

Complications and Management of Proximal Humerus Fracture with Plate Osteosynthesis**Anil Raj Regmi¹, Chitra Raj Adhikari², Aashish Yadav³**¹Consultant Orthopaedic Surgeon, Siddharthanagar City Hospital, Nepal.²Consultant Orthopaedic Surgeon, Gamu Regional Hospital, Laamu Gan, Maldives³Assistant Professor, Department of Orthopaedics, Madhubani Medical College and Hospital, Madhubani, Bihar

Received: 01-06-2025 / Revised: 15-07-2025 / Accepted: 21-08-2025

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Conflict of interest: Nil

Abstract

Background: Approximately 4 to 5% of all fractures are proximal humerus fractures. After hip and distal radius fractures, these are the third most frequent fractures in the senior population. In the case of proximal humerus fractures, there are still disagreements over whether conservative or surgical management is preferable. Numerous surgical procedures are performed. Locking plates are the next big thing in internal fixation. The purpose of this study is to assess the functional result and complications of open reduction treatment for proximal humerus fractures. Internal fixation using proximal humerus Interlocking plate.

Methods: This prospective study was conducted on 30 patients involving who were above 18 yrs of age with proximal humerus fractures treated by open reduction, and internal fixation with locking plate from March 2024 to February 2025 were evaluated.

Results: The majority of the patients in this study were elderly males, and the most common mode of injury was a slip and fall. The patients suffered two-part and three-part fractures of the proximal humerus, which united in an average of 14 weeks, with 28 cases (93.3%) having excellent and satisfactory results according to Neer's criteria.

Conclusion: As long as the patient followed a physiotherapy regimen and the parts underwent nearly normal anatomical reduction, the open reduction internal fixation of proximal third humeral fractures using PHILOS plating resulted in excellent to satisfactory outcomes and patient satisfaction.

Keywords: Proximal Humerus Fractures, Philos Locking Plate, Open Reduction, Internal Fixation.

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Introduction

In many respects, proximal humeral fractures remain unresolved. There is disagreement over how reliable the classification system is. The surgical management indication is still changing. There are numerous fixation methods, and none is best in every situation. [1]

Proximal humeral fractures are not unusual, particularly in the elderly population. According to reports, they make up between 4% and 5% of all fractures. [1,2] Immobilization and early motion are effective symptomatic treatments for approximately 85% of these fractures, which are mildly displaced or non-displaced. The blood supply may be disrupted in the 15% of fractures that remain displaced and unstable. It is a therapeutic difficulty to heal these fractures. The most common treatment for displaced and unstable extraarticular fractures is operative reduction and fixation using a variety of methods. [3] Because

articular fractures increase the likelihood of humeral head necrosis, the therapies are more debatable. According to an analysis of the published results, there isn't a single, widely recognized therapeutic method. Conservative management may be linked to delayed, malunion, and non-union labor, which can lead to excruciating dysfunction. [4,5] Traumatic proximal humeral fractures including osteoporosis necessitate individualized, well-thought-out management.

Percutaneous fixation, non-absorbable rotator cuff-incorporating sutures, tension band devices, and intramedullary nails are just a few of the many therapeutic approaches that have been documented. [2–4,6] Recently, it was recommended to combine the more modern usage of locking plates with the open reduction and internal fixation techniques. It has also been suggested that hemiarthroplasty can

be used to treat these fractures both immediately and over time. The quality of soft tissue, bone, age, and patient dependability all influence the technique and equipment selection. However, a stable reduction that permits early limb motion and full function restoration should be the aim of proximal humerus fracture fixation. This study examined the clinical and functional results of proximal humeral fractures treated with open reduction and internal fixation by plate osteosynthesis.

Materials and Methods

This prospective study was conducted on 30 patients, ages 18 to 90, who were hospitalized due to an isolated fracture of the upper end of their humerus from March 2024 to February 2025.

In order to determine the type of fracture, the degree of osteoporosis, any related disorders such as arthritis, and any pre-existing pathological conditions, all of these patients underwent screening to determine their suitability for anesthesia. In addition to having floating shoulder, individuals with neuromuscular disorders, pathological fractures, shoulder ailments, and any other bony injuries on the same side were not included in this study.

Following the patient's suitability for surgery in a supine position and using the Delto Pectoral approach, open reduction and internal fixation were carried out using a PHILOS plate in type 2, 3, and 4 fractures as categorized by Neer's. Depending on their level of pain reduction, all patients received arm sling pouches and were immediately permitted

to perform pendulum exercises and passive range of motion. From the tenth to the fourteenth postoperative day, sutures were removed. Patients were monitored for any problems and for clinical and radiological union at 6-week, 3-month, and 6-month intervals. Neer's criterion scoring method was used to analyze every patient at the last follow-up.

Results

Open reduction and internal fixation using screws and a locking philos plate were used to treat thirty patients who had closed displaced proximal humerus fractures. Thirteen (43.3%) of the patients were between the ages of 66 and 90, eleven (36.6%) were between the ages of 36 and 65, and six (20%) were between the ages of 18 and 35. The patients were 54.9 years old on average. Sixty percent of the patients were men, and forty percent were women; the ratio was three to two. Most (60%) of the injuries were caused by falls, which can include falls from stairs or from a two-wheeler on an outstretched hand. High intensity trauma to the shoulder, either directly or indirectly, accounted for 40% of RTA injuries. Ten patients (33.33%) suffered a left side fracture, while twenty patients (66.66%) suffered a right side fracture. Seventeen (56.6%) of the patients in our study had two-part fractures, five (16.6%) had three-part fractures (larger tuberosity and surgical neck), two (6.6%) had three-part fractures (lesser tuberosity and surgical neck), and six (20%) had four-part fractures (Figures 1, 2, and 3). One patient (3.3%) had implant impingement that restricted their movement.



Figure 1: Pre-operative radiograph



Figure 2: Immediate post-operative radiograph



Figure 3: Post-operative radiograph 6 months follow up

All of the patients had a reasonably excellent functional range of motion, with the exception of one (3.3%) patient who had varus malunion and one with a superficial wound infection. All fractures came together within a 12- to 16-week period. Neer's grading criteria were used to assess the final findings. Nine (30%) of the cases in our

study had great results, while 19 (63.3%) had adequate results. Two (6.6%) had a final follow-up with an unsatisfactory result.

On average, 3.06 days passed between the fracture and surgery. In our study, the average length of stay in the hospital was 12.2 days. (Table 1)

Table 1: Distribution of age, sex, type of fracture and results

Distribution		Number of cases	Percentage
Age	• 18-35 yrs	6	20.0%
	• 36-65 yrs	11	36.66%
	• 66-90 yrs	13	43.33%
	• Total	30	100.0%
Sex	• Female	12	40.0%
	• Male	18	60.0%
	• Total	30	100.0%
Type of fracture	• Type 2	17	56.6%
	• Type 3	7	23.33%
	• Type 4	6	20.0%
	• Total	30	100.0%
Side	• Left	10	33.33%
	• Right	20	66.67%
	• Total	30	100.0%
Type of injury	• Slip and Fall	18	60.0%
	• RTA	12	40.0%
	• Total	30	100.0%
Neer's Score (Six months Follow up)	• Excellent	9	30.0%
	• Satisfactory	19	63.666%
	• Unsatisfactory	2	6.6%
	• Total	30	100.0%

Discussion

Thirteen (43%), or the majority of the patients in our study, were between the ages of 65 and 90. Eleven (36%) of the patients were between the ages of 35 and 65. The patients were 54.9 years old on average. The patients in our cohort were mostly elderly. The average age of the 300 patients in Neer's initial study was 55.6 years. [7] In the study by Felix Brunner et al., the average age incidence was 65 years. [8] In the study by K.N. Sharafeldin et al., the average age was 61.5 years. [9] In the study of Ramchander Siwach et al., the average age was 65. [10] The male to female ratio in this study

was 3:2, with 60% of patients being male and 40% being female. Nine males and eighteen females, in a 1:2 ratio, were reported by K.N. Sharafeldin et al. [9] In his series, Ramchander Siwach et al. found that, at a ratio of 1:1.2, there were 12 males and 13 females. [10]

According to Hong-fei Shi et al., in their series, there were 28 male patients and 48 female patients, with a male to female ratio of 2.5:3.11. In 18 cases (60%), slip and fall was the primary cause of fractures in our study; in 12 cases (40%), a traffic accident was the form of injury. In their epidemiological research of proximal humerus

fractures, Rose SH et al. found that small falls accounted for 80% of injuries in patients over 40, particularly in female osteoporotics. [4] In their investigation of 27 patients with three- and four-part fractures, Herbert Resch et al. found that 24 of the patients had previously had high energy trauma. [12] Of the patients in our current investigation, 20 had fractures on their right side and 10 on their left. C. Gerber reported 34 fractures, 16 of which were on the left side and 18 on the right. [13] In our study, the average time between a fracture and surgery was 3.03 days.

In the study by Gerber C. et al., the average time between fracture and surgery was 3.2 days. [13] The procedure was completed within the first four days for 21 out of 27 patients in the Herbert Resch et al. research. [12] We compared our work to other research. We had one case of plate impingement, one case of superficial wound infection, and one case of malunion and subsequent displacement. In that instance, the surgical neck had secondary dislocation and malunion. Varus malunion resulted from the comminution of the underlying osteoporotic bone, which caused varus deformity and anterior angulation. Due to incorrect plate location, one patient experienced plate impingement and abduction restriction. A patient with uncontrolled diabetes who developed a superficial wound infection recovered in one week with daily bandages, antibiotics, and blood sugar control. According to several research, the incidence of avascular necrosis varies between 8% and 35%. Avascular necrosis did not occur in our situation. With solid fixation and comprehensive, scheduled rehabilitation, we had a lower risk of stiffness. Two individuals, however, continued to experience mild to moderate pain and a restriction in shoulder range of motion. Neer's scoring criteria were used to grade the final results. [7] Of the patients treated at our facility, 28 (93.3%) had good to outstanding outcomes. All patients with good and exceptional outcomes met Neer's criteria for normal muscle function and functional range of motion. Two patients (6.6%) received disappointing results. The restriction of abduction < 90° in one impingement case was deemed inadequate. Another case experienced Varus malunion, which was deemed inadequate since it resulted in mobility restriction and ongoing minor pain. The average time for all fractures to union was 14 weeks (10 to 16 weeks). Our study included no failure cases, and our findings were comparable to those of other studies on the surgical treatment of the proximal humerus.

Conclusion

In this study, open reduction internal fixation with locking plate was used to surgically treat thirty patients who had fractures of the proximal humerus. PHILOS plating for proximal fractures

has shown outstanding to satisfactory results in our study's instances. The primary goals are reliable fixation and anatomical reduction of fractured areas, particularly in older adults with osteoporosis.

Early physiotherapy should be administered after surgery. The functional success of surgical treatment for proximal humerus fractures is significantly influenced by the rehabilitation program.

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