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# COMPARATIVE STUDY BETWEEN PHILOS PLATE AND J NAIL IN THE MANAGEMENT OF PROXIMAL HUMERUS FRACTURE

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**ABSTRACT**

**Background:** Proximal humeral fractures are a common orthopedic issue resulting from trauma, necessitating effective surgical interventions to prevent functional impairment. The PHILOS plate and J nail technique are notable methods for fracture fixation, each with its advantages. This study aims to compare the efficacy, complications, and patient satisfaction associated with these techniques. **Methodology:** The study employed a prospective observational design, gaining ethical approval and informed consent. Adult patients with proximal humeral fractures between November 2019 and December 2021 were divided into two groups: PHILOS plate and J nail. Comprehensive data collection involved clinical examinations, radiological assessments, surgical documentation, and follow-up evaluations spanning 6 months to 2 years. Functional outcomes were measured using the Constant Murley Score, and statistical analyses were performed for inter-group comparisons. **Outcome Of The Study:** Demographic analysis revealed gender-associated prevalence, with 80% male participants in the PHILOS group compared to 42.86% in the J nail group. Fracture patterns exhibited a significant association with treatment choice, with 2-part fractures predominantly treated with PHILOS plates and 3-part fractures showing a more even distribution. The analysis of outcomes revealed that there were no statistically significant variations in functional results between the two groups, with both methods demonstrating varying levels of success. Complications differed between the groups, with shoulder stiffness, infection, and implant loosening prevalent in the PHILOS group, while restricted movements, wire migration, and nerve injury were notable in the J nail group. **Conclusion:** This study demonstrates the distinct strengths and limitations of the PHILOS plate and J nail technique in managing proximal humeral fractures. Both methods offer valuable options for specific fracture types, emphasizing the importance of personalized treatment decisions guided by fracture characteristics, patient demographics, and bone quality. Precise anatomical reduction, stable fixation, and tailored rehabilitation play pivotal roles in achieving optimal outcomes for the patients.

## INTRODUCTION

Proximal humeral fractures are a common orthopedic challenge, affecting individuals of different age groups and often resulting from low or high-energy trauma.[1] These fractures can lead to significant functional impairment and reduced quality of life if not appropriately managed. Over the years, various surgical techniques have been developed to address the complexities of treating proximal humeral fractures.[2,3]

Two such techniques that have gained attention are the PHILOS plate and the J nail fixation. The PHILOS plate, short for Proximal Humerus Interlocking Plate, is a well-established implant that offers rigid anatomical fixation, allowing for early mobilization and potentially favorable functional outcomes.[4] On the other hand, the J nail technique involves the use of three intramedullary nails to fix unstable proximal humeral fractures, utilizing a minimally invasive surgical approach with reduced soft tissue dissection.[5]

Both methods aim to provide stable fixation and promote proper healing of the fracture, but each approach has its advantages and limitations. The choice of surgical technique is influenced by factors such as the fracture pattern, bone quality, age of the patient, and activity level.[6,7]

In this comparative study, we aim to analyze and evaluate the functional outcomes of proximal humerus fracture fixation using the PHILOS plate and the J nail technique. By examining the existing literature and outcomes data, we seek to gain insights into the effectiveness, complications, and overall patient satisfaction associated with each approach. Additionally, this study aims to provide valuable information to orthopedic surgeons and medical professionals in making informed decisions about the most suitable surgical option for managing proximal humeral fractures.

Understanding the comparative benefits and drawbacks of these two techniques will contribute to advancing the field of orthopedics and optimizing patient care for individuals suffering from proximal humeral fractures. Through this study, we hope to shed light on the most appropriate surgical intervention for specific fracture types and patient populations, ultimately leading to improved treatment outcomes and enhanced patient well-being.

## METHODOLOGY

The comparative analysis of the PHILOS Plate and J Nail fixation for proximal humerus fractures followed a prospective observational design. Ethical approval was obtained from the hospital's Ethical Committee, ensuring adherence to ethical standards. Written informed consent was acquired from all eligible patients who expressed willingness to undergo the surgical procedure. The study population comprised adult patients admitted to a Tertiary Care Hospital with proximal humerus fractures occurring between November 2019 and December 2021. These individuals were separated into two clearly defined categories, Group A (PHILOS Plate) and Group B (J Nail), with surgical interventions performed based on their assignment.

Data collection involved a comprehensive approach, beginning with a detailed patient history acquired through verbal communication. Thorough clinical examinations encompassing both local and systemic assessments were conducted to gather relevant information. Radiological

diagnoses were established using X-rays and, if necessary, CT scans. Baseline laboratory investigations were performed to assess fitness for surgery. Surgical findings were meticulously documented, and post-operative evaluations encompassed clinical and radiological examinations. Additionally, wound healing progress, complications, the time required for fracture union, and the range of motion of the shoulder joint were methodically assessed.

To gauge functional outcomes, the widely recognized Constant Murley Score was utilized, which encompassed various parameters including shoulder function, pain levels, activities of daily living, range of motion, and strength. The interpretation of scores into categories such as Excellent, Good, Fair, and Poor aided in determining the success of each treatment approach. Follow-up procedures included regular appointments spanning a minimum of 6 months to a maximum of 2 years. These appointments occurred at predetermined intervals, including 1 week, 3 weeks, 6 weeks, and subsequently on a monthly basis. Radiographic assessments were conducted during each follow-up visit to monitor progress and healing.

**Statistical Analysis:**

The collected data were analyzed using suitable statistical methods, encompassing descriptive statistics, t-tests, chi-square tests, or ANOVA, as applicable, to facilitate a comprehensive comparison of outcomes between the two treatment groups.

## OBSERVATION AND RESULTS

**Table 1: Demographic Distribution Of Patients In Both Groups.**

| Gender | Philos Plate | | J Nail | | P value |
|---|---|---|---|---|---|
| | No. (%) | | No. (%) | | |
| Male | 24 | 80% | 12 | 42.86% | 0.003 |
| Female | 6 | 20% | 16 | 57.14% | |
| Age | | | | | |
| 18-40 | 6 | 20.00% | 5 | 17.86% | 0.75 |
| 41-60 | 10 | 33.33% | 12 | 42.86% | |
| 61 and above | 14 | 46.67% | 11 | 39.29% | |
| Total | 30 | 100.00% | 28 | 100.00% | |
| Mode of Trauma | | | | | |
| RTA | 20 | 66.66% | 15 | 53.57% | 0.051 |
| History of Fall | 6 | 20% | 2 | 7.14% | |
| Assault | 4 | 13.33% | 11 | 39.29% | |
| Total | 30 | 100% | 28 | 100% | |

Gender distribution revealed significant associations with the specified condition; 80% of male participants exhibited it, compared to 42.86% in j nail. Age groups (18-40, 41-60, 61+) displayed varying condition frequencies. P-values of 0.003 and 0.75 indicated significant associations with gender and non-significant age associations, respectively. Modes of trauma were explored; 66.66% with RTA history showed the condition, suggesting a trend (p=0.051), whereas fall (20%) and assault (13.33%) histories exhibited fewer clear associations.

**Table-2: Distribution Of Side Involve And Type Of Fracture In Both Groups.**

| Side involve | Philos Plate | | J Nail | | P value |
|---|---|---|---|---|---|
| | No. (%) | | No. (%) | | |
| Left | 11 | 36.67% | 15 | 53.57% | 0.19 |
| Right | 19 | 63.33% | 13 | 46.43% | |
| Total | 30 | 100.00% | 28 | 100.00% | |
| Type of fracture | | | | | |
| 2 part | 6 | 20 | 15 | 53.57% | 0.01 |
| 3 part | 18 | 60 | 13 | 46.43% | |
| 4 part | 6 | 20 | 0 | 0.00% | |
| Total | 30 | 100% | 28 | 100.00% | |

Regarding side involvement, the left side was implicated in 11 cases (36.67%), while the right side was implicated in 19 cases (63.33%). However, the calculated p-value of 0.19 indicated that this relationship lacks statistically significant association.

We also examined the fracture types, categorizing them as 2-part, 3-part, and 4-part fractures. Within the 2-part fractures, 6 cases (20%) were identified, and 15 cases (53.57%) were associated with the condition in philos plate. Among the 3-part fractures, 18 cases (60%) were noted, and 13 cases (46.43%) displayed the condition. Interestingly, all 6 cases (20%) of 4-part fractures did not exhibit the condition. The calculated p-value was 0.01, indicating a statistically significant association in this context.

**Table-3: Outcome Of Patients In Both Group**

| Outcome | Philos Plate | | Nailing | | P value |
|---|---|---|---|---|---|
| | No. (%) | | No. (%) | | |
| Excellent | 2 | 6.66% | 6 | 21.42 | 0.34 |
| Good | 22 | 73.33% | 16 | 57.14 | |
| Moderate | 4 | 13.33% | 5 | 17.86 | |
| Poor | 2 | 6.66% | 1 | 3.57 | |
| Total | 30 | 100% | 28 | 100% | |

Table 3 showcases the outcomes identified in both patient groups, delineated as follows: Within the 'Philos Plate' group, 2 cases (6.66%) achieved an 'Excellent' outcome, 22 cases (73.33%) were categorized as 'Good,' 4 cases (13.33%) as 'Moderate,' and 2 cases (6.66%) as 'Poor.' In the 'Nailing' group, 6 cases (21.42%) were classified as 'Excellent,' 16 cases (57.14%) as 'Good,' 5 cases (17.86%) as 'Moderate,' and 1 case (3.57%) as 'Poor.' Upon scrutiny, the calculated p-value amounted to 0.34, signifying that the identified outcome disparities between the two groups do not exhibit statistical significance

**Table-4: Complication In Patients Treated With Philos Plate.**

| Complications | No of patients | Percentage |
|---|---|---|
| Shoulder stiffness | 7 | 23.33% |
| Post-operative Infection | 2 | 6.67% |
| Implant loosening of screws asso with infection | 1 | 3.33% |
| Varus collapse/ malunion | 2 | 6.67% |
| None | 18 | 60.00% |

Table 4 presents a comprehensive overview of the complications that emerged among patients who underwent treatment involving the utilization of the Philos plate. Among the observed complications, shoulder stiffness manifested in 7 patients, constituting 23.33% of the patient cohort. Postoperative infection was identified in 2 patients, accounting for 6.67% of the total cases. In a distinct case, implant loosening of screws, associated with infection, was recorded, reflecting a prevalence of 3.33%. Additionally, varus collapse or malunion was noted in 2 patients, equating to a frequency of 6.67%. Remarkably, a majority of patients, comprising 60.00% of the cohort (18 patients), encountered no complications following treatment.

**Table-5: Complications In Patients Treated With Nails.**

| Complication | No of patients | Percentage |
|---|---|---|
| Restricted movements | 1 | 3.57% |
| Wire Migration | 1 | 3.57% |
| Infection | 0 | 0.00% |
| Malunion / nonunion | 0 | 0.00% |
| Nerve injury | 1 | 3.57% |
| None | 25 | 89.29% |

Table 5 provides a comprehensive overview of complications that emerged in patients who underwent treatment involving a nail implant. Among the noted complications, restricted movements were identified in a single patient, representing

3.57% of the patient cohort. Similarly, wire migration was documented in another patient, accounting for an equal proportion of 3.57% of the total cases. It is noteworthy that this specific patient group reported no instances of infection, or malunion/non-union, thus affirming their absence. A singular occurrence of nerve injury was observed in one patient, contributing to a frequency of 3.57%. Remarkably, a significant majority of the patient cohort, comprising 89.29% (25 patients), did not experience any complications subsequent to their treatment involving the nail implant

## DISCUSSION

The present study aimed to provide a comprehensive comparison between two widely used surgical techniques, the PHILOS plate and the J nail, for the management of proximal humerus fractures. The study analyzed various demographic, clinical, and outcome-related parameters to better understand the advantages and limitations of each approach.

The demographic distribution highlighted a significant gender-based association with the choice of treatment. More male participants received the PHILOS plate (80%) compared to the J nail (42.86%). This could potentially be attributed to the specific fracture types encountered in the male participants that made them more suitable candidates for the PHILOS plate. The association between gender and treatment choice was statistically significant (p=0.003).

Age distribution across the groups showed no significant associations, with patients from all age groups being represented in both treatment categories. Although age didn't appear to influence the treatment choice significantly, this could be due to the complex interplay of age-related factors in proximal humerus fractures. The lack of a statistically significant association (p=0.75) suggests that other factors might have driven the treatment selection.

Side involvement and fracture type were analyzed to understand their association with the choice of treatment. Although a higher percentage of fractures occurred on the right side (63.33%) compared to the left (36.67%), this difference wasn't statistically significant (p=0.19). This suggests that side involvement might not be a decisive factor in treatment selection.

Fracture-type analysis revealed a noteworthy association with the treatment choice. Two-part fractures were more often treated with the PHILOS plate (53.57%), whereas 3-part fractures were more evenly distributed between the two treatment groups**. Koukakis and colleagues** released a research paper discussing their findings on a group of 20 patients who had two-, three-, and four-part fractures. They used a specific plate for treatment. The average Constant score recorded at the 6-month mark was 76. Interestingly, there was no significant difference in functional recovery between patients under the age of 65 and those over 65 years old.

The study evaluated functional outcomes using the Constant Murley Score, a widely accepted measure encompassing various parameters. The distribution of outcomes across the two treatment groups showed no statistically significant differences. Both the PHILOS plate and the J nail exhibited varying levels of success, with the choice of treatment not being a dominant factor in determining the outcome. The calculated p-value (0.34) indicated that the observed outcome disparities between the two groups lacked statistical significance. In the study conducted by **Moonot and colleagues**, they reported a Constant score of 66.5, with an average follow-up duration of 11 months, for a cohort consisting of 32 patients who had three- and four-part fractures.

Complication analysis revealed varying patterns for each treatment. The PHILOS plate group had a higher incidence of complications such as shoulder stiffness, post-operative infection, implant loosening with associated infection, and varus collapse/malunion. In contrast, the J nail group experienced complications like restricted movements, wire migration, and nerve injury. The differences in complication profiles further emphasize the need to carefully weigh the advantages and disadvantages of each technique based on patient-specific factors.

The findings of this study have several clinical implications for orthopedic surgeons managing proximal humerus fractures. The study underscores the importance of individualized treatment decisions considering factors such as fracture type, patient age, and gender. While both techniques can yield positive outcomes, understanding their respective strengths and limitations is crucial for optimizing patient care.

The results also highlight the need for continuous refinement of surgical techniques and approaches. This includes further developing implant designs, refining surgical procedures, and enhancing post-operative rehabilitation protocols. Long-term follow-up studies are necessary to assess the durability of outcomes and potential late complications that might arise.

## CONCLUSION

The comparative analysis of the PHILOS plate and J nail technique highlights the strengths and limitations of each method. Fixation using intramedullary nails, such as the J nail, offers the advantage of being a closed method with minimal soft tissue invasion, making it suitable for certain unstable two-part fractures. This technique provides immediate relief of pain and relatively rigid fixation, allowing for early joint movement and potentially good results. On the other hand, the PHILOS plate has emerged as the implant of choice due to its stable internal fixation, early mobilization, and reliable functional outcomes. The PHILOS plate facilitates accurate anatomical restoration of the articular surface and tuberosities, which is crucial for optimal functional recovery.

In conclusion, while controversies regarding the treatment of proximal humeral fractures, the findings of this comparative study contribute valuable insights to the field of orthopedics. A continued focus on refining surgical techniques, individualizing treatment plans, and optimizing rehabilitation protocols will further advance the care of patients with proximal humeral fractures, ultimately leading to improved clinical outcomes and enhanced patient satisfaction.

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