17 Perilunate Dislocation Failed Fixation

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History of Previous Primary Failed Treatment

A 24-year-old male car driver involved in a high-speed road traffic collision (RTC), sustained an injury to their non-dominant left wrist and contralateral acetabulum.

Primary radiographs of the left wrist injury are shown in Figs. 17.1 and 17.2, clearly demonstrating instability about the lunate with gross scapholunate (SL) interval widening and loss of congruency of the radiocarpal articulation. The lines described by Gilula [1] are clearly disrupted. Note the significant radial dislocation of the scaphoid, which is not typical of the recognised perilunate injury pattern. Fractures to the triquetrum and ulnar styloid are also evident.

At presentation, the patient underwent a manipulation of the injury in the emergency department, resulting in the radiographs shown in Figs. 17.3 and 17.4, and satisfactory initial reduction of the wrist.

Seven days post-injury, once their acetabulum and been surgically managed, the patient underwent surgical stabilisation of his wrist under a regional block and fluoroscopic control. Figures 17.5 and 17.6 shows the final intra-operative imaging before they were placed in a forearm backslab. One week later, routine radiographs (Figs. 17.7 and 17.8) revealed gross disruption of the midcarpal joint, necessitating revision surgery 4 days subsequently.

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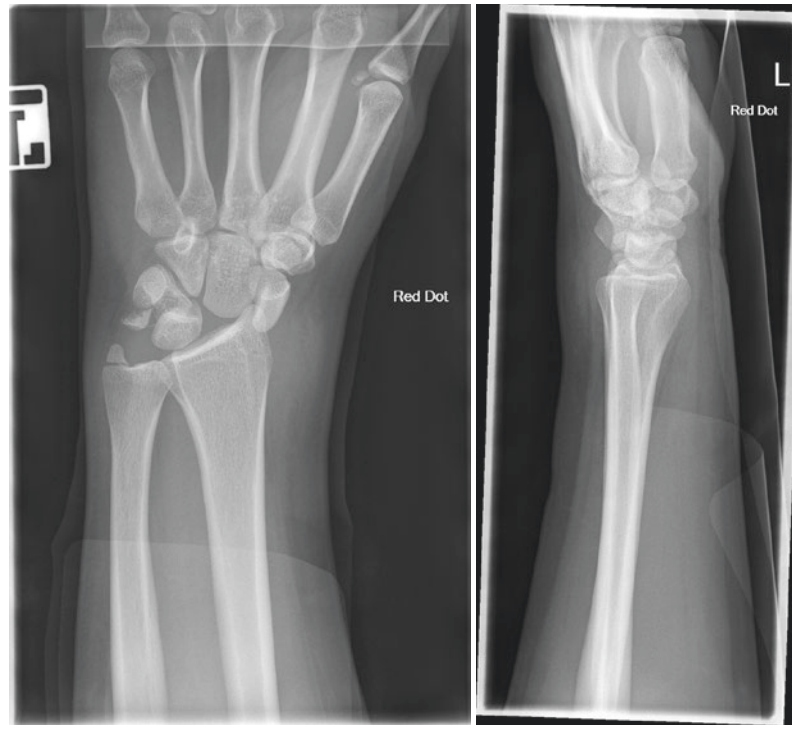
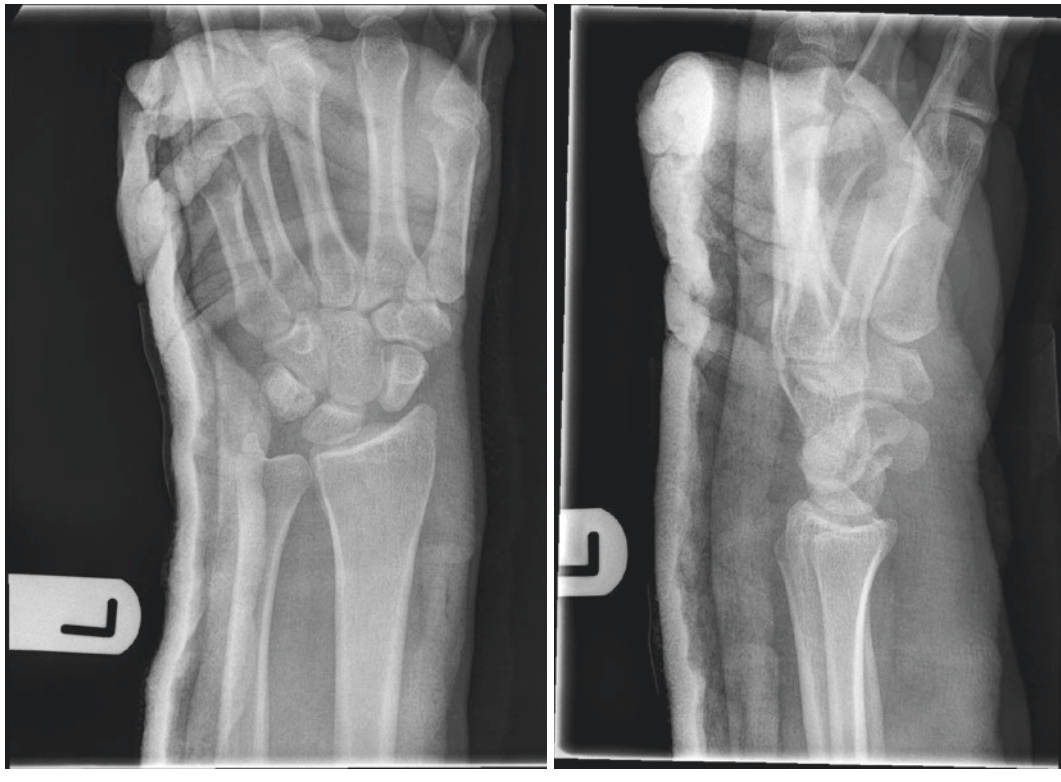
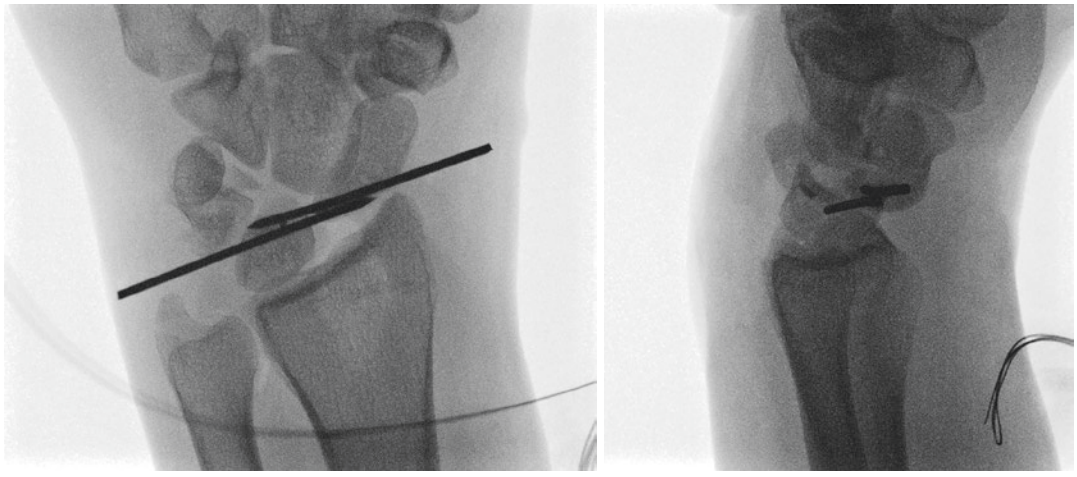


Figs. 17.1 and 17.2 AP and lateral of left wrist demonstrating instability about the lunate with gross scapholunate (SL) interval widening; there is loss of congruency of the radiocarpal articulation and there is significant radial dislocation of the scaphoid. Fractures to the triquetrum and ulnar styloid are also evident



Figs. 17.3 and 17.4 AP and lateral left wrist radiographs post manipulation showing satisfactory initial reduction of the wrist



Figs. 17.5 and 17.6 AP and lateral of the left wrist show the final intra-operative imaging before they were placed in a forearm backslab

Figs. 17.7 and 17.8 AP and lateral of left wrist of follow-up radiographs a week later revealed gross disruption of the midcarpal joint

Evaluation of the Aetiology of Failure of Fixation

The primary carpal reduction and stabilisation were performed through a dorsal approach to the wrist (between the third and fourth extensor compartments), utilising the radially based ligament sparing arthrotomy popularised by Berger [2]. At the time of the approach, trauma to the dorsal radiocarpal (DRC) ligament was documented. The operative surgeon identified a complex SL ligament tear partly avulsed from the lunate and partly avulsed from the scaphoid. Attempt was made to ensure that the SL diastasis was reduced along with dorsal intercarpal segment instability (DISI) using two 1.6 mm Kirschner wires before surgical repair of the SL ligament with two 2 mm anchors fitted with 4-0 braided, non-absorbable suture.

Figures 17.5 and 17.6 demonstrate just two wires, one inserted from the radial side through the scaphoid, and a second inserted from the ulnar side bypassing the fragmented triquetrum. While these two wires may have been able to stabilise the lunate, they were unable to confer any stability to the midcarpal joint. While the SL diastasis has been decreased, there is still incongruency of the scaphoid with respect to the radius, as well as the capitate. The lateral view shows that the midcarpal (luno-capitate) articulation does not appear to be congruent, with a volar displaced scaphoid.

The presentation radiographs (Figs. 17.1 and 17.2) show a very radially displaced scaphoid, which is not a common component of a perilunate injury. Trying to apply the basic concepts of perilunate instability here appears to have underestimated the injury severity and the likely contribution of extrinsic ligament injury in this case. Another contributor to this could have been the comminuted triquetrum and the disrupted DRC ligament encountered during surgical exposure. This high degree of instability requires a greater level of stabilisation and focus on adequate reduction of the radiocarpal and midcarpal articulations.

Clinical Examination

Following the primary stabilisation procedure, the wrist was swollen to some extent, but all wounds were clean and healthy. Movements of the digits were restricted by swelling; however, the neurological state of the hand was normal. While the patient had been instructed to be kept non-weight bearing through his incomplete cast, it would appear that he had been exposing it to load while trying to transfer from their bed after their acetabular surgery.

Diagnostic-Biochemical and Radiological Investigations

Following the radiographs taken one week post operatively, a CT was performed to help characterise the incongruent luno-capitate joint and the volar displaced scaphoid. It was deemed that, as the injury had been almost three weeks previously, the SL ligament was still amenable to primary repair in the setting of revision surgery.

Preoperative Planning

The revision surgery was planned with the help of the MDT meeting of consultant wrist surgeons and MSK radiologists. As implants had only been inserted 1 week prior, it was felt that there should be no difficulty in K-wire extraction. It was likely that anchors would not be amenable to removal from the carpal bones.

At the time of the MDT, it had been considered that the initial 1.6-mm K-wires may have been a bit too thick and may have contributed to the displaced scaphoid at the time of their insertion, by pushing the scaphoid volarwards. The decision to use more flexible 1.2-mm K-wires during the revision was made, to minimise adversely steering the clearly very unstable scaphoid at the time of wire insertion. An emphasis was placed on needing to stabilise the midcarpal joint with the revision wire configura-

tion, as this was clearly unstable. At least three wires were deemed to be necessary, and again the comminuted triquetrum was thought to be unsuitable to rely upon for the construct.

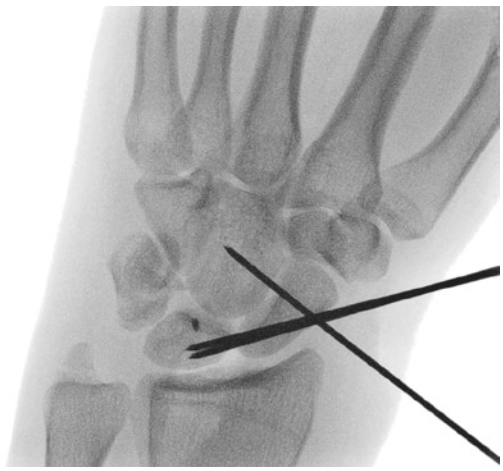
Bone graft was not applicable to this case due to the predominantly ligamentous nature of this injury.

Revision Surgery

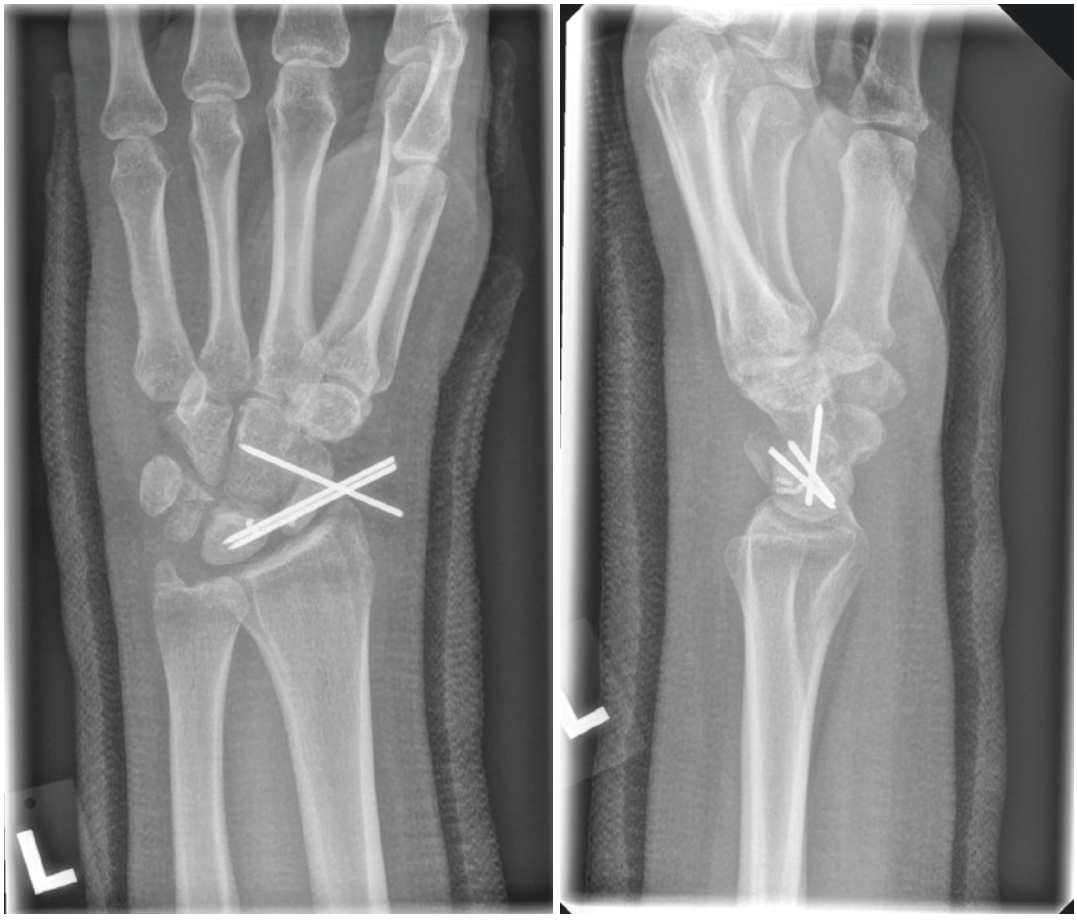
Revision stabilisation was performed under the regional block with fluoroscopic control. The previous dorsal approach was used to the wrist, along with the Berger capsulotomy. Both k-wires were removed and a dorsal wire was used to 'joy stick' the scaphoid into an anatomic position. Three 1.2-mm k-wires were then used to stabilise both the scapholunate interval and the midcarpal joint into more anatomically appropriate positions. Two wires were again used through the proximal carpal row to tray and ensure rotational stability at the SL interval. Figures 17.9 and 17.10 show the final intra-operative fluoroscopy with a reduced scaphoid and reduced midcarpal joint. At this stage, it was noted that one of the sutures holding the avulsed SL ligament had torn out of the soft tissue, therefore an additional anchor was placed into the lunate to re-tension the avulsed SL ligament.

The wires were cut and buried beneath the skin once the dorsal wound was closed, and the patient was placed in an incomplete cast. Again, the patient was advised to not weight bear through the operated wrist. A plan was made for them to be seen 1 week post-revision surgery with fresh radiographs before being put into a full forearm synthetic cast and given permission to forearm weight bear when needed. Their radiographs at this stage are shown in Figs. 17.11 and 17.12.

Eight weeks post-revision surgery, the patient had removed their wires under regional block before commencing aggressive physiotherapy to maximise their wrist range of movement and grip strength. This period of time was to allow for ligamentous healing, both of the scapholunate ligament, but also the evidently injured extrinsic wrist ligaments, to confer stability once the wires were removed.



Figs. 17.9 and 17.10 AP and lateral radiographs of the left wrist showing the final intra-operative fluoroscopy with a reduced scaphoid and reduced midcarpal joint. At this stage it was noted that one of the sutures holding the avulsed SL ligament had torn out of the soft tissue, therefore an additional anchor was placed into the lunate to re-tension the avulsed SL ligament



Figs. 17.11 and 17.12 AP and lateral radiographs of the left wrist 1 week after revision surgery showing that the wires were cut and buried beneath the skin and satisfactory reduction of the mid carpal joint and the radio carpal articulation

Summary: Lessons Learned

A key point to appreciate from this case is identifying, from the presentation radiographs (Figs. 17.1 and 17.2), that this injury is not a typical perilunate injury [3]. The surgeon must be weary due to the mechanism and the degree of scaphoid displacement that reduction is likely to be more difficult than a 'run-of-the-mill' injury around the lunate. There must also be an appreciation that there must be adequate stabilisation across the midcarpal joint, and midcarpal reduction must be scrupulously checked on intra-operative imaging.

The operative surgeon must take care not to displace unstable carpal bones when inserting k-wires to help stabilise, but also value the contribution of 'joy-stick' wires to help control unstable small bones within the wrist prior to definitive stabilisation.

This case highlights the importance of checking for displacement post-stabilisation, in this instance 1 week postoperatively. Robust clinical follow-up enabled revision to be undertaken in a timely manner while the wrist was still salvageable and amenable to ligamentous healing. The role of the MDT enabled a clear plan for revision fixation and its timely execution.

References

1. Linn MR, Mann FA, Gilula LA. Imaging the symptomatic wrist. Orthop Clin North Am. 1990;21(3):515–43.
2. Berger RA. The ligaments of the wrist. A current overview of anatomy with considerations of their potential functions. Hand Clin. 1997;13(1):63–82.
3. Mayfield JK, Johnson RP, Kilcoyne RK. Carpal dislocations: pathomechanics and progressive perilunar instability. J Hand Surg. 1980;5(3):226–41. https://doi.org/10.1016/s0363-5023(80)80007-4.