The Naviculo-Capitate Fracture Syndrome

BY RICHARD L. FENTON, M.D., NEW YORK, N. Y.

A fracture syndrome, referred to in this paper as the "naviculo-capitate fracture syndrome", has twice been encountered by the author: once in 1950, in a patient reported as having a fracture of the capitate, and once recently in a patient seen at the United States Army Hospital at Fort Bragg. In both instances the lesion posed a problem in diagnosis and treatment. The identical pattern displayed in these cases with regard to mechanism, roentgenographic appearance, and pathological findings warrants the making of a greater effort in the future to recognize this fracture syndrome, which has not previously been emphasized in the literature.

Fig. 1: Mechanism of the naviculo-capitate fracture.
Fig. 2: Appearance of the fracture at the time of surgery. A transverse incision has been made.

ANATOMY AND PATHOLOGY

The capitate bone is not normally subject to fracture, for it lies in a central position in the carpus and is surrounded and reinforced by the other carpal bones. Furthermore, it is roughly the shape of a cube and is structurally a sturdy bone. In sharp contrast, the navicular is situated on the outside of the carpal bones, on the radial side, and is an oblong, irregularly shaped bone with a narrow vulnerable waist.

During a fall, when the hand is outstretched in a position of dorsiflexion and radial deviation, the pointed radial styloid process (the chisel) impinges on the navicular laterally at its waist and the sturdy capitate (the anvil) supports the navicular medially. When the force of a blow from a fall on the outstretched hand is only moderately strong, the navicular alone will be fractured (usually through the waist). When the blow is particularly sharp and violent, however, and when the hand is in a particularly vulnerable position, the capitate will also be fractured. In the latter case, the force from the blow will be transmitted from the radial styloid process, through the navicular, onto the end of the capitate (Fig. 1). The roentgenograms made in both the author's cases show that the fracture line in each bone is a direct continuation of the fracture line in the other bone, the lines in the two bones running together smoothly and without interruption.

In the capitate, as in the navicular, the blood supply for the entire bone enters through the distal surface, the proximal surface being completely articular. Thus, when
the naviculo-capitate fracture occurs, separating the proximal end of the capitate from the distal end, it leaves the former entirely without blood supply. The area which receives the blood supply in the capitate is far greater than the corresponding area in the navicular.

The nature and degree of the force which fractures the capitate is apparently such that it rotates the proximal fragment 180 degrees (Fig. 2). In both of the author's cases this rotation occurred and the result was that the joint cartilage, which covers a large portion of the proximal fragment, was found in contact with the fractured surface of the distal fragment. At first the presence of this deformity added greatly to the confusion of the picture presented in the roentgenograms. Once a diagnosis of naviculo-capitate fracture syndrome had been made, however, the picture became clear.

CASE REPORTS

Case 1. On December 14, 1954, a white soldier, thirty-one years of age, fell down a flight of stairs, landing on his outstretched left hand. Five hours later he presented himself in the emergency room complaining of pain in his left wrist and right hip. An examination revealed bruises on the right side of the forehead and contusions on the right hip. It also showed that the left wrist was swollen and that there was crepitation on motion. No gross deformity of bone was noted. Roentgenograms were made (Fig. 3). These roentgenograms demonstrated a fracture through the waist of the navicular and another through the proximal end of the capitate. They also showed that the proximal fragment of the capitate had been rotated 180 degrees. A third fracture was found in the distal end of the radius; this fracture was linear, and there was no displacement of the fragments.

On December 14, under tourniquet control, a transverse incision was made over the mid-dorsum of the wrist at the level of the mid-carpal joint. The soft tissues were split longitudinally, the extensor tendons were retracted, and the joint capsule was opened transversely. When the edges of the split in the capsule had been
retracted, it was found that the joint was filled with the products of hemorrhage and that the proximal fragment of the capitate was lying free, without any soft-tissue attachments, having been rotated 180 degrees. The bone fragment was lifted from the wound, and the joint was irrigated. The fracture surface of the distal portion of the capitate was smoothed with a rongeur. The fracture of the navicular could be seen, and it was apparent that the fragments were in good position. The wound was then closed, a continuous, subcuticular No. 36 wire being used. A compression bandage was applied and the tourniquet was released. On the first and second days after the operation, stellate ganglion blocks were given to minimize swelling. On the tenth day the suture was removed; the wound had healed. A plaster-of-Paris bandage was then applied to the arm from the crease in the palm to below the elbow, the proximal phalanx of the thumb being included. This bandage was continued until early in June, by which time the fragments of the fractured navicular had united. On July 20th the patient returned to full duty. There was a full range of motion in his wrist at this time, and he experienced no pain except for slight discomfort after strenuous activity.

Case 2. A Puerto Rican male, eighteen years old, was first examined on September 25, 1950, one month after having been injured. He had fallen backwards in the street, landing on his outstretched left hand. He had had immediate pain and disability in the injured wrist but had sought no treatment until over four weeks later, when the pain had become very disturbing.

An examination on admission revealed a swollen left wrist which he held in a neutral position. There was diffuse tenderness over the dorsum of the wrist, especially over the anatomical snuff-box, and all motions were markedly restricted and very painful.

Roentgenograms made at this time (Figs. 4-A and 4-B) revealed the presence of a fracture through the distal third of the navicular. They also revealed a hemispherical fragment which appeared at first to belong to the navicular, being just ulnarward to the proximal end of this bone. A closer inspection of the roentgenograms revealed, however, that this fragment was actually the head of the capitate. The capitate, it appeared,
had also been fractured, and its head had been separated from the rest of the bone and had been rotated 180 degrees.

Shortly after the patient had been admitted, the joint was explored. The head of the capitate had been rotated as described and was lying in the joint, attached to the ligamentous structures by a single narrow fibrous strand. This fragment was removed. The alignment of the fragments of the fractured navicular was found to be excellent, but there was no evidence of union. The wound was closed and a plaster-of-Paris bandage was applied to the arm from the palmar crease to below the elbow, the proximal phalanx of the thumb again being included. This bandage was continued for sixteen weeks, after which time the fracture had healed and mobilization could be begun. When last seen in the spring of 1953, the patient had a painless wrist; there was a loss of about 15 degrees of dorsiflexion and 10 degrees of volar flexion (Fig. 4-C).

TREATMENT

The pathological nature of this fracture syndrome determines its treatment. Because the fragment of the capitate is avascular and because it has been rotated 180 degrees, its excision is necessary. This excision may be performed easily, however, for the fragment usually lies free in the joint with no ligamentous attachments. A transverse, dorsal incision, made at the mid-carpal level, should be used in this operation, and postoperatively rigid and prolonged immobilization should be maintained. This immobilization is necessitated by the presence of the navicular fracture; the capitate fracture alone would not require immobilization. When union of the navicular fragments has been obtained, the patient may be given whirlpool and active exercise. If union should not be obtained, however, the lesion should be treated in the same manner that any isolated ununited fracture of the navicular is treated.

If it is desired, the lag-screw method of McLaughlin may be used, the screw being inserted through a separate incision at the time of the operation. This method, which the author has never used, obviates immobilization.

G. Blundell Jones recently reported a case which is similar to those presented here. He treated his patient by immobilization without surgery, and the fracture healed in the position of injury, namely, with the proximal end of the capitate rotated 180 degrees. The functional result was excellent, the range of motion obtained in the wrist being three-quarters that of the normal. It was Dr. Jones' opinion that the injury was a transnavicular, transcapitate, perilunate fracture-dislocation of the carpus which underwent spontaneous reduction.

CONCLUSION

The author urges that in the future all wrist fractures be carefully appraised with the naviculo-capitate fracture syndrome in mind. It is felt that an appreciable number of these fracture syndromes go unrecognized and that they may represent a small percentage of the cases of fractures of the wrist in which clinically poor results have been obtained.

REFERENCES