

# “I probably shouldn’t have tried that jump!”



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## Ben’s case

Ben, a 22-year-old snowboarder, presents to the ED following a bad fall on the slopes. His biggest complaint is the pain present in his wrist.

Upon investigation, his wrist is obviously swollen and very painful to move, limiting the usefulness of the physical exam. However, it is noted that he has no neurovascular compromise. His vital signs are normal.

### Results

He is sent for posteroanterior (PA) and true lateral x-rays of his wrist. The PA shows subtle signs of carpal instability (Figure 1). There is a disruption of Gilula’s middle line (the middle line in Figure 2) and a triangular appearance of the lunate as it overlaps the capitate. The lateral x-ray is more dramatic, showing dorsal displacement of the carpus relative to the lunate (Figure 3).

### Questions

1. What is the differential diagnosis of a fall, on an outstretched hand, in a young, otherwise healthy patient?
2. How do I evaluate wrist x-rays?
3. What is the diagnosis in this case and the pathophysiology thereof?
4. What is the ED management of this injury?
5. What are the late findings of missed perilunate dislocations?

**Continue reading for the answers to these questions.**

## Questions & Answers

### 1. What is the differential diagnosis of a fall, on an outstretched hand, in a young, otherwise healthy patient?

Described anatomically from distal to proximal, these are:

- fracture dislocations of the carpal bones,
- fracture of the distal radius,
- radial head or neck fracture and
- distal humerus fracture.

The exact mechanism of injury will be slightly varied for each of these depending on different variables, including falling from a certain height, falling with the elbow locked and falling forward or backward. Hence, the physical exam should include the most painful joint, as well as the joint above and below. In children, buckle fractures should also be considered. In the elderly, humeral head fractures are also possible.

### 2. How do I evaluate wrist x-rays?

#### *The posteroanterior view*

Three smooth lines can be appreciated in the normal wrist (Figure 2). The distal is drawn at the proximal edge of the capitate and hamate, the middle is at the distal edge of the scaphoid, lunate and triquetrum. The proximal is drawn at the proximal articulations of these three bones. If these three lines are not smooth, carpal instability can be suspected.

Increased overlap of carpal bones, especially of the lunate to the capitate, is also helpful. The lunate normally appears quadrangular. Triangular appearance is suspicious for a ligamentous disruption.

Finally, the scaphoid will normally appear elongated. If there is a bicortical density, or if there is > 3 mm between



Figure 1. PA view of the wrist, showing an abnormal triangular, or "slice of pie" shaped lunate, overlap of the capitate by the lunate and disruption of the middle line of the carpal bones.



Figure 2. View of a normal wrist, showing Gilula's three lines and a quadrangular lunate.

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the scaphoid and the lunate, instability of the carpus should be suspected. Scaphoid fractures may be invisible on plain film, so a high clinical suspicion of a scaphoid fracture should indicate thumb spica splinting with a repeat x-ray in seven to 10 days, or earlier CT or bone scan.

### *The lateral view*

The capitate, lunate and radius should be well aligned (Figure 4).

## 3. *What is the diagnosis in this case and the pathophysiology thereof?*

Ben has an acute perilunate dislocation. Perilunate dislocations and perilunate fracture dislocations are typical injuries that occur in young adults exposed to high-energy trauma. Axial injuries with compression and extension of the wrist disrupt the two carpal rows resulting in traumatic failure of connecting structures.

One of several carpal injuries that can occur following a fall on the outstretched hand include perilunate dislocations and perilunate fracture dislocations which are the most devastating closed injuries of the wrist, producing an extremely unstable wrist, which is often missed on initial evaluation with potentially detrimental complications. In this injury, the lunate is usually subluxed and angulated palmarly, but still located in the lunate fossa of the radius, as opposed to lunate dislocation (considered the last stage of perilunate dislocation) where the carpal bones and the radius remain aligned while the lunate is totally dislocated towards the volar surface of the upper extremity.

Other wrist injuries that may follow the same mechanism include:

- scaphoid fracture,
- tears of the scapholunate interosseous ligament and long radiolunate ligament, as well as
- scapholunate fracture dislocations.

With increasing severity, other ligaments and bones in the carpus will be involved, so always consider the possibility of more than one injury to the wrist.



Figure 3. Lateral view of the wrist showing the lunate dislocated in a volar direction, although still within the lunate fossa of the distal radius.




Figure 4. The lunate in normal position within the lunate fossa of the distal radius.

#### 4. What is the ED management of this injury?

Early closed reduction is necessary to reduce pain, inflammation and the risk of late median nerve pathology. A procedure for closed reduction in the setting of the ED is to apply longitudinal traction to the wrist for 10 minutes, with countertraction between the distal metacarpals and upper arm. Reduction involves simultaneous longitudinal traction and wrist extension with one hand, while the thumb of the other hand stabilizes the volar aspect of the lunate. The wrist is then flexed to push the capitate over the dorsal lunate. The reduction is held by a short thumb spica cast with the wrist in minimal palmar flexion. Post-reduction radiographs should confirm the return of normal carpal anatomical position. Early follow-up with an orthopedic surgeon is indicated. Definitive treatment, usually involving open reduction and internal fixation with maintenance of reduction using K-wires, should ideally be performed within one to two weeks of the injury.

#### 5. What are the late findings of missed perilunate dislocations?

Because perilunate dislocations occur during high-force trauma, it may be overlooked due to distraction from more serious injuries. Late presentation of missed perilunate dislocation includes a normal range of motion, variable wrist pain, flexor tendon pathology and ulnar neuropathy, including sensory deficits, hypothenar wasting, wasting of hand intrinsic muscles and weakness of the third and fourth lumbricals. 

*This department covers selected points to avoid pitfalls and improve patient care by family physicians in the ED. Feedback can be sent to [diagnosis@sta.ca](mailto:diagnosis@sta.ca).*

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