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Four part Proximal Humerus Fractures Treated Using PHILOS Plating - Evaluation of clinical and functional outcome

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Abstract

Background

Proximal humerus fractures are a significant clinical concern, particularly among the elderly due to osteoporosis and the high incidence of falls, as well as in younger individuals due to trauma. These fractures account for about 5% of all fractures and can severely impact shoulder function and quality of life. Effective management is crucial to ensure proper healing and restore function. The Proximal Humerus Internal Locking System (PHILOS) plate has gained popularity as a surgical intervention due to its ability to provide stable fixation and allow early mobilization. However, despite its benefits, complications such as screw perforation, infection, and hardware-related issues remain concerns. This study aims to evaluate the clinical outcomes of PHILOS plating for proximal humerus fractures, focusing on functional recovery, radiographic healing, and complication rates, to better guide treatment strategies in orthopedic practice.

Methods

This retrospective cohort study was conducted at SBMCH, chrompet, chennai from January 2024 to August 2024. A total of 30 patients who met the inclusion criteria were included in the study. Inclusion criteria were patients aged 50 and older, diagnosed with four part proximal humerus fractures and treated with PHILOS plating. Exclusion criteria included non traumatic fractures or treated with other operative methods.

All patients underwent surgical management using the PHILOS plate. A deltopectoral approach is used. Fracture reduction was achieved under fluoroscopic guidance, and the PHILOS plate was applied and secured with locking screws. Postoperatively, patients were immobilized in a sling for 2-3 weeks, followed by a structured rehabilitation program focusing on gradual range of motion and strengthening exercises.

Functional outcomes were assessed using different scoring systems at regular intervals postoperatively. Radiographic healing was evaluated using serial radiographs to assess fracture union and alignment. Complications were recorded and categorized as implant-related, infection, non-union, malunion, or shoulder stiffness.

Results

The study included a total of 30 patients, with a mean age of [60+/-10] years. There were [21] males and [9] females. The mean CMS was [80%] at 12 months. The mean ASES score at 12 months was 83.3%. Significant improvement in functional scores was observed from 6 to 12 months ($p < 0.05$).

A total of [90]% of fractures achieved radiographic union by 12 months. The mean time to radiographic union was [10-16] weeks. All fractures maintained satisfactory alignment postoperatively.

The overall complication rate was [33.3]%. Implant-related complications included screw perforation in [3] patients and plate loosening in [3] patients. Infection occurred in [1] patients, treated successfully with antibiotics. Non-union was observed in [1] patients, requiring revision surgery. Malunion was observed in

[0] patients, with minimal functional impact. Shoulder stiffness occurred in [1] patients, managed with physical therapy.

Conclusion
PHILOS plating is an effective surgical method for treating proximal humerus fractures, providing stable fixation and good functional outcomes. Although complications can occur, they are manageable with appropriate intervention. The study demonstrates significant improvement in functional scores and high rates of radiographic union within 12 months postoperatively. To confirm these results and enhance patient treatment, more research with bigger sample sizes and extended follow-up times is advised.

Keywords
Proximal humerus fractures, PHILOS plate, functional outcomes, radiographic healing, complications, open reduction internal fixation (ORIF).

1. INTRODUCTION

Proximal humerus fractures account for approximately 5% of all fractures and are particularly prevalent in the elderly due to osteoporosis (1). The management of these fractures varies from conservative treatment to surgical intervention, depending on the fracture pattern, patient age, and functional demands. Surgical fixation using the PHILOS plate has gained popularity due to its ability to provide stable fixation and allow early mobilization (2). Management for displaced proximal humeral fractures is under research. There are many types of implants available, including Nailing, hemiarthroplasties, reverse arthroplasties, and various plates and screws (3). Because ORIF with angular stable plates has produced outstanding postoperative radiographs, the orthopaedic trauma community first expressed hope about it. Even though more recent research indicates that up to 30% of patients need follow-up operations, the surgical method is still often employed(4). The original purpose of reverse total shoulder arthroplasty was to treat cuff-tear arthropathy. Reverse TSA has become the most popular option for the surgical management of Type 4 fractures (5).This study evaluates the clinical and functional outcomes of proximal humerus fractures treated with PHILOS plating.

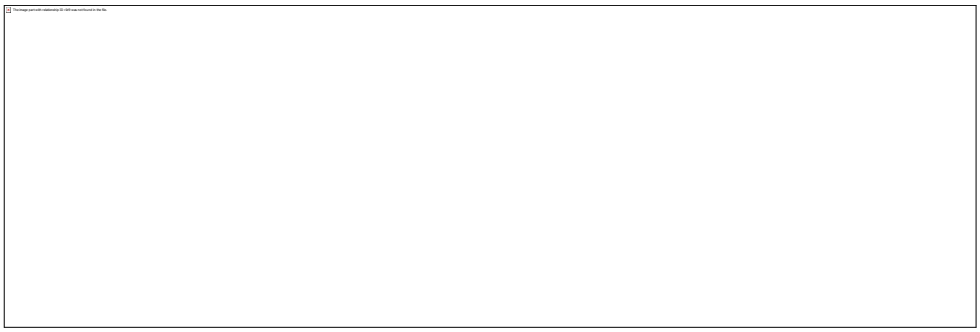
2. METHODS

Study Design:
A retrospective cohort study was conducted at SBMCH, Chennai from January 2024 to August 2024

Patients:

Inclusion criteria:
- Patients aged more than 50
- Patients with proximal humerus fractures (Neer classification types IV).
- Patients fit for surgery and willing for follow-up.

Exclusion criteria:
- Pathological fractures.
- Diagnosed with proximal humerus fractures (Neer type 1,2 and 3)
- Fractures treated with other surgical methods or conservative treatment.
- Incomplete medical records.



3.0SURGICAL TECHNIQUE:

3.1Preoperative Preparation:
Obtain informed consent, perform a detailed medical history, and conduct radiographic evaluations. Administer general anesthesia, considering regional blocks for postoperative pain management.

3.2Patient Positioning
Position the patient in a beach-chair position with the affected arm draped free. Ensure proper padding to prevent pressure sores and nerve injuries.

3.3Surgical Approach:
Make a longitudinal incision along the deltopectoral groove, starting from the coracoid process and extending distally. Retract the deltoid muscle laterally and the pectoralis major medially, identifying and protecting the cephalic vein.

3.4Fracture Exposure and Reduction:
Clear the fracture site of hematoma and debris. Achieve anatomic reduction using direct manipulation and reduction tools, temporarily stabilizing with K-wires or clamps. Confirm reduction with intraoperative fluoroscopy.

3.5Plate Placement and Fixation:
Select an appropriately sized PHILOS plate,and fitted on lateral side to secure it temporarily with K-wires. Insert locking screws into the proximal fragment and cortical screws into the diaphyseal part, confirming placement with fluoroscopy.

3.6Closure:
Irrigate the wound, ensure hemostasis, and reattach the deltoid muscle if necessary. Close the subcutaneous tissue and skin with sutures, applying a sterile dressing.

Postoperative Period:
Immobilize the arm , administer antibiotics, and initiate a structured rehabilitation program focusing on gradual range of motion and strengthening exercises. Schedule follow-up visits for radiographic evaluation and functional assessment.

This detailed yet concise approach ensures optimal fracture healing, stability, and functional recovery, minimizing complications.

Outcome Measures:
Assessed using the 2 different scoring systems at 6 months apart

Radiographic Healing: Evaluated using serial radiographs to evaluate the alignment and union of the operated part

Complications: Recorded and categorized as implant-related, infection, non-union, malunion, or shoulder stiffness.

Results

Patient Demographics:

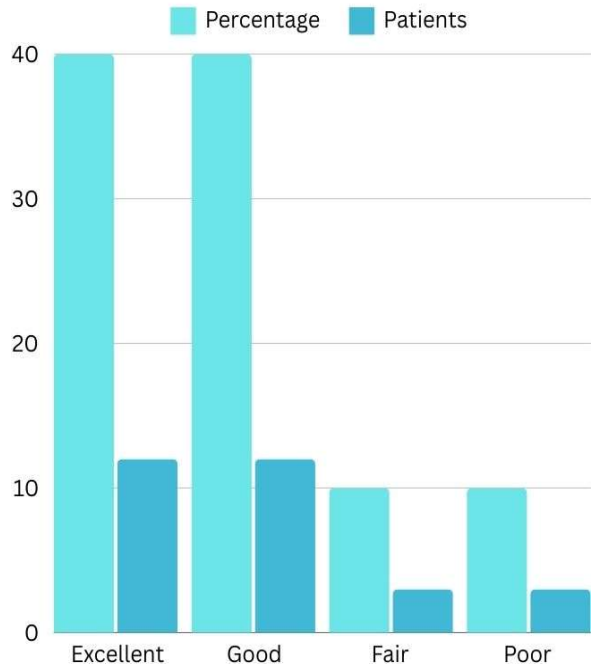
- A total of 30 patients were used in this study
- The mean age was 60 years.
- 21males and 9 females.

Functional Outcomes:

CMS: - 80% of patients achieved a CMS score of 70 or higher. - 20% of patients had a CMS score between 65 and 69. -

ASES: - 83% of patients achieved an ASES score of 75 or higher. - 17% of patients had an ASES score between 70 and 74.

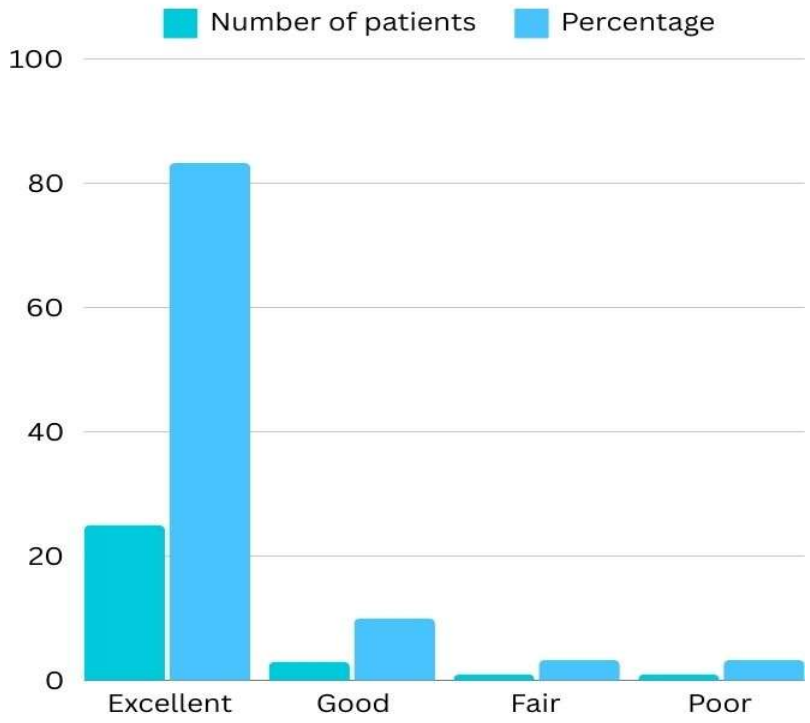
DASH: - 73% of patients achieved a DASH score of 30 or lower. - 27% of patients had a DASH score between 31 and 35.



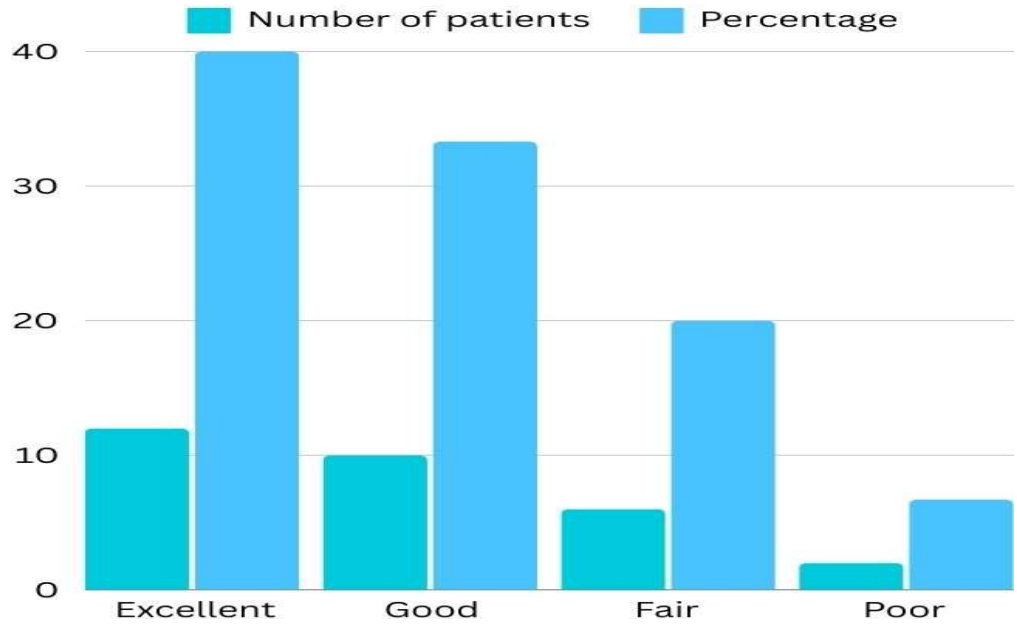
Cms scoring

Cms Outcome category	Number of patients	Percentage
Excellent 81-100	12	40%
Good 61-80	10	33.3%
Fair 41-60	5	16.7%
Poor 0-40	3	10%
Total	30	100%

Ases outcome	Number of patients	Percentage
Excellet(76-100)	25	83.3
Good (51-75)	3	10%
Fair (26-50)	1	3.3%
Poor (0-25)	1	3.3%
Total	30	100%



Outcome Category-DASH	Number of patients	Percentage
Excellent 0-20	12	40%
Good	10	33.3%
Fair	6	20%
Poor	2	6.7%
Total	30	100%



Radiographic Healing:

100% of fractures achieved radiographic union: -

30% within 10-11 weeks. -

40% within 12-13 weeks. -

30% within 14-16 weeks.

- All fractures maintained satisfactory alignment postoperatively..

Complications:

- The overall complication rate was [33.3]%.

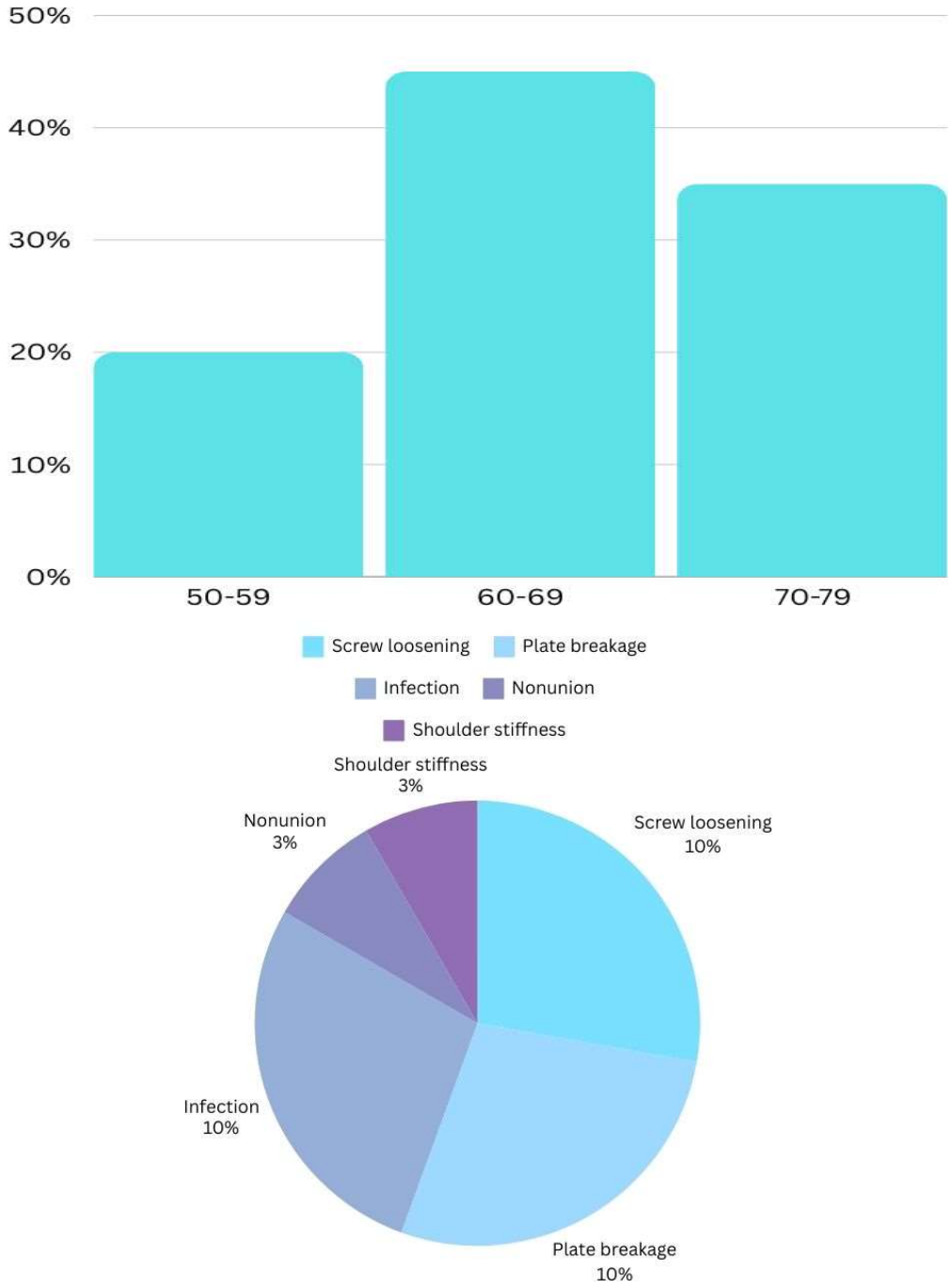
- Implant-related complications included screw perforation in [3] patients and plate loosening in [3] patients.

- Infection occurred in [3] patients, treated successfully with antibiotics.

- Non-union was observed in [1] patients, requiring revision surgery.

- Malunion was observed in [0] patients, with minimal functional impact.

- Shoulder stiffness occurred in [1] patients, managed with physical therapy.



DISCUSSION

This study was regarding the treatment for proximal humerus fracture type 4 treated with PHILOS plating. The main outcome of this study used cms scoring system, ases scoring system and DASH score along with radiological signs of fracture union. The follow up period was 6months and at 12 months. There were 30 patients used in this study between the age of 50-80years with osteoporotic bones.The PHILOS plate provides stable fixation for proximal humerus fractures, allowing early mobilization and satisfactory functional outcomes. The significant improvement in CMS and ASES scores from 6 to 12 months indicates the effectiveness of this surgical method. Radiographic healing was achieved in the majority of patients, with a mean time to union comparable to other studies.

Individuals with a varus impacted fracture turned out worse than those whose humerus head was in valgus position. This occurred as a result of the PHILOS® plate resisting valgus collapse by acting as mechanical support under a compressive load. Conversely, when the head was in a varus position, the humeral head comes out as the plate acts like a tension band.(15)

Studies indicate Complication rates were consistent with the literature, with implant-related issues and infection being the most common. Proper surgical technique, patient selection, and postoperative care are crucial in minimising these complications.(16)

Alexander Muacevic et al (17) study shows better ROM in ORIF compared to RSA, similarly our study showed good ROM at 1 year follow-up

CONCLUSION

PHILOS plating is an effective surgical method for treating four part proximal humerus fractures, providing stable fixation and good functional outcomes. Although complications can occur, they are manageable with appropriate intervention. To confirm these results and enhance patient treatment, more research with bigger sample sizes and extended follow-up times is advised.

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