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Clinical History:

A 35-year-old man sustained a heavy fall on his outstretched left arm. He presented with a painful and swollen left wrist.

Figure 1: Frontal radiograph of the left wrist Figure 2: Lateral radiograph of the left wrist



Answer
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What is the diagnosis?

- a) Simple fracture of the scaphoid.
- b) Trans-scaphoid perilunate fracture dislocation.
- c) Rotatory subluxation of the scaphoid.
- d) Ventral lunate dislocation.
- e) Dorsal intercalated segmental instability.

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Answer:

- b) Trans-scaphoid perilunate fracture dislocation.

Radiological findings

The frontal wrist radiographs (Figures 1 and 3) show an obvious displaced fracture across the waist of the scaphoid. There is gross disruption of carpal alignment, as evidenced by loss of parallelism, discontinuity and overlapping of the carpal arcs. The lunate has an abnormal triangular shape. The lateral radiograph (Figures 2 and 4) confirms the diagnosis of perilunate dislocation. The lunate remains normally centered over the radius, while all the other carpal bones are dislocated dorsally.

Figure 3: Figure is identical to Figure 1 with addition of arrows. The trans-scaphoid fracture is arrowed (open arrows). Arrowheads show broken arcs I (white arrowheads) and II (black arrowheads)

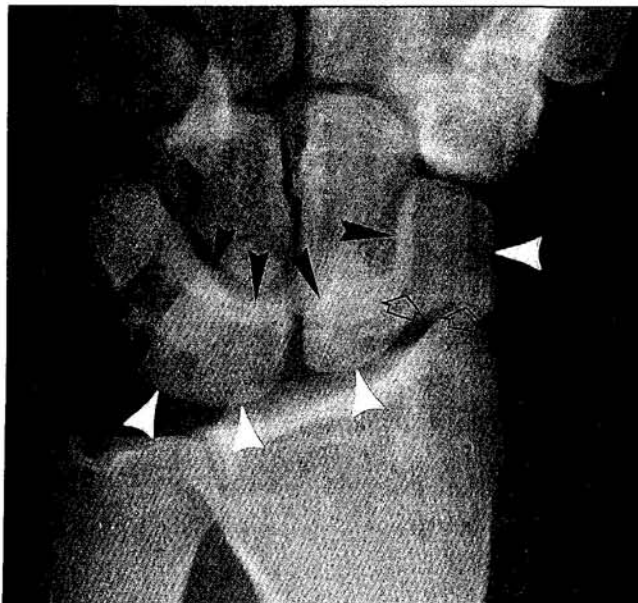
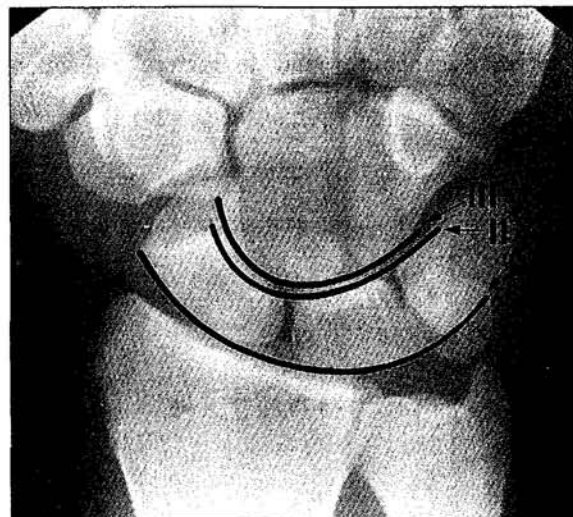


Figure 4: Figure is identical to Figure 2 with the addition of arrows. The semi-lunar shaped lunate bone (L) is in its normal position, articulating with the radius (R). The other bones of the proximal carpal row and all the bones of the distal carpal row are dislocated dorsally (white arrowheads). [C=capitate]



Figure 5: Frontal radiograph of a normal right wrist, illustrating Gilula's 3 carpal arcs



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Discussion

Simple scaphoid fracture

Fractures of the scaphoid are potentially serious injuries because of the high incidence of resultant avascular necrosis. However, displaced scaphoid fractures are usually not difficult to recognize on standard frontal wrist radiographs. On the contrary, perilunate dislocations associated with trans-scaphoid fractures may be missed if one is not aware of this association, as in this case.

Rotatory subluxation of the scaphoid

This is probably the best known type of carpal instability. It is recognized radiographically by the "signet ring" shape of the foreshortened scaphoid, a result of ventral tilting of that bone. There is often widening of the scapholunate joint space, indicating ligamentous disruption. None of these features were present in this case.

Ventral lunate dislocation

Lunate dislocation results from disruption of the ligaments between the capitate and lunate bones. In this form of carpal dislocation, the lunate bone is dislocated and rotated ventrally while the capitate remains in alignment with the radius. Accurate diagnosis of lunate dislocation is important as the displaced lunate may impinge upon and damage the adjacent median nerve. On the other hand, perilunate dislocation usually occurs with displacement of the capitate and all the surrounding bones, including the metacarpals, dorsal to a line drawn through the normal articulating lunate and radius (Figure 4).

Dorsal intercalated segmental instability (DISI)

DISI is a form of static carpal ligament instability, that is, it can be detected on standard frontal and lateral wrist radiographs. In DISI, the lunate is tilted dorsally with respect to the radius, due to abnormal ligamentous attachments which should be stabilizing the lunate and scaphoid bones. On lateral radiographs, an increased scapholunate angle of more than 80° is indicative of this condition (Normal angle is 30-60%).

In perilunate or lunate dislocations, the lunate bone has a triangular instead of the usual rhomboid shape on the frontal radiograph, but this sign may not be as easily recognised as drawing Gilula's arcs. A simple method of evaluating carpal alignment involves using the 3 carpal arcs named after Professor Louis A. Gilula of the Mallinckrodt Institute of Radiology in St. Louis, U.S.A. Arc I joins the proximal articular surfaces of the scaphoid, lunate and triquetrum. Arc II joins the distal articulating surfaces of the same 3 bones, while arc III outlines the proximal convexities of the capitate and hamate. In normal wrists, these 3 arcs should form smooth curves which do not overlap (Figure 5). Any break or abrupt step-off of a carpal arc should raise suspicion of underlying ligamentous disruption or fracture. It should be emphasized, however, that the rule of Gilula's arcs holds true only in a properly taken frontal radiograph, that is, with the wrist strictly neutral in position. ■

References

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