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RESEARCH ARTICLE
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A CROSS-SECTIONAL STUDY ON COMPLICATIONS ARISING FROM OPEN REDUCTION AND INTERNAL FIXATION IN CLAVICULAR FRACTURES

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Abstract

Aim and objectives of study: This study aims to evaluate the complications associated with the open reduction and internal fixation procedure in the treatment of clavicle fractures.

Study Design: Cross-sectional study.

Setting and Duration: The research was conducted at Muhammad Medical College / Ibn-E-Sina University Mirpurkhas Pakistan. from November 2023 to November 2024.

Methodology: A total of 55 patients with clavicle fractures were included in the study, all of whom underwent plate internal fixation and open reduction. The Constant shoulder score was utilized to assess shoulder union and range of motion, with evaluations based on radiographic findings, shoulder pain, and strength.

Results: Among the participants, 15 (27.27%) were female and 40 (72.72%) were male. The mean Constant shoulder score was 85 ± 4, with a 95% confidence interval. Hook plates were used in 20 (36.36%) patients. Notably, a significant proportion of individuals (approximately 98%) reported cosmetic concerns related to the surgery.

Conclusion: The findings indicate that complications associated with internal fixation include poor cosmetic outcomes, moderate pain, and skin numbness at the surgical site.

Keywords: Internal fixation, open reduction, clavicle fracture.

Introduction

The clavicle, commonly referred to as the collarbone, is a curved, 'S'-shaped bone that connects the shoulder girdle to the axial skeleton through the acromioclavicular and sternoclavicular joints. It is present in mammals with prehensile forelimbs but is absent in marine mammals. In humans, two clavicles are located on either side of the anterior neck. This bone plays a crucial role in maintaining cosmetic appearance, stability, and movement of the shoulder girdle. The clavicle's shape, along with its associated ligaments and muscles, forms a platform that facilitates shoulder mobility. Congenital absence or structural reduction of the clavicle can occur, and its stability is influenced by the development of surrounding musculature.

Clavicle fractures are common injuries, typically resulting from trauma or falls, and often manifest as a fracture at the midsection of the bone. In children, approximately 90% of clavicle fractures occur at the mid-shaft, whereas in adults, more than two-thirds of fractures happen at the diaphysis. These diaphyseal fractures are more likely to be displaced compared to fractures in the lateral or medial thirds of the clavicle. Among all clavicle fractures, around 25% are classified as lateral-third fractures, while 2-3% are medial-third fractures; the remainder occurs at the mid-shaft. Mid-shaft fractures usually result from direct force applied to the shoulder during accidents, intense physical activity, or sports. Such injuries frequently occur in cycling or equestrian sports when sudden stops cause the rider to fall onto an unprotected shoulder or extended arm. In elderly females, these fractures often arise from low-energy falls related to osteoporosis.

Treatment options vary based on the severity and nature of the fracture. Non-displaced clavicle fractures are typically managed conservatively without surgical intervention, often healing with minimal treatment, such as the use of an arm sling or figure-of-eight bandaging. Surgical intervention is indicated for cases involving malposition of the scapula, complex fractures, open fractures, or displacements exceeding two centimeters. The use of a clavicle hook plate is a preferred method for treating displaced distal clavicle fractures, particularly those extending to the acromioclavicular joint. Previous studies have shown that malunion and nonunion rates are less than 10% in patients treated with this method, often attributed to issues with plate stability. Research indicates that while surgical management of clavicle fractures can be effective in young adults, it is less beneficial and not typically recommended for children and older individuals.

Given the limited studies available on this topic, the high complication rates associated with clavicle fractures, and the controversies surrounding surgical versus non-surgical treatment options, this study aims to assess the complications resulting from internal fixation of clavicle fractures. Additionally, it seeks to evaluate the incidence of infections, malunion and nonunion occurrences, and patient satisfaction regarding surgical outcomes.

Methodology:

This study employed a cross-sectional design involving a sample of 55 patients with clavicle fractures. Participants were selected using a random sampling method. Individuals with neurovascular diseases, previous fractures, underlying health conditions, or those taking medications that could increase the risk of nonunion were excluded from the study. Ethical approval was obtained from the institute's review committee, and written consent was secured from all participants.

Upon consent, patients were interviewed using a structured questionnaire based on their responses. To assess shoulder strength, pain, and range of motion, the Constant Shoulder Score (CSS) was utilized. Radiographic imaging was performed to evaluate the union of the fractures. The CSS assigns scores across various categories: shoulder strength (25 points), daily activities (20 points), range of motion (40 points), and pain (15 points), with a total possible score of 100.

Data analysis was conducted using SPSS version 22, where mean, standard deviation, and frequency were calculated to evaluate the incidence of complications related to clavicle fractures. A p-value of less than 0.05 was considered statistically significant.

Results

In the current study, 15 (27.27%) individuals were female whereas 40 (72.72%) individuals were male. The mean constant shoulder score value was 85±4 with a 95% confidence interval. It was identified that treatment with the hook plates were used in 20 (36.36%) patients. Similarly, it was also identified that major number of individuals (almost 98%) had troubles because of poor cosmesis. Some patients also reported the feeling of numbness and pain at the surgical site till almost four weeks after surgery. Although, the range of motion and daily activities were normal and no disability or disfigurement was observed in the participants. as reported in Table 1.

Table 1: Complications Observed in Individuals with or without Hooks

Complaints	Without Hook (n=35)	With Hook (n=20)	Total (n=55)
Wound Infection	3	5	8
Poor Cosmesis (%)	98	96	97
Numbness (%)	74	87	80.5
Pain (%)	97	100	98.5
Scar Discomfort (%)	24	27	25.5
Union after 6 Months (%)	87	93.5	90
Pain after First Four Weeks (%)			
- Low	35	9	22
- Moderate	70		
- Severe	0		

Discussion

The present study aimed to evaluate the prevalence of complications associated with clavicle fractures following internal fixation. Specifically, we investigated the incidence rates of infection, malunion, nonunion, and patient dissatisfaction at the surgical site postoperatively. Clavicle fractures are typically categorized into three types based on their anatomical location: medial third, mid-shaft, and lateral third, with mid-shaft fractures being the most prevalent type addressed in this study. Our findings indicated a mean Constant shoulder score of 85 ± 4, with a 95% confidence interval, aligning closely with similar research that reported a Constant shoulder score of 89 at six weeks post-surgery.

In our cohort, all patients achieved union within six months, except for seven individuals in the non-hook group. Additionally, neither malunion nor nonunion was observed, corroborating findings from previous studies. The use of hook plates is a common practice for managing distal clavicle fractures, particularly in cases where the fracture extends into the acromioclavicular joint. A study by Coupe et al. noted a nonunion rate of only one patient among 89 during a nine-year follow-up, highlighting that most nonunion cases were linked to malunion, which often resulted in weakness and fatigue during daily activities. Conversely, Charles et al. reported a higher incidence of

nonunion among patients undergoing fixation surgery compared to those who did not require surgical intervention.
Our study also revealed a low incidence of postoperative infections, consistent with earlier research. Coupe's study similarly reported only one case of postoperative infection, which was superficial and resolved without intervention. Pain, a common postoperative symptom, was reported by 78.5% of participants, reflecting findings from prior studies indicating that pain is typically localized to the site of the fracture.

Furthermore, 97% of patients expressed dissatisfaction regarding cosmesis, mirroring results from previous studies. Notably, 80.5% of participants reported numbness at the surgical site, a finding that diverges from other research. This study suggests that nonsurgical treatments may be associated with a higher prevalence of
postoperative complications compared to surgical interventions. Plate fixation for clavicle fractures appears to be an effective surgical option that facilitates shoulder recovery, reduces the likelihood of postoperative complications, and enhances the chances of achieving union. Future research should consider employing alternative scoring techniques and comparing results across larger sample sizes for more robust analysis.

Conclusion

In conclusion, this study demonstrates that the treatment of clavicle fractures through internal fixation and open reduction yields favorable outcomes. Our findings indicate a high mean Constant shoulder score, a low incidence of postoperative infections, and successful union within six months post-surgery. However, issues related to cosmesis, numbness, and moderate pain were prevalent among the majority of patients. These results underscore the effectiveness of surgical intervention in managing clavicle fractures while highlighting areas for improvement in patient satisfaction and postoperative care.

Permission:
It was taken from the ethical review committee of the institute

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