Case report

Rare carpometacarpal dislocations

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Posttraumatic carpal and carpometacarpal (CMC) dislocations represent a heterogeneous group of disorders resulting from high-energy wrist trauma. Perilunate injury is the most common and best-known manifestation of carpal dislocation, typically occurring after hyperextension trauma. Other forms are very rare and have different causative mechanisms. Carpometacarpal (CMC) dislocations are also uncommon and may affect isolated or multiple CMC joints. These lesions are prone to wrist instability if not treated promptly. The aim of this article is to provide a systematic radiologic approach to the evaluation of wrist injury and to present two acute cases of rare CMC dislocations.

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1. Introduction

Posttraumatic carpal and carpometacarpal (CMC) dislocations represent a heterogeneous group of disorders most commonly resulting from high-energy wrist trauma. They are easily overlooked in the emergency setting if both clinicians and radiologists do not apply a high index of suspicion. When left untreated, these injuries can lead to chronic pain, stiffness and posttraumatic arthritis (Figs. 1 and 2).

Conventional radiology (CR) remains the first line imaging modality in the immediate posttraumatic setting. Whenever discordance exists between clinical and radiological observations, computed tomography (CT) should be used as a problem solver [1].

2. Clinical cases

2.1. Case 1

A 56-year-old woman presented to the emergency department with left wrist pain and dysfunction after sustaining a motor vehicle collision. Clinical examination revealed wrist deformity with hematoma. Anteroposterior (AP), lateral and internal oblique radiographs of the left hand showed an isolated ulnar and volar dislocation of the 5th CMC joint, without fracture. Treatment consisted of 5th CMC pinning for six weeks (Fig. 3).

2.2. Case 2

A 28-year-old patient was involved in a motor vehicle accident. He presented with wrist pain, loss of function and deformity. Radiographs revealed a dorsal luxation of 4th and 5th MCP without fracture (Fig. 4). Treatment consisted of 4th–5th MCP pinning for six weeks.

3. Discussion

Carpal and CMC dislocations are rare entities that will often present with only subtle abnormalities on CR images. As a result, they are easily overlooked or neglected in favor of more evident posttraumatic injuries. Such patients are at risk for long-term disability with osteoarthritis (Figs. 1 and 2). The eight carpal bones form an intricately connected unit that allows for three-dimensional movements of the wrist. They are divided into two horizontal rows. The proximal row (scaphoid, lunatum, triquetrum) forms an intercalated segment between the radius and the distal carpal row, and maintains wrist stability. The distal row, supporting the metacarpals, consists of the trapezium, trapezoid, capitatum and hamatum. Both intrinsic and extrinsic ligaments support the wrist. The extrinsic ligaments run between the radius or ulna and the carpal bones, whereas the intrinsic ligaments link adjacent carpal bones.

Carpometacarpal dislocations are uncommon, and are more often multiple than solitary. In one study of 20 cases, 30% of dislocations involved 2nd and 5th metacarpals, 30% involved 4th and 5th MCP and 25% represented an isolated 5th metacarpal dislocation. Of all solitary CMC dislocations, 50% involve the fifth, and 25% the...
second CMC joint [2–5]. CMC dislocations of the thumb are very rare [6]. These lesions are often associated with carpal fractures, the capitatum and hamatum being the most frequently involved bones.

The anatomy of the 5th hamatometacarpal joint allows for an opposition of 15 to 20°, its mobility being restricted by a ligamentous complex. More often than not, an external force will disrupt the bone rather than this ligamentous support (Fig. 5).

A dorsal 5th CMC dislocation occurs secondary to a force directed along the longitudinal axis of the 5th metacarpal shaft. The flexor carpi ulnaris tendon draws the 5th metacarpal proximally. A direct blow to the lateral aspect of the 5th metacarpal base can produce a volar 5th CMC dislocation. These can be further subclassified as ulnar or radial, depending on whether the flexor carpi ulnaris tendon and pisometacarpal ligament are intact.

Gangloff et al. have presented a study of 31 5th CMC dislocations, all of which were dorsal, with only one isolated dorsal 5th CMC dislocation without fracture of the 5th metacarpal base [7]. In our first clinical case, the 5th metacarpal dislocation was volar without fracture (Fig. 3).

In 30% of cases, these lesions were overlooked in the initial posttraumatic setting but could be seen retrospectively [8].

A systematic approach to a wrist radiograph involves careful examination of both intercarpal (IC) and CMC joints. The basic wrist CR series in a posttraumatic setting include PA, lateral and anteroposterior (AP) and PA oblique views. On the PA view, we should verify the normal alignment between the carpal bones, the integrity of the three carpal arcs (Gilula’s arcs) and the respect of the joint spaces, which should be of uniform width (1–2 mm) without any overlap of articular surfaces. Disruption of any of these arcs should raise the suspicion of carpal injury. Their normal appearance on a

![Fig. 1. A 45-year-old man with history of left wrist trauma 15 years ago. X-ray shows a chronic lunate dislocation with scaphoid fracture: a: PA radiograph shows a severe disruption and loss of continuity of the proximal carpal row (white arrows). The lunatum is not clearly visible. The scaphoid is smaller than expected. The most proximal arc of Gilula cannot be drawn; b: lateral radiograph shows a volarily dislocated lunatum (white arrowhead).](image)

![Fig. 2. The same patient. Chronic lunate dislocation with scaphoid fracture. CTA: Compute Tomography Arthrography: a: ventral paracoronal plane. The lunatum (star) is abnormally positioned at the level of the flexor tendons. It articulates laterally with a displaced fragment of the scaphoid bone; b: coronal image shows a preserved continuity of the distal carpal row. The proximal row is severely disrupted (arrowhead); c: sagittal image confirms the complete volar dislocation of the lunatum (arrow).](image)
PA projection has been likened to a 'parallel M' [2]. When a CMC joint dislocation is suspected, the basic CR series can be further supplemented with internal or external oblique views of the hand, to examine the 4th–5th and 2nd–3rd CMC joints, respectively.

On the lateral view, the extended middle finger forms a continuation of the axis of the forearm in a neutral position. We should always verify the alignment of the radius-lunate-3rd metacarpal bone and answer to the following question: Is the capitatum congruous with the cup of the lunatum?

To the best of our knowledge, there seems to be no generally accepted diagnostic algorithm for wrist imaging beyond CR in the acute setting. However, there is evidence pointing towards the limited sensitivity of X-ray in the detection of posttraumatic bone injury [9]. Both CT and magnetic resonance imaging (MRI) have been used as second-line imaging modalities. MRI has been shown to be superior to CT in the detection of purely trabecular fractures [10]. As for the detection of cortical disruptions, there is no consensus as to which modality is the most sensitive [11].

The radiation dose of a CT exam might be a factor of concern to clinicians, especially in young patients. However, since the wrist is a peripheral joint, the effective dose for a wrist CT is actually very low (0.03 mSv, compared to 2 mSv for a shoulder CT in a study by Biswas et al.) [12]. Moreover, new imaging techniques with CT iterative reconstructions allow significantly reduce patient dose [13,14]. Consequently, in our opinion, the long-term adverse effects of a radiographically occult bone lesion in young people far outweigh the theoretical harm done by a wrist CT.

In a recent study by Fotiadou et al., the impact of cross-sectional imaging on the clinical management of acute wrist injury in young patients was assessed [11]. They found that in 50% of patients with clinical uncertainty and negative X-ray, an osseous injury was subsequently detected on cross-sectional imaging. MRI has the advantage over CT of being able to detect ligamentous injury, even in the absence of bone lesions. Fotiadou et al. reported that this information changed the surgical management in a number of cases [11].
Fig. 5. Mechanism of volar ulnar dislocation without fracture (schematic drawing, ventral view). Pisometacarpal ligament (void arrow) and flexor carpi ulnaris tendon attachments (black arrow) remain intact and draw the fifth metacarpal proximally. Rupture of these two structures would result in a volar radial 5th carpometacarpal (CMC) dislocation.

4. Conclusion

Carpometacarpal (CMC) dislocations are uncommon and may affect isolated or multiple CMC joints. These lesions are prone to wrist instability if not treated promptly.

A systematic radiologic approach is necessary to evaluate wrist injury but we know that X-Ray lacks of sensibility. So, a CT should be done in these cases.

Disclosure of interest

The authors declare that they have no competing interest.

References