

Case Report

Beyond the terrible triad: a rare case of complex elbow injury and its surgical approach

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ABSTRACT

This case report presents a rare and complex elbow injury that expands the conventional scope of the "terrible triad" pattern. A 21-year-old male sustained high-energy trauma resulting in posterior elbow dislocation, radial head and coronoid process fractures, intra-articular distal humerus fractures involving the trochlea and capitellum, and a midshaft ulna fracture. Surgical management was performed using the posterior trans olecranon approach. The ulnar shaft fracture was stabilized by using a locking reconstruction plate and interfragmentary screw fixation. Intra-articular fractures were reduced and fixed using Herbert screws followed by dual-column plating of the distal humerus. The lateral collateral ligament was repaired, and olecranon osteotomy was fixed with tension-band wiring. A structured rehabilitation protocol was implemented postoperatively. At nine months, the patient returned to light activity with fair range of motion and no complications. This case highlights the importance of individualized surgical planning and early rehabilitation in managing complex elbow injuries that transcend the traditional definition of the terrible triad. The use of a trans-olecranon approach, stable fracture fixation, and anatomical articular reconstruction are the key elements for achieving satisfactory functional outcomes.

Keywords: Complex elbow trauma, Elbow dislocation, Distal humerus fracture, Ulna shaft fracture, Terrible triad, Surgical fixation

INTRODUCTION

Complex elbow injuries involving both bony and ligamentous components pose significant treatment challenges, particularly when they extend beyond the classical "terrible triad" pattern. The terrible triad, characterized by posterior elbow dislocation, radial head fracture, and coronoid process fracture, often results in joint instability and poor functional outcomes, if not managed appropriately.^{1,2} The complexity of such injuries increases when compounded by additional fractures such as intra-articular distal humerus fractures or diaphyseal ulnar involvement, which are rarely reported.³ This report presents an exceptionally rare injury combination involving a terrible triad pattern with concurrent fractures of the trochlea, capitellum, and ulnar shaft, thereby expanding the conventional scope of elbow trauma. This

type of constellation requires careful preoperative planning, surgical versatility, and anatomical familiarity in order to achieve satisfactory outcomes.^{1,4}

CASE REPORT

A 21-year-old male presented to our emergency department approximately 12 h after a high-energy road traffic accident and was referred from a peripheral center. The patient complained of pain, swelling, and a deformity of the right elbow. Clinical examination revealed a 1×1 cm posterior elbow laceration, multiple abrasions over the forearm, and restricted elbow movement. The distal neurovascular status was preserved. Plain radiographs demonstrated posterior elbow dislocation, radial head and coronoid process fractures, intra-articular fractures of both columns of the distal humerus (involving the trochlea and

capitellum), and a midshaft ulnar fracture. The patient underwent surgical management via a posterior approach. The ulnar shaft fracture was first stabilized with a 7-hole locking reconstruction plate and an interfragmentary screw. This was followed by a chevron osteotomy of the olecranon to access the elbow joint. Coronoid process fractures were fixed through the same approach using Kirschner wires and Herbert screws. The radial head was similarly stabilized using Herbert screws. The trochlear and capitellar fractures were anatomically reduced and fixed using Herbert and cannulated screws. Medial and dorsolateral column plating of the distal humerus were performed. A partially torn lateral collateral ligament (LCL) was identified and repaired intraoperatively. The olecranon osteotomy was repaired using tension-band wiring.

Postoperative course and follow-up

Postoperatively, the limb was immobilized in a posterior above-elbow slab with the elbow in 90 °flexion and forearm in a neutral position. Wound inspection was performed on the third postoperative day, and sutures were removed at two weeks. Physiotherapy was initiated in a staged manner, beginning with passive range of motion exercises at three weeks post-surgery, followed by active-assisted movements. Strengthening and resistance exercises were performed progressively after radiographic signs of healing. At five months, the patient was pain-free, performed daily activities independently, and returned to light manual tasks. At nine months, follow-up radiographs confirmed complete bone union without malalignment or implant-related complications. The range of motion achieved at the elbow was 10–120°, with forearm pronation and supination of 50° and 40°, respectively.



Figure 1: Plain radiograph demonstrating fractures of radial head, coronoid and intra-articular fracture of distal humerus.

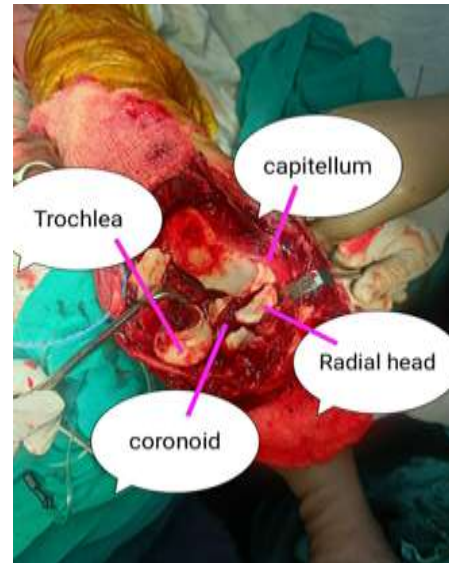


Figure 2: Intraoperative image after chevron olecranon osteotomy showing exposed distal humerus articular fragments.

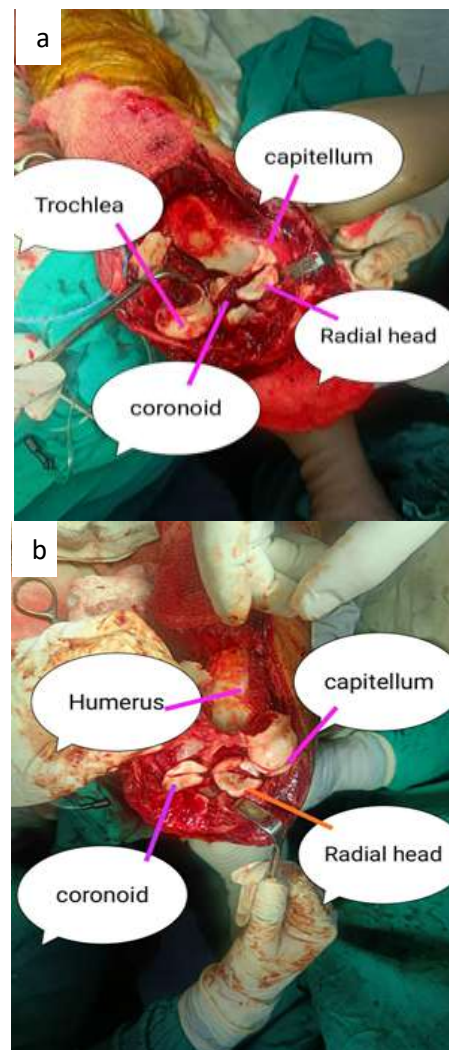


Figure 3: Intraoperative fixation of radial head and coronoid using herbe screws.



Figure 4: Immediate post operative radiograph of elbow.



Figure 5: Immediate post operative radiograph of elbow with forearm depicting fixation of ulnar shaft fracture.



Figure 6: At nine months patient is able to take hand to mouth and extend elbow 10 degree short of full extension.



Figure 7: Radiograph at 9 months showing bony union.

DISCUSSION

Terrible triad injuries require surgical restoration of elbow stability, including the repair of bony and ligamentous structures. When complicated by distal humerus fractures, especially those involving the articular surfaces of the trochlea and capitellum, standard protocols are insufficient.³ The trans-olecranon approach enables direct visualization of the distal humerus, which is critical for achieving anatomic reduction of comminuted articular fractures. Herbert screws have proven effective for intra-articular fragment fixation due to their headless design and compression capability, promoting early mobilization.⁵ While several studies have highlighted the challenges of managing terrible triad injuries, few, if any, have documented the concurrent involvement of the distal humerus and ulnar shaft, as seen here. The rarity of this pattern emphasizes the need for flexible, anatomy-based surgical strategies. Although not perfect, the patient's functional outcome reflects the efficacy of early intervention, stable fixation, and structured rehabilitation.

CONCLUSION

This case redefines the classic terrible triad by including simultaneous distal humerus (trochlea and capitellum) and ulnar shaft fractures, thereby forming a rare and challenging injury constellation. This underscores the need for prompt surgical intervention, careful anatomical reconstruction, and aggressive physiotherapy to optimize functional outcomes.

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