



Orthopaedics

FUNCTIONAL OUTCOME OF PROXIMAL HUMERUS FRACTURE IN ELDERLY MANAGED WITH PERCUTANEOUS K WIRES FIXATION AND JOSHI'S EXTERNAL STABILIZING SYSTEM

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ABSTRACT **Introduction:** About 5% of all fractures are proximal humerus fractures, making them a common injury. Closed reduction and percutaneous pinning, open reduction and internal fixation utilizing a locked PHILOS plate, trans-osseous suture fixation, intramedullary nailing, hemiarthroplasty, and reverse total shoulder arthroplasty are among the operational treatments for proximal humerus fractures. Every method has advantages and disadvantages of its own. We conducted a prospective observational study in the Department of Orthopaedics, Government Medical College among patients presenting with clinical features of proximal humerus fracture. Following confirmation of diagnosis, patients were planned for emergency surgery with Joshi's external stabilizing system. Following fixation, patients were followed up after 3 weeks, 3 months and 6 months and evaluated for the functional and radiological outcome using constant scores and DASH scores. **Results:** Our study findings showed that the trend of clinical and radiological outcomes among elderly patients with proximal humerus fractures operated for JESS with K wire showed a significant improvement. This was also quite visible with the significant improvement in the DASH and Constant scores across patients during follow up. Our study demonstrates that the combination of percutaneous K-wire fixation and Joshi's External Stabilizing System (JESS) is an effective treatment modality for proximal humerus fractures in elderly patients. These findings are consistent with the results of other studies, further validating the efficacy of this treatment approach. The low incidence of complications and the significant functional recovery observed in our study participants underscore the potential of K-wire fixation and JESS as a preferred treatment option for proximal humerus fractures in the elderly population.

KEYWORDS : JESS, Proximal humerus fracture, K wire, Constant score**INTRODUCTION**

About 5% of all fractures are proximal humerus fractures, making them a common injury (1, 2). With a 3:1 female to male ratio in the aforementioned age group, this is happening more frequently in senior patients over the age of 60 (3). Eighty-five percent of these injuries can be treated without surgery with minor displacement. Operative treatment is necessary for the remaining 15% of individuals who have considerable displacement of fracture pieces. The initial stages in effectively treating these injuries are a precise diagnosis and categorization of the fracture. Closed reduction and percutaneous pinning, open reduction and internal fixation utilizing a locked PHILOS plate, trans-osseous suture fixation, intramedullary nailing, hemiarthroplasty, and reverse total shoulder arthroplasty are among the operational treatments for proximal humerus fractures.

Every method has advantages and disadvantages of its own. The type of fracture, the patient's age, any co-morbidities, and the surgeon's comfort level with the specific technique all influence the surgical approach used. This study aims to investigate the functional outcome of closed reduction and percutaneous pinning, a minimally invasive procedure that has attracted a lot of interest (4). K-wires, either smooth or threaded, are connected to one another via clamps and rods; nevertheless, issues such as pin migration and loss of reduction have been seen in the past (5, 6). Since we have mutually linked the pins outside, there is far less likelihood of pin migration.

The most frequent cause of a proximal humerus fracture in older patients with osteoporotic bone is falling on an outstretched arm. A comprehensive medical history should include the patient's age, hand dominance, fall mechanism, injury velocity, and co-morbidities. Checks should also be made for any prior shoulder operations, paraesthesia, and any elbow, wrist, or hand pain in the afflicted extremity (7, 8). Considerable data can be gathered using the True AP, Scapular Y view and Axillary Lateral view to evaluate and categorize a proximal humerus fracture. Neer devised his classification system, which was published in 1970, using Codman's theory of four potential fracture fragments (9). He tried to determine which fracture types—those with a higher risk of avascular necrosis—were best treated with open reduction and which ones required prosthesis (10, 11).

The conservative approach, which includes functional bracing of the humeral shaft, has demonstrated a favourable functional outcome in low demand patients with significant medical co-morbidities who have undisplaced proximal humeral fractures. Commonly employed surgical techniques include Hemi-arthroplasty, Total Arthroplasty, Reverse Shoulder Arthroplasty, Locked Intramedullary Nailing, Trans- osseous suturing, and Closed Reduction with Percutaneous

Pinning (JESS fixation). The type of fracture, the patient's age, and the surgeon's comfort level and expertise with the procedure all play a role in the decision-making process because each treatment option has advantages and disadvantages.

A compact, lightweight, highly versatile external fixator device that methodically handles a variety of challenging issues with hand and forearm care. Created by Bombay-based Dr. B.B. Joshi. This solution offers unmatched application simplicity and a strong safety profile. With the least amount of equipment, it can be readily implemented by any surgeon in even the most remote locations. It offers a less complicated therapy option than what is currently offered. It permits early physical rehabilitation and minimally invasive procedures (12). Despite the availability of this novel approach, there is a paucity of studies that has evaluated the functional outcome of the proximal humerus fractures in elderly managed with k wire fixation and Joshi's external stabilization system. Due to lack of south Indian studies, we decided to take up this study.

MATERIALS AND METHODS

Patients presenting with age ≥ 45 yrs to Government Medical College, Thrissur, with history of trauma and diagnosed as proximal humerus fracture will be admitted and a detailed history will be taken and complete physical examination will be done. Diagnosis will be confirmed by xray. Following confirmation of diagnosis, patients are planned for emergency surgery with Joshi's external stabilizing system. Routine investigations required like RBS, LFT, RFT, SE, CBC with ESR, PT-INR, APTT, ECG will be done.

Following fixation, patients will be followed up after 3 weeks, 3 months and 6 months and evaluated for the functional and radiological outcome using constant score and DASH score.

The Constant score assigns points for Pain, Range of movements, Power and Activities of daily living. Muscle strength was measured with use of a 1 kg weight in the patient's hand and the shoulder in 90° of abduction, or, if 90° could not be reached, in maximum active abduction as described by Constant.

RESULTS

Mode of injury	
RTA	18 (72.0)
Domestic fall	7 (28.0)
Fracture pattern	
Neer I	2 (8.0)
Neer II	10 (40.0)
Neer III	12 (48.0)
Neer IV	1 (4.0)

Distribution Of Clinical And Radiological Outcomes

Clinical status	3 weeks Frequency(%)	3 months Frequency(%)	6 months Frequency(%)
Improvement	8 (32.0)	12 (48.0)	21 (84.0)
No improvement	17 (68.0)	13 (52.0)	4 (16.0)
Radiological status			
Improvement	6 (24.0)	13 (52.0)	19 (76.0)
No improvement	19 (76.0)	12 (48.0)	6 (24.0)

Distribution Of Constant Score And DASH Across Follow Up

Clinical status	3 weeks Frequency (%)	3 months Frequency (%)	6 months Frequency (%)
Constant score			
Poor	6 (24.0)	2 (8.0)	0 (0.0)
Moderate	13 (52.0)	10 (40.0)	4 (16.0)
Good	6 (24.0)	11 (44.0)	16 (64.0)
Excellent	0 (0.0)	2 (8.0)	5 (20.0)
DASH scores			
Excellent	1 (4.0)	4 (16.0)	7 (28.0)
Good	6 (24.0)	11 (44.0)	13 (52.0)
Satisfactory	11 (44.0)	6 (24.0)	5 (20.0)
Poor	7 (28.0)	4 (16.0)	0 (0.0)

DISCUSSION

The proximal humerus makes about 4-5% of all fractures and is a common, disabling injury that primarily affects older females. Fractures typically occur in people 65 to 75 years of age.[16] Gender disparity is evident as 70–80% of fractures occur in females. Low energy trauma in the elderly and increased risk in sedentary people with low mineral density, a family history of osteoporotic fractures, frequent falls, and signs of impaired balance are the causes of these fractures.

The proximal humerus is specially designed to enable a broad range of shoulder motion. Stability is sacrificed in order to achieve mobility. Because the supraspinatus muscle attaches greater tuberosity to a fractured proximal humerus, and the subscapularis muscle attaches lesser tuberosity, improper reduction and fixation of fracture fragments will disrupt the biomechanics of the joint. Close reduction is challenging because these muscles attempt to drag fracture pieces away with them. In the end, joint mobility and stability are impaired. The most often used categorization system, developed by Neer, divides fractures into groups according to the quantity and location of their constituent pieces.

In general, the bone density of the subchondral bone just beneath the articular surface is the strongest, whereas the bone of the central humeral head and neck is more porous. The bone density of the proximal humerus is relevant to fracture fixation. Conservative treatment is typically applied to proximal undisplaced or minimally displaced humerus fractures. If treated surgically, patients with displaced, unstable proximal humeral fractures may see better results.[17] Important components include early primary hemiarthroplasty, anatomic repair of the shoulder joint's soft tissues and bones, and a consistent, long-term rehabilitation regimen.

Surgical techniques for treating displaced fractures include open reduction, intramedullary nailing and external fixation, locking plate and screw fixation, percutaneous pin or screw fixation, and internal fixation with plate and screw. Dr. B. B. Joshi invented the Joshi's External Stabilizing System (JESS), an external fixation tool that is lightweight, inexpensive, and requires a minimal amount of tools to use.[18]

We basically conducted this prospective observational study in the Department of Orthopaedics, Government Medical College, Thrissur, Kerala to find the functional outcome of the proximal humerus fractures in the elderly managed with k-wire fixation and Joshi's external stabilization system in our tertiary care centre during the study period. To estimate the same we included 25 patients with age $\geq$ 45 years attending the department.

Our results showed that the study participants, were predominantly over 65 years old (52%) and mostly male (68%). A significant portion of participants had comorbidities, with 68% having diabetes mellitus, 40% hypertension, 24% coronary artery disease, and 12% chronic obstructive pulmonary disease. Common complaints among the participants included pain (84%) and swelling (96%), with 64% also

reporting associated injuries. The mode of injury was primarily from road traffic accidents (72%), followed by domestic falls (28%). These findings highlight the presentation and comorbidity profile of the elderly population who are most likely to end up with proximal humerus fractures. We also noted that our finding of RTA being the commonest mode of injury and pain and swelling is the commonest presenting complaint is well documented and established by previous studies published earlier. (18)

Regarding fracture patterns, 48% of the participants had Neer III fractures, 40% had Neer II, 8% had Neer I, and 4% had Neer IV fractures. Injuries were more frequent on the right side (64%) compared to the left (36%). Among the participants, 28% were smokers, and 44% consumed alcohol. These details provide a comprehensive overview of the demographic and clinical characteristics of the study group. We also noted that the commonest fracture type with which the patients presented to the hospital included Neer III, which was noted to be in line with findings established by Shah et al. (14)

At the three-week mark, only 32% showed improvement, which increased to 48% at three months, and further to 84% by six months ($P=0.002$). Conversely, the percentage of participants with no improvement decreased from 68% at three weeks to 16% at six months. Thus these results suggest that the patients showed clinical improvement during the follow-up, which also corroborated with our radiological findings. Radiological outcomes followed a similar trend, with 24% of participants showing improvement at three weeks, 52% at three months, and 76% at six months ($P=0.006$). The proportion of participants with no radiological improvement decreased from 76% at three weeks to 24% at six months. These results indicate a significant and progressive enhancement in both clinical and radiological outcomes over the six-month follow-up period. These findings were also noted to be similar to study findings by Goyal et al and Chokalingam et al, who also demonstrated that treatment with JESS showed a significant improvement in clinical and radiological findings across the follow up time. (14,15)

Clinical evaluations using the Constant score and DASH score for 25 participants revealed significant improvement over time. At three weeks, 24% of participants had a poor Constant score, decreasing to 8% at three months, and none by six months ($P<0.001$). Moderately scored participants dropped from 52% at three weeks to 16% by six months, while those with good scores increased from 24% to 64%, and those with excellent scores rose from 0% to 20% over the same period. This finding of improvement in constant score has also previously been demonstrated by other studies done across various other study settings. (13)

DASH score assessments reflected similar trends. The percentage of participants with excellent scores increased from 4% at three weeks to 28% by six months ($P<0.001$). Those with good scores went from 24% to 52%, while satisfactory scores decreased from 44% to 20%. The proportion with poor DASH scores dropped from 28% at three weeks to 16% at three months, with no participants scoring poorly at six months. A study done by Gupta et al also showed that the patients who operated with JESS and K wire fixator showed improvement in DASH scores during the follow-up. (19)

The observed improvements in clinical and radiological outcomes can be attributed to several scientific factors associated with percutaneous K-wire fixation and the use of JESS. These factors include biomechanical stability, biological healing processes, and the minimally invasive nature of the techniques used.

CONCLUSION

Our study findings showed that the trend of clinical and radiological outcomes among elderly patients with proximal humerus fractures operated for JESS with K wire showed a significant improvement. This was also quite visible with the significant improvement in the DASH and Constant scores across patients during follow up. Our study demonstrates that the combination of percutaneous K-wire fixation and Joshi's External Stabilizing System (JESS) is an effective treatment modality for proximal humerus fractures in elderly patients. The significant improvements in both clinical and radiological outcomes, as evidenced by the high union rates and favourable functional scores, highlight the benefits of this minimally invasive approach. The dual stabilization mechanism provided by K-wires and JESS offers robust biomechanical support while preserving the

biological environment necessary for bone healing.

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