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Carpal tunnel syndrome due to a small displaced fragment of bone

REPORT OF A CASE

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THE carpal tunnel syndrome,[1, 2] characterized by painful paresthesias in the hand, is associated with burning pain, tingling, or numbness of the thumb, index and long fingers. Thenar atrophy and loss of tactile discrimination may ensue. Symptoms are worst at night or after repetitive motion of the hands. Middle-aged women are most often affected.

A recognized complication of the treatment of Colles' fracture, the carpal tunnel syndrome usually results from placing the hand in the Cotton-Loder position (acute anterior flexion and ulnar deviation). The anterior border of a fractured radius has resulted in compression of the median nerve at the wrist, but there is no recent report that the carpal tunnel syndrome was associated with a small anteriorly displaced fragment of the radius. Our report concerns such a case.

REPORT OF A CASE

On November 24, 1967, a 44-year-old woman was examined by us because she fell at home and injured her right wrist. Examination revealed a closed fracture of the distal right radius and ulnar styloid, with severe posterior displacement of the radial fragment (*Fig. 1*). There was moderate swelling of the wrist, but no neurovascular abnormalities were found. The fractures were reduced by manipulation after local infiltration of the fracture hematoma with 2 percent mepivacaine hydrochloride, NF. A long arm cast was applied with the patient's hand in moderate anterior flexion and ulnar deviation. Postreduction roentgenograms demonstrated satisfactory fracture alignment (*Fig. 2*). The next day the patient had a severe pain in the wrist and hand despite the application of ice packs and elevation of the arm. Examination revealed an excellent capillary pulse and the presence of finger motion. There was decreased sensation to pinprick over the sensory distribution of the median nerve to the fingers. The cast was removed and a sugar-tongs splint was applied with the hand in neutral position. The patient was admitted to the Cleveland Clinic Hospital, and the arm was elevated. After eight days she was discharged from the hospital; she had only slightly less than normal sensation to pinprick in the thumb and the long finger. One month after the injury the splint was removed, and roentgenograms revealed a small fragment of bone projecting anteriorly (*Fig. 3*). A short arm cast was applied with the wrist in neutral position. Seven weeks after injury the patient was readmitted to the hospital because of severe burning sensation and pain in the sensory dis-

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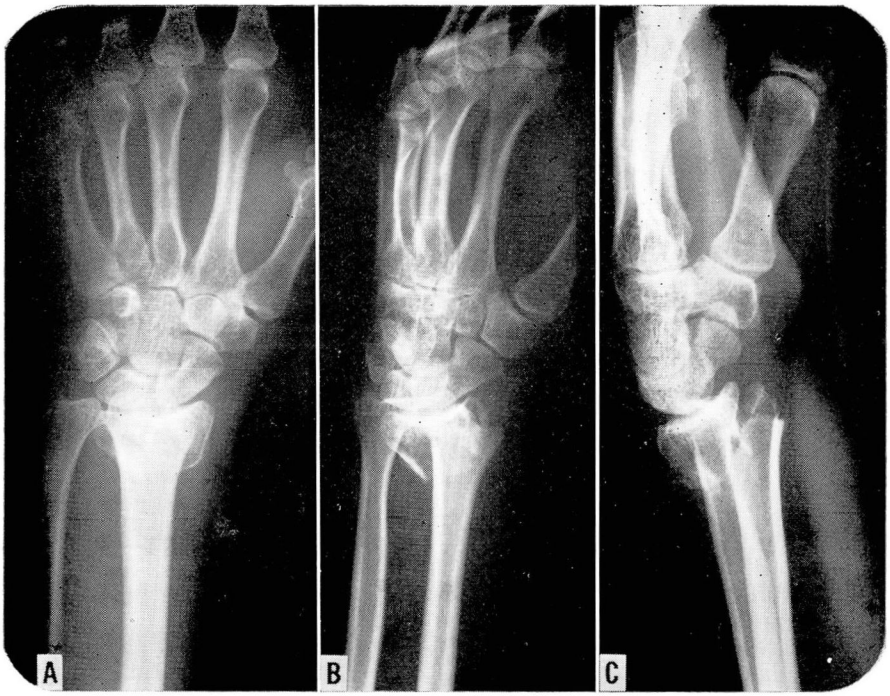

Fig. 1. Posteroanterior (A), oblique (B), and lateral (C) roentgenograms showing comminuted fracture of distal end of radius and ulna in a 44-year-old woman.

tribution of the median nerve to the hand. Decreased sensation to pinprick in the right thumb and long finger persisted.

On January 9, 1968, the transverse carpal ligament was divided and a 1 cm by 0.75 cm by 0.5 cm fragment (*Fig. 4*) of the radius was excised. The median nerve was severely compressed at the proximal border of the transverse carpal ligament (*Fig. 5*). Fibrosis and early adhesions surrounded the median nerve from the fragment of bone to the transverse carpal ligament, a distance of 1.0 cm. Electric stimulation revealed intact median nerve conduction of the wrist. Fifty milligrams of hydrocortisone tertiary-butylacetate was infiltrated around the median nerve at the wrist.

After surgery the patient experienced notable relief of pain in the hand and fingers, but still had a moderate burning sensation in the index and long fingers. Ten weeks after fracture the roentgenograms showed demineralization of the hand and wrist bones (*Fig. 6*). There was limited motion of the wrist and fingers. The burning sensation in the index and long fingers had lessened. Sixteen weeks after fracture, motion of the fingers and wrist was improved. Slight hyperesthesia of the index finger was present. The burning sensation in the long finger was slight and subsiding.

DISCUSSION

In 1854, Paget[3] discussed median nerve compression that occurred after a fracture of the distal radius. In 1922, Lewis and Miller[4] reviewed 234 peripheral nerve injuries of the upper extremity, and found one example of

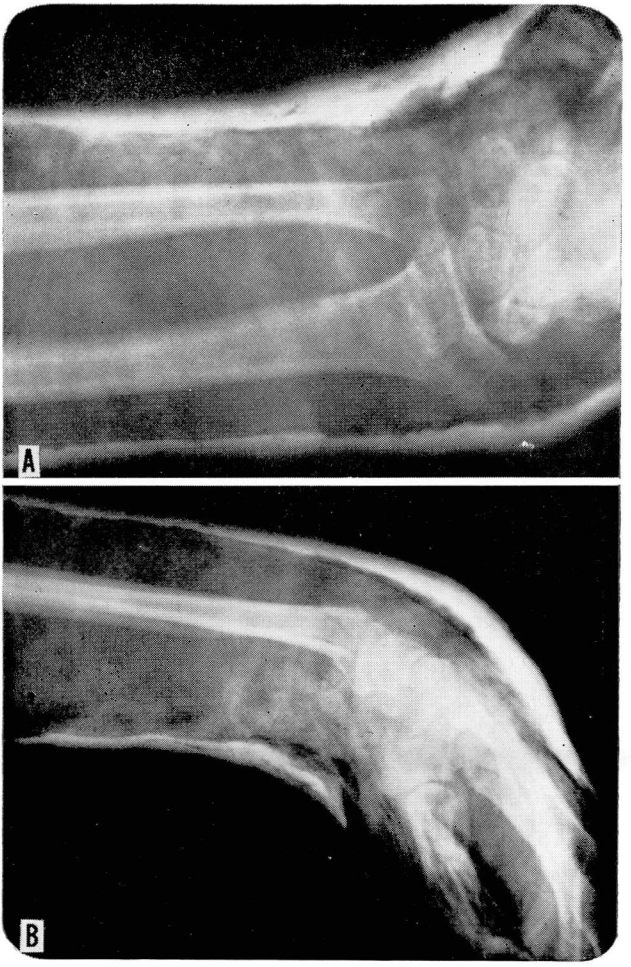

Fig. 2. Posteroanterior (A) and lateral (B) roentgenograms immediately after reduction of the fracture.

carpal tunnel syndrome after a fracture of the distal radius. The carpal tunnel syndrome was found in 3.3 percent of 600 patients with Colles' fractures, as reported in the review by Lynch and Lipscomb[5] in 1963. The Cotton-Loder position was implicated in 12 of the 15 cases of median nerve compression. Symptoms of the carpal tunnel syndrome occurred within a few hours to three months after fractures. In 1966, in a review of data of 654 hands with a carpal tunnel syndrome, Phalen[2] reported that 70 patients had a history of wrist injury that could be a possible cause of the median neuropathy. Colles' fracture occurred in 13 patients.

Fig. 3. Anteroposterior (A) and lateral (B) roentgenograms four weeks after the fracture. Note anteriorly displaced fragment of the radius.

The anatomy of the carpal tunnel comprises a compact channel with rigid borders bounded anteriorly by the transverse carpal ligament, medially by the carpal pisiform and the hook of the carpal hamate, and laterally by the tuberosity of the carpal navicular and ridge of the carpal trapezium. The carpal bones and intercarpal ligaments compose the floor of the tunnel. The tendons of the flexor hallucis longus, flexor digitorum profundus, flexor digitorum sublimis, and the median nerve all pass through the narrow confines of the carpal tunnel. The median nerve divides into a medial and a lateral division after passing through the carpal tunnel. The medial division supplies sensory nerve fibers to the medial border of the index finger, the anterior surface of the long finger, and the lateral surface of the ring finger. A small motor branch goes to the second lumbrical muscle. The lateral division supplies sensory nerve fibers to the anterior surface of the thumb, to the anterior aspect of the index finger, and motor fibers to the first lumbrical muscle. The recurrent motor branch of the median nerve supplies the op-

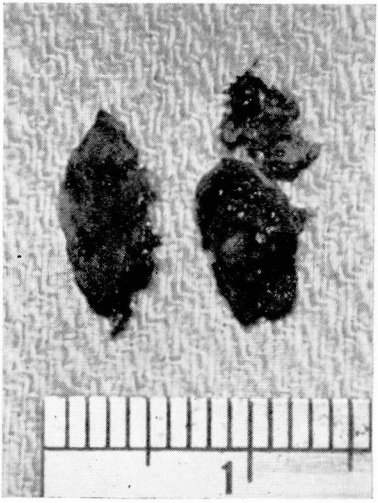

Fig. 4. Photo of excised fragments of the radius. (Scale is in centimeters.)

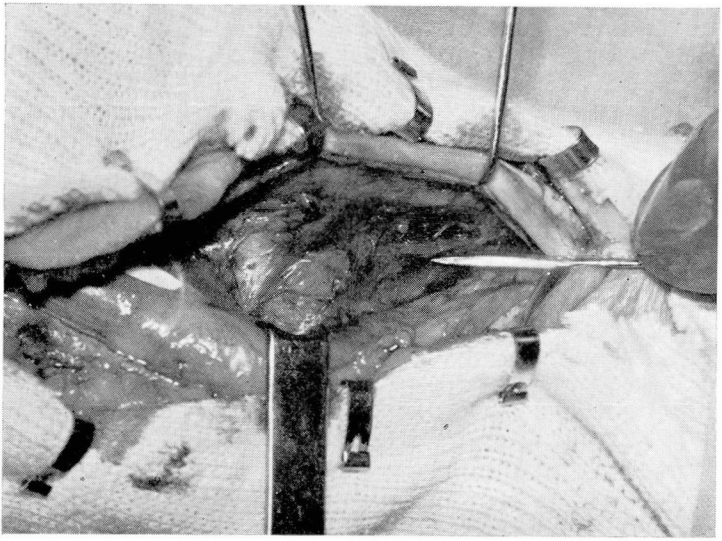

Fig. 5. Photo at operation, showing severe compression of the median nerve with anteriorly displaced bone fragment.

ponens pollicis, the abductor pollicis brevis, and the superficial head of the flexor pollicis brevis. The median nerve carries most of the sympathetic nerve supply to the hand.

Tanzer[6] reported that pressure in the proximal half of the carpal tunnel

Fig. 6. Posteroanterior (A) and lateral (B) roentgenograms 10 weeks after injury, demonstrating demineralization of the bones.

increased by flexion and extension of the wrist. Pressure in the distal half of the carpal tunnel is increased by extension alone.

Abbott and Saunders[7] injected the sheath of the median nerve at the wrist with Berlin blue and lipiadol. Acute anterior flexion and ulnar deviation (the Cotton-Loder position) prevented flow of these solutions past the proximal border of the transverse carpal ligament. In other positions the solutions flowed easily into the palm of the hand.

SUMMARY

In a case of Colles' fracture, a small fragment of the radius was displaced anteriorly and was associated with the carpal tunnel syndrome in a 44-year-old woman. Despite a change of the originally applied cast, with repositioning of the wrist, symptoms and signs of the carpal tunnel syndrome persisted. The displaced fragment of the radius caused adhesions and fibrosis to surround the median nerve and apparently contributed to its compression. The carpal tunnel syndrome was relieved after surgical release of the transverse carpal ligament and excision of the bony fragment.

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