



Bipolar dislocation of the forearm (floating forearm)

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Bipolar dislocation of the forearm (floating forearm) is an unusual injury and is therefore often overlooked. We report a 28-year-old male patient who presented at another center with a history of a fall while climbing a tree. The patient's left elbow was treated with closed reduction and immobilization with a long-arm cast brace due to elbow dislocation. However, the patient was admitted with pain and swelling of the wrist to our emergency department the following day. Physical and radiological examination revealed dorsal trans-scaphoid perilunate dislocation. A dorsal incision was performed for open reduction and internal fixation to provide wide surgical exposure. Concomitant occurrence of elbow dislocation and fracture-dislocation of the perilunate is infrequent. Therefore, physicians should be aware of possible additional injuries and current recommended treatment methods.

Key words: Elbow dislocation; floating forearm; fracture-dislocation of the perilunate.

Bipolar dislocation of the forearm consists of dislocation of the elbow with fracture-dislocation of the perilunate. Simultaneous ipsilateral elbow and perilunate dislocation, or floating forearm, is a very unusual injury. These injuries usually occur with high-energy traumas.^[1-4]

We present a case with concomitant ipsilateral elbow and dorsal trans-scaphoid perilunate fracture-dislocation.

Case report

A 28-year-old male with a long-arm plaster cast presented at our center following hospitalization and closed reduction for dislocation of the left elbow at another institution, due to a fall while climbing a tree (Fig. 1a, b). On evaluation, the patient complained of pain in the hand with diffuse tenderness and swelling. Additionally, the patient had complaints of numbness in the palm and all fingers. Radial and ulnar pulses could be palpated, although with difficulty due to marked swelling. Open

injuries and skin lesions were not observed.

On conventional anteroposterior (AP) radiograph, scapholunate joint space was observed to be greater than 3 mm. The normal rectangular profile of the lunate appeared triangular due to its tilt. Additionally, an osteochondral fracture of the scaphoid with displaced scaphoid fracture and bony fragment neighboring the scaphoid were signs of interosseous ligament injury. Furthermore, ulnar styloid fracture of the wrist was observed although it was not large enough to warrant fixation. On a lateral radiograph of the wrist, the imaginary line connecting the centers of the radius, lunate and capitate was broken. Additionally, the lunate was dislocated volarly and the line connecting the capitate with the axis of the radius passed through the edge of the lunate only (Fig. 1c, d).

Emergency surgery was planned due to the neurological symptoms such as paresthesias in the palm and all fingers and circulatory disturbance such as diffuse ten-

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Fig. 1. (a) Anteroposterior and (b) lateral radiograph of the dislocation of the elbow. A conventional (c) anteroposterior and (d) lateral radiograph of perilunate dislocation of the wrist. (e, f) After reduction, stabilization of the perilunate dislocation of the wrist was achieved by transfixation.

derness and swelling in left hand. Initial closed reduction under general anesthesia for perilunate fracture-dislocation was not successful and open reduction was attempted. A dorsal incision was performed for the carpal dislocation and revealed a torn dorsal capsule trapped between the capitate and the lunate that prevented the reduction of the midcarpal dislocation. The scapholunate interosseous ligament was ruptured. After reduction, stabilization was achieved by transfixation with four K-wires; two from the scaphoid into the lunate and two more from the capitate into the lunate. The displaced scaphoid fracture was also fixed by two K-wires from the scaphoid into the lunate. The elbow was found to be stable under fluoroscopic imaging (Fig. 1e, f).

Postoperatively, the patient was immobilized using an above-the-elbow splint for three weeks followed by a

below-the-elbow thumb spica plaster cast. The cast and K-wires were removed at the 6th postoperative week. Radiographs of the left elbow and wrist were satisfactory. Intensive physiotherapy was applied due to stiffness of the elbow and wrist.

There were no symptoms of neurologic dysfunction at the two year follow-up (Fig. 2a, b). The patient reported no pain during manual labor. Active range of motion was measured at 50/0/40° for extension/flexion in the wrist using the neutral-0 method. Radiographs of the wrist and elbow were taken at the 2nd year follow-up. Posttraumatic arthritis was not detected in the elbow radiograph (Fig. 2c, d). On magnetic resonance imaging (MRI), ligaments of the wrist appeared healed and stable and there were no signs of avascular necrosis of the scaphoid, lunate and proximal capitate (Fig. 2e, f).



Fig. 2. (a, b) There were no symptoms of neurologic dysfunction at the 2nd year follow-up. After two years, no symptoms of posttraumatic arthritis was detected in radiographs of the (c) wrist and (d) the elbow. (e, f) The ligaments of the wrist were healed and stable, and no signs of avascular necrosis of the scaphoid, lunate and proximal capitate were present on the magnetic resonance imaging views at the end of two years. [Color figures can be viewed in the online issue, which is available at www.aott.org.tr]

Discussion

Ipsilateral elbow and wrist dislocation is a very rare injury.^[1-4] In the absence of other fractures, only three cases of isolated bipolar fracture dislocation have been reported in the literature. In the three cases reported by Chen, two included additional fractures and only one was an isolated bipolar dislocation diagnosed after 6 weeks and undergoing resection of the proximal row.^[1] Prasad et al. reported a case with additional radial styloid fracture and no follow-up.^[2] In the present case, diagnosis was missed due to the absence of pain and swelling of the wrist on the first day. In a case reported by Daoudi et al.,

the injury was easily identified due to the presence of an open wound on the volar aspect of the wrist.^[3] Zejjari et al. reported a case of bilateral floating forearm after a fall from a height with similar functional results to other cases reported in the literature.^[4]

Perilunate dislocation occurs due to high-energy trauma, such as a motor vehicle accident or a fall from a prominent height. These patients often have associated injuries and it is common for the wrist injury to be overlooked. Elbow dislocation is observed at a rate of 20%.^[5] In 1993, Herzberg et al.^[6] found the incidence of perilunate fracture-dislocation to be twice that of perilunate

dislocation. The incidence of missed initial diagnosis of perilunate dislocation has been reported as high as 25%, which increases with an obvious elbow dislocation in high-energy trauma. Inadequate assessment during the initial examination or misdiagnosis may result in worse prognoses.^[2,5,7]

The carpal bones around the lunate may be displaced, usually the result of a hyperextension injury. In perilunate dislocations, the carpal bones are displaced volarly or dorsally. Many variations, depending on the direction and amplitude of forces, can be observed. These forces also determine the spectrum of injuries occurring in association with perilunate dislocations.^[5,8]

Radiography is the main tool of diagnosis.^[5,8] In standard wrist radiographs, the AP view may appear relatively normal while lateral radiographs reveal loss of co-linearity of the radius, lunate and capitate. In cases in which breaks are present in this line, an intracarpal malalignment should be strongly suspected. In a dorsal perilunate dislocation, the capitate rests on top of the lunate.^[5,9] In our case, dorsal perilunate dislocation was apparent on lateral radiograph of a volar lunate subluxation. The capitate and associated carpal bones were well aligned with the radius.

Treatment options include cast immobilization, percutaneous pin fixation and open reduction and internal fixation (ORIF) through a dorsal, volar, or combined dorsal-volar approach.^[5,8,10] The type of approach is controversial, although dorsal incision is advocated as it provides sufficient visualization of the fragments and reduction of both the fracture and the dislocation and significantly reduces operative time. However, the median nerve may be compressed in the carpal canal by the lunate and the patient may display signs of median nerve injury. In cases where decompression of the median nerve is necessary, the palmar approach is possible.^[5,8,10] For the significant repair of the scapholunate interosseous ligament, no. 0 nonabsorbable horizontal mattress sutures should be placed, if possible, through the bone.^[5]

In conclusion, perilunate dislocation may be overlooked due to their unexpected nature in concurrence with a dislocated elbow following trauma. Careful clinical examination and urgent intervention should be performed in these cases. Assessment of the adjacent joints, shoulder and wrist should be included if the clinical ex-

amination suggests injury. Carpal dislocations are complex and difficult to adequately evaluate without multiple radiographs taken in various projections.

Conflicts of Interest: No conflicts declared.

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