



The Functional Outcome of Surgical Management of Proximal Humerus Fractures by Philos Plating – A Prospective Study

¹Dr. S.V.S Ravitejaswara Rao, ²Dr. P. Nagaraju, ³Dr. Shanmukha Rao

^{1,2}PG Scholar, Department of Orthopedics, GEMS & Hospital, Srikakulam, Dr. YSR UHS, Andhra Pradesh, India

³Assistant Professor, GEMS & Hospital, Srikakulam, Dr. YSR UHS, Andhra Pradesh, India

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Corresponding Author: Dr. S.V.S. Ravitejaswara Rao, PG Scholar, Department of Orthopedics, Great Eastern Medical School and Hospital, Dr. YSR UHS, Andhra Pradesh, India

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Abstract

Background

Fractures of the proximal humerus are common, debilitating injuries that are becoming more common, particularly among the elderly. There is still much disagreement on the best approaches to handle displaced proximal humerus fractures. The goal of treatment is to create a shoulder that is pain-free and capable of performing all daily activities. A more modern internal fixing method is locking plates. PHILOS plates provide rigid fixation and more angular stability for treating proximal humerus fractures than traditional surgical methods. They also make it easier to mobilize and recover quickly, which leads to a pain-free shoulder with successful functional recovery.

Methods

The orthopaedics department of Great Eastern Medical School & Hospital Ragolu Srikakulam conducted this prospective study. Displaced two-, three-, and four-part fractures of the proximal humerus, including those containing osteopenic bone, with or without shoulder dislocation, were all included in the study. The constant Murley score was applied to conduct the functional evaluation.

Results

In our study, men constituted the majority of the patients, with domestic falls being the most frequent cause of damage in the elderly and road traffic accidents (RTAs) being the most frequent cause of injury in the young, leading to 2-, 3-, and 4-part fractures of the proximal humerus. All 20 patients'

fractures recovered. 80% of patients got excellent and good results, while just 20% had results that were unsatisfactory, according to the reliable Murley criterion. Additionally, there are no failures.

Conclusion

As a result of their angular stability, locking compression plates are an effective implant in proximal humeral fractures, especially in comminuted fractures and in older patients with osteoporotic bones, enabling early mobilization.

Keywords

Proximal humerus fractures/ ORIF (Open reduction and internal fixation)/constant Murleyscore.

Introduction

Proximal humerus fractures are 4 to 5% of all fractures, which are particularly prevalent in the elderly along with hip fractures and distal radius fractures¹. An estimated 3/10,000 people have affected annually, and the frequency is rising quickly with age². More commonly than men, women are affected³.

The majority of those who suffer from this fracture are elderly, which raises the possibility that their bones are osteoporotic or fragile. For both the surgical procedure and the functional outcome, the quality of the bone appears to be essential².

These fractures have a bimodal distribution occurring either in young people following high-energy trauma or in those older than 50 years with low-velocity injuries like simple falls. Low-intensity trauma, such as a fall from a standing position with an arm extended, is the primary cause of most proximal humerus fractures⁴⁻⁵. There have been many possible treatment modalities employed in the past. These include percutaneous wire and screw

fixation, tensionband wiring, conventional plate, and screw fixation, Hemi replacement arthroplasty, and transosseous suture fixation. Precontoured locking plates operate under the concepts of angular stability, less vascularity disturbance, and decreased likelihood of plate failure⁶.

Compared to conventional implants, the Proximal Humeral Internal Locking System (PHILOS) plate fixation offers more angular stability. It functions as a locked internal fixator and offers improved screw anchorage in osteoporotic bone, with positive functional results⁷⁻⁸.

Aims and Objectives

1. Testing the effectiveness and functional outcome of PHILOS plating in proximal humerus fractures is the study's main objective.
2. To evaluate the incidence of complications that PHILOS plating can cause in proximal humerus fractures.

Materials & Methods

This is a prospective study, conducted in the department of Orthopaedics, at GREAT EASTERN MEDICAL SCHOOL AND HOSPITAL. All patients with displaced proximal humerus fractures admitted to our hospital from January 2021 to JUNE 2022 were considered for the study if they fulfilled the following criteria.

Inclusion Criteria

1. Patients with 2-, 3- or 4-part proximal humeral fracture. (Neer's classification)
2. Patients of either sex aged >18 years and <80 years.
3. A patient's signed informed consent and willingness to participate in the study.

Exclusion Criteria

1. Age <18yrs and >80 years.
2. Associated ipsilateral upper limb fractures.

3. Pathological fracture

4. Fractures with neurovascular deficits

5. Patients are hesitant to get surgery.

There were 20 patients, with 14 men and 6 women. The average patient age was 45.5 years (range 21-70). In 12 patients, the right shoulder and in 8 patients, the left shoulder, were affected. RTA caused fractures to occur in 11 patients while falls caused fractures to occur in 9 patients. The diagnosis was made through clinical evaluation, radiographic examination in standard anteroposterior and lateral views, and a CT scan (rarely). The fractures were categorized using Neer's classification system⁹⁻¹⁰. 9 patients suffered from two-part fractures, 10 from three-part fractures, and 1 from four-part fractures.

When the patient with these fractures arrived, POP U-slab and an arm sling helped to temporarily stabilize

the fracture. The patients underwent a complete preoperative evaluation that considered their overall

health as well as a clinical, hematological, and radiographic evaluation of the kind of fracture. Patients were assessed for any underlying medical issues, references were obtained from the appropriate departments, and the necessary treatment was commenced. Well-written informed consent was taken from all the patients. Before starting the analysis, prior approval from the Ethical Committee was acquired.

Surgical Technique

Before surgery, an intravenous prophylactic dose of antibiotic was given to each patient. Under brachial block or general anesthesia, the surgery was performed while the patient was in a beach chair position on the radiolucent table. The surgical approach preferred in all the patients was the Deltopectoral approach.



Figure 1: Showing beach chair position of the patient on the radiolucent table and intraoperative picture of Philos plate.

A 10 to 15-cm incision was made, beginning just above the coracoid process and extending along the

deltopectoral groove. In the internervous plane are the deltoid muscle and the pectoralis major muscle. To

separate the two muscles, pull the pectoralis major medially and the deltoid laterally. Either laterally or medially, the cephalic vein retracts. Before access can be achieved to the anterior portion of the shoulder joint, the short head of the biceps and the coracobrachialis muscle must be moved medially. Stretch the subscapularis muscle by externally rotating the arm, and divide the subscapularis muscle from its insertion onto the lesser tuberosity of the humerus by inserting a blunt object between the capsule and the muscle. Incise the capsule longitudinally to enter the joint. The rotator cuff is liberally tagged with nonabsorbable sutures anteriorly, posteriorly, and superiorly prior to the attempt at fracture reduction in order to aid in the reduction of the fracture fragments and, ultimately, to strengthen fixation of the fracture to the plate. When the tuberosities are improperly reduced, poor results have been demonstrated. To keep the fracture reduction in place in comminuted fractures, temporary fixation with K-wires is advised. Care must be taken to ensure that the k-wires do not interrupt the placement of the subsequently applied plate. The pre-contoured anatomic locking compression plate is positioned approximately 5-8 mm distal to the upper margin of the greater tuberosity after temporary fracture reduction is accomplished. The danger of subacromial impingement can be increased by setting the plate excessively high, thus care should be made to prevent this. However, caution must also be exercised to prevent the plate from being positioned too low, which can restrict the best screw placement in the humeral head. On fluoroscopic imaging, the correct plate location was verified and the effectiveness of the fracture reduction was accepted. Proximal and distal screws are inserted into the plate

when the fracture has been reduced and the plate is in the proper position. Each locking screw's tip in the head should be inserted at least 5 millimeters away from the subchondral bone. The rotator cuff sutures are threaded through the tiny holes in the proximal end of the plate after all the screws have been inserted and then secured for further fixation. The range of motion of the shoulder was checked on the table for impingement. The wound was closed in layers¹¹

Post-Operative Care

Following surgery, the shoulder was placed in a universal shoulder immobilizer for immobilization. Both the appropriate antibiotics and analgesics were administered. Radiographs were taken immediately following surgery to verify the bone alignment and maintain the reduction. By the tenth day, the sutures were removed.

Depending on the degree of the pain, pendulum exercises were begun as soon as possible. Passive range of motion began within the first week. According to the stability of the osteosynthesis, an active range of motion was begun between two and four weeks after surgery. The fourth to sixth week marks the end of immobility. From the sixth to the eighth week, a full range of motion with active exercises was initiated. Following surgery, patients will be reviewed at 6 weeks, 12 weeks, and 6 months. According to the Constant Murley score, a functional assessment was made.



Figure 2: Pre-op and post-opx rays of case no - 9

Results

In our sample of 20 patients, the mean patient is 45.5 years old, with the youngest being 27 and the oldest being 68.

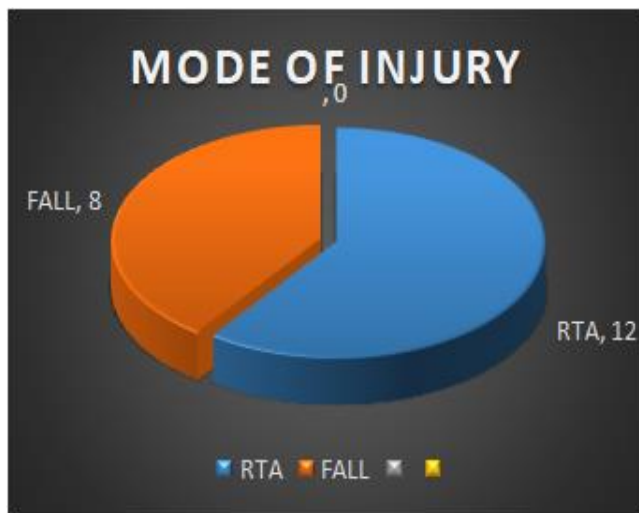
AGE	NO OF PATIENTS	PERCENTAGE
21-30	2	10%
31-40	6	30%
41-50	4	20%
51-60	6	30%
61-70	2	10%
TOTAL	20	100%

14 Patients in our study are men (70%) and 6 patients are women (30%). M: F=2.3:1 is the male-to-female ratio.

SEX	NO OF PATIENTS	PERCENTAGE
MALES	14	70%
FEMALES	06	30%
TOTAL	20	100%

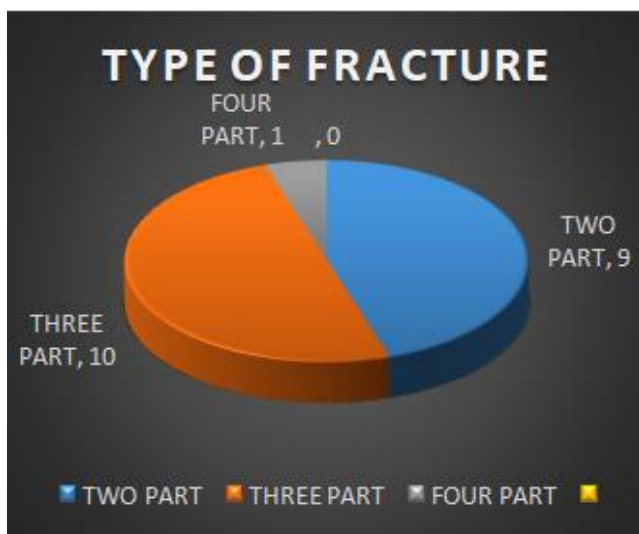
In 12 patients, the right shoulder and in 8 patients, the left shoulder, were affected.

RTA caused fractures to occur in 11 patients while falls caused fractures to occur in 9 patients.

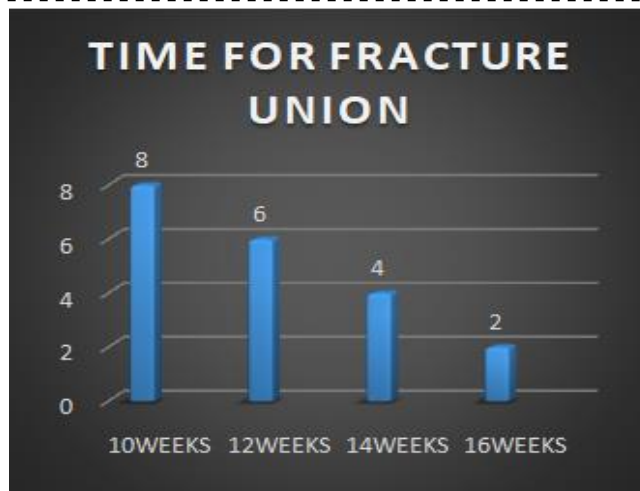


The fractures were categorized using Neer's classification system. 9 patients suffered from two-part fractures, 10 from three-part fractures, and 1 from four-part fractures.

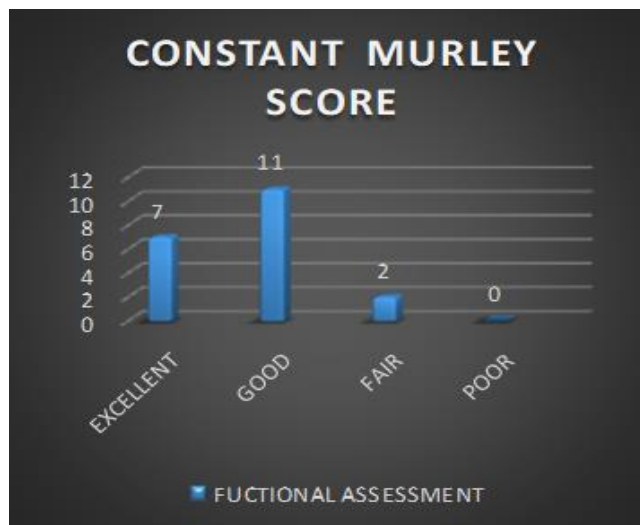
TYPE OF FRACTURE	NO OF PATIENTS	PERCENTAGE
2- PART FRACTURE	9	50%
3- PART FRACTURE	10	45%
4- PART FRACTURE	1	5%
TOTAL	20	100%



In our analysis, we found that the typical healing time for a fracture is 12 weeks. It took 10 weeks for 8 out of 20 patients, 12 weeks for 6, 14 weeks for 4, and 16 weeks for the other 2 patients to unite.



Two patients (10%) experienced shoulder stiffness during the follow-up period. One patient (5%) got a superficial wound infection, which was eventually treated with antibiotics. Two (10%) patients suffered varusmalunion, which was a 4-part fracture.



In our study, we had excellent results in 7 (35%) of patients, 10(50%) had good results, and 2(15%) patients had fair results but none of the cases is a failure in our study.

Discussion

Proximal humeral fractures constitute 4-5% of all fractures of long bones. The age distribution of these fractures is often bimodal, with younger persons sustaining high-energy velocity injuries and older people sustaining mild trauma. While undisplaced fractures can be successfully treated without surgery in some cases, those with intra-articular extension and extensive comminution require surgical fixation¹². The major goals of surgical treatment for displaced proximal humerus fractures are to achieve anatomical reduction, rigid fixation, and restoration of the rotator cuff mechanism, as well as to provide a functional outcome that is nearly normal to the patient's pre-injury state. The preferred surgical approach is Open Reduction and Internal Fixation. It enables direct fracture fragment imaging, promotes direct reduction, and aids in anatomical reduction. It aids in the implant's proper location as well.

The proximal humerus interlocking system (PHILOS: anatomic locking compression plates) is made to keep a fracture reduction stable even in osteoporotic bone. With the combination of fixed-angle screw-plate locking and 3-dimensional placement of screws in the humeral head, these plates have a number of advantages, including the potential for early exercise and a brief period of immobilization due to the high initial stability achieved resistance to screw pull-out even in patients with poor osseous stock, and gentle fracture reduction through the use of indirect reduction maneuvers.

The average age incidence was 44.9 years in the study by C. Gerber et al.¹³ and 45.5 years in our series. The male-to-female ratios published by Agarwal S, et al¹⁴. and Gerber C, et al¹³. Indicated a male predominance of 1.7:1 and 1.35:1, respectively, in our study M-F

ratio was 2.3-1. The greater involvement of males in daily activities compared to females can be used to explain the larger male-to-female ratio. In this study, patients' modes of injury were 60% road traffic collision and 40% history of fall. Similar findings were reported in a study by Patil SN, et al. with 70% of cases involving a road traffic accident¹⁵.

According to Neer's classification, patients with 3-part fractures were observed in 10 (50%) of cases, followed by 2-part fractures in 9 (45%)of cases and 4-part fractures in 1 (5%) of incidences. 50 patients were evaluated in a series of research by RizwanShahid et al., and of the 37 patients, 11 (22%) had part fractures, 21 (42%) had three-part fractures, and 18 (36%) had four-part fractures¹⁶. According to our analysis, it takes a fracture 12 weeks on average to heal. Similar findings were observed in a study by Patil SN, et al. with (90%) fracture union by 12 weeks¹⁵.

Malunion occurred in 2 cases at the surgical neck, one involving a 68-year-old man with a 4-part fracture and the other involving a 60-year-old woman with a 3-part fracture. It causes a varus deformity and anterior angulation, which reduces the neck shaft angle by 120 degrees. It was certainly caused by the comminution of the underlying osteoporotic bone, which may have gone impaction at the fracture site following reduction and resulted in varusmalunion. Two patients experienced plate impingement, a hardware-related problem, and a limitation of abduction. Improper plate location may have contributed to the impingement.

Stiffness is more of a surgical issue than an implant, and in two patients, it caused shoulder stiffness, which led to unsatisfactory results. Overall complications

rate was (48.8%), with varus malunion being (16.3%), according to a systemic review by Sproul RC, et al¹⁷.

The final functional outcome of our study is evaluated using a constant MURLEY score. Of the 20 patients, 7 (35%) had excellent outcomes, 11 (55%) had good results, and 2 (10%) had fair outcomes. All occurrences of fair outcomes involved elderly people and complications. None of the study participants were failures. According to the study by AA Martinez et al, there were 13 excellent, 36 good responses, 08(13.8%) fair, poor: 1 (1.7%)¹⁸. Richard J. Hawkins' study revealed patients 08(53.3%) were excellent, 06 (40%) good, and poor 01 (6.7%)¹⁹.

Limitation

The study still has some limitations, including a small sample size and a brief follow-up period.

Conclusion

In conclusion, when done correctly, internal fixation of proximal humeral fractures with anatomic locking compression plates yields reliable results. If the proper surgical method is used by a skilled surgeon, we believe that the anatomic locking compression plate is appropriate for the stabilization of proximal humeral fractures and can produce a good functional outcome.

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