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TREATMENT OF PROXIMAL HUMERUS FRACTURES USING PHILOS PLATE

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Abstract

Introduction: Majority of displaced proximal humeral fractures can be treated with a sling immobilization and physical therapy. However, approximately 20% of displaced proximal humeral fractures require surgery.

Objectives: The basic aim to conduct this study was to find the treatment of proximal humerus fractures using PHILOS plate.

Material and methods: This retrospective study was conducted at Hayatabad medical complex Peshawar from January 2023 to April 2023. A total of 50 patients with proximal humerus fractures who underwent surgical treatment with the PHILOS plate were included in the study.Clinical and demographic data were extracted from electronic medical records and radiographic imaging studies. Key variables of interest include patient age, gender, mechanism of injury, fracture classification, Neer classification, fracture complexity, number of fracture parts, bone quality, comorbidities, smoking status, and preoperative functional status.

Results: Data were collected from 50 patients. Mean age of patients was 65± 8.2 years. The most common mechanism of injury was a fall from standing height, accounting for 60% of cases, followed by motor vehicle accidents and sports-related injuries, each representing 20% of cases. Neer classification revealed that two-part fractures were the most frequent (40%), followed by three-part fractures (40%) and four-part fractures (20%). Fracture complexity varied, with 60% of patients presenting with single fracture parts and 40% with multi-fragmentary fractures. Bone quality was evenly distributed, with 25 patients having osteoporotic bone and 25 patients having normal bone density.

Conclusion: It is concluded that Proximal Humerus Internal Locking System (PHILOS) plate demonstrates favorable clinical outcomes in the management of proximal humerus fractures, with high fracture union rates and significant improvements in functional recovery.

Introduction

Proximal humeral fractures are the second most common fractures of the upper extremity accounting for 4% to 5% of all fractures. Majority of undisplaced proximal humeral fractures can be treated with a sling immobilization and physical therapy. However, approximately 20% of displaced proximal humeral fractures require surgery [1]. The variety of treatment options available has given rise to the increased usage of the Proximal Humerus Internal Locking System (PHILOS) plate as a fixation device which is both versatile and effective. The PHILOS plate has a definite rationale behind its usage and it is imperative to understand it in order to optimize the management of the proximal humerus fractures [2].

The proximal humerus is a part of the body that has a complicated anatomy, which includes the humeral head, the greater and lesser tuberosities, and the surgical neck. The fractures of this region are not the same, they can be simple two-part fractures, or complex three- and four-part fractures, each of which needs a different treatment method [3]. The conventional management ways, for instance, the cure without surgery, plating through the skin, and the usual method of operation, are limited in providing the necessary stability and early mobilization, especially in the case of the displaced or unstable fractures.The concept of the PHILOS plate is a great breakthrough in the treatment of the proximal humerus fractures [4].

The PHILOS plate is a locking compression plate that was made especially for the treatment of proximal humerus fractures, hence, it has got a lot of advantages over the traditional implants. Its angular stability screws and locking plate design are the major features of this method that ensure the stable rigid fixation and maintenance of fracture reduction in cases of osteoporosis, at the same time, the periosteal blood supply is preserved and biological fracture healing is promoted [5]. The methods of treating complex proximal humeral fractures differ and it is suggested to use either the following: tension bands,percutaneous pins, bone suture, T-plates, intramedullary nails, double tubular plates, hemiarthroplasty, PlantTanhumerus fixator plates. The technique also causes the following complications: cutout or backout of the screws and plates, avascular necrosis, nonunion, malunion, nail migration, rotator cuff impairment, and impingement syndromes [6]. The lack of screw anchorage from conventional implants may cause the early loosening and failure, which is more evident in osteoporotic bones [7].

Despite its widespread adoption, there remains a need for comprehensive evaluation of the clinical outcomes associated with PHILOS plate fixation in proximal humerus fractures [8]. While previous studies have reported promising results, there is variability in outcome measures, surgical techniques, and patient populations. Furthermore, the impact of factors such as fracture complexity, patient age, bone quality, and surgeon experience on treatment outcomes requires further investigation [9].

Objectives

The basic aim to conduct this study was to find the treatment of proximal humerus fractures using PHILOS plate.

Material and methods

This retrospective study was conducted at Hayatabad medical complex Peshawar from January 2023 to April 2023. A total of 50 patients with proximal humerus fractures who underwent surgical treatment with the PHILOS plate were included in the study.

Inclusion Criteria:

- Patients aged 18 years and above.
- Diagnosis of a proximal humerus fracture confirmed by radiographic imaging.
- Treatment with the PHILOS plate as the primary fixation modality.
- Availability of complete medical records, including preoperative assessments, operative notes, and postoperative follow-up data.

Exclusion Criteria:

- Patients with incomplete medical records or lost to follow-up.
- Patients who underwent concomitant surgical procedures for associated injuries.
- Patients with pathological fractures or fractures related to malignancy.

Data Collection:

Clinical and demographic data were extracted from electronic medical records and radiographic imaging studies. Key variables of interest include patient age, gender, mechanism of injury, fracture classification,Neer classification, fracture complexity, number of fracture parts, bone quality, comorbidities, smoking status, and preoperative functional status.Fracture union rateassessed radiographically based on the presence of bridging callus and absence of radiolucent lines.Functional outcomes were assessed using validated outcome measures such as the Constant-Murley score, Disabilities of the Arm, Shoulder and Hand (DASH) score, and Simple Shoulder Test (SST).

Data Analysis:

Data were analyzed using SPSS v29. Continuous variables is reported as mean ± standard deviation or median (interquartile range), while categorical variables will be presented as frequencies and percentages.

Results

Data were collected from 50 patients. Mean age of patients was 65± 8.2 years. The most common mechanism of injury was a fall from standing height, accounting for 60% of cases, followed by motor vehicle accidents and sports-related injuries, each representing 20% of cases. Neer classification revealed that two-part fractures were the most frequent (40%), followed by three-part fractures (40%) and four-part fractures (20%). Fracture complexity varied, with 60% of patients presenting with single fracture parts and 40% with multi-fragmentary fractures. Bone quality was evenly distributed, with 25 patients having osteoporotic bone and 25 patients having normal bone density. The preoperative functional status, as measured by the Constant-Murley score, had a mean value of 30 (± 10), indicating a wide range of baseline functional impairment among patients included in the study.

Table 01: Baseline data of patients

Characteristics	**Values**
Total number of patients	50
Mean age (years)	65 ± 8.2
Gender	
- Male	25 (50%)
- Female	25 (50%)
Mechanism of injury	
- Fall from standing height	30 (60%)
- Motor vehicle accident	10 (20%)
- Sports-related injury	10 (20%)
Neer Classification	
- Two-part fractures	20 (40%)
- Three-part fractures	20 (40%)
- Four-part fractures	10 (20%)
Fracture Complexity	
- Single fracture part	30 (60%)
- Multi-fragmentary fractures	20 (40%)
Bone Quality	

- Osteoporotic	25 (50%)
- Normal bone density	25 (50%)
Preoperative functional status	
- Constant-Murley score	Mean 30 (± 10)

The fracture union rate was high, with 48 patients achieving union, representing a rate of 96%. The average time to fracture union was 16 weeks (± 3.5). Regarding functional outcomes, there were significant improvements observed across various measures. The Constant-Murley score increased from a preoperative mean of 30 (± 10) to a final score of 75 (± 15) ($p < 0.001$). Similarly, the Disabilities of the Arm, Shoulder and Hand (DASH) score improved substantially from a preoperative mean of 50 (± 20) to a final score of 20 (± 10) ($p < 0.001$). Additionally, the Simple Shoulder Test (SST) score showed significant enhancement, with a preoperative mean of 3 (± 1) increasing to 9 (± 1) at the final follow-up ($p < 0.001$).

Table 02: Outcomes after treatment

Outcome Measures	**Values**
Fracture union rate	48 (96%)
Time to fracture union (weeks)	16 ± 3.5
Functional outcomes:	
- Constant-Murley score	Pre: 30 ± 10, Final: 75 ± 15 ($p < 0.001$)
- DASH score	Pre: 50 ± 20, Final: 20 ± 10 ($p < 0.001$)
- SST score	Pre: 3 ± 1, Final: 9 ± 1 ($p < 0.001$)

Neer's scoring system was utilized to evaluate various aspects of functional recovery among patients. Pain levels, assessed on a scale of 0 to 15, had a mean score of 12 (± 3), indicating moderate pain experienced by patients. Functionality, pertaining to activities of daily living and scored from 0 to 20, showed significant improvement with a mean score of 18 (± 4), reflecting patients' enhanced ability to perform daily tasks. Range of motion, measured on a scale of 0 to 40, demonstrated substantial improvement with a mean score of 32 (± 6), suggesting increased joint mobility. Strength, rated from 0 to 25, had a mean score of 20 (± 5), indicating satisfactory recovery of muscle strength. Patient satisfaction, assessed on a scale of 0 to 10, was high with a mean score of 8 (± 2), indicating overall contentment with treatment outcomes. The total Neer's score, encompassing all criteria and ranging from 0 to 100, had a mean value of 90 (± 10), signifying favorable overall functional recovery among patients treated with the PHILOS plate for proximal humerus fractures.

Table 03: Neer’s scoring system

Neer's Scoring Criteria	**Score Range**	**Mean Score (± SD)**
Pain	0-15	12 (± 3)
Function (activities of daily living)	0-20	18 (± 4)
Range of motion	0-40	32 (± 6)
Strength	0-25	20 (± 5)
Patient satisfaction	0-10	8 (± 2)
Total Score	0-100	90 (± 10)

Discussion

The application of the Proximal Humerus Internal Locking System (PHILOS) plate has become more and more popular for treating these fractures, thus it is a new fixation method that can be used in any kind of fracture. This paper aimed to investigate the clinical outcomes of 50 patients treated with the PHILOS plate for proximal humerus fractures and to determine the factors that influence their recovery [10].Our study has proven the favorable clinical outcomes, with a very high fracture union rate of 96% and a mean time to union of 16 weeks. This shows that the PHILOS plate is an

effective instrument of providing stable fixation and healing of fractures [11]. Besides, the functional outcomes were also improved significantly as the data showed the considerable growth of the Constantly-Murley, Disabilities of the Arm, Shoulder and Hand (DASH), and Simple Shoulder Test (SST) scores from the preoperative to the final follow up. Although the overall complication rate was not that high, at the same time, infection, implant-related issues, and shoulder stiffness were seen in some patients [12]. These complications are the proof of the necessity of the thorough surgical technique, the careful selection of patients and the postoperative management in the optimum of the results. Moreover, the link between osteoporosis and higher numbers of implant-related complications makes it clear that individualized methods should be used in patients with reduced bone quality [13].The factors that may affect the complexity of fracture, bone quality, and patient characteristics can also affect the treatment outcomes and complication rates. The study revealed that there is no significant difference in the rates of fracture union or in the outcomes of functional results between the two-part and the three/four- part fractures, thus, the PHILOS plate is definitely a reliable device for all the fracture patterns [14]. The difference in the incidence of implant-related complications for osteoporotic patients was high, which showed the necessity of the careful consideration of the bone quality in treatment planning [15].Through the application of Neer's scoring system, a comprehensive evaluation of the functional outcomes was achieved, that was based on pain, function, range of motion, strength, and patient satisfaction. The mean scores showed that the functional recovery and patient-reported outcomes after the treatment with the PHILOS plate were significantly improved [16].

Conclusion

It is concluded that Proximal Humerus Internal Locking System (PHILOS) plate demonstrates favorable clinical outcomes in the management of proximal humerus fractures, with high fracture union rates and significant improvements in functional recovery. Despite the occurrence of implant-related complications in some cases, careful surgical technique and patient selection can mitigate these risks. Utilizing Neer's scoring system provides a comprehensive assessment of functional outcomes, highlighting the efficacy of the PHILOS plate in restoring shoulder function and patient satisfaction.

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