

Functional Outcome following Capitellum Excision in Isolated Capitellum Fracture: A Case Series

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Abstract

Background: Capitellum fractures are rare, and outcomes of fragment excision are reported by very few studies. The purpose of this study was to determine the range of motion and clinical outcomes for patients treated with capitellum excision.

Methods: Five patients with isolated capitellum fractures who underwent capitellum excision were retrospectively followed up for functional outcomes. The mechanism of injury, complications, type of fracture, and postoperative outcomes were assessed using the Disabilities of the Arm, Shoulder, and Hand (DASH) score and Oxford Elbow Score. Final elbow range of motion (ROM) and elbow instability were also evaluated.

Results: The clinical follow-up was 12 months. The final examination demonstrated an average elbow range of motion from 8.3 degrees to 123.3 degrees flexion. Patients had full forearm rotation, and there was no clinical evidence of elbow instability. The DASH score and Oxford Elbow Score had improved for the patients at the final follow-up.

Conclusion: Capitellum excision can provide good functional outcomes in cases where open reduction and internal fixation cannot offer a satisfactory fixation and postoperative functional range of motion.

Keywords: Capitellum fractures, Excision, Range of motion, Clinical outcomes

Introduction

Capitellum fractures, though rare, represent a significant clinical challenge due to their intricate anatomy and functional importance within the elbow joint. The capitellum, a dome-shaped structure on the distal humerus, articulates with the radial head and plays a crucial role in elbow stability and movement. It is the secondary static stabilizer of the elbow. Injuries to this structure can result in impaired joint function and long-term disability if not managed appropriately and on time.

Capitellum fractures are uncommon, accounting for approximately 1% of all elbow fractures and 6% of distal humerus fractures [1, 2]. These injuries typically occur as a result of a fall on an outstretched hand with the elbow in a flexed position, leading to direct axial loading on the radial head and capitellum. High-energy trauma, such as motor vehicle accidents or sports-related injuries, are common mechanisms, particularly in younger, more active populations.

Capitellum fractures are classified based on the Bryan and Morrey classification system, which includes four types [3, 4, 5]:

- Type I (Hahn-Steinthal fracture): Large coronal shear fracture involving the majority of the capitellum and potentially extending to the trochlea.

- Type II (Kocher-Lorenz fracture): Smaller osteochondral fracture involving only the articular cartilage and subchondral bone of the capitellum.

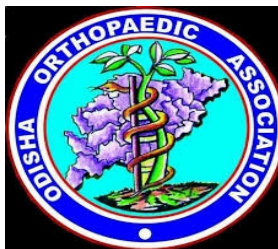
- Type III: Comminuted fracture of the capitellum.

- Type IV: Coronal shear fracture that extends to the trochlea.

Patients with capitellum fractures typically present with acute elbow pain, swelling, and limited range of motion. A thorough physical examination often reveals tenderness over the lateral aspect of the elbow, and neurovascular assessment is essential to rule out associated injuries. Diagnostic imaging, including plain radiographs and computed tomography (CT) scans, is crucial for accurate fracture characterization and surgical planning.

Management strategies for capitellum fractures depend on the fracture type, displacement, and patient factors such as age and activity level. Non-displaced or minimally displaced fractures may be treated conservatively with immobilization followed by early range-of-motion exercises. However, displaced fractures often necessitate surgical intervention to restore joint congruity and function.

In cases of isolated capitellum fractures, particularly those involving small, comminuted fragments or where fixation is not feasible, capitellum excision has been proposed as a viable surgical option [3, 5, 6]. The goal of excision is to alleviate pain, remove loose fragments that may impede joint movement, and prevent long-term complications such as arthritis. This procedure involves the careful removal of the fractured capitellum while preserving the integrity of the surrounding joint structures. The outcomes of capitellum excision are generally favorable, with most patients experiencing pain relief and improved range of motion [7]. Despite few complications, capitellum excision remains a valuable option in the armamentarium



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of elbow surgeons for managing capitellum fractures. This study aims to provide a comprehensive overview of the capitellum excision procedure and its outcomes in a small cohort of patients, contributing valuable insights into the management of isolated capitellum fractures.

Methodology

This is a retrospective review of the clinical outcomes of five patients who underwent capitellum excision for isolated capitellum fractures at our institution in the last five years. The study was conducted in accordance with the approval of the Institutional Ethics Committee.

The inclusion criteria for the study are as follows:

- Patients diagnosed with isolated capitellum fractures based on clinical and radiological findings.
- Patients who underwent capitellum excision due to irreparable comminution, poor bone quality, or failed surgical intervention.

The exclusion criteria include:

- Patients with concomitant fractures of the elbow or upper extremity.
- Patients with neurovascular injuries.
- Patients with significant comorbid conditions that could affect surgical outcomes.

Five patients met the criteria, and each patient underwent a comprehensive preoperative evaluation, including:

- History and physical examination of elbow pain, range of motion, and functional limitations.
- Standard anteroposterior (AP) and lateral radiographs of the elbow.
- Computed tomography (CT) scans to assess the extent of the fracture and involvement of the trochlea.
- Routine preoperative laboratory tests and anesthetic evaluation.

An anterior approach to the elbow was used to address the fracture fragment, and post-excision, the elbow was checked for varus and valgus stability intraoperatively. Patients were mobilized immediately postoperatively, while the third patient was asked to start mobilization two weeks post-surgery. Patients were followed up at 2 weeks, 6 weeks, 3 months, 6 months, and 12 months postoperatively and were evaluated with the Oxford Elbow Score (OES), DASH scores, and the elbow range of motion. (Figure 1, 2)

Results

The study cohort comprised five patients who underwent capitellum excision for isolated capitellum fractures. The patient demographics and fracture characteristics are summarized in Table 1. All five patients underwent successful capitellum excision without intraoperative complications. Postoperative recovery and rehabilitation proceeded without any significant issues. At the final examination, patients had a mean OES of 42 and a mean DASH score

of 10.6. Improvements in the range of motion (ROM) were observed in all patients. Preoperative and postoperative ROM at the final 12 months follow-up were measured and are summarized in Table 2.

Discussion

The results of this study indicate that capitellum excision can yield favorable functional outcomes in patients with isolated capitellum fractures, particularly in cases where traditional fixation methods are not viable. The significant improvement in the range of motion and enhanced functional scores observed in our small cohort highlight the efficacy of this surgical approach.

Capitellum fractures, especially comminuted ones, pose a therapeutic challenge. Traditional open reduction and internal fixation (ORIF) is often the preferred method for treating these fractures, aiming to restore joint congruity and stability [8, 9]. However, ORIF can be technically demanding and may not always be feasible, particularly in cases with severe comminution or poor bone quality [9]. Our findings suggest that capitellum excision offers a viable alternative, providing satisfactory functional outcomes without the complexities associated with ORIF.

Previous studies have shown mixed results with ORIF, with some patients experiencing complications such as hardware failure, nonunion, or stiffness [10, 11]. In contrast, the patients in our study who underwent capitellum excision did not experience any significant complications, and they reported substantial improvements in pain and elbow function. These findings align with other reports suggesting that excision may be particularly beneficial in selected cases.

The improvement in the range of motion observed in our study is noteworthy. Postoperative flexion-extension and pronation-

Table 1: The patient demographics and fracture characteristics

Patient	Age	Gender	Mechanism of Injury	Fracture Type	Previous Elbow Surgery
1	35	Male	Motor vehicle accident	Type I (Hahn-Steinthal fracture)	No
2	18	Male	Sports-related injury	Type I (Hahn-Steinthal fracture)	No
3	48	Female	Fall on outstretched hand	Comminuted (Type III)	No
4	24	Male	Motor vehicle accident	Type I (Hahn-Steinthal fracture)	No
5	29	Male	Motor vehicle accident	Type II (Kocher Lorenz fracture)	No

Table 2: Preoperative and postoperative ROM at the final 12 months follow-up

Patient	Preoperative Extension- Flexion	Postoperative at 12 months Extension- Flexion	Preoperative Pronation- Supination	Postoperative Pronation- Supination
1	30° - 70°	10° - 130°	15° - 45°	70° - 80°
2	25° - 90°	5° - 120°	30° - 60°	70° - 90°
3	20° - 65°	10° - 120°	25° - 55°	45° - 75°
4	40° - 90°	20° - 120°	30° - 45°	70° - 85°
5	25° - 75°	10° - 110°	30° - 50°	75° - 80°



Figure 1: Patient 1: A- Pre op radiograph; B Post op radiograph



Figure 2: Patient 2: A- Pre op radiograph; B Post op radiograph

supination ranges increased significantly, allowing patients to resume daily activities and, in some cases, engage in more demanding physical tasks. In our study, none of the patients demonstrated postoperative elbow instability, and we believe this is likely due to two reasons: first, the primary stabilizers of the elbow, namely the ulnohumeral joint, MCL, and LCL, remain intact; second, the anterior approach to the elbow avoids dissection of the LCL. Although previous authors have cited postoperative instability as a major reason to avoid excision, the biomechanical consequences of capitellum excision were tested by Dushuttle et al., who concluded that excision of isolated capitellum fracture fragments in cadavers did not result in valgus instability, provided that there was no evidence of any other ligamentous injury [3, 5]

Limitations and Future Research:

The primary limitation of this study is the small sample size, which restricts the generalizability of our findings. Additionally, the follow-

up period of twelve months may not capture long-term complications or the development of post-traumatic arthritis. Future research should focus on larger, multicenter studies with extended follow-up periods to validate these results and provide more comprehensive insights into the long-term outcomes of capitellum excision.

Conclusion

In conclusion, capitellum excision appears to be a viable and effective treatment option for isolated capitellum fractures, particularly in cases unsuitable for ORIF. The procedure provides significant pain relief, improved range of motion, and enhanced functional outcomes with minimal complications. These findings contribute to the growing body of evidence supporting the use of capitellum excision in managing complex elbow fractures and underscore the need for further research with larger sample sizes and longer follow-up periods to validate these findings and refine surgical indications to optimize surgical outcomes.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

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