INTER-CARPAL DISLOCATIONS AND FRACTURE-DISLOCATIONS

A Review of Fifty-nine Cases

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Most of the patients in this series were treated at some stage in Royal Air Force Hospitals during the recent war. About a quarter of the total were seen or treated personally, the remainder being assessed by examination of their case-records and radiographs. Probably all except one of these patients sustained their injuries as a result of forcible dorsiflexion of the wrist joint, but the exact mechanism of injury could seldom be determined. It should be emphasized that almost all the results are early; a late follow-up of the Service cases has not been possible. The results have been assessed for convenience as "good"—a painless wrist with an adequate range of movement; "fair"—slight pain and stiffness insufficient to interfere with most normal activities; and "poor"—a painful, weak or very stiff wrist.

It will be seen that although anterior dislocations of the lunate bone are generally considered to be the most common type of inter-carpal dislocation, trans-scapho-perilunar dislocations outnumber them in this series by almost two to one. It is possible, however, that dislocations of the lunate were more often treated in general surgical units and not referred to orthopaedic departments. Otherwise the series probably gives a reasonably accurate indication of the relative incidence of the various injuries.

![Fig. 1](image)

The radiographs of a case of trans-scapho-perilunar fracture-dislocation. Satisfactory reduction was obtained and four months later the scaphoid was uniting.

TRANS-SCAPHO-PERILUNAR FRACTURE-DISLOCATION—TWENTY-SEVEN CASES

This injury is not a common one and the radiographs may be misinterpreted (Fig. 1); thus nine cases had been labelled "dislocated lunate," "fractured scaphoid" or "congenital abnormality of the carpus."

Clinical features—Before it is obscured by marked swelling, backward displacement with increased antero-posterior thickness about the mid-carpal level is apparent, and the proximal margin of the capitate may be palpable on the dorsum. Radial deviation of the hand is usually present together with painful restriction of wrist and finger movements. Associated injuries—The ligamentous injury is inevitably severe and chip fractures, damage to articular surfaces and fractures of the styloid processes are common. Thus one or both styloid processes were fractured in ten of the cases, the capitate twice, and the triquetrum, pisiform and fourth metacarpal in single instances. Complications—Avascular necrosis of the proximal scaphoid fragment occurred in thirteen or approximately half the cases. Transient median nerve paralysis was noted only twice.
Treatment—"Early" cases seen within fourteen days of injury could usually be reduced by closed manipulation; with steady manual traction, the wrist was gradually brought into flexion and slight ulnar deviation and a forearm plaster including the proximal joint of the thumb was applied. Twenty patients were seen early; closed reduction was obtained in all, although in three a slight rotational subluxation or lack of complete apposition between the scaphoid fragments persisted. Two cases were successfully reduced eleven and twelve days after injury. It is sometimes advised that the wrist be immobilised in the neutral position after the first week; but in two cases dorsal subluxation tended to recur, and it would seem wise to maintain palmar flexion for three weeks after reduction.

Treatment of the "late" case—Closed reduction failed in two "late" cases seen three weeks after injury, and attempts at closed reduction after this period may cause more damage to the wrist than careful open reduction. Open reduction was performed in two cases, four and six weeks after injury. When more than six weeks had elapsed without reduction, and the wrist remained painful after a fair trial, arthrodesis of the wrist joint was advised.

Treatment of avascular necrosis—Three different lines of treatment were adopted when the diagnosis of avascularity of the proximal scaphoid fragment was made: bone grafting, three cases; excision of the avascular fragment, four; and continued immobilisation, five. When excision was carried out, the operation was performed as soon as the diagnosis was made, normally six or eight weeks after injury, and immobilisation was continued for a further two or three weeks. It is to be noted, however, that early excision of a large scaphoid fragment in the presence of a lax ulnar collateral ligament jeopardises the stability of the wrist. In this small series the results of excision and of continued immobilisation were approximately equal; grafting was disappointing.

Results—(i) Closed reduction and immobilisation only—Eleven cases. The average period of immobilisation was almost five and a half months. Sound bony union of the scaphoid occurred in four cases, all with a good result; in one of these avascularity of the proximal fragment had been noted. In five cases it was thought probable that bony union had occurred, despite an avascular fragment in one case; one result was good, one fair, and three were not recorded. In two cases with avascular necrosis non-union was accepted after five and seven months of immobilisation; the functional result, however, was good in one patient who returned to duty as a pilot and fair in the other.

(ii) Closed reduction followed by excision of an avascular scaphoid fragment—Four cases. One was a failure and the wrist was arthrodesed nine months later; another had a fair result in spite of radial deviation of the hand; in the remaining two the results were good.

(iii) Closed reduction followed by scaphoid grafting or simple drilling—Five cases. Four patients had a cortical peg graft inserted into the scaphoid by the "closed" or "blind" method; two already had an avascular proximal fragment, and one grafted four weeks after injury later showed radiographic evidence of avascularity. In one the scaphoid failed to unite and the result was poor. In the other three, union was obtained; the functional result remained poor in two but promised well at six months in the third. In one patient simple drilling of the scaphoid was performed eleven weeks after injury; union was not sound five months after operation.

(iv) Open reduction—Two cases. This was performed twice, four and six weeks after injury. In the first case, despite an avascular fragment, the scaphoid united after seven months immobilisation. The patient was last seen only two weeks later but was then moving his wrist well. In the second case the proximal part of the scaphoid was removed at the time of operation because it was thought certain that its blood supply had been impaired; the functional result was good.

(v) Late unreduced cases—Five cases. These were seen at periods from three weeks to seven months after injury. Three had successful arthrodesis of the wrist and another was thought likely to require arthrodesis. The fifth had a weak and stiff but painless wrist nine months after injury, with some crepitus in the sheaths of the flexor tendons to the fingers.
DISLOCATION OF LUNATE—FOURTEEN CASES

All cases showed anterior displacement (Fig. 2). In two instances the original radiographs had been reported as normal, thus accounting for some delay in treatment.

Clinical features—Wrist movements were limited and the fingers were held in semiflexion; tingling, numbness or pain in the median nerve distribution were common. The displaced lunate was sometimes felt as a prominence on the anterior aspect of the wrist, with a corresponding depression on the dorsal aspect.

Associated injuries—The lunate bone itself, the triquetrum and the capitate were each fractured in single instances.

Complications—A transient median palsy was recorded in four cases and in one patient persisted for more than three months. Vascular changes in the bone were notable for their absence. Only one lunate showed increased relative density but with no evidence of collapse or necrosis; after three previous attempts at reduction the dislocation had been reduced by skeletal traction seventeen days after injury, by which time skin ulceration had developed in front of the wrist. The radiographic appearances in this case did not resemble Kienböck's disease. MacAusland (1944) found no record of Kienböck's disease after dislocation of the lunate, even with open reduction. It seems unlikely therefore that this "disease" can result from a single injury of the type that causes dislocation of the lunate, in which some blood supply to the bone is usually preserved through the intact palmar radio-carpal ligament.

Treatment—In cases seen within ten days of injury, reduction by traction and direct digital pressure on the displaced lunate was usually accomplished quite easily. The wrist was immobilised in palmar flexion for about a week and in the neutral position for a further two weeks.

Of nine "early" dislocations eight were reduced in this way; one, though seen within two days, required the use of a distraction frame with Kirschner wires through the olecranon and the necks of the metacarpals.

Five patients were seen "late" with unreduced dislocations at intervals varying from two weeks to three months after injury. One was reduced on a distraction frame at seventeen days, and the remaining four had the lunate excised by the anterior approach. Operative reduction was not attempted in any case.

Results—Of the ten patients whose dislocations were reduced, six had a good result; one patient with almost full movement still complained of pain six months after injury and was therefore classified as fair; in two the injury was too recent for assessment but progress was satisfactory.

Fig. 2
Typical radiographs of anterior dislocation of the lunate.
The patient whose dislocation was reduced by skeletal traction seventeen days after injury had a poor result. After eighteen months he had rather a stiff wrist with discomfort in cold weather and there was still some radiographic evidence of bone atrophy.

The results in the four cases of excision were satisfactory, all the patients having a good grip, a painless wrist and adequate movement, except for some limitation of palmar flexion.

**FORWARD DISLOCATION OF LUNATE AND HALF OF SCAPHOID—SIX CASES**

Certainly in its clinical features, and probably in the mechanism of its production, this injury is similar to simple anterior dislocation of the lunate. In five cases the proximal fragment of the scaphoid dislocated forwards with the lunate as usual, but the distal fragment was displaced with the lunate in one case.

*Associated injuries*—The triquetrum was fractured twice and both styloid processes once. One fracture-dislocation was compound.

*Complications*—A transient median palsy occurred four times and avascular necrosis of the proximal scaphoid fragment was observed in three cases.

*Treatment*—Reduction was usually obtained by the same type of manipulation as for simple dislocation of the lunate; but it was more difficult and failed in two cases, one seen within a few hours of injury and the other after ten days. After reduction the wrist was immobilised in forty degrees of palmar flexion for three weeks, the plaster including the proximal joint of the thumb. Thereafter the wrist was maintained in the neutral or slightly dorsiflexed position, as a rule until the scaphoid was united.

In both cases where closed reduction failed the displaced lunate and scaphoid fragment were excised. In two others the scaphoid fragment, although reduced, was excised on account of avascularity.

*Results*—Two patients treated conservatively throughout obtained reasonably good results: in one, bony union of the scaphoid was secured after six months in spite of avascularity of the proximal fragment; but in the other union remained doubtful after four months. Of the two cases treated by excision of the avascular proximal scaphoid fragment, the result was fair in one but not recorded in the other. Excision of the unreduced lunate and portion of scaphoid gave one good and one fair result.

**PERILUNAR DISLOCATION OF THE CARPUS—THREE CASES**

In this injury the scaphoid remains intact and undergoes rotational subluxation as the carpal bones are displaced backwards on the lunate; thus the tubercle of the scaphoid comes to point into the palm and the proximal pole faces backwards. The treatment is the same as for the similar trans-scaphoid dislocation, except that the wrist need be immobilised for only three or four weeks.

Two early cases were reduced by manipulation, one with a good result, the other not yet assessed. The third patient was first seen three months after injury with the dislocation unreduced; despite antero-posterior broadening of the wrist and gross limitation of wrist movement, the grip was good and there was little pain in the wrist. One patient had a transient median palsy, but no vascular complications were seen.

**SUBLUXATION, RECURRENT SUBLUXATION, AND DISLOCATION OF THE SCAPHOID—FIVE CASES**

*Subluxation of the scaphoid*—one case. In this condition the scaphoid undergoes a rotational subluxation with dorsal displacement of the proximal pole. In one patient who was seen early the antero-posterior radiograph showed a gap between the scaphoid and lunate bones (Fig. 3a). The injury, however, was complicated by fractures of the radial styloid and triquetrum and by a previous atrophic arthritis of the wrist. The displacement was reduced with the wrist in dorsiflexion and radial deviation; this position was maintained for six weeks and the reduction remained stable (Fig. 3b).
Recurrent subluxation of the scaphoid—three cases. Three patients had sustained their injuries from three months to two years before examination and the subluxation had become recurrent. They complained of a click, usually painful, when the wrist was flexed in the palmar direction. There was also some impairment of wrist movement and of grip. The subluxation could be confirmed from the radiographs. The characteristic click on flexion of the wrist may be due to the radial extensor tendons slipping over the projecting proximal pole of the scaphoid, but more probably to the scaphoid slipping over the posterior margin of the radius. It can be eliminated by pressure over the posterolateral aspect of the wrist.

When subluxation is recurrent and the symptoms warrant operative treatment, it is probably best to make the reduction secure by arthrodesis of the scaphoid to the lunate bone. In one case so treated the interosseous scapho-lunate ligament was absent and the dorsal radio-carpal ligament was very much attenuated. After removal of the adjacent articular cartilage, small bone chips from the lower end of the radius were packed between the two bones and the wrist was immobilised in plaster for four and a half months. Although sound fusion was doubtful, the patient had a useful range of wrist movement, a fairly powerful grip and no symptoms seven months after operation. In another patient with recurrent subluxation the scaphoid was excised; the result was not satisfactory. The third patient simply had manipulation of the wrist followed by active exercises; as his symptoms were relieved at the time this simple treatment may be worth a trial before scapho-lunate arthrodesis is considered.

Dislocation of the scaphoid—one case. This injury was sustained in a fall off a motor-cycle. The wrist was locked in ulnar deviation (Fig. 4) and a tender prominence was palpable near the tip of the radial styloid process. The radiographs showed the proximal pole of the scaphoid lying on the posterior-lateral aspect of the radial styloid and the tuberosity tilted anteriorly; the capitate had slipped proximally towards the scaphoid space (Fig. 5).

Manipulative reduction was not difficult, traction being used on the hand and direct pressure on the displaced scaphoid. The wrist was immobilised in dorsiflexion and abduction for five weeks. Three months after injury, wrist movements were approximately three-quarters of normal; the patient had a powerful grip without pain, and there was no radiographic evidence of impairment of the blood supply to the scaphoid.

OTHER CARPAL DISLOCATIONS

Anterior dislocation of the trapeziun—one case. This was a compound injury caused by a metal box falling on the hand. The trapeziun was dislocated forwards on the scaphoid,
Fig. 4
A case of dislocation of the scaphoid, showing ulnar deviation of the hand.

Fig. 5
Radiographs showing dislocation of the scaphoid. The proximal pole is lying on the postero-lateral aspect of the radial styloid and the tuberosity is tilted anteriorly.
carrying the first metacarpal with it; the base of the second metacarpal was fractured. Reduction was not obtained at the time of wound excision and the dislocation was accepted, plaster fixation being discarded after eighteen days. Ten weeks after injury, the patient had full wrist and finger movement and a fairly powerful grip. Apart from some loss of dexterity and slight pain when grasping with the thumb and index finger, the function of the hand was normal.

**Posterior dislocation of trapezoid—one case.** This patient was first seen two months after injury. The deformity was obvious; wrist movement was limited and painful when forced. Radiographs showed the trapezoid displaced backwards together with the second metacarpal. No special treatment was undertaken and the patient was invalided from the Service six months later.

![Fig. 6](image)

**Fig. 6**
Anterior dislocation of lunate and perilunar dislocation of carpus, with fracture of the tip of the radial styloid.

**Anterior dislocation of lunate and perilunar trans-styloid fracture-dislocation—one case.** The patient, a man aged fifty-six years, sustained this injury when his sleeve was caught in moving machinery. Radial displacement could be seen and the finger and wrist movements were markedly restricted. Radiographs showed an anterior dislocation of the lunate, a postero-lateral shift of the other carpal bones and a fracture of the radial styloid process (Fig. 6). The displacement was reduced and the wrist immobilised in palmar flexion and ulnar deviation. After ten days the degree of palmar flexion was reduced and the plaster was discarded after a further four weeks. The patient returned to his work as a brass-finisher three and a half months after injury. The radiograph now shows the common tendency for a lunate bone which has been dislocated to tilt backwards. A year after injury the patient is working and has only slight discomfort; movements are almost full.

**Dislocation of capitate and trapezoid—one case.** This patient, aged seventy-one years, was knocked down by an omnibus. A wound extended along the distal crease of the wrist and round the ulnar side to the dorsum. The radiograph showed postero-medial dislocation of the capitate together with the third and fourth metacarpals, and posterior dislocation of the trapezoid carrying the second metacarpal (Fig. 7). In addition, a triangular fragment of bone had been separated from the posterior margin of the base of the third metacarpal.

At operation the medial articular surface of the capitate was readily visible on the dorsum of the hand. The skin on the ulnar side of the hand could not be closed completely, but elsewhere it was sutured after reduction of the dislocation. Plaster was applied with
the wrist joint in palmar flexion and the unsutured area was covered by a split-skin graft twelve days later. The wounds healed cleanly and immobilisation was discontinued after a total of ten weeks. Six months after the injury the patient had no pain, a powerful grip and approximately one-third of the normal wrist movement.

**SUMMARY AND CONCLUSIONS**

1. Fifty-nine patients with various inter-carpal dislocations have been reviewed.

2. In this series trans-scapho-perilunar fracture-dislocation was the commonest injury. Early cases can be reduced by closed manipulation but in late cases operative reduction is usually advisable. When the injury is more than three months old, arthrodesis of the wrist joint is indicated.

3. When trans-scapho-perilunar fracture-dislocation was complicated by avascular necrosis of the proximal scaphoid fragment, the results in a small series treated by early excision were approximately equal to those treated by continued immobilisation. The results of grafting the scaphoid were poor.

4. Dislocations of the lunate seen within ten days of injury could usually be reduced with good results; no such case developed Kienböck's disease within the period of review. In late cases excision gave satisfactory results.

5. Forward dislocation of the lunate with half the scaphoid gave good results when manual reduction succeeded, but the results of excision of fragments were less satisfactory.

6. There was one case of forward dislocation of the lunate together with the distal half of the scaphoid.

7. Subluxation of the scaphoid is disclosed in antero-posterior radiographs by a typical gap between it and the lunate bone. The subluxation may become recurrent and present a characteristic syndrome.

8. Other rare dislocations of the carpal bones are described.

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**REFERENCE**