



STUDY OF FUNCTIONAL OUTCOME AND POSTOPERATIVE COMPLICATIONS AMONG PROXIMAL HUMERUS FRACTURE PATIENTS TREATED WITH PROXIMAL HUMERUS INTERNAL LOCKING SYSTEM (PHILOS) PL

Orthopaedics

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ABSTRACT

Introduction: Proximal humerus fractures represent a significant portion of upper extremity injuries, accounting for approximately 4% to 5% of all fractures and about 26% of humerus fractures. There are different types of fixation for proximal humerus fracture like percutaneous pinning, screw fixation, trans-osseous suture fixation, nailing, ORIF with plate and prosthetic replacement. This paper aims to evaluate the functional outcomes of proximal humerus fractures treated with PHILOS plating, analyze the complications associated with this treatment method. **Methods:** A retrospective analysis of 40 patients who underwent open reduction and internal fixation with PHILOS plating for proximal humerus fractures. All the patients are of more than 18 years of age. Functional outcomes were assessed using the Constant-Murley Shoulder Score and Neer scoring systems & complications were documented. **Results:** The mean age of patients was 58.6 years. The average follow-up time was 6 months. The mean union time was 14 weeks. Excellent results (Constant-Murley score >89) were achieved in 65% of cases. Complication rates were low, with shoulder stiffness and malunion being the most common. **Conclusion:** In proximal humerus fractures proper anatomical reduction and stable fixation are important factors for better functional outcome. PHILOS plating is an effective treatment for proximal humerus fractures, providing rigid fixation, high union rates, and early mobilization, leading to excellent functional outcomes.

KEYWORDS

Proximal humerus fracture, PHILOS plating, functional outcome.

INTRODUCTION:

Proximal humerus fractures represent a significant portion of upper extremity injuries, accounting for approximately 4% to 5% of all fractures(1) and about 26% of humerus fractures. Proximal humerus fractures constitute a significant portion of upper extremity fractures, often requiring surgical intervention for optimal outcomes. Majority of undisplaced proximal humeral fractures can be treated conservatively with a sling immobilization.(2) These fractures are particularly prevalent in the elderly, often resulting from falls, while younger individuals may sustain them due to high-energy trauma such as motor vehicle collisions, sports injuries, or assaults.

This study aims to evaluate the functional outcomes and complications associated with PHILOS plating in 40 patients.

The management of proximal humerus fractures varies depending on the degree of displacement and stability. Most undisplaced or minimally displaced fractures can be treated conservatively with sling immobilization(2). However, displaced fractures, which constitute about 20% of cases, often require surgical intervention to achieve stable fixation and optimal functional outcomes(3) as Conservative treatment is usually associated with nonunion, malunion and avascular necrosis resulting in a painful dysfunction.(4,5)

Over the past 10 years, there has been considerable expansion in the range of reconstructive implants available to treat these injuries. Surgical options for proximal humerus fractures include various fixation methods such as percutaneous pinning, screw fixation, trans-osseous suture fixation, nailing, open reduction and internal fixation (ORIF) with plate, and prosthetic replacement with debatable outcome.(3,6) In elderly patients with poor bone quality, conventional plating systems may have a higher risk of failure. The management of these fractures can be a significant challenge, especially in the presence of poor cancellous bone due to osteoporosis and multiple fracture segments resulting in failure of fixation with conventional plating systems.

The Proximal Humerus Internal Locking System (PHILOS) plate has been introduced to address these challenges, particularly in older osteoporotic individuals and complex fracture patterns.

This paper aims to evaluate the functional outcomes of proximal humerus fractures treated with PHILOS plating, analyze the complications associated with this treatment method.

MATERIALS AND METHODS:

This study retrospectively reviewed 35 patients who underwent PHILOS plating for proximal humerus fractures at a tertiary care

hospital. Inclusion criteria were all adult patients with closed two-part and three-part fractures of the proximal humerus. Exclusion criteria were patients with open fractures, polytrauma, critical patients, patients with pathological fractures. Shoulder immobilizer was given to all patient for brief period of time preoperatively. Patient was followed at the regular interval 1, 3 and 6 month interval. Fracture union, range of motion, residual deformities were assessed. Constant and murley score was used for evaluation of Functional outcomes through clinical and radiological assessments.

Surgical Technique

The surgical procedure for PHILOS plating typically involves the following steps:

Supine position under regional block with a dose of third generation cephalosporin given preoperatively. Deltpectoral approach is commonly utilized. An 8-10 cm incision is made along the deltpectoral groove. The plane between deltoid and the pectoralis major muscle was identified and separated. The cephalic vein was retracted laterally or medially depending upon the exposure. Hematoma is cleared, and fracture fragments are reduced using K-wires.

The PHILOS plate is fixed 5-8 mm distal to the greater tuberosity and 2-4 mm posterior to the bicipital groove. The plate should be positioned at least 5-8 mm distal to the upper end of greater tuberosity and in line with the shaft of humerus. The plate should be at least 5 mm posterior to the bicipital groove thus sparing the long head of biceps. Screws are inserted, and final reduction is checked under C-arm. The wound is closed, and the patient is placed in an arm pouch.

Postoperative Protocol

Post operatively the sutures were removed on the 14th day. Postoperatively limb was stabilized via shoulder immobilizer & active finger movements were advised depending on pain tolerance. Patients were assessed at regular intervals (e.g., 1, 3, and 6 months) to evaluate fracture union, range of motion, and complications. Functional outcome were assessed using tools such as the Constant Scoring system. The constant scores of 0 to 55 were graded as poor, 56 to 70 as fair, 71 to 85 as good, and 86 to 100 as excellent.

RESULTS:

The study included 35 patients with a mean age of 58.6 years. Out of 35 patients 20 patients were male and 15 were female. The average follow-up period was 6 months, and the mean time to fracture union was 14 weeks. In this study majority of patient n=25 (71.42%) of patients sustained an injury due to falls on outstretched hand, followed by RTA n=9 (25.71%) and assaults n=1 (2.85%) cases. Functional

assessment using the Constant Scoring system revealed excellent results in 62.5% of cases. The most common complications were shoulder stiffness and malunion each occurring in 4(10%) of patients. Superficial infection was found in n=3 (7.5%) of managed successfully by antibiotics, AVN was seen in one male. Hardware failure in form of loosening screws was seen in n=1(2.5%) patient and secondary varus 8°- 11° was found in n=2(5%)patients. Pseudoarthrosis was found in one female patient as shown in Table.

DISCUSSION:

Proximal humerus fractures comprise the third most common fracture in the geriatric population (7) after hip and distal radius fractures. The functional outcome after operative treatment of any periarticular fracture is better when articular fragments are anatomically reduced, the key fracture fragments are rigidly fixed and the joint is moved early. The goal of surgical treatment in patients is to achieve effective stabilization of an adequately reduced fracture to maximize functional outcomes. The PHILOS plating system offers anatomical & stable fixation and early mobilization. These factors contribute to the high union rates and excellent functional outcomes. The low complication rates further support the efficacy of this technique.

Misra A et al(8) in their series of patients treated with internal fixation, 76% had better pain relief and 67% patients had good functional range. In our series of 20 operative patients, all patient had good pain relief Koval et al.[9] in their series of 104 cases pointed out that the use of plates required more extensive soft tissue stripping, which may increase the risk of osteonecrosis. In our series, operative patients treated with plate fixation had no features suggestive of osteonecrosis at the end of 6 month, but our series had a small number of cases Hertel et al[10] studied osteonecrosis of proximal humerus which was intraarticular by assessing the perfusion and stated the criteria

Hertel Criteria

(1) <8mm of calcar length attached to articular segment,(2) disrupted medial hinge,(3) increasing fracture complexity,(4) displacement>10mm,(5) angulation>45

Sudkamp N et al(11) reported that the most common complication encountered in their study was primary screw perforation of the humeral head (in 21 out of 155 patients, 13.5%). This was purely related to incorrect surgical technique of initial malreduction and delayed loss of reduction. In our series, there were no screw penetrations into the joint and the best way to avoid this was to get radiographs throughout the arc of rotation with drill bit in-situ to get the exact length of the screw.

Our findings are consistent with previous studies that have reported high success rates with PHILOS plating. For instance, a study by Jhamnani et al. (2023)(12) also reported excellent results in a similar patient population.

George Osterhoff et al(13)and Juan Agudelo et al. [14] observed that a follow-up of 6 months is sufficient for evaluation of varus malalignment and screw cut-out as the bone-plate interface in plate osteosynthesis of these fractures usually fails during the first 3-4 weeks post-operatively.

Limitations

This study is limited by its retrospective design and small sample size. Future prospective studies with larger cohorts are needed to validate these finding

CONCLUSION:

PHILOS plating is an effective surgical option for managing proximal humerus fractures, offering stable fixation, early mobilization, and good functional outcomes. It is particularly beneficial in elderly patients with osteoporotic bone and complex fracture patterns. While complications can occur, they are relatively infrequent, and many are related to surgical technique, emphasizing the importance of proper surgical execution. Further research with larger sample sizes and long-term follow-up is warranted to continue to optimize the treatment of proximal humerus fractures.

Age Distribution

AGE GROUP (IN YEARS)	NUMBER	PERCENTAGE
18-25	1	2.85%
26-35	2	5.71%

36-45	4	11.42%
46-55	6	17.14%
56-65	14	40%
66-75	6	17.14%
>75	2	5.71%
Total	35	100%

Neer's Classification

NEER CLASS	NUMBER	PERCENTAGE
2 PART	8	22.85%
3 PART	21	35%
4 PART	6	17.14%
TOTAL	35	100%

Functional Outcome

FINAL CONSTANT SCORE	FUNCTIONAL OUTCOME	NUMBER OF PATIENTS	PERCENTAGE
86-100	EXCELLENT	22	62.85%
71-85	GOOD	10	28.57%
56-70	FAIR	3	8.57%
0-55	POOR	0	0%

Complications

COMPLICATIONS	MALE	FEMALE	Total (%)
Shoulder stiffness	1	3	4(10%)
malunion	2	2	4(10%)
Superficial infection	2	1	3(7.5%)
Wound dehiscence	0	0	0
AVN of humeral head	1	0	1(2.5%)
Hardware failure	1	0	1(2.5%)
Secondary varus	1	1	2(5%)
Pseudoarthrosis	0	1	1(2.5%)

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