

Irreducible Complex Posterior Elbow Dislocation with Varus Posteromedial Rotary Instability – A Case Report

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Learning Point of the Article:

Open reduction of irreducible elbow dislocations due to varus posteromedial rotary instability may require addressing capsular interposition, ligament repair, and coronoid fixation for optimal outcome.

Abstract

Introduction: Elbow dislocations, particularly those associated with varus posteromedial rotary instability, are relatively uncommon. We present the case of a 25-year-old male initially managed nonoperatively for a posterior elbow dislocation, who subsequently experienced irreducible re-dislocation with characteristic fractures of the anteromedial facet and tip of the coronoid, indicative of varus posteromedial rotary instability.

Case Report: Following an unsuccessful attempt at closed reduction under general anesthesia, open reduction was performed, revealing the interposition of the posterior capsule of the humero-ulnar joint as the cause of irreducibility. Fixation of the coronoid fracture was undertaken, and the patient exhibited excellent functional outcomes at a 4.5-year follow-up.

Conclusion: This case underscores the rarity of irreducible elbow dislocation in the context of varus posteromedial rotary instability and highlights the crucial role of capsular interposition in such cases. Successful open reduction, coronoid fixation, and attentive postoperative care contributed to the patient's favorable long-term functional outcome.

Keywords: Varus posteromedial rotary instability, elbow dislocation, capsular Interposition, open reduction, coronoid fracture.

Introduction

Acute elbow dislocations are relatively common, with a reported rate of approximately 5/100,000 person-years, with adolescent males being particularly susceptible [1]. Simple dislocations, which do not involve fractures, are more prevalent than complex fracture-dislocations. Most acute elbow dislocations occur posteriorly or posterolaterally, often due to falls onto outstretched hands with the forearm in a pronated position, while other types such as anterior, lateral, and posteromedial dislocations, as well as transolecranon fracture dislocations, are less frequent [2]. Most elbow dislocations are amenable to closed

reduction; irreducible elbow dislocation, though uncommon, presents significant challenges and often results in poorer outcomes. Inadequate evaluation or management of accompanying injuries to the coronoid, radial head, and ligaments during initial elbow dislocations can contribute to its persistence and so is the patient's delay in seeking treatment. Irreducibility by closed means may also be attributable to osseous or soft tissue interposition or buttonholing of the radial head through the lateral collateral ligament (LCL) complex. Treating elbow instability poses a challenge as it necessitates a delicate balance between addressing instability and avoiding

Author's Photo Gallery



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Figure 1: Initial radiographs showing posterolateral elbow dislocation with fracture of the coronoid tip and anteromedial facet (A and B), computed tomography scan showing elbow dislocation with coronoid fracture (*) and fracture of anteromedial facet (#) (C and D).

excessive stiffness. Arthroscopic assessment plays a crucial role in diagnosing and evaluating the severity of acute or chronic instability cases, allowing for precise treatment planning. Capsular-ligament plication or ligament reattachment using suture anchors are common arthroscopic treatment methods [3]. Surgical repair or reconstruction of ligamentous injuries, such as LCL and medial collateral ligament, is indicated in cases of severe or recurrent instability, with various techniques available depending on the extent of the injury and patient factors [4]. Most of the cases reported in the literature are those of posterior, simple elbow dislocations, wherein the elbow dislocation is not associated with any fracture [4-13]. Irreducibility after varus posteromedial rotary instability of the elbow has not been reported so far in the literature. We present a case of irreducible posterior elbow dislocation due to varus posteromedial rotary instability, wherein interposition of the posterior capsule of the humero-ulnar joint prevented relocation of the elbow.

Case Report

A 25-year-old, otherwise, healthy male was referred to our center with an irreducible posterior elbow dislocation. He had injured himself 1 month back after falling on the elbow while attempting to catch a cricket ball. (Fig. 1) Closed reduction under conscious sedation was performed by an orthopedic surgeon elsewhere and the elbow was immobilized in a back-slab (Fig. 2). At 3 weeks, the back-slab was removed. As the patient attempted to extend the elbow, he felt a jerk and had sudden onset pain. Repeat radiographs confirmed re-dislocation. Closed reduction was attempted again but failed, and the patient was referred to our center.

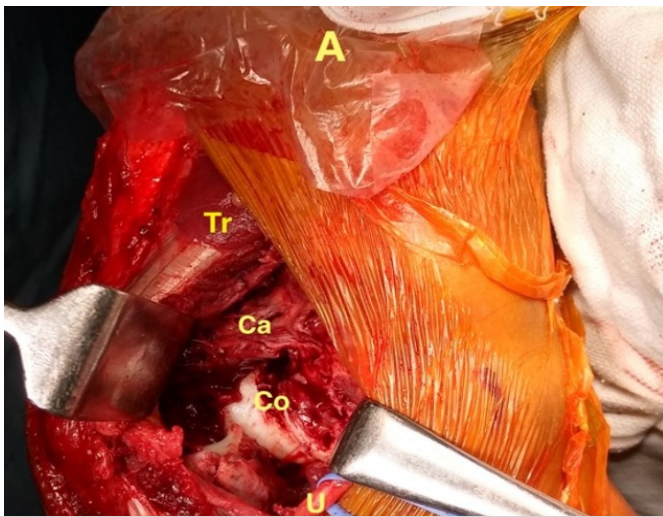
On presentation, we noted that the patient had minimal swelling around the elbow and painful restriction of flexion-extension movements as well as pronosupination. There was no neurovascular deficit.

Investigations

On the initial radiographs, we noted a posterolateral elbow dislocation with a fracture of the coronoid tip and anteromedial facet, typical of a varus posteromedial rotary mechanism (Fig. 1a and b). In addition to the findings of initial radiographs, redislocation radiographs revealed significant anterior translation of the distal humerus, relative to the proximal radius and ulna. A computed tomography (CT) scan of the elbow was done; sagittal and coronal reformatted sections and three-dimensional volume rendered images were obtained (Fig. 1c and d). No osseous interposition was noticed in any of the radiographs or computed tomography scans. Post-reduction radiographs showed a congruently reduced elbow (Fig 2). As the elbow had been successfully reduced previously by closed reduction, we assumed that the irreducibility was due to pain and inadequate muscle relaxation, and magnetic resonance imaging was not obtained to check for soft-tissue interposition.



Figure 2: AP and lateral radiographs following the initial reduction.



Treatment

Under general anesthesia, we attempted to perform a closed reduction of the elbow; however, this was unsuccessful and we proceeded to open reduction. The patient was placed in the lateral decubitus position. The elbow was approached through the utilitarian posterior midline incision, taking care to curve the incision medially around the olecranon. The ulnar nerve was identified and dissected till its course between the two heads of the flexor carpi ulnaris. Thereafter, the triceps muscle was carefully lifted off the distal humerus in a medial-to-lateral direction. As soon as this was performed, we could visualize soft tissue interposed in the humero-ulnar joint (Fig 3). On further inspection, this was found to be the posterior capsule of the elbow joint (Fig 4). We then proceeded to

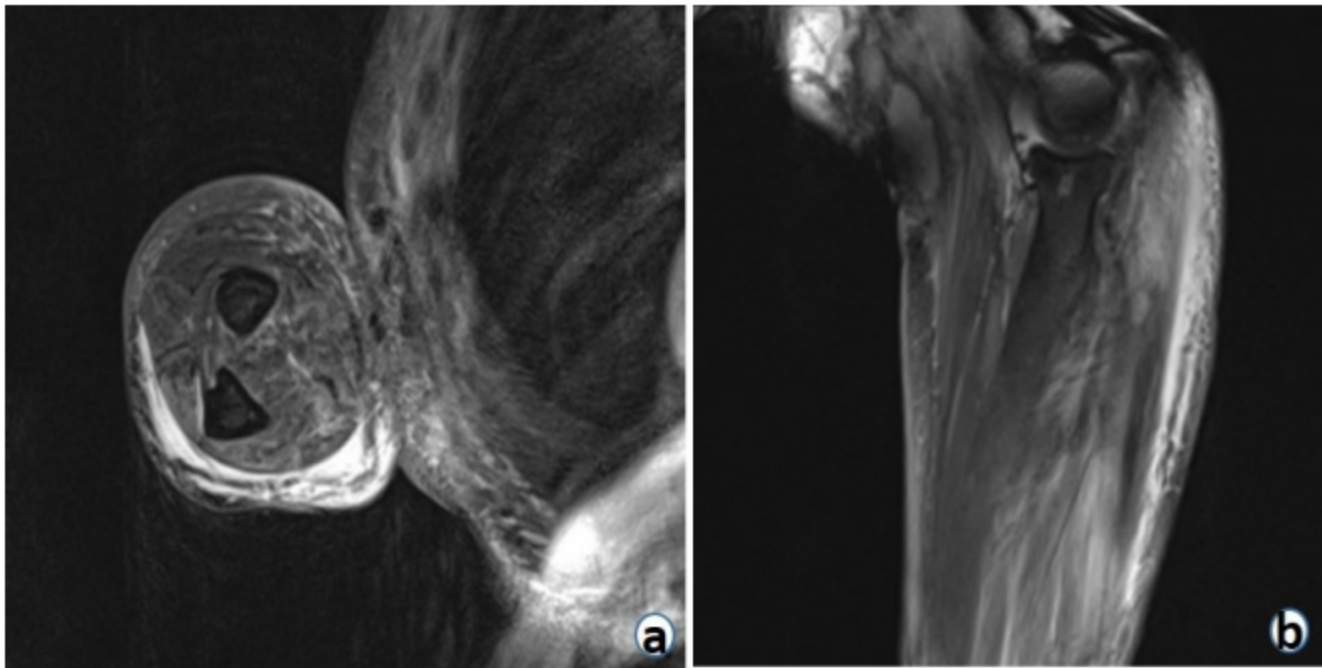


Figure 3: (a) T2 MRI axial cut right elbow demonstrating antecubital fossa abscess. (b) T2 MRI sagittal right elbow demonstrating antecubital fossa abscess.



Figure 4: Diagrammatic representation of interposed posterior capsule (dashed lines) preventing reduction.

then anchored to the lateral condyle by passing sutures through two drill holes (one anterior and one posterior). As recommended by Morrey and O'Driscoll [14], sutures were tied with the elbow in 45° of flexion and neutral rotation to ensure appropriate tension on the LCL. The annular ligament was found to be intact. The humeral attachment of the ulnar collateral ligament was found to be intact and did not require repair after fixation of the anteromedial facet fragment. Intra-operative radiographs confirmed that the elbow was reduced congruently and was found to be stable throughout the range of motion. The elbow stability was assessed radiologically using the hanging arm test, conducted with the elbow fully extended and in supination [15]. Sterile towels were positioned beneath the arm to create a dislocating force from



Figure 5: Intraoperative image showing final fixation with plate and screw.



Figure 6: Final radiograph showing fracture union and mild heterotrophic ossification.

the weight of the hanging limb. A concentric reduction observed in the lateral view during this test indicates elbow stability. To protect the repair, an elbow-spanning external fixator was applied in 45° of flexion and neutral rotation; we could not use the hinged external fixator as this was not available in our setup. The wound was closed in layers over a suction drain. Indomethacin was administered at the dose of 25 mg t.i.d for 4 weeks as per our institute protocol for heterotopic ossification prophylaxis. Postoperatively, the patient reported paresthesia in the ulnar nerve distribution; however, he had no motor deficit and this resolved completely by 3 weeks.

Outcome and Follow-up

The external fixator was removed after 10 days and a gradual active range of flexion-extension was started in an elbow range-of-motion brace with the forearm in neutral rotation. The brace was discontinued after 6 weeks and unrestricted prono-

supination was permitted. Serial clinical and radiological examination was done. The patient had an uneventful postoperative course and regained a painless full range of flexion-extension and prono-supination by 3-month follow-up. By 6 months, the patient achieved complete radiological fracture union. Mild heterotopic ossification was noted along the posterior aspect of the olecranon. At 2-year follow-up, one screw from the buttress plate was noted to have backed out therefore, the plate along with screws was removed. One screw was noted to be buried deep in the anteromedial pericapsular tissues of the humero-ulnar joint and could not be approached through the midline posterior approach (Fig 6). Removal of this screw would have necessitated a separate anterior approach and dissection of the anterior humero-ulnar joint capsule. Since this screw was anterior, and far away from the ulnar nerve, as well as the humero-ulnar joint, a second, anterior approach to remove the screw was not performed. The patient was counseled about the retained screw and has been offered the



Figure 7: Near full range of motion and stable left elbow joint at final follow-up.

S No.	Authors	Type of Dislocation	Direction of Dislocation	Age/Sex	Mechanism of Trauma	Cause of Irreducibility
1.	Charitides et al. [7]	Complex [radial head fracture]	Posteromedial	45 years, female	Fall	Incarceration of radial head
2	Satake et al. [13]	Complex [avulsion of medial epicondyle]	Posterior	9 year, male	Fall on outstretched hand	Incarceration of medial epicondyle
3	Uma Anand [24]	Complex [radial neck fractures]	Posterior	56 years, female	Trauma	Incarceration of radial head
4	Weng et al. [25]	Complex [avulsion of lateral epicondyle]	Posterolateral	67 years, male	Fall on outstretched hand	Impaction of coronoid into capitulum
A. Soft-tissue interposition						
1.	Smith [3]	Complex [avulsion of capitulum]	Posterior	-	-	Brachialis interposition
2.	Chhparwal et al. [8]	Complex [chip fracture of olecranon and capitulum]	Lateral	21 years, male	Fall on flexed and pronated elbow	Brachialis interposition
3.	Devadoss et al. [9]	Simple	Posterolateral	7 years, female	Fall on outstretched hand	Button holing of radial head through poster lateral capsular
4.	Fenelon et al. [10]	Simple	Posterolateral	20 years, male	Fall on outstretched arm	Button holing of radial head through lateral collateral and posterolateral capsular complex
5.	Patel et al. [11]	Complex [olecranon physéal separation]	Anteromedial	6 years, male	Direct posterior blow to flexed elbow	Transcapsular button-holing of ulna
6.	Greiss et al. [17]	Simple	Posterolateral	24 years, male	Fall on outstretched arm	Button holing of radial head through lateral collateral and posterolateral capsular complex
7.	Exarchou [18]	Simple	Lateral	35 years, female	Fall from mule	Anconeus and capsule interposition
8.	Pawlowsky et al. [19]	Simple	Posterolateral	17 years, female	Fall during tug of war	Bowstringing of radial collateral and annular ligament and interposition of radial collateral ligament and anterior capsule
9.	Kim et al. [20]	Simple	Posteromedial	70 years, male	Fall on extended elbow	Anconeus and radial collateral ligament
10.	Gyawali et al. [23]	Simple	Anterior	8 years, female	Fall from height	Button holing of radial head through poster lateral capsular
11.	Takase et al. [26]	Complex [olecranon fracture]	Anterior	6 years, female	Fall on flexed elbow [posterior impact]	Button holing of radial head through poster lateral capsular

Table 1: Causes of irreducibility in elbow dislocation – literature review.

option for removal if it were to become symptomatic in future. At the time of writing this report, the patient has been in follow-up for about 4 years and 5 months. He was noted to have a loss of terminal 5° of hyperextension as compared to the other side, and a full range of flexion, with no complaints of instability (Fig. 7). Radiology demonstrated a congruent elbow with complete union of the coronoid fragments and no signs of arthrosis of the elbow (Fig. 4). Minimal heterotopic ossification was noted on the posterior aspect of the elbow, but this did not result in any symptoms and was therefore not addressed. The Mayo Elbow performance score at the final follow-up was 95.

Discussion

Elbow dislocations can be classified as “simple” or “complex,” depending on whether or not they involve the articular and ligamentous structures that contribute to elbow stability [16]. A review of the published literature on irreducible elbow dislocations reveals a variety of causes (Table 1). The dislocation was simple in most cases and most often, posterolateral [9, 10, 17-19]. The most frequently reported cause for irreducibility was buttonholing of the radial head

posteriorly through a tear in the lateral ligament complex or the common extensor origin [9, 10, 19, 20]. To achieve reduction, the tear needed to be enlarged to allow the radial head to fall back into place; the rent was repaired subsequently [9, 10, 19, 20].

Osseous interposition has also been reported as a cause for irreducibility [7, 13, 17, 18]. Perhaps, the most commonly interposed structure is the medial epicondyle and the mechanism for this has been well described. As valgus force is applied to the elbow, the medial epicondyle fails in tension. The ulnohumeral joint opens up and the vacuum thus created entraps in the displaced epicondyle within the joint, preventing reduction. Interposition of the fractured radial head has also been reported as a cause of irreducible posterolateral dislocation [7, 17].

Varus posteromedial rotatory instability (VPMRI) is known to be associated with instability and recurrent dislocations [21-23]. Due to capsule-ligamentous disruption and fracture of the coronoid, the reduction is usually easy [24]. The inability to reduce a dislocated elbow joint in the presence of VPMRI has not yet been reported to the best of our knowledge. Chhparwal et al. [8] reported a case of irreducible elbow dislocation due to the interposition of the brachialis muscle

with chip fractures of the coronoid and capitulum. However, these fracture fragments were small and did not cause any instability.

We discovered that in our case, closed reduction during the 2nd time was prevented by the torn, interposed posterior capsule (Fig. 5). A probable explanation could be that the posterior capsule would have sustained damage during the primary dislocation. In the subsequent 3 weeks, it did not heal completely. During the second episode, the incompletely healed capsule probably re-ruptured and got entrapped in the ulno-humeral joint. Once the aforementioned issue was addressed surgically, the elbow could be reduced easily.

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

Conflict of interest: Nil **Source of support:** None

Conclusion

Irreducible elbow dislocation is uncommonly encountered after VPMRI of the elbow. When faced with this problem, the surgeon must think in terms of obstacles to reduction. The present case highlights the role of the interposed posterior capsule of the humero-ulnar joint as an obstacle to reduction.

Clinical Message

1. Irreducibility in the case of varus posteromedial rotary instability of the elbow is rare, and warrants open reduction. In this case, the interposition of the humero-ulnar joint capsule was the cause of irreducibility.
2. To ensure an excellent functional outcome in such cases, the surgeon must ensure congruent reduction of the elbow, repair the LCL, and perform adequate fixation of the tip as well as the anteromedial facet fragment of the coronoid.

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