

## Case Report

# Internal Fixation of Type I Capitellum Fracture with Headless Screws: A Case Report

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## ABSTRACT

**Background:** Capitellum fractures are relatively rare. Distal humeral fractures that include capitellum and trochlea constitute approximately 6% of all distal humeral fractures and 1% of all elbow fractures. Despite the rarity of these injuries, an increasing number of clinical series have emerged, enhancing our understanding of these fractures.

**Case Report:** A 26-year-old woman came to the emergency department with complaints of swelling and localized pain on the lateral side of her left elbow 2 hours after she fell off her motorcycle. Routine imaging such as plain radiographs and computed tomography scanning confirmed the fracture. She underwent open reduction and internal fixation surgery, stabilization of articular fragments with headless screws, and was fixated by a back slab and arm sling. The patient was also encouraged to do early elbow mobilization to avoid contractures and joint stiffness, routine follow-up every two weeks for a ROM evaluation. Preoperative Mayo Elbow-Performance Index score (MEPI) was 15, and postoperative 100.

**Discussion:** The aim of capitellum fracture treatment is anatomical reconstruction and fixation to reduce the risk of non-union. In this case, we performed open reduction, secured two headless screws, which allow rigid fixation at the fracture site, provide fracture site compression through variable thread pitch design, and remained not removed later. These screws are suitable for use in anteroposterior and posteroanterior directions.

**Conclusion:** The patient at two months follow-up has shown significant improvement. Accurate reduction, stable fracture fixation, and early postoperative mobilization were reported to provide good results with a MEPI score of 100.

Keywords: Capitellum fracture; Headless screws fixation; Early mobilization; Human and medicine

## INTRODUCTION

Capitellum fracture is a rare coronal articular humeral fracture, usually includes a larger area involving the trochlea and posterior humeri. These cases account for only 1% of all elbow fractures and 6% of distal humeral fractures.<sup>1-4</sup> Children under ten years are more resistant to

stress due to the bone's cartilaginous composition.<sup>5</sup>

Bryan and Morrey classification of capitellum fracture:<sup>1-4</sup>

1. Type I: simple, complete capitellum fracture (Hahn-Steinthal fracture)

2. Type II: fracture of the articular cartilage with minimal subchondral contact (Kocher-Lorenz fracture)
3. Type III: comminuted fracture (Broberg-Morrey fracture)
4. Type IV: coronal fracture involving the capitellum and trochlear (McKee Modification).

The main symptom of patients with capitellum fracture at initial presentation is usually the range of movement demonstrated at 70 degrees, which is the position of the joint capsule due to hemarthrosis in that area. A sight of bruised and swelling on the lateral side of the elbow, restricted flexion, extension, and rotation of the elbow, tenderness on palpation, with or without pain around the wrist may also present.<sup>4</sup>

Radiographs and CT with three-dimensional images better be evaluated in both anteroposterior and lateral views.<sup>2</sup> Capitellum fractures often are not seen on the anteroposterior approach because the fracture line may not be recognized against the background of the distal humerus, while best seen on the lateral view.<sup>4</sup>

Non-operative management such as posterior splint immobilization (manually for three weeks) is indicated for non-displaced cases, type 1 and type 2 capitellum fracture, or displacement smaller than 2 mm followed by weekly monitoring of joint motion.<sup>1-4</sup> Option for closed reduction is worth considering, but prolonged immobilization often leads to joint stiffness. Therefore, open reduction is much preferred as the management of these cases.<sup>4</sup>

Open Reduction Internal Fixation (ORIF) approach targets anatomical reconstruction. Displaced type 1, 2, and type 4 capitellum fracture cases with good bone quality and no comminuted fracture will undergo operative management. Insertion of 1 or 2 headless screws or lag screws with/ without bone graft is considered, depending on how much bone component loss.<sup>1-4,6</sup>

Postoperative management focused on avoiding shoulder abduction, which limits elbow varus pressure. Shoulder mobility should be maintained with arm-sling and splint at elbow flexion 90 degrees. After suture removal two weeks after surgery, the patient should undergo routine evaluation and radiological follow-up every 4-6 weeks, until union formation is secured and complete range of motion and functional strength have recovered. The implant itself preferably is not removed unless symptomatic. Hardware removal may be considered after a healing period of the consolidated bone, certainly not less than six months for metaphysis fractures and 12 months when the diaphysis is involved. Avoidance of the risk of fracture requires restrictions of activity for several months after implant removal.<sup>7,8</sup>

The Mayo Elbow Performance Index (MEPI) is an instrument used to test the limitations caused by the pathology of the elbow during activities of daily living. This specific test uses four subscales (Table 1) with certain points of each function:<sup>9</sup>

1. Pain
2. Range of motion



3. Stability
4. Daily function

**Table 1.** Mayo Elbow Performance Index

Function	Points	Definition	Points
Pain	45	None	45
		Mild	30
		Moderate	15
		Severe	0
Motion	20	Arc > 100°	20
		Arc 50-100°	15
		Arc < 50°	5
Stability	10	Stable	10
		Moderate instability	5
		Gross instability	0
Function	25	Comb hair	5
		Feed	5
		Hygiene	5
		Wear shirt	5
		Wear shoes	5

Total score = 100, Excellent result = > 90, Good result = 75-89, Fair = 60-74, Poor result = < 60

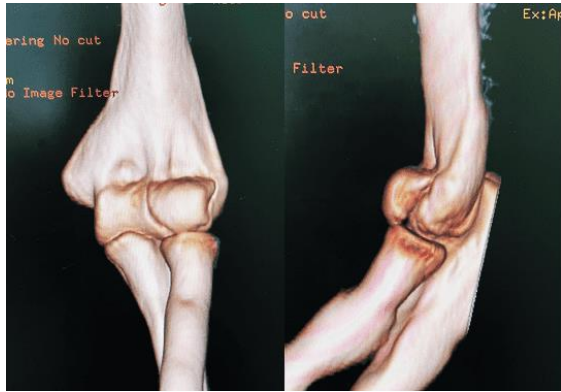
MEPI often appears in scientific documentation as a gold standard for questionnaires, to measure improvement after surgery, to compare treatments or conditions, and as an indication for therapy.<sup>8</sup> Complications that can occur in cases of capitellum fracture are various and not typical, such as elbow contracture/stiffness (most common), non-union (1-11% with ORIF), ulnar nerve injury, heterotopic ossification (4% with ORIF), avascular necrosis (AVN) of capitellum, instability, post-traumatic arthritis, cubital valgus, tardy ulnar nerve palsy, and infection. Early identification and diagnosis with targeted management lead to a better outcome and complete recovery.<sup>2-4</sup>

## CASE REPORT

A 26-year-old woman presented with complaints of swelling and localized pain on

the lateral side of her left elbow after she fell off her motorcycle to the left with her hand and elbow bear her weight one-sidedly. On the physical examination, her left elbow looked bruised and swollen (Figure 1), specifically on the lateral side of the elbow, with restricted flexion and extension limited to 100 degrees with medial elbow tenderness. Other examinations yielded no other positive findings, palpable radial artery pulse, Capillary Refill Time (CRT) less than 2 seconds, and normal sensibility. Routine imaging such as plain radiographs (Figure 2) and computed tomography (CT) scanning (Figure 3) confirmed the fracture.

**Figure 1.** Clinical photo at initial presentation**Figure 2.** Preoperative radiographs of left elbow fracture (a) lateral view (b) anteroposterior view.



**Figure 3.** Preoperative three-dimensional CT images of left elbow fracture (a) anteroposterior view (b) lateral view.



**Figure 4.** Lateral approach incision



**Figure 5.** (a) Lateral, and (b) anteroposterior view of left elbow postoperative radiographs

The patient underwent surgery for open reduction and internal fixation and articular fragments stabilization with headless screws. We debrided the fracture site, identified and mobilized the fracture fragments, which the articular surface and the lateral column subjected to an anatomical reduction under direct

visualization. An intraoperative dynamic examination showed satisfying stability of the osteosynthesis and anatomic articular congruity. The surgical technique, in this case, is a lateral approach (Figure 4) to insert two  $\phi$  2.4 mm headless screws, priorly reduced, held temporarily by K-wire, and directly fixated to the capitellum with cannulated screw in an anteroposterior direction (Figure 5).

Initially, the patient was protected with a back slab and arm sling. Wrist and fingers exercise started on the first day postoperatively. Active-assisted elbow exercises started on the 2<sup>nd</sup>-week follow-up immediately after back slab removal. We encouraged the patient to do early elbow mobilization to avoid contractures and joint stiffness. We also scheduled routine follow-up every two weeks for her range of motion (ROM) evaluation.

A postoperative assessment with MEPI showed a maximum result of 100. The patient did not feel pain (scores 45), range of motion arc >100 degrees (scores 20), stable (scores 10), and she can comb hair, feed, bathe, and dress by herself (scores 25). The patient eventually progressed to have the range of motion from 120° on 2<sup>nd</sup>-week follow-up, 140° on 4<sup>th</sup>-week follow-up, and 160° on 8<sup>th</sup>-week follow-up.

The image above showed postoperative follow-up up to 10 weeks (Figure 6). The patient cooperated well and exercised her elbow as taught. Our patient was able to perform various elbow movements and normal daily activities without pain. The outcome is close to the normal



maximal extension range (Figure 7) and still under monitoring.



**Figure 6.** Flexion on 10<sup>th</sup>-week follow-up.



**Figure 7.** Maximal extension on 10<sup>th</sup>-week follow-up

## DISCUSSION

The mechanism of injury in this fracture is generally a low-energy fall on the outstretched hand with the elbow in varying degrees of flexion. Axial compression of the elbow in the half-bend

position creates a large force transmitted through the radial head of the capitellum.<sup>10,11</sup>

Among the other three, the Hahn-Steinthal fracture occurs the most, often missed at initial radiographs caused by its overlapping position with lateral humeral epicondyle. It is also hardly distinguished from McKee Modification fracture due to the absence of the trochlear fracture line on radiographs itself. To properly delineate and classify the fracture, CT-scan with 3-dimensional reconstruction is usually suggested most of the time.<sup>11,12</sup>

The operative approach indicated in cases other than non-displaced and minimally displaced fracture (<2mm) with the purpose of normal bone alignment, ROM restoration, and no loss of function – in this case – the patient is in her productive age. Non-operative management also has more complications like joint stiffness cases and is not favorable. The posterior approach here is not much preferable. The presence of the ulnar nerve at a crucial spot increases the risk of postoperative ulnar nerve lesion. Complicated anterior fracture fixation causes a higher level of difficulty. Thus, lateral approach takes place.<sup>13,14</sup>

Accuracy and proficiency in the technique of the lateral incision approach are crucial. The Lateral Collateral Ligament near the incision area is one of the components of elbow joint stability that we should keep an eye on.<sup>13–15</sup> Cannulated screws enable temporary stability through the guidewires and achieve more accurate fixation. To accommodate the guidewire, the core diameter of the screw is often larger than non-



cannulated ones, which have a wider tip and a broader thread surface area. Cannulated screws are easier to use – once the guidewire is in the correct position, the screw will follow the same trajectory. Non-cannulated screws insertion requires more experience and attention to avoid repetitive perforation.<sup>13–15</sup>

**Table 2.** Comparison of preoperative and postoperative MEPI score

Indicator	MEPI Score	
	Pre-op	Post-op
Pain	0	45
Range of Motion	15	20
Stability	0	10
Function	0	25
<b>Total</b>	<b>15</b>	<b>100</b>

The preoperative MEPI score, in this case (Table 2), is 15, with a 50-100 degrees range of movement. Postoperative MEPI score within 10-weeks of recovery is 100. The patient did not feel pain (scores 45), range of motion arc >100 degrees (scores 20), stable (scores 10), and she can comb hair, feed, bathe, and dress by herself (scores 25). Based on this evaluation, surgical treatment with headless screw shows satisfying results, thus highly recommended for capitellum fracture cases.<sup>16–18</sup>

## CONCLUSION

Considering the frequent occurrence of contractures and stiffness as complications in postoperative headless screw patients, the author suggests routine elbow exercises and ROM evaluation. Our result shows that adequate surgical stabilization and early active mobilization with regular ROM exercises leads to

the desired recovery and patient's independent living, with a Mayo Elbow-Performance Index (MEPI) score of 100.

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