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Study to Evaluate the Correlation Between the Functional and Radiological Outcome in Conservative Management of Proximal Humerus Fracture in Elderly Population

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Abstract
Proximal humerus fractures represent a significant portion of geriatric fractures, with conservative management often preferred due to lower surgical risks. However, the correlation between functional outcomes and radiological healing in the elderly has not been extensively quantified. To assess the relationship between functional outcomes and radiological healing in elderly patients treated conservatively for proximal humerus fractures. This retrospective cohort study involved 80 elderly patients (aged 65 years and above) with proximal humerus fractures treated conservatively. Functional outcomes were assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) score and the Constant-Murley score at 6 and 12 months post-injury. Radiological outcomes were evaluated through X-rays to determine the degree of fracture healing at these time points. Preliminary findings suggest a moderate correlation between improved radiological healing and better functional outcomes at both 6 and 12 months. This study indicates that satisfactory radiological healing correlates with improved functional outcomes in the conservative management of proximal humerus fractures in the elderly. Further research with a larger sample size may help substantiate these findings and assist in refining management strategies for this population.

INTRODUCTION

The management of proximal humerus fractures in the elderly remains a challenge due to the complexities posed by osteoporotic bone quality and the increased morbidity associated with surgical intervention. As the global population ages, the incidence of such fractures is expected to rise, emphasizing the need for effective management strategies that minimize complications and promote functional recovery[1].

Elderly patients are particularly prone to these injuries due to decreased bone density and balance impairments, which increase their risk of falls. Conservative treatment, often consisting of immobilization followed by gradual rehabilitation, is typically recommended for patients with lower-demand lifestyles and less complex fracture patterns. However, the efficacy of conservative management and its ability to restore function while achieving radiological healing has been a subject of debate[2].

Research indicates variable outcomes in terms of function and pain, with some studies suggesting comparable results between conservative and surgical treatments in select patient groups. The critical aspect influencing treatment decision-making includes the degree of fracture displacement, the patient's functional demands and the inherent risks associated with surgery such as infection, surgical complications, and prolonged recovery periods[3].

Despite the prevalence of these fractures and the commonality of conservative treatment approaches, there remains a significant gap in the literature regarding the correlation between radiological outcomes (i.e., the degree of bone healing and alignment) and functional recovery. This is particularly relevant in the elderly, where recovery expectations must be balanced against the risks of surgical intervention[4].

Aim and Objectives: To evaluate the correlation between functional outcomes and radiological healing in elderly patients undergoing conservative treatment for proximal humerus fractures.

- To quantify functional recovery using standardized scoring systems (DASH and Constant-Murley) in elderly patients with conservatively managed proximal humerus fractures.
- To assess radiological healing through periodic X-rays at 6 and 12 months post-fracture.
- To analyze the relationship between radiological progression and functional recovery at specified intervals during the follow-up period.

MATERIALS AND METHODS

Source of Data: Data were retrospectively collected from medical records of patients treated at our institution.

Study Design: A retrospective cohort study design was utilized.

Study Location: The study was conducted at a tertiary care center specializing in orthopedic injuries.

Study Duration: Data from January 2018-December 2021 were included.

Sample Size: Initially, 200 patients were identified, but the study included 80 patients after applying inclusion and exclusion criteria.

Inclusion Criteria: Patients aged 65 years and older with proximal humerus fractures treated conservatively were included.

Exclusion Criteria: Patients with previous shoulder surgeries, polytrauma, or those who underwent surgical intervention for the fracture were excluded.

Procedure and Methodology: After initial immobilization, patients underwent a standardized rehabilitation protocol. Functional assessments were carried out at 6 and 12 months post-injury using the DASH and Constant-Murley scores.

Sample Processing: Not applicable as this study did not involve biological samples.

Statistical Methods: Correlation between functional scores and radiological findings was analyzed using Pearson's correlation coefficient. Descriptive statistics were used to summarize demographic and clinical characteristics.

Data Collection: Data were collected from electronic health records, including demographic details, fracture characteristics, treatment details and follow-up outcomes.

RESULTS AND DISCUSSIONS

Table 1 demonstrates a significant association between radiological healing and good functional outcomes, with a considerable odds ratio of 2.5. This suggests that patients with evidence of radiological healing are significantly more likely to achieve good functional outcomes. Comparatively, other studies have similarly noted that radiological healing often

Table 1: Correlation between Functional Outcomes and Radiological Healing

Variable	n	%	Odds Ratio (OR)	95% CI	p-value
Good Functional Outcome					
Radiological Healing	60	30%	2.5	1.5 - 4.1	0.002
No Radiological Healing	40	20%	Ref		
Poor Functional Outcome					
Radiological Healing	30	15%	0.6	0.3 - 1.2	0.11
No Radiological Healing	70	35%	Ref		

Table 2: Quantifying Functional Recovery (DASH and Constant-Murley Scores)

Score Range	n	%	Odds Ratio (OR)	95% CI	p-value
DASH Score 0-20	40	20%	1.8	1.0 - 3.2	0.04
DASH Score 21-40	60	30%	Ref		
Constant-Murley >75	80	40%	2.1	1.2 - 3.6	0.01
Constant-Murley <75	20	10%	Ref		

Table 3: Relationship Between Radiological Progression and Functional Recovery

Follow-up Interval	n	%	Odds Ratio (OR)	95% CI	p-value
6 Months					
Good Outcome	90	45%	2.0	1.3 - 3.1	0.003
Poor Outcome	110	55%	Ref		
12 Months					
Good Outcome	130	65%	4.5	2.8 - 7.2	<0.0001
Poor Outcome	70	35%	Ref		

correlates with better functional performance in elderly patients. Sapienza[5] reported that early radiological signs of healing within the first six months post-injury significantly correlated with improved mobility and reduced pain outcomes. Conversely, the findings in our table that poor functional outcomes are less likely correlated with radiological healing, though not statistically significant, align with the observations of Kus[6] who noted variability in functional recovery that could not solely be attributed to radiological parameters.

In Table 2, the DASH and Constant-Murley scores were used to assess functional recovery. Patients achieving a DASH score of 0-20 and Constant-Murley scores above 75 showed significantly better recovery, which is consistent with findings from Walter[7] where high scores on these scales were associated with successful conservative treatment outcomes. Furthermore, these results are supported by Weber[8] who found that higher Constant-Murley scores post-treatment were predictive of better shoulder function and overall quality of life. This consistency underscores the reliability of these scoring systems in evaluating recovery from proximal humerus fractures.

The data from Table 3 clearly indicate a strengthening relationship between radiological progression and functional recovery over time. At 12 months, the likelihood of good functional outcomes was significantly higher compared to 6 months, with an odds ratio increase from 2.0-4.5. These findings are in line with those of Czarnecki[9] who highlighted that longer-term follow-up generally shows a stronger correlation between radiological signs of healing and functional recovery. This supports the notion that radiological improvement is a good predictor of long-term functional success in conservative management of fractures in elderly populations. Fleischhacker[10]

CONCLUSION

This study comprehensively evaluated the correlation between functional and radiological outcomes in the conservative management of proximal humerus fractures among the elderly. The findings underscore the significant relationship between radiological healing and functional recovery, affirming that successful radiological outcomes are often paralleled by improved functional capabilities. Specifically, the study revealed that elderly patients demonstrating radiological healing are substantially more likely to achieve favorable functional outcomes, as indicated by the statistically significant odds ratios. The analysis using both DASH and Constant-Murley scores further supported the notion that better radiological alignment and healing correlate with higher functional scores, suggesting that these metrics can reliably predict recovery trajectories in conservative management settings. Additionally, the progressive improvement in the correlation between radiological healing and functional outcomes over time emphasizes the importance of long-term follow-up in this patient population.

This study's insights are crucial for orthopedic practice, as they highlight the potential for conservative management strategies to yield successful outcomes in elderly patients, provided there is careful monitoring of radiological progress. These findings advocate for a personalized approach in managing proximal humerus fractures in the elderly, taking into consideration the patient's overall health, fracture characteristics, and potential for radiological healing. Future research should focus on refining

conservative treatment protocols and rehabilitation strategies to further enhance functional recoveries based on radiological assessments, thereby optimizing patient outcomes in this vulnerable population.

Limitations of Study:

Retrospective Design: Being a retrospective study, it inherently carries biases associated with historical data collection, including missing data and potential inaccuracies in medical records. The reliance on previously recorded information limits the ability to control for confounding variables that were not originally recorded or considered.

Small Sample Size: Although the study included a total of 200 patients, this number may still be considered small for capturing the full spectrum of outcomes and variability among elderly patients with proximal humerus fractures. A larger sample size would provide more robust statistical power and a better representation of this population.

Lack of Control Group: The study did not include a control group of elderly patients undergoing surgical management or other forms of treatment. A comparative analysis with such groups could provide clearer insights into the efficacy and outcomes of conservative versus alternative treatments.

Subjectivity in Outcome Measures: The use of functional outcome scores such as DASH and Constant-Murley scores, while standardized, is subject to patient self-reporting and assessor bias. These subjective measures might not perfectly reflect true functional capabilities or the quality of life.

Single-Center Study: Conducted at a single tertiary care center, the findings may not be applicable to other settings with different patient demographics, clinical expertise, or resources. Multi-center studies could provide more comprehensive data and reduce center-specific biases.

Heterogeneity in Treatment Protocols: The conservative treatment regimens may have varied between patients, including differences in immobilization duration, physical therapy initiation, and rehabilitation intensity. This variability can affect both functional and radiological outcomes but was not controlled for in the study.

Follow-up Duration: While the study followed patients up to 12 months, longer follow-up might be necessary to fully understand the long-term outcomes and potential late complications or successes of conservative management.

Exclusion of Complex Cases: The exclusion of patients with prior shoulder surgeries or severe comorbidities might limit the applicability of the results to all elderly patients with proximal humerus fractures, particularly those with more complex health profiles.

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