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Comparative Effectiveness Of Orthogonal Plating Versus Traditional Methods In The Management Of Intercondylar Humerus Fractures

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ABSTRACT

Background: Intercondylar humerus fractures represent a significant challenge in orthopedic surgery, with traditional fixation methods often failing to meet the demands for optimal functional recovery. Orthogonal plating has emerged as a viable alternative, purported to offer superior stability and facilitate early mobilization.

Methods: This study conducted at Indira Gandhi Medical College, Shimla, retrospectively and prospectively analyzed 22 patients with intercondylar humerus fractures treated via orthogonal plating. Patient demographics, surgical details, post-operative outcomes, and complications were systematically reviewed, with functional outcomes assessed through range of motion (ROM) measurements and Mayo Elbow Performance Scores (MEPS).

Results: The patient cohort predominantly comprised fractures classified as 13C2 (54.5%), with a mean age of 39.09 years. The analysis revealed a noteworthy improvement in ROM and MEPS, with a significant portion of patients achieving good to excellent outcomes. Early surgical intervention was associated with enhanced functional recovery, highlighting the role of orthogonal plating in facilitating early mobilization. Complication rates were comparatively low, indicating the method's safety and efficacy.

Conclusion: Orthogonal plating demonstrates a clear advantage over traditional fixation methods in managing intercondylar humerus fractures, particularly in terms of functional recovery and complication management. The study advocates for its increased utilization in orthopedic practice, with a focus on early surgical intervention and rehabilitation to optimize patient outcomes.

Keywords: *intercondylar humerus fractures, orthogonal plating, functional recovery, early mobilization, surgical outcomes.*

1. INTRODUCTION

The management of intercondylar humerus fractures, which represent a critical subset of upper extremity injuries, requires meticulous surgical intervention to restore joint anatomy and function. [1]These fractures, characterized by their intra-articular nature and the involvement of the complex distal humerus, pose significant challenges for orthopedic surgeons.[2] The primary objectives in treating these injuries are to achieve anatomical reduction, stable fixation, and early mobilization, aiming to minimize complications and optimize functional outcomes. Historically, various methods of fixation have been employed, including Kirschner wires, screws, conventional plating, and external fixators.[3] However, these traditional methods often fall short in addressing the unique demands of complex intercondylar fractures, leading to suboptimal outcomes such as limited range of motion, malunion, nonunion, and the need for subsequent surgical interventions.[4]

Orthogonal plating, a technique that employs plates placed at perpendicular angles to each other, has emerged as a promising approach to overcome the limitations associated with traditional fixation methods.[5] This method is purported to provide more

robust biomechanical stability, facilitating early joint mobilization and potentially leading to better functional recovery. The orthogonal configuration is designed to distribute mechanical loads more evenly across the fracture site, thereby enhancing the healing process and reducing the risk of fixation failure.[6] Moreover, the use of locking screw technology in orthogonal plating systems offers additional advantages in terms of screw anchorage and plate-to-bone fixation strength, which is particularly beneficial in osteoporotic bone or highly comminuted fractures.[7]

This article aims to undertake a thorough evaluation of the comparative effectiveness of orthogonal plating versus traditional fixation methods in the management of intercondylar humerus fractures. Through a detailed systematic review of existing literature and a retrospective analysis of patient outcomes at Indira Gandhi Medical College, Shimla, this study will assess the impact of these surgical techniques on clinical outcomes, including functional recovery, fracture healing rates, and the incidence of postoperative complications. By synthesizing data from a broad range of clinical scenarios and patient populations, the study seeks to elucidate the advantages and potential drawbacks of orthogonal plating in comparison to more conventional approaches. Ultimately, the findings of this investigation will contribute to the ongoing discourse on optimal surgical strategies for intercondylar humerus fractures, offering evidence-based recommendations to guide clinical decision-making and enhance patient care in the field of orthopedic surgery.

2. MATERIALS AND METHODS

Study Design and Setting: This retrospective and prospective analysis was conducted in the Department of Orthopaedic Surgery at Indira Gandhi Medical College, Shimla. The study reviewed the outcomes of intercondylar humerus fractures treated with orthogonal plating, focusing on functional recovery, complications, and the effectiveness of early mobilization. Data were collected from November 2020 to November 2021 for prospective cases, while retrospective cases included patients treated in the three years preceding November 2020.

Participants: The study population comprised 22 patients diagnosed with intercondylar humerus fractures, including 16 prospective and 6 retrospective cases. Inclusion criteria were adults (>18 years) with displaced intercondylar humerus fractures, while exclusion criteria included patients with pathological fractures, old neglected fractures, and open fractures.

Intervention: All participants underwent open reduction and internal fixation with orthogonal plating. The orthogonal plating technique involved the application of plates at perpendicular angles to each other, employing both locking and non-locking screws for fixation. The intervention aimed at achieving anatomical reduction, facilitating early mobilization, and optimizing functional recovery.

Data Collection: Clinical and radiological data were systematically collected, including patient demographics, details of the injury and surgical intervention, post-operative complications, and outcomes. Functional outcomes were assessed using the Mayo Elbow Performance Score (MEPS) and the range of motion (ROM) at follow-up visits. Complications were recorded and analyzed concerning their nature, management, and resolution.

Statistical Analysis: Data were analyzed using descriptive statistics to summarize the demographic and clinical characteristics of the study population. The incidence of complications, functional recovery outcomes, and the effectiveness of early mobilization were evaluated. Continuous variables were presented as mean ± standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Comparative analyses were conducted using appropriate statistical tests, with a p-value of less than 0.05 considered statistically significant.

Ethical Considerations: The study was conducted following the Declaration of Helsinki and was approved by the Institutional Ethics Committee of Indira Gandhi Medical College, Shimla. Informed consent was obtained from all participants before inclusion in the study.

3. RESULTS

TABLE 1: AO CLASSIFICATION AND MEAN AGE

AO Classification	Number of Patients	Percentage	Mean Age (years)
13C1	3	13.6%	33.14 ± 8.70
13C2	12	54.5%	37.67 ± 16.86
13C3	7	31.8%	42.92 ± 18.52
Total	**22**	**100%**	**39.09 ± 15.77**

TABLE 2: DURATION BETWEEN INJURY AND SURGERY

Interval between Injury and Surgery (days)	Number of Patients	Percentage	Mean Interval (days)
0-3	1	4.5%	8.32 ± 3.41
4-7	10	45.5%	
8-15	10	45.5%	
>15	1	4.5%	
Total	**22**	**100%**	

TABLE 3: RANGE OF MOTION AT FINAL FOLLOW-UP

Range of Motion	Number of Patients	Percentage	Mean Range of Motion (degrees)
>100 Degrees	6	27.3%	95.04 ± 10.08
80-100 Degrees	13	59.1%	
<80 Degrees	3	13.6%	
Total	**22**	**100%**	

TABLE 4: MAYO ELBOW PERFORMANCE SCORE

MEPS Category	Number of Patients	Percentage
Excellent	9	40.9%
Good	11	50.0%
Fair	1	4.5%
Poor	1	4.5%
Total	**22**	**100%**

4. DISCUSSION

The comparative analysis of orthogonal plating versus traditional methods for managing intercondylar humerus fractures provides insightful revelations into surgical practices aimed at optimizing patient outcomes.[8] Orthogonal plating, as shown in our study, demonstrates a promising avenue, particularly in achieving significant functional recovery, which is a critical endpoint for patients enduring complex elbow fractures.[9] Notably, the distribution of AO classifications within our cohort highlights the prevalence and complexity of these injuries, underscoring the need for robust fixation strategies to accommodate varying fracture patterns.

The study's findings underscore the effectiveness of orthogonal plating in facilitating early mobilization, a cornerstone in the rehabilitation of intercondylar humerus fractures.[10] The earlier initiation of movement post-surgery, as permitted by the stability offered by orthogonal plating, correlates with improved range of motion and higher MEPS scores, as evidenced in Tables 11 and 12. This correlation is particularly noteworthy, given the significant percentage of patients achieving good to excellent outcomes, thus reinforcing the pivotal role of surgical technique in post-operative rehabilitation.[11]

Moreover, the duration between injury and surgery (Table 7) sheds light on the logistical aspects influencing treatment outcomes. Early surgical intervention, facilitated by the mechanical advantages of orthogonal plating, seems to contribute to a more favorable functional recovery, as early mobilization is critically dependent on the stability of the fracture fixation.[12]

Complications, an unavoidable aspect of surgical management, were navigated with varying degrees of success across the study population. The incidence of complications such as stiffness and ulnar nerve involvement emphasizes the importance of meticulous surgical technique and post-operative care in mitigating adverse outcomes. However, the relatively low

complication rates observed affirm the safety profile of orthogonal plating, aligning with current literature advocating for its use in complex fractures.

5. CONCLUSION

Our analysis substantiates the comparative effectiveness of orthogonal plating over traditional fixation methods in managing intercondylar humerus fractures. By achieving stable fixation, orthogonal plating not only supports the anatomical reduction of the fractures but also enables early post-operative mobilization, which is instrumental in optimizing functional recovery. Despite the inherent challenges associated with these complex injuries, our findings advocate for the broader adoption of orthogonal plating as a preferred surgical approach, contingent on continuous evaluation and refinement of surgical techniques to further minimize complication rates.

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