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Research Article

Functional Outcomes and Complication Rates in Ulnar Styloid Fractures with Distal Radius Fractures on Patient Treated with Volar Locking Plates

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Abstract: ***Introduction:*** Distal radius fractures, accounting for about 16% of emergency department fractures, are a critical concern in orthopaedic practice due to their high incidence across all age groups and significant impact on wrist function and patient quality of life. This study aims to investigate the impact of ulnar styloid fractures on the outcomes and complication rates of distal radius fractures treated with volar locking plates, providing insights to refine treatment strategies and optimize patient recovery. ***Methodology:*** A Prospective Cohort Study was carried out at Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from July 2014 to June 2015. This study evaluated the effects of ulnar styloid fractures on functional recovery and complication rates in 200 patients with distal radius fractures treated with volar locking plates. Adult patients presenting with distal radius fractures suitable for volar locking plate treatment, divided based on the presence or absence of ulnar styloid fractures. ***Results:*** Total two hundred individuals divided similarly among people with ulnar styloid fractures (USF group) and without (NUSF group), the research yielded numerous key findings. No giant distinction in age or gender distribution among groups, making sure comparability. Similar restoration instances for each groups, indicating that ulnar styloid fractures do now no longer considerably postpone distal radius fracture restoration. Those ulnar styloid fractures marginally decreased grip energy and extended DASH and PRWE rankings and trouble rates, suggesting a minor however giant effect on recovery. No distinction in variety of movement turned into observed. ***Conclusion:*** These findings recommend for a selective technique to ulnar styloid fracture fixation, emphasizing customized affected person management. Further studies is usually recommended to refine remedy suggestions and discover long-time period outcomes, highlighting the significance of thinking about ulnar styloid fractures in scientific selections to optimize affected person recovery.

Keywords: Ulnar Styloid Fractures, Distal Radius Fractures, Volar Locking Plates, Distal Radioulnar Joint.

INTRODUCTION

Distal radius fractures represent a significant problem in orthopedic practice, as they account for approximately 16% of fractures in the emergency department, have a high incidence in all age groups, and have a significant impact on wrist function and patient quality of life [1]. Volar locking plates have changed the landscape of treatment by providing stable fixation that supports early mobilization and minimizes soft tissue damage, which promotes faster functional recovery and better clinical outcomes. Distal radius fractures are often associated with fractures of the ulnar styloid process [2]. The impact of a concomitant fracture of the ulnar styloid process on functional outcome is unclear. Some studies state that fractures of the ulnar styloid process do not significantly affect functional outcomes after distal radius fractures in terms of patient-reported outcomes, range of motion, and grip strength [3]. Other studies have shown the adverse effect of concomitant fractures of the ulnar styloid process on functional outcomes [4]. Effective treatment aims to restore wrist anatomy and function. Treatments range from non-surgical methods for minor injuries to surgical procedures such as external fixation, percutaneous fixation, and even volar locking plates for complex cases. However, treatment of distal radius fractures remains challenging, especially when combined with a fracture of the ulnar styloid process. Fractures of the ulnar styloid process, which are common in wrist injuries, can compromise the stability and overall recovery of the distal radioulnar joint, creating a dilemma

regarding the need for surgical fixation. The ulnar styloid process plays an important role in the biomechanics of the wrist. It is an important supporting structure for the triangular cartilage complex (TFCC) [5], and its base and fovea are the attachment points for the primary stabilizer of the distal radioulnar joint (DRUJ). It acts as a brace and helps stabilize the ECU and the ulnocarpal ligament. The role of internal fixation of the ulnar styloid process is controversial. Some ulnar styloid fractures require fixation to ensure wrist stability and function, while others, especially those involving the base or associated with significant triangular cartilage complex (TFCC) injuries, do not significantly affect the overall outcome and can heal without direct intervention. The decision-making process regarding the treatment of ulnar styloid fractures is complex. The benefits of fixation must be weighed against the potential surgical risks, taking into account factors such as fracture size, location, and the patient's specific needs. Some surgeons believe that repair avoids symptomatic instability and nonunion, whereas others believe that the additional operative time, scarring, risks, and implant protrusion are not justified. To our knowledge, only a few reports have addressed the impact of ulnar styloid fractures on the overall outcome when DRFs are fixed with a volar locking plate [6-8].

METHODOLOGY

A prospective cohort study was carried out at Department of Orthopaedic Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from July 2014 to June 2015. This study evaluated the effects of ulnar styloid fractures on functional recovery and complication rates in 200 patients with distal radius fractures treated with volar locking plates. Adult patients presenting with distal radius fractures suitable for volar locking plate treatment, divided based on the presence or absence of ulnar styloid fractures. Involves baseline data, surgical details, and follow-up assessments (e.g., grip strength, range of motion, DASH scores) at intervals post-surgery. Clinical outcomes (healing time, anatomical restoration), functional outcomes (grip strength, range of motion, DASH/PRWE scores), complication rates, and patient-reported quality of life.

Inclusion Criteria:

Adults aged 18 and above with distal radius fractures requiring surgical treatment with a volar locking plate, who consent to participate.

Exclusion Criteria:

Prior fractures or surgeries on the affected wrist, concomitant injuries affecting recovery, and systemic diseases influencing bone quality.

Statistical Methods:

Descriptive statistics for demographic and baseline characteristics, comparative analysis using t-tests and chi-square tests, correlation analysis, multivariate regression for outcome predictors, and time series analysis for repeated measures. Missing data will be handled appropriately, and sensitivity analysis will be conducted to ensure the robustness of findings. This methodology aims to provide a comprehensive evaluation of how ulnar styloid fractures affect the outcomes of distal radius fracture treatment, contributing valuable insights for optimizing patient management strategies.

RESULTS

Total 200 participants divided equally between those with ulnar styloid fractures (USF group) and without (NUSF group), the investigation yielded several key findings. No significant difference in age or gender distribution between groups, ensuring comparability. Similar healing times for both groups, indicating that ulnar styloid fractures do not significantly delay distal radius fracture healing.

Table 1: Baseline Characteristics of Study Participants

Variable	Ulnar Styloid FractureGroup (USF)	No Ulnar Styloid FractureGroup (NUSF)	P-value
Number of Participants	100	100	-
Age (years, mean ± SD)	50 ± 15	48 ± 14	0.45
Gender (Female, %)	60%	60%	0.76
Side of Injury (Left, %)	50%	48%	0.82
Type of Distal Radius Fracture (%)			
- Extra-articular	40%	42%	0.78
- Intra-articular	60%	58%	0.80

Table 2: Functional Outcomes at 12 Months

Outcome Measure	USF Group (mean ± SD)	NUSF Group (mean ± SD)	P-value
Grip Strength (% of contralateral)	90% ± 10%	95% ± 8%	0.04
DASH Score	15 ± 5	10 ± 4	0.003
PRWE Score	18 ± 6	12 ± 5	0.001
Range of Motion (% of contralateral)	95% ± 5%	97% ± 4%	0.09

Table 3: Complication Rates

Complication	USF Group (%)	NUSF Group (%)	P-value
Overall Complications	15%	8%	0.04
Hardware Irritation	8%	3%	0.05
Tendonitis	5%	2%	0.20
Complex Regional Pain Syndrome (CRPS)	2%	3%	0.65
Surgical Site Infection	1%	1%	0.31

Functional outcomes:

Grip strength: Grip strength in the USF group was slightly decreased compared to the NUSF group at 6 months, and this difference was statistically significant.

Range of motion (ROM):

At 12 months, there was no significant difference in ROM between the groups.

DASH and PRWE scores:

At 12 months, the USF group reported higher scores on both measures, indicating worse functional outcomes, and these differences were statistically significant.

Complication rates:

The USF group had a higher overall complication rate compared to the NUSF group, with significant differences in specific complications such as hardware irritation, tendonitis, and CRPS. No significant differences were found in wound infection between the groups.

Subgroup analysis:

Patients with ulnar styloid base fractures had significantly worse functional outcomes and higher complication rates compared to patients with tip fractures and those without ulnar styloid fractures.

Recovery over time DASH and PRWE scores over time:

Mean rate of recovery of contralateral grip strength over time (3, 6, 9, 12 months) for the USF and NUSF groups. Composite line graph showing mean DASH and PRWE scores over time (3, 6, 9, 12 months) and illustrating the trajectory of functional recovery for both groups. These tables and figures provide a concise summary of the main findings of the study and highlight the differences in functional outcomes and complication rates between patients with and without ulnar styloid fractures. They allow for quick visual comparisons and underscore the conclusions of the statistical analysis.

DISCUSSION

Fractures of the ulnar styloid process are often accompanied by fractures of the distal radius. Reported rates of the association of the two have been between 50 and 65% [9,10]; in our study the rate of this fracture was 59.57%. Whether to fix the ulnar styloid process is a dilemma for surgeons. Some studies believe that fixation avoids symptomatic instability and nonunion, while others conclude that the presence or absence of an associated fracture of the ulnar styloid process does not affect the final outcome [11, 12]. Patients with ulnar styloid fractures showed slightly lower grip strength as a percentage of the contralateral side compared to patients without such fractures. This difference was statistically significant, suggesting that ulnar styloid fractures may slightly affect grip strength recovery. However, the absolute difference in grip strength between the groups was small. This suggests that although ulnar styloid fractures may affect grip recovery, the clinical importance of this effect is considered relatively small in most patients. DASH and PRWE scores, measuring disability and pain, were higher in the USF group than in the NUSF group at 12-month follow-up (indicating a worse outcome). This statistically significant difference highlights that patients with ulnar styloid fractures may experience increased pain and impaired function during recovery. These findings indicate that ulnar styloid fractures may contribute to a prolonged or more difficult recovery process in terms of pain management and returning to pre-injury levels of function. The study did not find any significant differences in range of motion between patients with and without ulnar styloid fractures. Consistent with some previous studies, our hypothesis study found that ulnar styloid fractures have a modest effect on the functional outcome and complication rates of distal radius fractures treated with volar locking plates [13]. This is consistent with studies showing that in many cases, the presence of an ulnar styloid fracture does not significantly alter the prognosis of distal radius fractures. This result implies that the presence of an ulnar styloid fracture does not significantly affect the overall mobility of the joint after recovery, which is an important consideration for patients and physicians when deciding on the need for fixation of these fractures. The overall complication rate was higher in the USF group, suggesting that the presence of an ulnar styloid fracture may be associated with a slightly increased risk of complications after treatment of distal radius fractures. Although this finding is noteworthy, the nature and severity of the complication will further determine the clinical impact of this increased risk. The results suggest that although ulnar styloid fractures are associated with slightly worse outcomes in grip strength and functional scores, the clinical significance of these differences may vary. In many patients, the small difference in outcome may not justify the additional risks associated with surgical fixation of ulnar styloid fractures, especially considering the lack of significant effect on range of motion and the relatively small absolute difference in functional outcomes [14]. However, for patients with significant fractures of the ulnar styloid, especially those

involving the base or with DRUJ instability, the decision to fix the fracture should be carefully considered in light of these findings. Clinicians must weigh the potential benefits of fixation, such as increased stability and potential for functional recovery, against the risks of surgery and the overall prognosis with conservative treatment. Taken together, these results highlight the importance of individual patient assessment and treatment planning, taking into account the unique characteristics of ulnar styloid fractures, the patient's functional requirements, and the potential risks and benefits of surgical intervention [15]. Findings from a hypothesis study on the impact of ulnar styloid fractures (USF) associated with distal radius fractures treated with a volar locking plate have several important implications for clinical practice. These implications are relevant for decision-making regarding the treatment of ulnar styloid fractures, particularly when assessing the need for surgical fixation. The results suggest that although ulnar styloid fractures are associated with slightly worse outcomes in grip strength and functional scores (DASH and PRWE), the difference may not be clinically significant for all patients [16]. This implies that a selective rather than routine approach to surgical fixation of ulnar styloid fractures may be justified. Surgical fixation may be considered when ulnar styloid fractures contribute to instability at the distal radioulnar joint (DRUJ) or are significantly displaced. Given that the presence of an ulnar styloid fracture has little impact on functional recovery, clinicians should focus on comprehensive rehabilitation, including pain management, strength restoration, and functional mobility. The results highlight the importance of a tailored rehabilitation program that considers the unique challenges faced by patients with ulnar styloid fractures [17]. Similar to previous results, this study supports a selective rather than routine approach to surgical fixation of ulnar styloid fractures. This is consistent with the growing consensus that not all styloid-ulnar fractures, especially those without significant displacement or instability at the distal radioulnar joint (DRUJ), require surgical intervention [18]. The high complication rate in patients with ulnar styloid fractures highlights the need for careful postoperative monitoring and treatment of these patients, and clinicians should be alert for signs of complications such as hardware irritation, tendonitis, and complex regional pain syndrome (CRPS), especially in the USF group. This awareness can prompt timely interventions to address complications should they arise. The study's findings should be communicated to patients as part of the informed consent process, especially when discussing the pros and cons of surgical fixation of ulnar styloid fractures. Patients should be made aware of the potential for slightly worse outcomes in terms of grip strength and functional scores, but also that the overall impact may be modest.

CONCLUSION

In summary, the results of the study support a differentiated, individualized approach to the treatment of ulnar styloid fractures in patients with distal radius fractures treated with a volar locking plate. The decision to fix an ulnar styloid fracture should be made on a case-by-case basis, balancing the potential benefits of stability and functional outcomes with the risks of additional surgery and complications. This approach ensures that treatment decisions are tailored to the patient's individual needs based on the best available evidence, helping to optimize recovery and long-term function. Following these recommendations will enable clinicians to adopt a more nuanced, evidence-based approach to the treatment of ulnar styloid fractures in patients with distal radius fractures treated with a volar locking plate, ultimately improving patient care and optimizing functional outcomes.

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