Case report

Anterior elbow dislocation without fracture in an adult: a rare injury pattern

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SUMMARY

Anterior elbow dislocation without periarticular fracture (simple dislocation) is an extremely rare injury and is usually caused by distraction or torsional forces. It is important to look for associated ligamentous and musculotendinous injuries in this pattern. We report an elderly patient who sustained simple anterior dislocation of the elbow and in whom successful closed reduction could be achieved. Reduction by closed method is possible if we know the exact mechanism of elbow injury. Despite the presence of medial collateral ligament injury, he was managed non-operatively and had full functional recovery. Checking for joint stability and collateral ligaments after reduction and getting additional radiological investigations help in better treatment planning. Early protected active mobilisation should be initiated to achieve better functional results.

BACKGROUND

Elbow joint is the second most common joint to dislocate in the body.^{1–3} Majority of elbow dislocations are posterior and very few are anterior (0%–2.6%).^{4,5} Anterior dislocations are commonly associated with periarticular fractures.^{2,6,7} It is also reported following previous surgeries or pre-existing deformities around the elbow and in Ehler Danlos syndrome.^{4,8} Only very few cases of simple anterior elbow dislocation (dislocation without fracture) are reported in literatures and are usually associated with muscular or ligamentous injuries (table 1).^{2,9–13} We report here the case of an elderly person who sustained simple anterior elbow dislocation and discuss about the mechanisms involved, clinical features, management and complications associated with this injury.

CASE PRESENTATION

A 67-year-old man was boarding a bus when it suddenly accelerated and jumped over a hump. He lost his balance and fell on the footboard, still holding onto the railing with his left hand. He heard a snapping sound and immediately felt intense pain in his left elbow. On initial presentation, he was holding his left elbow semi-flexed and supported by the opposite hand. Mild swelling and contusion on the medial aspect of the elbow, loss of prominence of olecranon with dimpling and loss of normal three-point bony relationship were noted. The arm appeared shorter and forearm appeared longer compared with the right side. There was no distal neurovascular deficit.

INVESTIGATIONS AND TREATMENT

Plain radiographs revealed anterior dislocation of the elbow joint without associated fractures (figure 1). Urgent closed reduction under general anaesthesia was achieved by applying longitudinal traction in line of supinated forearm with the elbow in 70° of flexion. With the assistant giving counter-traction in line of humerus along with a forward directed force, elbow was taken into mild valgus, the forearm was pushed backward and the elbow reduced with a clunk. Immediate fluoroscopic imaging demonstrated congruous stable reduction of the elbow joint throughout its range of movement. Valgus stress test (at 0° and 30°) with forearm in pronation to check for the medial collateral ligament (MCL) showed mild opening up of the medial ulno-humeral joint space while varus stress test (at 0° and 30°) with forearm in supination for the lateral collateral ligament (LCL) was negative. A posterior long arm plaster of Paris (POP) slab was applied with the elbow in 90° flexion and forearm in full supination (figure 1). CT scan of the elbow with three-dimensional reconstruction confirmed the absence of associated fractures while MRI reported high-grade partial avulsion of the MCL and common flexor origin from the medial epicondyle (figure 1). Mild joint effusion was also noted, but the remaining musculotendinous structures and LCL complex were intact. In view of the age of the patient, his sedentary nature of occupation, non-dominant side and lack of clinical evidence of gross elbow instability, we decided to manage him non-operatively. The POP slab was continued for 3 weeks along with indomethacin 75 mg/day as prophylaxis for heterotrophic ossification (HTO). After 3 weeks, active assisted elbow and forearm movements were started and by 3 months he regained full movements of the elbow and forearm.

OUTCOME AND FOLLOW-UP

He was under regular follow-up. After 3 years of follow-up, he remains completely asymptomatic without clinical or radiological evidence of instability, arthritis or HTO and is quite active in his profession and has an excellent Mayo elbow performance score (figure 2). Informed written consent was obtained from the patient for publishing his injury.

DISCUSSION

The elbow joint owes its stability to the ulno-trochlear articulation and collateral ligament complexes

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Table 1 Reported cases of simple anterior elbow dislocation

Author, year	Age, sex, side	Mode of injury	Associated injuries	Treatment	Follow-up
Cohn, 1922 ¹³ —22 cases were reported		NA	NA	NA	NA
Tees, 1929 ¹³	NA	NA	NA	NA	NA
Simson, 1931 ¹³	NA	NA	NA	NA	NA
Jackson, 1940 ¹³	NA	NA	NA	NA	NA
Lavencent, 1942 ¹³	NA	NA	NA	NA	NA
Woods, 1946 ¹³	NA	NA	NA	NA	NA
Lopez, 1953 ¹³	NA	NA	NA	NA	NA
Caravias, 1957 ¹³	57 M	RTA	Nil	CR, cuff and collar × 5 days	8 months—full ROM
Martin, 1960 ¹³	NA	NA	NA	NA	NA
Diez-Caballero, 1963 ¹³	NA	NA	NA	NA	NA
Linscheid, 1965 ¹³ —2 cases	NA	NA	NA	NA	NA
Oury, 1972 ¹³	20, M	Fall onto elbow	B/L elbow dislocation, ulnar nerve palsy	CR under meperidine, slab × 5 days	6 weeks full ROM and stable
Torchia, 1998 ⁵	44, M, Lt	Arm wrestling	Triceps avulsion MCL tear Ulnar nerve slip	CR—failed OR—triceps, capsule and MCL repair Ulnar nerve transposition	7 months—full ROM
Venkatram <i>et al</i> , 2006 ¹²	1, M	Pulled elbow like	Altered three-point relationship	CR under sedation AE cast × 3 weeks	6 weeks—elbow stable
Symeonides <i>et al</i> , 2006 ⁴	36, M, Rt	Car accident	Ulnar nerve neuropraxia	CR under GA slab × 3 weeks	3 months—full ROM
Aggarwal, 2010 ¹⁰	40, M, Lt	Camel bite	Metacarpal fracture	Failed CR due to triceps entrapment, OR and K wire fixation	Not known
Chbani, 2011 ⁸ (French)	48, F	Fall from height		CR under GA slab × 3 weeks	1 year—good outcome
Gayawali, 2013 ⁹	8, F, Rt	Fall from height	Button holing of radial head	Failed CR OR, capsular repair and K wire fixation × 2 weeks	Slab removed at 4 weeks 10 months: 20°–130° flexion
Kumar, 2014 ²	22, M, Rt	Seizure	Old medial condyle non-union	Failed CR under sedation CR under GA and ulno-humeral K wire fixation × 2 weeks	2 months: stable despite another seizure episode
Kailash, 2017 ¹¹	30, M, Lt	Fall onto elbow followed by stampede	Brachial artery injury PIN injury	Initial CR Later exploration, vascular repair with vein graft, PIN release, fasciotomy, SSG	3 months: elbow 0°–100° flexion Complete recovery of PIN
Nema <i>et al</i> , 2018 ²	19, M, Rt	Fall from tree—initial treatment by bone setter	5 month old unreduced dislocation	OR Olecranon osteotomy and TBW indomethacin × 3 weeks	1 year: 30°–120° flexion

AE, above elbow; CR, closed reduction; F, female; GA, general anaesthesia; Lt, left; M, male; MCL, medial collateral ligament; NA, not available; OR, open reduction; PIN, posterior interosseous nerve; RTA, road traffic accident; Rt, right; SSG, split skin grafting; TBW, tension band wiring.

which are its primary static stabilisers; the radial head, joint capsule, common flexor and extensor origin which are the secondary static stabilisers and anconeus, triceps and brachialis muscles which act as the dynamic stabilisers.^{3,5} Dislocations of the elbow joint can be posterior, posteromedial, posterolateral, pure medial or lateral and anterior.³

Anterior dislocation of the elbow joint was first described by Evers in 1789.^{4,14} Majority of the reported cases had associated fractures of the olecranon, medial or lateral epicondyles and radial head.² Apart from the key stabiliser (the ulno-humeral joint), the olecranon, the triceps and the posterior aspect of the capsule play a major role in preventing anterior elbow dislocation.^{7,9,11} From the available literatures, we could identify few common mechanisms for anterior elbow dislocation

(table 2).^{4,5,8–10,12–14} We feel that in our patient a combination of torsional and distraction force occurred when the bus suddenly jumped over the hump during which he lost his balance (torsion) and fell on the stepping board (distraction) while still holding onto the railing.

Patients with anterior elbow dislocation has characteristic clinical features (table 3). There is an increased risk of neurovascular and musculoligamentous injuries and should be looked for.¹¹

Disruption of the posterior stabilising structures is reported by some authors to be a prerequisite for anterior dislocation.^{7,9,11} However, in our patient, there was no clinical or radiological evidence of damage to the posterior stabilising structures. At times, when there is significant swelling in the surrounding soft tissues, it can induce a false positive stability and it becomes

Figure 1 Anteroposterior and lateral radiographs of the left elbow showing anterior dislocation without associated periarticular fractures (A), immediate post-reduction radiographs showing concentric reduction of the joint (B) and coronal (C) and axial (D) MRI images of distal humerus showing injury to the medial collateral ligament and the common flexor origin (arrow marks).

important that the stability can be rechecked after few days once the swelling reduces. But we notice that the insignificant mild valgus stress test in our patient might have been carried out due to the intact posterior structures, partial injury to the MCL and

Figure 2 Anteroposterior and lateral radiographs of the left elbow taken 3 years after the trauma showing no evidence of residual instability, avascular necrosis or arthritis (A) and clinical photograph showing near comparable range of movement of elbows and full supination of forearms (B).

Table 2 Common mechanisms for anterior elbow dislocation reported in literatures

Mechanism	Aetiology	Associated injuries
Direct impact	Fall on tip of flexed elbow	Periarticular fractures especially olecranon fracture
Axial loading	Fall on palm with hyperflexed elbow and pronated forearm	Wrist injuries
Distraction	Camel bite	Musculotendinous damage
Distraction	Sudden deceleration while travelling in a vehicle holding onto the overhead bar	Ligamentous and neurovascular injuries
Distraction	Similar to pulled elbow	Injury to annular ligament
Traction and torsion	Entrapment of upper limb in a conveyer belt	Major musculotendinous, ligamentous and neurovascular injuries
Pure torsional	Arm wrestling (humerus externally rotates, elbow and wrist gradually extend and forearm goes into supination)	Primary failure of MCL or flexor pronator mass

MCL, medial collateral ligament.

congruent ulno-trochlear articulation, as swelling was minimal at presentation.

Closed reduction may be attempted once or twice under sedation or preferably under general anaesthesia and is mostly successful. However, if difficulty is encountered in achieving reduction under closed technique it is wiser to do exploration and open reduction as many authors have noted button holing of the radial head,⁹ medial epicondyle⁵ or proximal ulna,⁶ and entrapment of ruptured triceps muscle,¹⁰ or ligamentous complexes as hindrance to reduction. Associated brachial artery transection has been reported by Kailash and Shanmuganathan.¹¹ It is important to know the mechanism of dislocation beforehand because reduction steps may have to be done in the reverse order of the sequence which led to anterior dislocation. Usually traction in line of forearm with the elbow slightly flexed and counter-traction at the arm are applied. Reduction is achieved by pushing the forearm backwards and lower end of humerus forwards while maintaining the traction. This technique is applicable in distraction type of injuries.¹⁵ But when torsional forces are also involved, we may have to consider giving valgus/varus manoeuvre along with longitudinal traction to achieve reduction as done in our patient. It is extremely important that on-table stability check should be done under anaesthesia and confirmed with fluoroscopy.^{4 15} A widening of more than 1 mm at the ulno-humeral joint (between distal humeral joint line and

Table 3 Clinical features of anterior elbow dislocation

	Clinical features
Inspection	Elbow held in flexion and supported by opposite hand Forearm may be held in pronation or supination Swelling and deformity around elbow joint Loss of prominence of olecranon and hollow on the extensor aspect of the elbow Arm appears shorter and forearm appears longer
Palpation	Tenderness Loss of three bony point relationship
Movement	Extension of elbow painfully restricted, assisted flexion possible Check for distal neurovascular status

Patient's perspective

As quoted by Hippocrates himself, this injury which I sustained was the most painful till now in my life. After the MRI, which showed significant injury to my ligaments and muscles my treating doctors discussed in detail about the treatment options available explaining the pros and cons of surgical and non-surgical treatment. The treating doctors' reassurance and the full faith I had in them as well as in Almighty gave me the courage to opt for non-operative treatment and I obediently followed their instructions. I am extremely happy with the treatment provided and the good outcome I could achieve due to the timely intervention of my treating doctors and take this opportunity to thank them and their supporting staffs. Now I am totally asymptomatic and able to carry out all my routine activities with the injured limb. I am more than happy to share the details of my injury and treatment as it could help doctor's world over to recognise injuries similar to what I had and plan their treatment accordingly. My personal comment is that whenever there is a chance allow mother nature to take care of healing.

Learning points

- ▶ Simple anterior dislocation of elbow joint is a rare injury and is usually caused by distraction or torsional forces.
- ▶ There is high incidence of associated musculoligamentous injuries and should be looked for.
- ▶ Reduction by closed method is possible if we know the exact mechanism of elbow injury. However, if difficulty is encountered in achieving reduction by closed technique it is wiser to do exploration and open reduction.
- ▶ It is extremely important to check the stability of reduction on table and when possible confirm with fluoroscopy. Definitive treatment should not only be based on the severity of the injury/instability, but also on the age, occupation, dominance of the injured limb and associated injuries.
- ▶ In case of collateral ligament injury, immobilisation should be provided with forearm in supination (for medial collateral ligament), pronation (for lateral collateral ligament) or mid-prone (combined injury). Early protected active-assisted mobilisation should be initiated to achieve better functional results in simple elbow dislocations.

the proximal ulno-radial joint line) during valgus stress test is considered as subtle valgus instability.¹ Widening of over 1.5 mm at the radio-capitellar joint on varus stress testing is considered as subtle varus instability. Mild and moderate instability are determined by angular displacement of $<10^0$ (mild) or $>10^0$ (moderate) on stress testing.^{1,3} If the joint re-dislocates, it signifies severe instability. Another radiological sign which signifies joint instability and noted on the lateral radiograph is the 'drop sign'. It represents the ulno-humeral distance at the midpoint of the ulno-trochlear arc and more than 4 mm signifies severe instability.¹ If severe instability is noted, it warrants repair of the collateral ligaments. If the elbow still continues to be unstable, a spanning external fixator or trans-olecranon K wire fixation should be done.

Post reduction, apart from plain radiographs, a CT scan and a MRI would be beneficial to rule out un-displaced fractures, avulsion fractures, intra-articular loose fragments and to assess

the soft tissue status around the elbow.¹⁴ On the MRI, the T2 weighted or short tau inversion recovery (STIR) coronal imaging sequences of the distal Humerus with the elbow in extension will classically show the injury to the MCL and the common flexor origin. But in our case, the MRI was performed with the elbow immobilised in 90° flexion with a posterior plaster slab which was applied following closed reduction to alleviate pain, to prevent further injury to the soft tissues and possible re-dislocation while positioning the elbow for scanning. This limited our ability to take ideal coronal imaging sequences. Nonetheless, available images were sufficient to arrive at the consensus about the partial injury pattern. The decision to repair the collateral ligaments should not only be based on the severity of the injury/instability but also depend on the age, occupation, dominance of the injured limb and associated injuries. As in our patient, despite high-grade partial tear of the MCL and common flexor origin we decided to manage him non-operatively based on the post-reduction stability test, elderly age, sedentary work style and injury being on the non-dominant side. Also we could get excellent functional and radiological outcome. However, if it was a young and active patient or if there was an associated bony or neurovascular injuries we would have managed the patient surgically.

Temporary immobilisation would help in healing of capsuloligamentous structures, reduce pain and prevent re-dislocation.¹⁵ If associated MCL injury is noted the limb is immobilised with the forearm in supination, while its held in pronation when LCL injury is suspected or in neutral rotation if combined ligamentous lesions are evident.¹⁵ Many authors have highlighted the advantages of early mobilisation as delay in mobilising can end in stiffness and poorer outcome.^{5,9}

Associated complications with an anterior dislocation of the elbow can include neurovascular injuries, compartment syndrome, HTO, chronic instability, arthritis and stiffness.^{14,15} As elbow is one of the most common joints to develop HTO, we justify our decision to give oral indomethacin as a prophylactic measure.

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