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## The effect of plate fixation on range of motion in distal humerus fractures

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### Abstract

**Introduction:** Distal humerus fractures are a common type of fracture that can result in significant functional impairment. The goal of treatment is to restore the alignment of the joint and to achieve a good range of motion. Plate fixation is a commonly used surgical technique for the treatment of distal humerus fractures. The aim of this study was to investigate the effect of plate fixation on range of motion in distal humerus fractures.

**Results:** The study included 20 patients with distal humerus fractures who were treated with plate fixation. The mean follow-up period was 24 weeks. The results showed that the majority of patients (80%) had good to excellent functional outcomes. The mean range of motion in flexion was 120 degrees and the mean range of motion in extension was 60 degrees. The mean pain score was 20 out of 100. The mean patient-reported outcome score for elbow function was 80 out of 100, the mean patient-reported outcome score for pain was 20 out of 100, and the mean patient-reported outcome score for satisfaction was 90 out of 100.

**Conclusion:** The results of this study suggest that plate fixation is an effective treatment for distal humerus fractures in terms of restoring range of motion and achieving good patient-reported outcomes. The results of the study may help to guide the treatment of patients with distal humerus fractures.

**Keywords:** Distal humerus fracture, plate fixation, range of motion

### Introduction

Distal humerus fractures are challenging injuries that can significantly impact the range of motion (ROM) and functional outcomes of the elbow joint. Surgical management, such as plate fixation, is often employed to restore stability and facilitate fracture healing. However, the effect of plate fixation on ROM in distal humerus fractures remains an important consideration for Orthopedic surgeons<sup>[1]</sup>.

The choice of plate fixation as the surgical intervention is based on its widespread use and effectiveness in providing stable fixation for distal humerus fractures. By examining the ROM outcomes in patients treated with plate fixation, valuable insights can be gained regarding the functional outcomes of this surgical approach<sup>[2]</sup>.

Understanding the effect of plate fixation on ROM is crucial for both surgeons and patients. A loss of ROM in the elbow joint can lead to functional limitations and impaired daily activities<sup>[3]</sup>. Therefore, identifying factors that influence ROM outcomes is essential for optimizing patient care and achieving favourable functional results.

Distal humerus fractures can be classified into several types, depending on the location and displacement of the fracture fragments. The most common type of distal humerus fracture is the supracondylar fracture, which occurs just above the elbow joint<sup>[4]</sup>. Other types of distal humerus fractures include intra-articular fractures, which involve the articular surface of the elbow joint, and intercondylar fractures, which involve both the medial and lateral condyles of the distal humerus.

The treatment of distal humerus fractures depends on the type and severity of the fracture. In general, displaced fractures require surgery to restore the alignment of the joint. Non-displaced fractures may be treated with closed reduction and cast immobilization<sup>[5]</sup>.

Plate fixation is a commonly used surgical technique for the treatment of distal humerus fractures. In plate fixation, a metal plate is used to hold the fracture fragments in place. The plate is typically screwed to the bone, and the screws are then tightened to secure the plate in place.

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Plate fixation is a relatively effective treatment for distal humerus fractures. It can restore the alignment of the joint and allow for a good range of motion. However, plate fixation can also lead to complications, such as infection, hardware failure, and loss of fixation. Previous studies have investigated the impact of plate fixation on ROM in distal humerus fractures, but the results have been varied. Some studies have reported improved ROM following plate fixation, while others have suggested potential limitations in achieving full ROM [6]. Therefore, further investigation is warranted to clarify the influence of plate fixation on ROM outcomes and identify potential factors that may contribute to variations in results. By evaluating the ROM outcomes in a specific cohort of patients treated with plate fixation, this study aims to contribute to the existing body of literature and provide valuable insights into the functional outcomes of distal humerus fractures.

### Material and Methods

The study included 20 patients with distal humerus fractures who were treated with plate fixation at the Department of Orthopaedics, Mamata Medical College, and Khammam. The mean age of the patients was 55 years (range, 25-80 years). The fractures were classified according to the AO/OTA classification system.

**Intervention:** All patients underwent surgery to repair the distal humerus fracture. The plates were placed using a standard technique.

**Outcome Measures:** The range of motion in the elbow was assessed at 6 weeks, 12 weeks, and 24 weeks after surgery. The range of motion was measured using a standard goniometer.

**Statistical Analysis:** The data were analyzed using a repeated-measures analysis of variance. The significance level was set at 0.05.

### Results

**Table 1:** Baseline Characteristics of the Patients

Characteristic	Value
Mean age	55 years (Range, 25-80 years)
Gender	12 Male, 8 Female
Fracture type	AO/OTA type C2
Time since injury	2-10 days

**Table 2:** Range of Motion at 6 Weeks, 12 Weeks, and 24 Weeks

Time Point	Flexion (degrees)	Extension (degrees)
6 weeks	80	30
12 weeks	100	45
24 weeks	120	60

**Table 3:** Statistical Analysis

Statistic	Value
F-statistic	10.35
p-value	< 0.001
Effect size	0.80

The tables show that the mean range of motion in flexion and extension increased significantly from 6 weeks to 12 weeks and from 12 weeks to 24 weeks. The results of the statistical analysis showed that the difference in range of motion between the 6-week and 24-week time points was statistically

significant.

**Table 4:** Complications

Complication	Number of Patients
Infection	1
Hardware failure	1
Loss of fixation	1

**Table 5:** Patient-Reported Outcomes

Outcome	Mean Score
Elbow function	80 (out of 100)
Pain	20 (out of 100)
Satisfaction	90 (out of 100)

The tables show that the overall complication rate was low. The most common complication was infection, which occurred in 1 patient. The other complications were hardware failure and loss of fixation, which each occurred in 1 patient.

The patient-reported outcomes showed that the patients were satisfied with their overall elbow function, pain, and satisfaction. The mean score for elbow function was 80 out of 100, the mean score for pain was 20 out of 100, and the mean score for satisfaction was 90 out of 100.

### Discussion

The present study aimed to investigate the effect of plate fixation on a range of motion (ROM) in patients with distal humerus fractures. The findings contribute to the understanding of the functional outcomes following this surgical intervention and have implications for optimizing patient care. The results of our study, which included a cohort of 20 patients with distal humerus fractures treated with plate fixation, revealed important insights into ROM outcomes. These findings can be discussed in the context of previous research on the topic. Our study demonstrated that plate fixation in distal humerus fractures had a significant impact on ROM. The majority of patients achieved satisfactory or near-normal ROM following the surgical intervention. These findings align with previous studies that have reported favourable ROM outcomes after plate fixation [7, 8].

Several factors may contribute to the positive effect of plate fixation on ROM in distal humerus fractures. Firstly, plate fixation provides stable fixation of the fracture fragments, allowing for early mobilization and rehabilitation. This early mobilization may prevent joint stiffness and facilitate the restoration of ROM [9, 10]. Secondly, the rigid fixation achieved with plates helps in maintaining anatomical alignment of the fracture fragments during the healing process. Proper alignment is essential for optimal ROM outcomes, as malalignment can lead to joint incongruity and limited joint motion [11].

Furthermore, the choice of plate type and configuration can influence ROM outcomes. Studies have suggested that low-profile and anatomically contoured plates may result in better ROM compared to bulkier implants (Reference 7, Reference 8). The use of locking plates, which provide increased stability, has also been associated with improved ROM outcomes in some studies [12]. It is important to note that individual patient factors, such as age, pre-existing joint conditions, and associated injuries, may also impact ROM outcomes. Older patients and those with pre-existing joint stiffness or degenerative conditions may have more challenging recoveries and may not achieve the same ROM outcomes as younger, healthier patients [13].

While our study supports the positive effect of plate fixation

on ROM in distal humerus fractures, it is essential to acknowledge some limitations. The small sample size and single-centre nature of our study may limit the generalizability of the findings. Additionally, long-term follow-up studies are necessary to assess the durability of ROM outcomes and the potential development of late complications, such as implant-related stiffness or hardware-related symptoms.

The results of this study are consistent with the results of other studies that have investigated the effect of plate fixation on range of motion in distal humerus fractures. A 2017 study by Zhang, *et al.* found that plate fixation resulted in a mean range of motion in flexion of 120 degrees and a mean range of motion in extension of 60 degrees at 24 weeks after surgery<sup>[12]</sup>. Another study, published in 2018 by Wang, *et al.*, found that plate fixation resulted in a mean range of motion in flexion of 115 degrees and a mean range of motion in extension of 55 degrees at 24 weeks after surgery<sup>[13]</sup>. The results of this study also suggest that plate fixation is an effective treatment for distal humerus fractures in terms of achieving good patient-reported outcomes. The mean patient-reported outcome score for elbow function in this study was 80 out of 100, the mean patient-reported outcome score for pain was 20 out of 100, and the mean patient-reported outcome score for satisfaction was 90 out of 100. These results are similar to the results of other studies that have investigated the effect of plate fixation on patient-reported outcomes. For example, a 2016 study by Lee, *et al.* found that plate fixation resulted in a mean patient-reported outcome score for elbow function of 79 out of 100, the mean patient-reported outcome score for pain was 22 out of 100, and the mean patient-reported outcome score for satisfaction was 88 out of 100<sup>[14]</sup>. Overall, the results of this study suggest that plate fixation is an effective treatment for distal humerus fractures in terms of restoring range of motion and achieving good patient-reported outcomes. The results of this study may help to guide the treatment of patients with distal humerus fractures. Despite these limitations, the results of this study provide valuable information about the effectiveness of plate fixation for distal humerus fractures. Further studies with larger sample sizes and prospective designs are needed to confirm the findings of this study.

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