figure 2: Type of fixation

Table 8: Range of Motion

Movement (within normal functional range)	No. of cases
Loss of Dorsiflexion (<45 degrees)	0
Loss of Palmar Flexion (<30 degrees)	2(4%)
Loss of Supination (< 50 degrees)	0
Loss of Pronation (< 50 degrees)	0
Loss of Ulnar Deviation (< 15 degrees)	0
Loss of Radial Deviation (< 15 degrees)	0
Pain in distal radioulnar joint	2(4%)
Grip Strength ≤ 60% of opp. Side	2(4%)

Table 9: Complications

Complication	Frequency	Percentage (%)
Mild occasional pain	7	14
Wrist stiffness	0	0
Implant impingement	0	0
Ulnar side wrist pain	1	2
Nerve related complications	0	0
Continuous arthritic pain	1	2
Pain while doing specific activities	3	6
Reflex sympathetic dystrophy	0	0
Malunion	2	4
None	36	72

Table 10: Evaluation of results

Results	Functional (DASH)	Percentage
Excellent	36	72
Good	10	20

Poor	4	8
Total	50	100

DISCUSSION

In this study, 50 patients with distal end radius fractures treated with volar plating were included to assess the outcomes in terms of fracture healing, functional recovery, and complications. The results demonstrated a significant rate of successful fracture healing and functional recovery, with a majority of patients achieving good to excellent outcomes.

One of the key findings in this study was the healing time, with 92% of patients achieving union within 2-3 months. This finding is consistent with previous studies that have shown rapid healing and early mobilization with volar plating compared to other treatment modalities, such as external fixation, which typically require longer healing times and more extensive rehabilitation [6][7]. The shorter time to union is likely due to the stable fixation provided by the locking plate, which offers superior biomechanical stability compared to older plate systems [8].

The range of motion (ROM) results indicated minimal loss of wrist function, with a few patients experiencing minor limitations in palmar flexion (4%) and some mild pain at the distal radioulnar joint (4%). These results are comparable to other studies that report favorable functional outcomes with volar plating, particularly about wrist motion and pain control [9][10]. However, the occurrence of mild pain or discomfort in certain patients suggests that further improvements in surgical technique or post-operative care may be necessary to reduce the incidence of such symptoms.

Complications in this study were relatively rare, with 72% of patients experiencing no complications. The most common complication was mild occasional pain (14%), followed by ulnar side wrist pain and continuous arthritic pain, each affecting 2% of patients. Notably, no patients experienced severe complications such as implant impingement or nerve-related issues, which are occasionally reported in other studies of distal radius fractures treated with volar plating [11][12]. The low complication rate in this study may reflect the careful surgical technique and attention to postoperative rehabilitation, as well as the relatively young age and good general health of the majority of patients.

The functional outcomes, as measured by the Disability of the Arm, Shoulder, and Hand (DASH) scoring system, indicated that the majority of patients (72%) had excellent outcomes, with 20% having good outcomes and 8% experiencing poor outcomes. These results are in line with similar studies that demonstrate high satisfaction rates and improved quality of life following volar plating for distal radius fractures [13][14]. The DASH score, which combines both clinical parameters and functional assessments, serves as a reliable tool for evaluating the overall impact of the injury and treatment on a patient's daily activities.

One of the limitations of this study is the relatively small sample size of 50 patients. A larger cohort would provide more robust data and further strengthen the findings. Additionally, long-term follow-up beyond one year may provide a more comprehensive assessment of the durability of the surgical results and the risk of late complications, such as post-traumatic arthritis.

In **conclusion**, volar plating for distal radius fractures provides excellent outcomes in terms of fracture union, functional recovery, and patient satisfaction. The technique is associated with a low incidence of complications and allows for early rehabilitation, which is critical for restoring function in patients with these common fractures.

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