

Evaluation of Functional Outcome of Surgical Management of Proximal Humerus Fracture by Various Modalities: A Prospective StudyAshok Kumar Chaurasia¹, Shakil Ahmad², Rakesh Kumar³¹Senior Resident, Department of Orthopaedics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar²Senior Resident, Department of Orthopaedics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar³Associate Professor and HOD, Department of Orthopaedics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar

Received: 25-09-2024 / Revised: 23-10-2024 / Accepted: 26-10-2024

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Conflict of interest: Nil

Abstract:**Background:** Approximately 5.7% of all fractures are proximal humerus fractures, which are also the most prevalent type (80%). Proximal humeral fractures (PHFs), which tend to be related to systemic osteoporosis, are also the third most frequent fracture in elderly people. It is anticipated that throughout the next three decades, their occurrence will increase. Assessing and contrasting the functional results of various fixation techniques for proximal humerus shaft fractures is the aim of the study.**Methods:** The present prospective study was carried out from March 2022 to February 2023 at the Department of Orthopaedics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, on patients who were admitted with proximal humerus fractures in accordance with Neer's classification inclusion criteria. Both surgery and radiological examination were completed. At the first, fourth, eighth, and fourteenth weeks following surgery, postoperative follow-up was conducted, and each case's results were assessed using Neer's shoulder score.**Results:** There were 60 cases total, with an average age of 48.2 years. A common cause of fractures was traffic-related injuries. Eight of the 60 cases had satisfactory results, four were unsatisfactory, two had a failure, and 46 had excellent results. The mean scores on Neer's score were as follows: range of motion (16.55 units), function (23.5 units), pain (33.5 units), and anatomy (6.9 units).**Conclusion:** A realistic approach and surgical care of complicated humerus fractures depend on clinical evaluation, adequate radiographic images, patient age, and activity. A successful operation and a positive functional outcome depend on carefully choosing the patient and having a solid understanding of anatomy and biomechanical concepts.**Keywords:** Neer's score, Humerus fracture, Range of motion, Functional outcome.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The most frequent fracture affecting the shoulder girdle in adults is a proximal humeral fracture, which happens at or close to the surgical neck of the humerus [1]. Proximal humerus fractures account for 80% of all humerus fractures and for 5.7% of all fractures. Furthermore, the third most frequent fracture in elderly people is a proximal humeral fracture (PHF), which is usually related to systemic osteoporosis. Over the next three decades, their incidence is predicted to treble [2,3].

The most frequent therapy is non-surgical; nonetheless, 20% of these fractures require surgical intervention because of growing difficulties as the patient ages. The most popular treatments for displaced proximal humerus fractures are open reduction and fixation with locking plates. Other alterna-

tives, however, include primary hemiarthroplasty of the shoulder, proximal humeral interlocking nailing, and closed reduction and percutaneous pinning [4]. Locking plate osteosynthesis is the most often used surgical procedure for treating proximal humerus fractures, however many others have been recorded and developed.

The benefits of direct exposure of the fracture site include the ability to manipulate fragments directly and visualize reduction and implant location. However, there have been numerous reports of a high rate of complications with this method, including varus collapse with screw cut-out and an elevated risk of humeral head avascular necrosis. The primary risk factors for proximal humerus fracture fixation failure are typically regarded as osteoporosis,

patient age, and inadequate medial cortical support [5]. Minimal soft tissue violation during closed reduction with percutaneous fixation of proximal humerus fractures promotes healing and lessens avascular necrosis of the humeral head. Percutaneous fixation may reduce the risk of osteonecrosis in patients who have had a proximal humeral fracture, according to earlier research. It has been observed that the prevalence of osteonecrosis with percutaneous pinning ranges from 4% to 16%, but the prevalence following other open methods ranges from 12.5% to 71%. Consequently, the chance of the poor clinical outcomes observed in patients who develop osteonecrosis is significantly decreased, albeit not completely eliminated, by percutaneous pinning [6].

Aims of this study to evaluate the functional outcome of various treatment modalities (Surgical) for proximal humerus fracture treatment modalities (Surgical) of proximal humerus Fracture.

Materials and Methods

From March 2022 to February 2023, 60 patients with proximal humeral fractures were seen in the casualty and outpatient departments of Sri Krishna Medical College and Hospital in Muzaffarpur, Bihar, as part of this prospective study. These patients were admitted to the hospital and given surgical treatment. Through patient examinations and history inquiries, we collected patient records.

All patients had necessary examinations. Different fixation methods were used to operate on the patients. Patients were followed up with on a regular basis. All adults' patients admitted with proximal humerus fractures. [Neer's classification: grade 2 to grade 4]. Patients with skeletally immature, pathological fractures, distal neurovascular deficit, Polytrauma with an Injury Severity Score >16 and Shaft humerus fractures with proximal extension were excluded in this study. All of the included cases underwent radiological evaluation in accordance

with Neer's trauma series, which includes axillary, lateral "Y," and AP views of the scapula, as well as the velpeau view on occasion.

Anaesthetic fitness was assessed, and all standard surgical investigations were completed on the included subjects. The following criteria were taken into consideration when choosing the treatment modality: Neer's categorization [grade 2 to grade 4]; comminution and dislocation of the humeral head; valgus impaction; bone quality; open or compound fracture; and patient age. Every patient was put under general anesthesia. All of the cases were treated using one of the following techniques. Percutaneous K-wire fixation and closed reduction.

1. Open reduction and internal fixation with K-wire.
2. Open reduction and internal fixation with ethibondsutures.
3. Open reduction and internal fixation with Locking Compression Plate.
4. Closed reduction and internal fixation by Intra-medullary Nail.
5. Shoulder Hemiarthroplasty.

Patients were monitored on an OPD basis for six weeks, twelve weeks, six months, and one year. Clinical assessments of shoulder function, range of motion, discomfort, and wound healing were made during this time and documented at each visit. Clinically, a fracture was deemed united when full shoulder function was evident and there was no discomfort at the fracture site. When there is no visible fracture line, the fracture is radiologically considered unified. Results were evaluated by the use of Neer's shoulder score based on pain, function, range of motion and anatomy for each case assessed and recorded.

Case of OR & IF with Locking Compression Plate



Figure 1: pre op x-ray: three part fracture

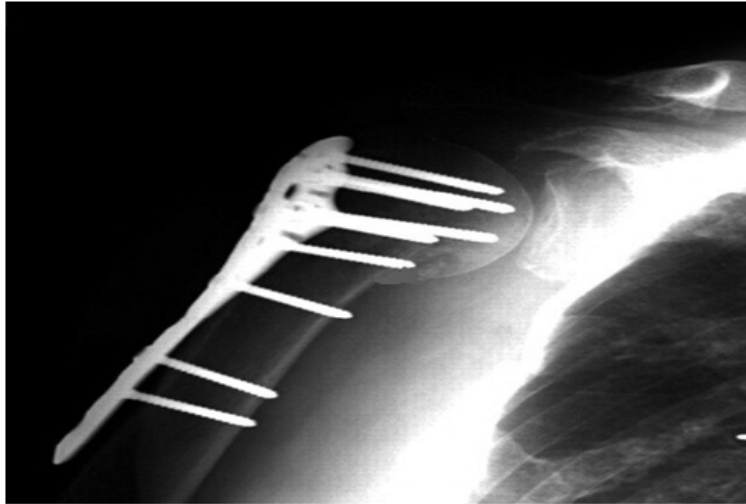


Figure 2: follow up x-ray at 16 weeks revealing fracture union

Case of CR & IF with K-Wire



Figure 3: Pre-op x-ray: Two part fracture



Figure 4: Fixation with K-wire

Case of CR & IF with Intramedullary Nailing



Figure 5: Pre-op x-ray: two part fracture



Figure 6: Fixation with Intramedullary nail



Figure 7: PREOP X-Ray: Four part # with dislocation



Figure 8: post op x-ray with prosthesis insertion

Results

Table 1: Demographic data among the cases in the study

Distribution of cases	No. of cases	Percentage
Age wise(years)		
≤18-40	20	33.3%
41-60	28	46.7%
>61	12	20%
Gender		
Male	28	46.7%
Female	32	53.3%
Side of fracture		
Right	22	36.7%
Left	38	63.3%
Type of fracture		
Closed	50	83.3%
Open	10	16.7%
Neers's type of fracture		
2 part	24	40%
3 part	16	26.7%
4 part	14	23.3%
Fracture with dislocation	6	10%
Cause of injury		
Road traffic accident	36	60%
Fall	20	33.3%
Others	4	6.7%

Table 2: Distribution of surgical management among the cases in the study

Surgical treatment	No. of cases	Percentage
ORIF with LCP	28	46.7%
ORIF with K-wire	8	13.3%
ORIF with K-wire and cancellous screws	4	6.7%
Percutaneous pinning	12	20%
Shoulder hemiarthroplasty	2	3.3%
CRIF within tramedullary nailing	4	6.7%
ORIF with ethibond suture	2	3.3%

Table 3: Distribution of clinical and radiological union among the cases in the study

Distribution of cases	No. of cases	Percentage
Clinical union (in weeks)		
11	2	3.3%
12	30	50%
13	8	13.3%
14	14	23.3%
15	6	10%
Radiological union (in weeks)		
16-18	44	73.3%
19-20	12	20%
>20	4	6.7%

Table 4: Distribution of Neer's score of cases and result in the study (n=30)

Neer's score	1 st week (%)	4 th week (%)	8 th week (%)	Final (%)	Result
<70	60(100%)	44(73.3%)	8(13.3%)	2(3.3%)	Failure
70-79	0	16(26.7%)	6(10%)	4(6.7%)	Unsatisfactory
80-89	0	0	44(73.3%)	8(13.3%)	Satisfactory
>90	0	0	2(3.3%)	46(76.7%)	Excellent

Table 5: Average score of pain, function, ROM and anatomy of cases in the study

Modalities	Min-max	Mean	Median	±SD
Pain	29-35	33.5	35	1.65
Function	12-30	23.5	24	3.5
Range of Motion	14-19	16.55	16	1.85
Anatomy	4-10	6.9	8	1.68
Total	59-90	79.65	82	7.65

Discussion

Proximal humerus fractures are difficult to treat, and there is constant debate over whether surgery is the best course of action. Numerous research and works of literature outline numerous management methods, including non-surgical and operative approaches, with varying functional outcomes and consequences. Age has a significant impact on results; young persons typically have good results, whereas older adults frequently have poor ones. Based on Neer's classification of fractures and Neer's score of outcomes, our study has concentrated on the results of fractures regardless of age or the type of surgical technique utilized to treat proximal humerus fractures.

With a mean age of 48.2 years, the average age incidence and range was between 19 and 68 years, which was comparable to the 52.65-year result from the study by Launonen et al. [7] According to Court-Brown et al.'s epidemiological study, women are 70 years old, males are 56, and the average age is 66. [8,9] In our study, there were more females than males, suggesting that osteoporosis is a risk factor for older females. Studies by Nwachukwu et al. with an 8:12 male to female sex ratio showed similar findings.[10] Due to a lack of postmenopausal care and knowledge, the risk of fracture in women rises linearly with age. Road traffic injuries were the most frequent type of injury in our sample, suggesting that high velocity injuries are

the primary mechanism of fracture. Our study's results were in line with numerous previous research in the literature that identified additional causes of harm, such as electric shock and rod assault. In contrast to Björkenheim et al. findings, fractures were more common on the left side of our study (63.3%) than the right (36.7%), which is consistent with the findings of Gerber et al. [11,12]. Similar to the findings of the study by Vijayvargiya et al., our study's analysis of fracture types revealed that two-part fractures were the most common, accounting for 40% of all fractures of other studies, however, three- and four-part fractures were more common than two-part fractures.[13]Of the 60 cases in the current study, 42 were internally repaired with cancellous screws, intramedullary nails, or K-wires. Stable fixation and excellent reduction are essential for managing displaced fractures, according to numerous authors in published literature. Forty percent of cases experienced a postoperative infection during the postoperative period, which resolved without any complications following antibiotic therapy. Due to the older patients' reluctance to undergo full therapy, six cases developed stiffness. Phase-wise physiotherapy was initiated in situations of stiffness following clinical union, and positive outcomes were achieved. Similar results were noted in the study by Doshi et al., who also noted a small number of postoperative cases of avascular necrosis.[14] Out of the 60 cases that participated in our current study, 46 had outstand-

ing results, 8 had tolerable results, 4 had unsatisfactory results, and 2 had failed. Neer's scoring system was used in several trials, and the results showed a similar pattern: 70–80% of patients had excellent to satisfactory shaving results, while the remaining 20–30% had unsatisfactory or unsuccessful results. Of the 42 instances in our study that ORIF handled, 32 had great results, 6 had fair results, and 4 had unsatisfactory results. Two older patients who had ORIF with K-wiring had failure; both cases were caused by a deep-seated pin tract infection that resulted in arthritis and failure. Our ORIF results nearly matched those of previous research, although minimal fixation procedures yield better results. Twelve instances had percutaneous pinning in our study; eight of these had outstanding results, two had fair results, and two had bad results. Percutaneous pinning is significantly better than ORIF in terms of functional result, according to a small number of trials. [15,16]

Conclusion

In conclusion, to acquire the best and most accurate result, a surgeon must have good surgical skills and experience choosing the right procedure based on various aspects, such as the type of fracture. The key to a realistic approach and successful surgical care of complicated humerus fractures is clinical evaluation, acquiring appropriate radiographic images, patient age, and activity. The prerequisites for a successful surgery and a favorable functional outcome are appropriate patient selection and in-depth understanding of anatomy and biomechanical principles.

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