

# Extensile Posterolateral Novel Approach Through the Anconeus Muscle for an Atypical Coronal Shear Fracture of the Capitellum with Associated Lateral Epicondyle and Olecranon Fractures: A Case Report

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**Abstract:** A 70-year-old female with a history of hypertension presented with a complex elbow injury following a fall. Imaging revealed fractures of the capitellum, lateral epicondyle, and olecranon. The fractures were managed using an extensile posterolateral approach through the anconeus muscle, achieving anatomical reduction and satisfactory functional outcomes 110° of flexion and full pronation/supination and Mayo Elbow Performance Score (MEPS) indicated an excellent outcome. This approach preserved the extensor origin and facilitated access for fixation, suggesting its potential as an alternative for managing such rare injuries.

**Plain Language Summary:** This case report describes a rare and complex elbow injury involving fractures of the capitellum, lateral epicondyle, and olecranon in a 70-year-old woman. A surgical approach through the anconeus muscle was used to repair the damage while preserving important structures. The patient recovered well and regained good arm function. This approach could be a useful option for similar injuries in the future.

**Keywords:** coronal shear fracture, capitellum, extensile posterolateral approach, elbow fracture, orthopedic surgery

## Introduction

Fractures involving the capitellum, lateral epicondyle, and olecranon are among the rarest elbow injuries, accounting for less than 1% of elbow fractures and 6% of distal humeral fractures.<sup>1</sup> Women are more likely to have distal humeral coronal shear fractures than men due to osteoporosis and weight distribution.<sup>2</sup> These injuries pose significant challenges in diagnosis and treatment due to their complex anatomy and the need for precise surgical intervention.<sup>3</sup> The fractures often involve the capitellum and extend into the trochlear, with patterns ranging from simple single-planar fractures to complex multi-planar fractures with bone impaction and significant ligament damage.<sup>4</sup> Additionally, associated injuries such as medial epicondyle fractures, trochlear impaction, and wear and tear on the joint surfaces further complicate the clinical presentation and management.<sup>5</sup>

Surgical intervention is often necessary to restore joint congruity and function. However, no universally accepted surgical approach has been established for managing coronal shear fractures. Techniques such as anterior-lateral

approaches,<sup>6,7</sup> posterior olecranon approaches,<sup>8,9</sup> and lateral epicondyle osteotomy techniques have been described.<sup>10</sup> Each has inherent limitations, including risks of soft tissue disruption and nerve injury.

This case report highlights a novel extensile posterolateral approach through the anconeus muscle, which preserved critical structures and allowed for optimal fracture fixation. The aim of this study is to discuss the diagnostic challenges, surgical techniques, and outcomes associated with this atypical fracture pattern.

## Case Report

A 70-year-old female with controlled hypertension presented with right elbow pain, swelling, and limited range of motion (ROM) two days after a fall onto her elbow. On initial examination, the patient was alert, oriented, and hemodynamically stable. The right upper limb exhibited significant ecchymosis, with localized swelling tenderness at the elbow. No open wounds were observed. The ROM was severely restricted, but the distal neurovascular status was intact.

Laboratory tests performed during the preoperative evaluation revealed no significant abnormalities. Imaging studies, including anteroposterior (AP) X-rays (Figures 1 and 2) and computed tomography (CT) (Figures 3 and 4), showed a complex intra-articular olecranon fracture associated with a capitellar fracture, a comminuted lateral epicondyle fracture, a small trochlear fragment, and a coronal shear fracture of the capitellum.

## Surgical Technique

Under general anesthesia, the patient was positioned in the left lateral decubitus position with the treated arm crossed over the body at 90° of shoulder abduction. The arm was supported on custom-made padding to stabilize the patient, with additional padding placed under prominent bony areas to prevent axillary nerve compression in the contralateral shoulder.

An extensile posterolateral approach was selected, providing excellent exposure of the distal humerus, capitellum, and proximal ulna while preserving the extensor mechanism. A slightly lateral posterior skin incision was made differ than



**Figure 1** Anteroposterior (AP) X-ray of the elbow joint of the first presentation.



**Figure 2** Lateral X-ray of the elbow joint of the first presentation.



**Figure 3** 3D CT scan demonstrated an intra-articular olecranon fracture with associated capitellar fracture, lateral epicondyle comminuted fracture, and a small piece trochlear fracture and a coronal shear fracture of the capitellum.



**Figure 4** 3D CT scan demonstrated the comminution of the fracture.

the classical posterior approach, beginning approximately 6 cm proximal to the olecranon tip and extending 6 cm distally along the lateral border of the proximal ulna. The incision curved mildly lateral over the olecranon to minimize skin tension and protect the subcutaneous ulnar nerve. This course followed the anconeus muscle belly, permitting entry into the interval between the lateral triceps and anconeus with negligible soft-tissue disruption.

Proximally, dissection advanced using a triceps-reflecting technique, following the posterior triceps-elevating approach described by Bryan and Morrey. The anconeus muscle was split longitudinally in a one-third to two-thirds configuration, detaching approximately 4–5 cm from its insertion on the lateral olecranon and superior posterior ulna while maintaining a portion of the insertion to facilitate anatomic reattachment during closure. This method provided extensile posterolateral exposure without disrupting the extensor mechanism.

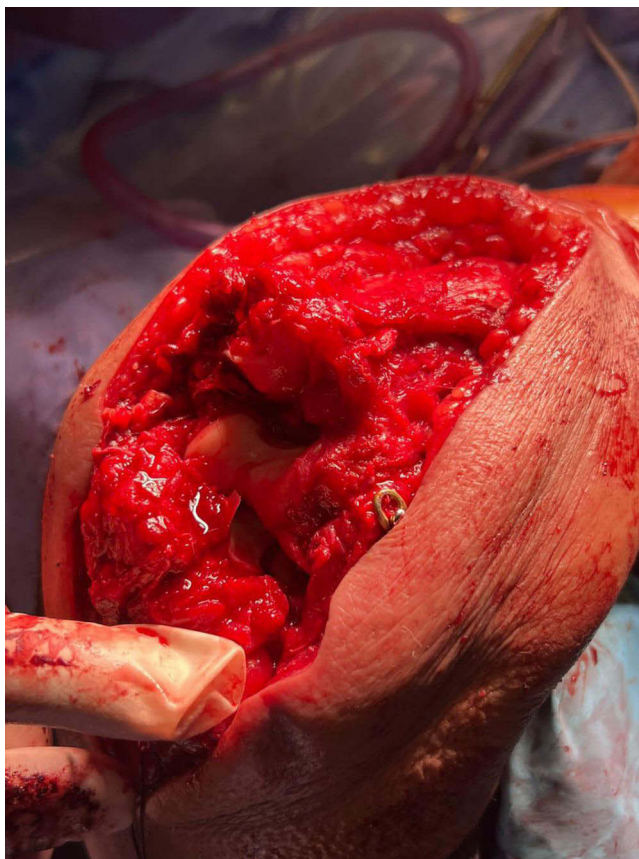
The joint capsule, already disrupted by the fracture, provided a window for intra-articular visualization.

Intraoperative assessment showed the integrity of the lateral collateral ligament complex. This approach achieved wide visualization of the articular surface as maintaining soft tissue, enhancing both stability and early postoperative rehabilitation.

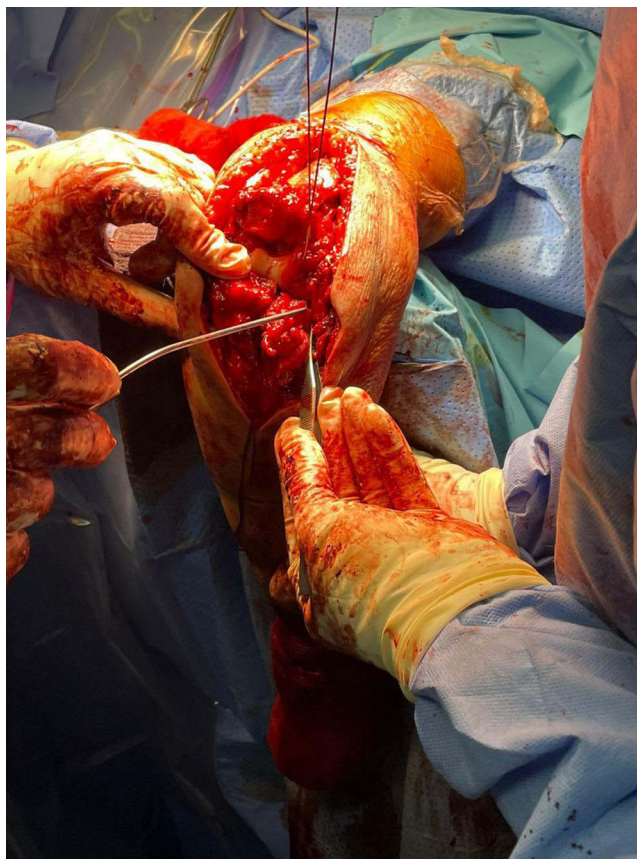
Fixation of the capitellar fragment was started by inserting 1.2-mm Kirschner wires from posterior to anterior under fluoroscopic guidance to achieve stabilization. Definitive fixation was performed using headless compression screws (Herbert type) inserted along the posterior-to-anterior trajectory, perpendicular to the fracture level. This configuration provided prime interfragmentary compression and minimized articular surface disruption. Subsequent reduction on the surgical table, the capitellar fragment was anatomically realigned and secured with multiple K-wires and Herbert screws, achieving a congruent articular surface (Figures 5–7).

The lateral epicondylar fragment was reduced and stabilized anatomically using a 7-hole (2.7 mm) buttress T-plate, providing rigid fixation and restoring the lateral column integrity. The olecranon fracture, was simple and transverse, using tension-band wiring reduced effectively converting the triceps' tensile forces into compression at the fracture site to initiate stable union and allow early range of motion. The choice of construct was based on biomechanical and clinical principles, rather than financial considerations, as plate fixation was considered unnecessary given the fracture morphology and bone quality.

Following fixation, the joint capsule was closed, and the muscular layers were meticulously approximated. The anconeus muscle was reattached to its original insertion on the lateral olecranon to restore the biodynamics. The subcutaneous tissue and skin were sutured in layers, and a sterile dressing was applied. The elbow was immobilized using a back slab, and final assessment under C-arm fluoroscopy confirmed anatomical reduction and stable fixation (Figures 8 and 9).



**Figure 5** Demonstrates the fracture pattern intraoperatively.



**Figure 6** Demonstrates the reduction intraoperatively.

## Postoperative Outcomes

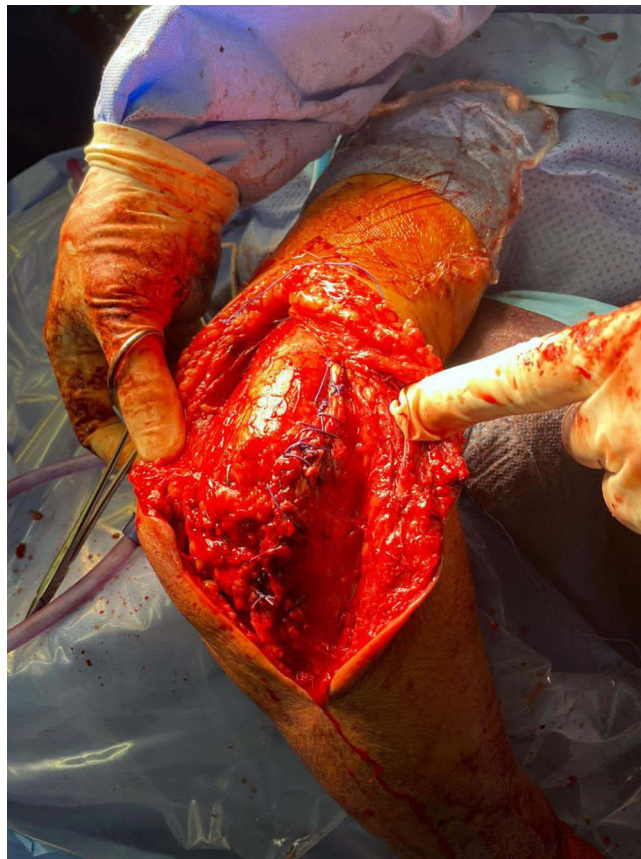
Postoperative imaging confirmed satisfactory reduction and fixation. At nine months, the patient achieved 110° of flexion and full pronation/supination, with stable arcs of motion and no signs of neurovascular compromise. Radiographs showed complete fracture union without evidence of hardware loosening or migration. The patient reported minimal discomfort and had returned to daily activities without limitations. Functional assessment using the Mayo Elbow Performance Score (MEPS) indicated an excellent outcome. Mild hardware irritation over the olecranon was noted during early recovery but resolved by the nine-month follow-up. No other long-term complications were observed, such as infection, stiffness, or hardware failure.

## Discussion

Fractures of the capitellum and trochlea are rare injuries, with isolated capitellum fractures accounting for 3–6% of distal humeral fractures and approximately 1% of elbow injuries.<sup>11–13</sup> These fractures pose diagnostic and treatment challenges due to their complex geometry and the necessity for precise anatomical reduction. Olecranon fractures are similarly significant, comprising 10% of all elbow fractures and 20% of proximal forearm fractures.<sup>10</sup>

Adolescents and young adults are more prone to lateral humeral epicondylar fractures, often due to high-energy trauma.<sup>14,15</sup> In adults, lateral epicondyle avulsion fractures are less frequent but are associated with elbow instability, particularly in cases where conservative treatment fails. These fractures often accompany other injuries, such as olecranon fractures or complex fracture-dislocations, further complicating management.<sup>6</sup>

The fracture pattern in the present case was unique. Based on the Guberdy classification, it was identified as a type 2A capitellum and trochlear fracture with a transverse olecranon fracture, as classified by Colten. The lateral epicondyle was also involved but was not comminuted. This distinctive geometry necessitated a surgical approach that provided adequate visualization and access while minimizing soft tissue disruption.



**Figure 7** Demonstrates the extensile approach through anconeus muscle closure intraoperatively.



**Figure 8** Postoperative Anteroposterior (AP) X-ray of the elbow joint.



**Figure 9** Postoperative lateral X-ray of the elbow joint.

Various surgical approaches have been described for managing coronal shear fractures, each with inherent advantages and limitations. The lateral epicondyle osteotomy technique described by Li and the group provides excellent visualization but risks complications related to osteotomy fixation.<sup>10</sup> Imatani et al proposed an anterolateral approach; however, this technique carries the potential for radial nerve injury.<sup>6</sup> Sen et al utilized a lateral approach, which requires detachment of the common extensor tendon to expose the lateral epicondyle, potentially compromising extensor function.<sup>16</sup> Yari et al advocated for the extended lateral approach, which necessitates releasing the lateral collateral ligament complex for adequate visualization of the trochlear fragments, potentially leading to instability.<sup>2</sup>

In this case, we opted for an extensile posterolateral approach through the anconeus muscle. This technique preserved critical extensor origins and provided excellent visualization of the fracture site without the need for ligament release or osteotomy. By leveraging the disrupted anconeus fibers, the approach allowed for direct access to the fracture geometry, facilitating anatomical reduction and fixation. Unlike the usual posterior approach with olecranon osteotomy—which offers good visualization but disrupts the extensor mechanism and carries risks of non-union and hardware irritation—the current technique utilized the pre-existing transverse olecranon fracture as a window for exposure. The triceps was reflected medially, and the anconeus was split longitudinally in a one-third to two-thirds ratio, providing extensile posterolateral exposure without creating an additional osteotomy. This preserved the triceps insertion, reduced surgical complications, and facilitated early postoperative rehabilitation.

While open reduction and internal fixation (ORIF) of distal humeral coronal shear fractures can be associated with complications such as stiffness, ulnar neuritis, infection, and hardware-related issues,<sup>17</sup> no significant complications were observed during the 9 months follow up in this case.

The limitations of this study include the short follow-up duration of nine months, which restricts the ability to evaluate long-term outcomes such as post-traumatic arthritis, avascular necrosis, or heterotopic ossification.<sup>17</sup> Despite these limitations, the immediate results were promising, with satisfactory functional outcomes and no evidence of instability or hardware complications.

## Conclusion

The extensile posterolateral approach through the anconeus muscle is a viable option for managing complex elbow fractures, preserving extensor origin, and providing excellent access for fixation and better rehabilitation outcomes.

Long-term studies are required to validate its efficacy and address potential complications.

## Ethical Approval

No institutional review board approval was required.

## Consent for Publication

Written informed consent for publication of this case report was obtained directly from the patient.

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## Disclosure

The authors declare no conflicts of interest in this work.

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