Original Article

Assessment of Functional Outcomes in Patients with Proximal Humerus Fractures Treated Conservatively Versus Surgically: A Prospective Observational Study

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Abstract

Background: Proximal humerus fractures are frequent in elderly and active adults, often causing functional disability. The decision between surgical and conservative management remains debated, particularly regarding outcomes, pain, and return to daily activities. This is to compare functional outcomes, range of motion, pain scores, and complications in surgically versus conservatively managed proximal humerus fractures. **Materials and Methods:** This prospective observational study included 100 patients treated at a tertiary care center. Fifty underwent surgical fixation with a locking compression plate or intramedullary nail, and 50 were managed conservatively with immobilization and physiotherapy. Outcomes were assessed at six months using the Constant-Murley Score, range of motion, VAS pain scale, and complication rates. **Results:** The mean age was 54.8 ± 12.6 years, with a male-to-female ratio of 1.3:1. Road traffic accidents (48%) and falls (42%) were leading causes. At six months, the surgical group achieved significantly higher Constant-Murley Scores (78.6 ± 8.4) than the conservative group (70.2 ± 9.6; $p < 0.01$). Excellent or good outcomes were noted in 72% of surgical cases versus 54% of conservative cases, while poor outcomes were more frequent with conservative treatment (18%). Range of motion recovery was significantly superior following surgery for flexion, abduction, and rotations ($p < 0.05$). Pain scores were lower in the surgical group (2.1 ± 0.8) compared with the conservative group (3.0 ± 1.1; $p = 0.03$). Return to daily activities was earlier after surgery (12.4 ± 3.6 weeks vs. 15.8 ± 4.2 weeks; $p < 0.05$). Complication rates were slightly higher in the surgical group (16% vs. 10%), but not statistically significant. **Conclusion:** Surgical management yields better functional recovery, range of motion, and pain relief, though with marginally increased complications.

Keywords: Proximal humerus fracture, surgical management, conservative treatment, functional outcome, Constant-Murley Score.

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Introduction

Proximal humerus fractures represent one of the most common fractures in adults, accounting for approximately 4–5% of all fractures. Their incidence is rising, particularly among elderly individuals due to osteoporosis and low-energy falls, while in younger adults, high-energy trauma such as road traffic accidents remains the predominant cause.[1,2] These injuries often result in significant morbidity, impaired shoulder function, and reduced quality of life, especially when diagnosis, treatment, or rehabilitation is delayed.[3]

Management of proximal humerus fractures remains controversial. Conservative treatment with immobilization and physiotherapy has historically been the standard for minimally displaced fractures, as it is associated with fewer complications and lower costs.[3,4] However, the development of modern fixation techniques, such as proximal humerus internal locking plates and intramedullary nails, has broadened surgical indications to include displaced and complex fracture patterns. Surgical fixation offers the advantages of anatomical reduction, stable fixation, early mobilization, and potentially superior functional recovery, though it also carries risks such as infection, implant-related irritation, and higher treatment costs.[1,4]

Despite these advancements, functional outcomes following surgical and conservative approaches remain an area of ongoing debate. Several studies demonstrate improved functional scores and range of motion after surgery, particularly in displaced fractures, whereas others report no significant differences compared with conservative management, especially in older, low-demand patients.[2,3,5] This uncertainty underscores the need for individualized treatment decisions, considering fracture characteristics, patient age, comorbidities, functional demands, and resource availability.

In this context, the present prospective observational study was undertaken to compare surgical and conservative management

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of proximal humerus fractures. The primary objective was to assess functional outcomes using the Constant-Murley Score. Secondary objectives included evaluation of range of motion, pain intensity, return to daily activities, and complication rates. This study aims to provide evidence to guide clinical decision-making in the management of these fractures.

Materials and Methods

Study Design and Setting: This was a prospective observational study conducted in the Department of Orthopaedics, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, over a period of one year from March 2024 to February 2025.

Study Population: A total of 100 patients with proximal humerus fractures presenting to the hospital during the study period were included. Patients were allocated into two groups based on the treatment modality:

Group A (Surgical group): 50 patients underwent operative fixation using either locking compression plate or intramedullary nail.

Group B (Conservative group): 50 patients were treated with shoulder immobilization followed by supervised physiotherapy.

Inclusion Criteria: Patients aged 18–80 years with radiologically confirmed proximal humerus fractures.

Fresh fractures (<2 weeks old).

Patients fit for surgery and willing to participate in follow-up.

Exclusion Criteria:

Pathological fractures.

Open fractures (Gustilo–Anderson grade II and III).

Associated neurovascular injuries.

Polytrauma or ipsilateral limb fractures.

Patients unwilling or unable to provide consent or follow-up.

Intervention: Surgical fixation was performed under regional or general anesthesia using standard techniques (locking compression plate or intramedullary nail). Conservative treatment included immobilization with a shoulder-arm pouch or plaster, followed by progressive physiotherapy after fracture consolidation.

Outcome Measures: All patients were evaluated at baseline and followed up at six months. Outcomes assessed included:

Functional outcome: Constant-Murley Score.

Range of motion (ROM): Forward flexion, abduction, external and internal rotation using goniometer.

Pain assessment: Visual Analog Scale (VAS).

Return to daily activities: Recorded in weeks.

Complications: Infection, malunion, stiffness, and implant-related problems.

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee of Chalmeda Anand Rao Institute of Medical Sciences. Written informed consent was obtained from all participants prior to enrollment.

Statistical Analysis: Data were compiled in Microsoft Excel and analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical data were presented as frequencies and percentages. Independent t-test and Chi-square test were applied where appropriate. A p-value <0.05 was considered statistically significant.

Results

A total of 100 patients with proximal humerus fractures were enrolled in this prospective observational study. The mean age of the cohort was 54.8 ± 12.6 years (range 25–80 years), with a slight male predominance (56%). Road traffic accidents were the most common mechanism of injury (48%), followed by accidental falls (42%) and other causes (10%). The dominant limb was more frequently involved (62%) than the non-dominant side (38%) [Table 1].

Table 1. Demographic Characteristics of Study Population (N = 100)

Variable	Category / Value
Age (years)	Mean ± SD: 54.8 ± 12.6 (Range: 25–80)
Gender	Male: 56 (56%) Female: 44 (44%)
Mechanism of Injury	Road traffic accident: 48 (48%) Fall: 42 (42%) Others: 10 (10%)
Side Involved	Dominant: 62 (62%) Non-dominant: 38 (38%)

Among the study population, 50 patients underwent surgical management and 50 were treated conservatively. Functional assessment using the Constant-Murley Score revealed significantly higher mean scores in the surgical group (78.6 ± 8.4) compared to the conservative group (70.2 ± 9.6, p < 0.01). Excellent or good functional outcomes were achieved in 72% of surgically treated patients versus 54% of those managed conservatively, while poor outcomes were more frequent in the conservative group (18%) than in the surgical group (8%) [Table 2].

Table 2. Functional Outcomes Based on Treatment Group

Outcome Measure	Surgical Group (n=50)	Conservative Group (n=50)	p-value
Constant-Murley Score (Mean ± SD)	78.6 ± 8.4	70.2 ± 9.6	<0.01
Excellent/Good Outcome (%)	72%	54%	<0.05
Poor Outcome (%)	8%	18%	<0.05

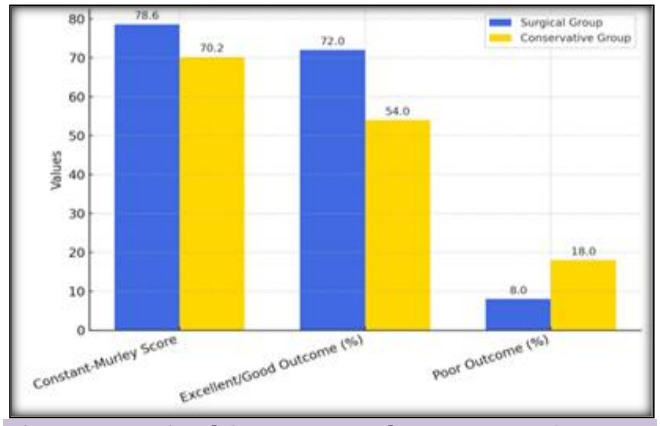

Figure 1: Functional Outcomes Based on Treatment Group

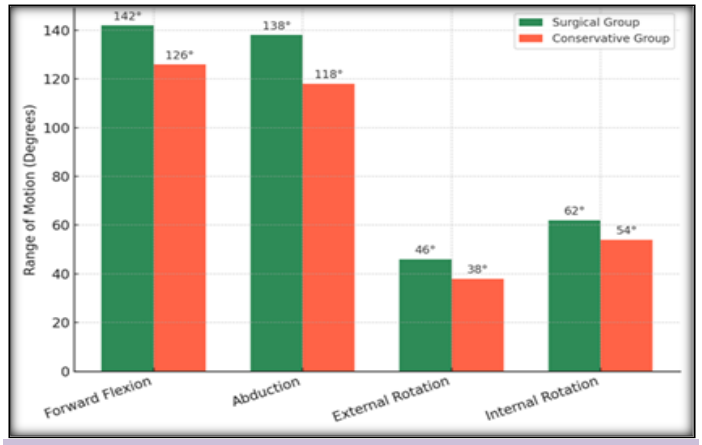

Figure 2: Range of Motion at Final Follow-Up

Evaluation of range of motion at final follow-up demonstrated superior outcomes in the surgical group across all parameters. Mean forward flexion and abduction were 142° ± 15 and 138° ± 18, respectively, compared with 126° ± 14 and 118° ± 16 in the conservative group ($p < 0.05$). External and internal rotation also showed significant improvement in the surgical cohort [Table 3].

Table 3: Range of Motion at Final Follow-Up

Movement	Surgical Group (n=50)	Conservative Group (n=50)	p-value
Forward Flexion (°)	142 ± 15	126 ± 14	<0.05
Abduction (°)	138 ± 18	118 ± 16	<0.05
External Rotation (°)	46 ± 9	38 ± 8	<0.05
Internal Rotation (°)	62 ± 10	54 ± 9	<0.05

Pain scores and functional independence further supported the superiority of surgical intervention. The mean VAS pain score was lower in the surgical group (2.1 ± 0.8) compared with the conservative group (3.0 ± 1.1, $p = 0.03$). Patients who underwent surgery also returned to daily activities earlier (12.4 ± 3.6 weeks) than those treated conservatively (15.8 ± 4.2 weeks, $p < 0.05$). Complications were slightly higher in the surgical group (16%), including superficial infection, implant-related irritation, and malunion, while the conservative group reported 10% complications, primarily malunion and shoulder stiffness. The difference was not statistically significant [Table 4].

Table 4: Pain, Functional Independence, and Complications

Outcome	Surgical Group (n=50)	Conservative Group (n=50)	p-value
VAS Pain Score (Mean ± SD)	2.1 ± 0.8	3.0 ± 1.1	0.03
Return to Daily Activities (weeks)	12.4 ± 3.6	15.8 ± 4.2	<0.05
Complications	16% (Infection, implant irritation, malunion)	10% (Malunion, stiffness)	NS

Discussion

This prospective observational study compared surgical and conservative management of proximal humerus fractures and found that patients undergoing surgery achieved significantly superior functional outcomes, range of motion, and faster return to daily activities, despite a slightly higher complication rate.

Our findings are consistent with previous literature highlighting the functional benefits of surgical fixation. Fallatah et al. demonstrated that surgical interventions, including hemiarthroplasty, can provide satisfactory pain relief and functional restoration in selected patients with complex proximal humerus fractures.[6] Similarly, Ahmad et al., in a registry-based analysis, reported favorable functional recovery following surgical management, reinforcing its value in active adults.[8] A recent meta-analysis by Lee et al. also supported operative intervention in younger patients (<65 years), noting superior outcomes in terms of shoulder mobility and function compared to conservative care.[9]

On the other hand, evidence also supports the continued role of conservative management, particularly in elderly patients with low functional demands. Canbora et al. showed that conservatively managed displaced fractures in older individuals may still achieve acceptable functional outcomes when radiological alignment is preserved.[7] Martinez-Catalan emphasized that non-operative treatment remains effective in minimally displaced fractures, provided careful monitoring and rehabilitation are ensured.[11] These findings highlight that patient selection is key, as conservative approaches may avoid surgical risks without severely compromising function in selected populations.

Rehabilitation plays a crucial role in determining long-term outcomes. Nah et al., in the SPHEER study, reported that compliance with rehabilitation protocols significantly influences recovery, regardless of the treatment modality.[12] This underscores that both surgical and conservative strategies must be coupled with structured rehabilitation for optimal results. Importantly, Fjalestad et al. previously reported that overall fracture healing is achievable with either modality, though functional results tend to favor surgical fixation in displaced fractures.[10]

Taken together, the present study supports the use of surgical management in active adults and displaced fractures to

maximize functional recovery, while also acknowledging that conservative treatment remains appropriate for elderly or medically unfit patients where surgical risks outweigh benefits.

Limitations:

The present study has certain limitations. It was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings. The follow-up period was restricted to six months, and long-term functional outcomes, complications, and quality-of-life measures were not assessed. Additionally, treatment allocation was observational rather than randomized, which may introduce selection bias. Future multicenter randomized controlled trials with longer follow-up are recommended to validate these results.

Conclusion

This prospective observational study highlights that surgical management of proximal humerus fractures provides superior functional recovery, greater range of motion, lower pain scores, and earlier return to daily activities when compared with conservative treatment. Although surgical intervention was associated with a slightly higher complication rate, these were largely manageable and outweighed by the functional benefits, particularly in active adults with displaced fractures. Conservative treatment, however, remains a reasonable option in elderly patients with limited functional demands or in those with contraindications for surgery. Overall, individualized treatment planning based on patient profile, fracture type, and resource availability is essential for optimal outcomes.

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Conflicts of interest

There are no conflicts of interest.

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