A RARE COMBINATION OF TWO UNCOMMON FRACTURES OF THE CARPAL BONES

THEODORE JAMES, *Pinelands, Cape*

By direct violence any one or more of the carpal bones may be fractured. Certain of them, such as the carpal navicular and lunate, are susceptible to fracture by indirect violence, and others are uncommonly or rarely damaged in this way. Among the rare carpal fractures that have been described are those of the os multangulum minus,[1,2] the os multangulum majus,[3-10] the os capitatum[4] and the os hamatum.[11-13] This paper presents the rare occurrence of a fracture of the os triquetrum and a fracture of the os multangulum majus in the same wrist at the same time.

In 1911 Deneke[14] published 3 cases of fracture of the os triquetrum and all were associated with a fracture of the styloid process of the ulnar bone. Subsequently a number of other writers described fractures of the os triquetrum.[15-23] Simon,[16] in 1928, emphasized a relationship between fractures of the triquetral bone and injuries of the navicular and lunate bones.

In 1942 Greening[24] was able to collect 20 fractures of the triquetral from 580 cases of injury to the wrist bones seen over a 2-year period in his hospital. Of his 20 cases 3 had

associated fractures of the lower end of the radius. He remarked that the observation of previous authors upon the rarity of the isolated fracture of the triquetral bone was not accurate. Fairbank[25] had 8 cases in his experience.

In 1945 Kellam and McGoey[26] reported on 192 cases of fractures and dislocations of the carpal bones. They list 175 fractures, the frequency being as follows: Os naviculare (145 cases), os triquetrum (11), os multangulum majus (4), os capitatum (3), os lunatum (2), os pisiforme (1), os multangulum minus (1), multiple (8 cases). Their list also shows that 10% of cases referred for injury to the distal third of the radius had also suffered injury to a carpal bone; and that of 331 successive cases of fracture of the radius at all levels 7% had also a carpal injury.

In 4 years in a busy out-patient department Bartone and Grieco[27] (1956) found 46 cases of fracture of the triquetral bone. Though they came to regard it as a rather infrequent carpal fracture, yet in their experience it was the second commonest fracture of the carpal bones. In 14 of their 46 cases triquetral fracture was combined with a fracture of the radius (9), the ulna (3), the navicular (2) and the hamate (1). There was no triquetral fracture associated with a fracture of the os multangulum majus. No explanation was offered for the manner of production of the combined fractures.

Classification

Bartone and Grieco[27] divide the kinds of fracture of the triquetral bone into 'dorsal chip', 'body', and 'body and dorsal chip'. There was no separation of the fragments in those fractures involving the body alone (1 case) or body and dorsal chip (8 cases). The commonest type was a fracture producing a dorsal chip. Of these there were 23 in their series of 46 cases. Bonnin and Greening[28] divide fractures of the os triquetrum into those associated with the posterior tubercle of the triquetral and involving marginal, styloid and other fractures of the distal end of the radius, those with a fracture of the posterior pole of the lunate, those with a fracture of the tip of the ulnar styloid process, and perilunate dislocation of the wrist with a fracture of the proximal pole of the navicular. They make a second group in which fractures in related bones are associated with a compression fracture of the triquetral bone. Greening[24] clearly defined 3 types of fracture of the os triquetrum as demonstrated by radiographic examination, which showed up (1) fractures extending through two-thirds of the bone at its dorsal aspect, with radiating cracks or fissures though the bone; (2) a type in which a small flake of bone is avulsed from the dorsum with considerable separation; and (3) a type in which there is a small flake with little or no separation.

Radiography

Greening[24] and Fairbank[25] state definitely that an X-ray examination of the os triquetrum will show no fracture in the antero-posterior view whereas the lateral and oblique views will; Bartone and Grieco[27] say much the same. Nevertheless Durbin,[29] in his demonstration of established non-union of a fracture of the triquetral bone, reproduces a radiograph showing clearly a transverse linear fracture of the bone at the initial examination in the antero-posterior view. This radiograph bears a close resemblance to the antero-posterior view taken of the carpal bones in my case where, also, the transverse linear fracture is readily seen. The lateral view is sometimes very informative in that it may show up a flake of bone that may vary in size from a minute fragment to one of 4 mm. in diameter;[25] it will also enable one to distinguish whether the fragment arises from the triquetral or the lunate.

A Case of Simultaneous Fractures of the Os Triquetrum and the Os Multangulum Majus in the Same Wrist

A youth of 16 years was travelling on a lorry which became involved in a road accident. He was thrown from the vehicle to the ground, which he struck with his right shoulder. When he was brought for examination it was easy to detect a fracture of the right clavicle, the fragments of which were grossly separated. Apart from some degree of shock, no other injury was seen. However, on the following day the lad

Fig. 1. Showing a linear fracture through the body of the triquetral bone and a chip or splinter-fracture of the greater multangular bone in the antero-posterior and oblique views.

complained of some pain, swelling and stiffness in the left wrist-joint and an X-ray examination disclosed a transverse fracture through the body of the os triquetrum and a flake or splinter of bone avulsed from the os multangulum majus, these fractures showing up in both oblique and antero-posterior views (Fig. 1).

The Manner of Production of Fractures of the Os Triquetrum and Os Multangulum Majus

Greening[24] and Greening and Bonnin[28] go into the manner of production of fractures of the os triquetrum in detail. Their conclusions are summarized as follows: The fracture happens when a fall is taken upon the palm of the hand and a fairly large area of the dorsum of the triquetral is compressed between the pisiform bone and the lower end of the ulna, so producing a fracture extending through the body of the bone. But, if the triquetral bone is momentarily dislocated backwards, the ligament passing between it and the lunate avulses a flake of bone without a compression fracture. The os triquetrum is roughly pyramidal and its sharpest angle is inserted between the hamate and lunate bones. This wedged insertion tends to extrude the bone when falls are taken upon the extended wrist, but the tendency is counteracted by a movement of the wrist into ulnar deviation whereby the os triquetrum moves more deeply into the wrist under cover of the distal end of the ulna. Falls taken on the back of the hand, the wrist being violently flexed, impose an excessive strain on the ulnar collateral ligament and a flake is pulled off or the ligament is torn. It has been remarked upon that a fracture of the os triquetrum always accompanies a perilunate dislocation of the carpus, when all the bones of the wrist, except the lunate, are dislocated backwards and outwards so that a flake of bone is torn from the triquetral by ligaments which attach it to the lunate.

The os multangulum majus has been regarded as almost immune to fracture, and even experimental attempts to fracture the bone have not always been successful; yet it has been fractured, as the few reported cases show. Transverse fracture through the body have occurred but a flake type of fracture is commoner. The bone is so well protected by ligamentous attachments that fractures are rare, and it can be only a direct wrenching upon a ligament that avulses the bony fragment.

Symptoms

Even in the simplest types of fracture of the os triquetrum pain, tenderness, swelling and restriction of movement of the wrist occur. These symptoms may be slight or severe, and when they are slight they may give the clinical picture of a sprain of the wrist. Some authors have been able to localize symptoms over the bone itself but they are much more frequently spread over the region of the wrist, when it is reasonable to suspect some other injury than a simple fracture of the os triquetrum. In rare cases the fragments of bone have been actually palpated, but even where a fracture of the triquetral is strongly suspected it is not possible to differentiate the type of fracture. The evidence points to the necessity for radiographic differentiation of a sprain of the wrist from a fracture of the os triquetrum.

DISCUSSION

The literature indicates that fracture of the os triquetrum is uncommon and is rarely associated with fracture of another carpal bone. Simultaneous fracture of the os triquetrum and the os multangulum majus in the one wrist is most rare; I have not found a single case in a search through the relevant literature, and this case is presented as a unique instance. Had there been no accompanying fracture of the os multangulum majus it would still not be easy, despite Greening's explanation of the methods of production, to explain how a youth falling heavily upon his right shoulder and badly fracturing his right collar bone could also fracture the os triquetrum of his left wrist. It is even more difficult to explain the combined carpal fractures. However, disregarding the fracture of the clavicle, the tentative suggestion is that part of the impact of the fall was taken by the hand with the wrist in the fully extended position and in excessive ulnar deviation, which latter stress was taken up by the radial collateral ligament, which produced the flake type of fracture through its attachment to the greater multangular bone; and that the fracture through the triquetral bone was due to direct compression at the moment that the wrist was in this extreme position.

Although this case of triquetral fracture, like Durbin's, could be diagnosed on the antero-posterior radiographic examination, there is much evidence that all sprains of the wrist should, if possible, be X-rayed in the lateral and oblique positions as well as the antero-posterior. Failure to detect a fracture through the body of the triquetral by omission of these examinations leads to a painful non-union of the fragments, as Durbin[29] clearly showed. It appears likely that if all sprains of the wrist were X-rayed many more cases of fracture of carpal bones would be brought to light, and that those sprains of the wrist that take so long to heal and then leave the patient with a weakened wrist would be shown to have a bony pathology. There remains no doubt that whether there is or is not wide separation of the fragments, fixation of the wrist in the optimal position for function for at least 5 weeks is the right treatment.

SUMMARY

A review of the literature on the more unusual carpal fractures is presented as a background to a case of combined fractures of the triquetral and greater multangular bones in the one wrist. A survey of previously published classifications of triquetral bone injuries is made, significant points in radiography are mentioned, and a discussion is entered upon of the manner of production of these fractures, their symptomatology, and the respect with which all sprains of the wrist should be regarded.

REFERENCES

1. Derom, E. (1932): J. Chir. (Brux.), **31-29**, 450.
2. de Moraes, F. (1938): Rev. Orthop., **25**, 217.
3. Sorrel, E. (1929): Bull. Soc. nat. Chir., **55**, 1431.
4. Greene, E. I. and Miller, L. F. (1933): J. Bone Jt Surg., **15**, 775.
5. Drobný, J. (1933): Čas. Lék. čes., **72**, 805.
6. Odén, O. (1934): Acta radiol. (Stockh.), **15**, 83.
7. Kanert, W. (1935): Mschr. Unfallheilk., **42**, 128.
8. Oreto, P. (1935): Riv. sanit. sicil., **23**, 589.
9. Bourguet, D. (1939): Rev. Orthop., **26**, 152.
10. Petridis, P. (1939): *Ibid.*, **26**, 149.
11. Ottolenghi, G. E. (1937): Rev. Ortop. Traum., **7**, 165.
12. Edelmann, H. (1934): Zbl. Chir., **61**, 1915.
13. Milch, H. (1934): J. Bone Jt Surg., **16**, 459.
14. Deneke, F. (1911): Dtsch. Z. Chir., **111**, 413.
15. Eilers, O. (1927): *Ibid.*, **206**, 141.
16. Simon, J. (1928): Čas. Lék. čes., **67**, 1194.
17. Phillips, K. T. (1931): New Engl. J. Med., **204**, 322.
18. Volkmann, J. (1932): Bruns' Beitr. klin. Chir., **156**, 275.
19. Peltesohn, S. (1932): Med. Klin., **28**, 78.
20. Costa, A. J. and Ronchetti, A. (1931): Rev. Cirug. (B. Aires), **10**, 278.
21. Thompson, J. E. (1933): Amer. J. Surg., **21**, 214.
22. Zimmer, E. A. (1937): Schweiz. med. Wschr., **67**, 534.
23. Garraud, R. (1938): Rev. Orthop., **25**, 705.
24. Greening, W. P. (1942): Brit. med. J., **1**, 221.
25. Fairbank, T. J. (1942): *Ibid.*, **2**, 310.
26. Kellam, H. I. J. and McGoey, P. F. (1945): Canad. Med. Assoc. J., **53**, 332.
27. Bartone, N. F. and Grieco, R. V. (1956): J. Bone Jt Surg., **38A**, 353.
28. Bonnin, J. G. and Greening, W. P. (1943-44): Brit. J. Surg., **31**, 278.
29. Durbin, F. C. (1950): J. Bone Jt Surg., **32B**, 388.