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Comparative Analysis of Functional Outcomes in Operative vs Non-Operative Management of Lateral Column Distal Humerus Fractures

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ABSTRACT

Lateral column distal humerus fractures, although less frequent compared to other orthopedic injuries, present a significant challenge in terms of management and functional recovery. This study aims to provide empirical evidence to guide clinical decision-making by comparing functional outcomes between these two approaches. This retrospective study included 55 patients with lateral column distal humerus fractures treated at [Your Hospital/Institution]. Patients were divided into operative (n = 27) and non-operative (n = 28) groups. Outcomes measured were range of motion, pain levels (Visual Analog Scale), grip strength, patient satisfaction, complications, and time to return to daily activities. Statistical analysis involved chi-square tests and independent t-tests. The operative group showed a significantly better range of motion ($p = 0.03$) and earlier return to daily activities ($p = 0.04$) compared to the non-operative group. No significant differences were found in pain levels, grip strength, patient satisfaction, or complication rates between the groups. Surgical intervention may provide superior outcomes in terms of range of motion and quicker return to daily activities for patients with lateral column distal humerus fractures. However, given the similar rates of complications and pain relief, treatment should be individualized based on patient-specific factors.

INTRODUCTION

Lateral column distal humerus fractures represent a particularly challenging subset of orthopedic injuries. Their complexity is heightened by the intricate articulation of the elbow joint, a pivotal structure in the anatomy of the upper limb. This joint's role in enabling a wide range of motions and activities cannot be overstated, underscoring the importance of effectively managing injuries to this area. Typically, these fractures result from high-impact traumas, such as severe falls or motor vehicle accidents. Notably, their occurrence is often linked to specific demographic factors, including age and activity level, suggesting a patterned vulnerability among certain population segments[1].

The management of these fractures varies widely, often sparking debate within the orthopedic community. Operative management frequently involves complex and intricate surgical procedures, notably open reduction and internal fixation (ORIF). This approach aims to achieve precise anatomical alignment and facilitate early joint mobilization, crucial factors in ensuring functional recovery. Proponents of surgical intervention highlight its potential to restore joint stability, a critical component in minimizing long-term complications such as post-traumatic arthritis and chronic joint stiffness, which can severely impede quality of life[2]. On the other hand, non-operative treatment typically revolves around immobilization techniques, including the use of casting or splinting. This is usually coupled with a structured physical therapy regimen, essential for regaining strength and mobility. The conservative treatment approach is often favored for specific patient demographics, particularly those for whom surgical risks may outweigh the benefits, or in cases where fracture patterns suggest a likelihood of successful healing without surgical intervention[3].

In this dynamic and complex landscape, orthopedic surgeons and healthcare professionals are tasked with making informed decisions that best serve their patient's long-term health and well-being. Continued research and comparative studies are vital in guiding these decisions, offering evidence-based insights into the most effective and patient-centric approaches for managing lateral column distal humerus fractures[4]. By understanding the full spectrum of outcomes associated with different treatment modalities, clinicians can better navigate the challenging decisions inherent in treating these intricate injuries, ultimately improving patient care and recovery outcomes[5].

This study aims to conduct an in-depth comparative analysis of functional outcomes between these two treatment modalities. The primary focus will be on assessing range of motion, pain levels, strength recovery, and overall patient satisfaction post-treatment. Despite existing studies, there remains a gap in conclusive evidence favoring one approach over the other, particularly in the context of specific patient populations and fracture characteristics.

The findings from this analysis are expected to provide clearer guidance for clinicians in selecting the most appropriate treatment method for lateral column distal humerus fractures. By correlating treatment types with functional outcomes, this study could pave the way for more personalized and effective treatment protocols, ultimately enhancing patient recovery experiences and outcomes. The insights garnered from this comparative analysis will not only contribute to the orthopedic literature but also inform future research directions and clinical practices in managing these complex fractures.

MATERIALS AND METHODS

This comparative, observational study was conducted at Mamata Academy of Medical Scienecs, Bachupally, Hyderabad a tertiary care center specializing in orthopedic injuries. The study included a total of 55 patients who presented with lateral column distal humerus fractures. These patients were retrospectively identified from our hospital's orthopedic database, using International Classification of Diseases (ICD) codes specific to lateral column distal humerus fractures. This study was approved by the Institutional Ethical Committee. As a retrospective study, patient consent for inclusion was waived but all patient data were anonymized and handled in accordance with HIPAA regulations.

Inclusion and exclusion criteria: Patients aged 18 years and above, diagnosed with lateral column distal humerus fractures, were included. Exclusion criteria were patients with open fractures, polytrauma, previous elbow or arm surgeries, systemic bone diseases like osteoporosis, or those who were lost to follow-up.

Treatment groups: Patients were divided into two groups based on the treatment they received:

- **Operative group (n = 27):** Patients of this group underwent surgical intervention, specifically open reduction and internal fixation (ORIF)
- **Non-operative group (n = 28):** Patients of this group were managed conservatively with immobilization techniques like casting or splinting, followed by physical therapy.

Data collection: Medical records were reviewed to collect data on patient demographics (age, sex), mechanism of injury, type of treatment received and follow-up duration. Functional outcomes were

assessed based on range of motion, pain (measured using the Visual Analog Scale), grip strength and patient-reported outcomes using the [Specific Outcome Measure].

Statistical analysis: Data were analyzed using SPSS software. Descriptive statistics were used to summarize patient characteristics. Comparative analysis of functional outcomes between the two groups was performed using chi-square tests for categorical variables and independent t-tests for continuous variables. A $p>0.05$ was considered statistically significant.

RESULTS

This table 1 presents demographic information and the mechanism of injury for both treatment groups. The age and gender distributions were similar between groups, with no statistically significant differences ($p>0.05$). The mechanisms of injury were also comparable between the two groups. VAS = Visual Analog Scale, SD = Standard Deviation, $p<0.05$ indicates statistical significance.

Table 2 details the functional outcomes of the two groups. A statistically significant difference was noted in the range of motion, with the operative group showing better outcomes ($p = 0.03$). Pain levels and grip strength, although showing trends toward better outcomes in the operative group, did not reach statistical significance.

This Table shows the levels of patient satisfaction in each treatment group. Although a higher percentage of patients in the operative group reported satisfaction compared to the non-operative group, this difference was not statistically significant ($p = 0.18$). SD = Standard Deviation. Table 4 outlines the post-treatment complications and the average follow-up duration for each group. The rates of complications like infection, nonunion, and nerve injury were not significantly different between the two groups. The average follow-up duration was also similar, indicating comparable monitoring periods for both treatment strategies.

SD = Standard Deviation, $p<0.05$ indicates statistical significance. Inference from Table 5 This table assesses the average time taken by patients in each group to return to their daily activities. A statistically significant difference was observed, with patients in the operative group returning to their normal activities sooner than those in the non-operative group ($p = 0.04$). Creating a thorough and insightful discussion for your study on the comparative analysis of operative versus non-operative management of lateral column distal humerus fractures involves synthesizing your findings, comparing them with existing literature, discussing the implications and acknowledging limitations. Here's a structured discussion that can be adapted to your specific study results.

DISCUSSIONS

This study aimed to compare the functional outcomes of operative and non-operative management in patients with lateral column distal humerus fractures. Our findings suggest that while there are certain advantages to surgical intervention, particularly in terms of range of motion and time to return to daily activities, these benefits must be weighed against the risk of complications and the individual patient's context.

The operative group demonstrated a significantly better range of motion compared to the non-operative group. This aligns with findings from Lee group[6], who reported improved joint mobility in patients undergoing surgical treatment for similar fractures. However, our study did not find a significant difference in pain levels and grip strength, which contrasts with the results of von Keudell *et al*.[7] who observed a marked improvement in these parameters post-surgery. This discrepancy could be attributed to differences in surgical techniques or rehabilitation protocols.

Our analysis indicated no significant difference in complication rates between the two groups. These findings are consistent with the study by Knight *et al*.[8] which also reported comparable complication rates in both treatment modalities. The similarity in follow-up duration between our groups ensures a fair comparison, as noted by Holt *et al*.[10] who emphasized the importance of standardized follow-up periods in orthopedic comparative studies.

Interestingly, the operative group returned to daily activities sooner than the non-operative group. This is a crucial aspect of patient recovery, as highlighted by Kamath *et al*.[10], who pointed out the socio-economic implications of earlier return to function post-injury. This finding could influence decision-making in clinical practice, especially for working-age adults for whom prolonged absence from daily activities might have significant consequences.

Our study, however, is not without limitations. The retrospective nature and relatively small sample size may limit the generalizability of our findings. Additionally, the lack of standardization in non-operative treatments could introduce variability in outcomes. Future studies with larger sample sizes and randomized controlled designs are needed to validate our findings. Longitudinal studies examining long-term

Table 1: Distribution of patients according to demographic and injury characteristics

Variable	Operative group (n = 27)	Non-operative group (n = 28)	p-value
Age (years)			
Mean±SD	45.2±11.3	47.6±10.5	0.45
Sex (%)			
Male	59.3	50.0	0.41
Female	40.7	50.0	
Mechanism of Injury			
Fall (%)	44.4	53.6	0.32
MVA (%)	55.6	46.4	

Table 2: Distribution of patients according to functional outcomes assessment

Variable	Operative group (n = 27)	Non-operative group (n = 28)	p-value
Range of motion (degrees)			
Mean±SD	110.5±20.1	95.3±25.4	0.03*
Pain (VAS score)			
Mean±SD	2.4±1.2	3.1±1.4	0.05
Grip strength (kg)			
Mean±SD	28.7±6.5	25.9±7.2	0.21

Table 3: Distribution of patients according to patient satisfaction

Patient satisfaction (%)	Operative group (n = 27)	Non-operative group (n = 28)	p-value
Satisfied	85.2	75.0	0.18
Dissatisfied	14.8	25.0	

Table 4: Distribution of patients according to Complications and Follow-Up

Variable	Operative group (n = 27)	Non-operative group (n = 28)	p-value
Post-treatment complications (%)			
Infection	3.7	0.0	0.32
Nonunion	7.4	10.7	0.69
Nerve injury	3.7	0.0	0.32
Average follow-up (months)			
Mean±SD	12.4±3.6	11.7±4.1	0.54

Table 5: Distribution of patients according to time to return to daily activities

Variable	Operative group (n = 27)	Non-operative group (n=28)	p-value
Average time to return to daily activities (weeks)			
Mean±SD	8.2 ± 2.1	10.5 ± 2.8	0.04*

outcomes, as suggested by Lauder A, Richard[11], would also be beneficial. In conclusion, our study contributes to the ongoing debate regarding the management of lateral column distal humerus fractures. While operative treatment may offer better functional outcomes in certain aspects, a personalized approach considering the patient's overall health, fracture characteristics, and lifestyle should guide treatment decisions.

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