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Case Report

Posterior Ulno-Humeral Dislocation with Radioulnar Shaft Fracture: Case Report and Literature Review

Ramin Shayan-Moghadam[1,*], Mahboubeh Motahel[2], Mohammadhasan Sharafi[1], Leila Oryadi Zanjani[3,*]

[1] Resident, Department of Orthopedic and Trauma Surgery, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
[2] Medical Student, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3] Assistant Professor, Department of Orthopedic and Trauma Surgery, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran

[*]Corresponding author: Ramin Shayan-Moghadam; Department of Orthopedic and Trauma Surgery, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-9133254159, Email: ramin.sh7293@gmail.com

[*]Co-corresponding author: Leila Oryadi Zanjani; Department of Orthopedic and Trauma Surgery, Shariati Hospital, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-9125973795, Email: leila_zanjani@yahoo.com

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Abstract

Background: The occurrence of radioulnar shaft fracture and elbow dislocation simultaneously is not a usual event, and it has only been reported in a few studies. This study aimed to report a case with posterior ulno-humeral joint dislocation and concomitant radioulnar shaft fracture. Furthermore, in a literature review, we summarized other studies that reported this kind of fracture-dislocation and the treatment chosen in each study.
Case Report: A 12-year-old boy was admitted to the emergency department due to high-energy trauma following a car accident while cycling. Open fracture of the left radioulnar shaft and posterior dislocation of the left elbow were detected.
Conclusion: More studies are required to advance our knowledge about this kind of fracture-dislocation, especially its mechanism of injury. Subsequent examinations can help us design an efficient classification system and determine the best treatment option for radioulnar shaft fracture with elbow dislocation.

Keywords: Fracture Dislocation; Elbow; Monteggia Fracture

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Background

Elbow is a stable joint because of its static and dynamic stabilizer components. Ulno-humeral (coronoid) and radio-humeral articular structures, the joint capsule, and collateral ligaments are static stabilizers. Muscles around the elbow construct dynamic stabilizers (1).

The joint stabilizers cause elbow dislocation much less frequently than shoulder dislocation. As a result, elbow dislocation and concomitant radioulnar fracture are scarce conditions that occur only in high-energy trauma such as vehicle collisions, falling from heights, and sports injuries (2-4).

Monteggia fracture-dislocation (ulnar shaft fracture accompany radial head dislocation) and terrible triad (concomitant coronoid fracture, radial head fracture, and ulno-humeral joint dislocation) are two common, well-known mechanisms for concomitant forearm fracture and elbow dislocation (5-7).

However, the occurrence of radioulnar shaft fracture and elbow dislocation simultaneously is not a usual event, and it has only been reported in a few studies.

The present paper aimed to report a case with posterior ulno-humeral joint dislocation and concomitant radioulnar shaft fracture. Furthermore, in a literature review, we summarized other studies that reported this kind of fracture-dislocation and the treatment chosen in each study.

Case Report

A 12-year-old boy was admitted to the emergency department due to high-energy trauma following a car accident while cycling. To elaborate, the car hit the left upper limb of the child. After a primary survey according to the Advanced Trauma Life Support (ATLS) at the resuscitation room and rulings out life-threatening injuries, we started to evaluate musculoskeletal damages.

The patient complained of left-elbow and forearm pain and limitation in elbow movements. The pain did not alleviate by analgesics. There were no complaints of pain in other parts of his body. No past medical history was reported.

Physical examination revealed apparent deformity and a 2 cm long laceration at the middle part of the left forearm (Figure 1).

Figure 1. Forearm appearance and obvious laceration

Tenderness was detected during palpation of the middle part of the left forearm and elbow. Elbow movements were severely limited and painful. Neurovascular evaluation of the left upper limb was regular.

After obtaining the necessary radiographs (Figure 2), left radioulnar shaft open fracture and posterior dislocation of the left elbow were detected. Immediately, ulno-humeral joint dislocation was reduced under sedation in the emergency room and stabilized with a long upper limb splint.

Figure 2. Anteroposterior (AP) and lateral views of the patient's elbow and forearm

He was scheduled for a radioulnar shaft fracture. On the next day of admission, surgical fixation with plate and screw was done for radioulnar fracture through the volar Henry approach for radius and standard approach for ulna fracture (Figure 3). After radioulnar fixation, we checked for elbow instability under C-arm visualization. The elbow joint was completely stable through a full range of motion (ROM). We placed the limb in a long-arm splint for two weeks. Active assisted ROM began after one week.

Figure 3. Postoperative anteroposterior (AP) and lateral views of the forearm

Discussion

We present a rare case with posterior dislocation of the ulno-humeral joint with concomitant radioulnar shaft fracture. Posterior dislocation of the elbow and radioulnar shaft fracture is rare and only reported in a few studies. As a result, there is no uniform information about the epidemiology, mechanism of injury, classification, and treatment of this kind of fracture-dislocation.

Literature Review

In our primary research, we realized that there were a few case reports about the posterior dislocation of elbow and concomitant radioulnar shaft fracture. Finally, we found that just one study case among them was very similar to ours (in both, radial head was not dislocated unlike Monteggia fractures). In our study, we systematically searched the electronic databases, including MEDLINE via PubMed, Scopus, ISI Web of Science, and Google Scholar, till January 2022. The following keywords were used systematically in all mentioned databases: ("Monteggia fracture" OR "ulnar fracture" OR "radius fracture" OR "radial shaft fracture" OR "ulnar shaft fracture" OR "radioulnar fracture" OR "radioulnar shaft fracture" OR "distal radioulnar fracture" AND ("elbow dislocation" OR "ulno-humeral dislocation").

Only English papers were used in our review and included all observational and interventional studies. Limitations were applied to exclude conference papers, editorials, letters, commentaries, short surveys, and notes. We followed the principles of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (8).

A total of 145 articles were identified initially. After duplicate removal, two independent researchers screened 113 articles by title and abstract, and selected 32 titles for full-text assessment. Six more papers were added after checking the reference lists of the included studies. From the 38 articles that underwent full-text assessment, 11 titles were finally included in the review (Figure 4). Table 1 provides a summary of the included articles

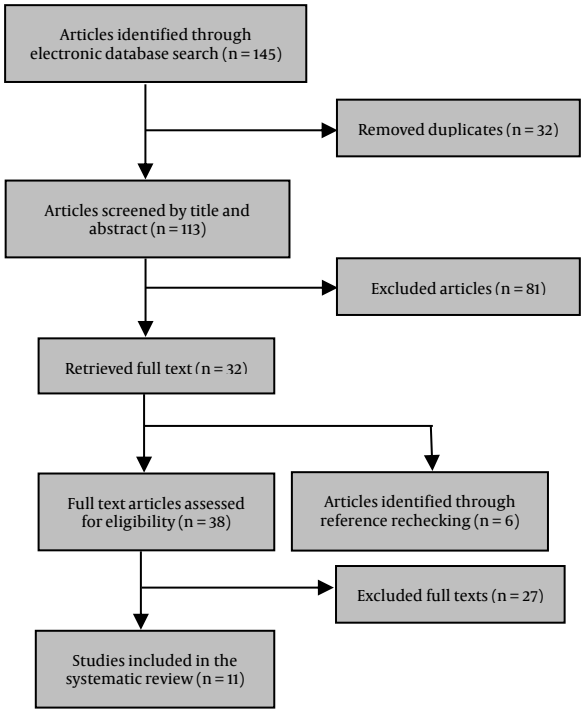

Figure 4. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for identification and selection of the studies

Table 1. Summary of the reviewed studies

The first author (publish year)	Fracture-dislocation type	Case presentation and mechanism of injury	Treatment
Hung et al. (2003) (10)	Posterior dislocation of right elbow along with posteriorly angulated ulna and radius fracture	A 68-year-old woman with posterior dislocation of right elbow along with posteriorly angulated ulna and radius fracture due to falling on her flexed elbow while descending from a bus	CR of the elbow with longitudinal traction, ORIF with DCP for radioulnar fracture
Fleming et al. (2004) (13)	Posterior dislocation of the left elbow along with an open fracture of the distal radius and ulna	An 8-year-old girl with posterior dislocation of left elbow along with distal radius and ulnar fracture after falling from playground slide	CR of the elbow, ORIF with K-wire for forearm fractures
Mathur et al. (2006) (12)	Divergent dislocation of the superior radioulnar joint and posterior dislocation of the ulno-humeral joint along with distal radius and ulnar fracture	A 12-year-old girl with left forearm-elbow fracture-dislocation after falling down 10 steps and landing on her outstretched hand while her elbow was extended and her forearm was pronated at injury time (weak radial pulse in the injured side)	CR of the elbow, ORIF with K-wire in radius fracture, CR of the ulnar fracture
Kose et al. (2008) (3)	Posterolateral dislocation of the right elbow with concomitant distal radioulnar fractures	An 80-year-old woman with posterolateral dislocation of the right elbow with concomitant distal radioulnar fractures after falling from stairs and landing on the outstretched hand	CR under sedation for the elbow, plate and screw for radioulnar fracture
Ramesh and Lim (2011) (2)	Left radioulnar fracture and ulno-humeral dislocation	A 20-year-old man with left radioulnar fracture and ulno-humeral dislocation combined with type 1 coronoid fracture and deep branch of radial nerve palsy after falling while playing Sepak Takraw	Traction and manipulation for elbow reduction, ORIF with LC-DCP for radioulnar fracture
Rijal (2012) (15)	Posterolateral dislocation of the left elbow as well as fracture of the shaft of radius and ulna	A 16-year-old boy with posterolateral dislocation of the left elbow and fracture of the shaft of radius and ulna due to a road traffic accident	CR of the elbow, ORIF with DCP for fracture of ulna and radius and back slab for 3 weeks
Kumar et al. (2013) (14)	Open segmental fracture of both bone forearm with an extruded segment of radius and dislocation of the ipsilateral elbow in the right arm	A 12-year-old girl with an open segmental fracture of both bone forearm with an extruded segment of radius and dislocation of the ipsilateral elbow in the right arm after falling from a tree	CR of the elbow, reimplantation of extruded bone after sterilization and forearm internal fixation using K-wire
Goni et al. (2015) (4)	Posteromedial dislocation of the right elbow with lateral humeral condyle fracture and right radioulnar shaft fracture	A 44-year-old woman with posteromedial dislocation of the right elbow with lateral humeral condyle fracture and right radioulnar shaft fracture due to falling from a motorbike as a pillion rider	CR of the elbow and back slab applied, ORIF with LC-DCP for radioulnar shaft fracture
Hassini et al. (2018) (15)	Diaphyseal fractures of radius and ulna along with posterior dislocation of right elbow	A 10-year-old boy with fracture of shaft of radius and ulna along with posterior dislocation of his right elbow after falling from a height of 1 m with a reception on his right hand palm	Elbow CR with longitudinal traction and flexion of the elbow, CR of forearm bone fracture and fixation with long arm cast for 8 weeks
Dharmshaktu (2019) (10)	Posterior dislocation of the right elbow and concomitant radioulnar shaft fracture	A 9-year-old boy with posterior dislocation of the right elbow and concomitant radioulnar shaft fracture after falling from a height of approximately 5 feet and landing on the outstretched hand	CR of the elbow, internal fixation of forearm fracture with intramedullary nailing (TENS)
Alencar Neto et al. (2019) (16)	Humeral shaft fractures combined with left elbow dislocation and fracture of the distal third of forearm bones (ulna greenstick fracture and distal radial epiphyseal dislocation)	A 13-year-old boy who had fallen from a height of 3 m with fractures in his left humerus, radius, and ulna along with elbow dislocation	CR of the elbow, epiphyseal dislocation, and ulna greenstick fracture, antebrachiopalmar splint, then fixation with a retrograde flexible rod for humeral shaft fracture
Our case	Posterior ulno-humeral dislocation with radioulnar shaft fracture	A 12-year-old boy with a forearm-elbow fracture-dislocation following a car accident when he was cycling	CR of the ulno-humeral joint, ORIF with plate and screw for forearm bone fracture

CR: Closed reduction; ORIF: Open reduction and internal fixation; DCP: Dynamic compression plate; LC-DCP: Limited contact-dynamic compression plate; TENS: Titanium elastic nail system

Ramesh and Lim reported a 20-year-old man with a radioulnar fracture and ulno-humeral dislocation combined with type 1 coronoid fracture and a deep branch of radial nerve palsy, which is almost like the case we reported. They have named this type of fracture "reverse Monteggia fracture" due to ulno-humeral dislocation instead of radio-capitellar (2). Olney and Menelaus studied an extensive series of Monteggia lesions in 102 children to determine which fracture types and equivalent lesions (based on Bado classification) mainly occurred in children. Their study revealed that type 1 and type 3 occurred frequently, and types 2 and 4 were sporadic in children.

They concluded that although the Bado classification system was applicable in childhood injuries, maybe a more comprehensive classification system for Monteggia fracture-dislocation was needed in children (9). Ulno-humeral dislocation is not considered in the Bado classification system; therefore, according to these results, we suggest a new classification system for Monteggia-relevant fractures.

The mechanism of injury of the current fracture-dislocation is not clearly defined. According to Kose et al. case report, the means of posterolateral elbow dislocation with a distal radioulnar fracture in an 80-year-old woman was explained. They declared that this type of fracture-dislocation occurred while the elbow was in extension, the forearm in hyper pronation, and the wrist in radial deviation when falling on an outstretched hand. Elbow dislocation occurred first, and then both the radius and ulnar bones fracture (3).

Dharmshaktu also reported the exact mechanism of injury for mentioned fracture-dislocation (10). Hung et al. reported a 68-year-old woman with posterior dislocation of the right elbow and posteriorly angulated ulna and radius fracture due to falling from a bus to the ground with her flexed elbow as a mechanism of injury (11).

There is no proven treatment for forearm fracture with posterior elbow dislocation. Dharmshaktu used intramedullary nailing for this kind of fracture in a nine-year-old patient (10). Mathur et al. (12), Fleming et al. (13), and Kumar et al. (14) used Kirschner wire (K-wire) for fracture fixation. Hassini et al. used closed reduction and fixation with a long arm cast for forearm bone fracture treatment (15). We used a plate for fixation, which appears to be a practical therapeutic choice for short-term follow-up.

Ramesh and Lim (2), Kose et al. (3), Goni et al. (4), Rijal et al. (15), and Hung et al. (11) applied plate and screw for fracture fixation like our treatment method. Alencar Neto et al. reported a 13-year-old boy with elbow dislocation and radioulnar fracture accompanied by humeral shaft fracture, which has not been reported formerly. They applied a closed reduction method for elbow and forearm bones, antebrachiopalmar splint, and then retrograde flexible rods for humeral fracture treatment (16).

However, more studies are required to advance our knowledge about this kind of fracture-dislocation, especially its mechanism of injury. Subsequent examinations can help us design an efficient classification system and determine the best treatment option for radioulnar shaft fracture with elbow dislocation.

Conclusion

Identifying and classifying forearm fractures accurately is essential for effective therapy. However, more study is required to advance our knowledge about this kind of fracture-dislocation, especially its mechanism of injury. Subsequent examinations can help us design an efficient classification system and find out the best treatment option for radioulnar shaft fracture with elbow dislocation.

Conflict of Interest

The authors declare no conflict of interest in this study.

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None.

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