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Rigid Wire Fixation Of Fractures Of The Hand

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RIGID WIRE FIXATION OF FRACTURES OF THE HAND

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For many years fractures of the hand have been successfully treated by wrapping the hand in position of function or immobilizing the hand with the aid of plaster. The great percentage of fractures is still treated in this manner, but with the advent of internal fixation of fractures, a similar method has evolved using Kirschner wires for the small bones of the hand. The wires may be inserted successfully longitudinally, transversely or obliquely.

Insertion of Kirschner wires may be done with a Steinman pin inserter. This instrument is used in the manner of a wood worker's awl, in a back and forth rotary motion. The drill, designed by Dr. Bunnell, provides a more satisfactory insertion of the wire but demands that both hands of the operator be employed in handling the drill, and an assistant must keep the fragments accurately approximated.

The Dingman Lion jaw forceps, for holding small bones, are effective in open reduction. The 'end on' wire cutter provides a method for cutting the wire close to the skin, which will then retract over the wire. If the wire is allowed to protrude, it may be removed more easily, but the opening in the skin provides an entrance for bacteria. Antibiotics provide the protection from infection which is a common sequelae of introducing a foreign body into bone.

Adequate operating room x-ray must be available, and the fractures may be reduced either open or closed. The anesthesia can usually be obtained regionally with a metacarpal or brachial block. Seldom is general anesthesia necessary, but the use of a pneumatic tourniquet is essential for good open reduction.

The wire must be started at right angles to the cortex of the bone, and then directed as desired. These wires differ from Kuntchner nails which obtain their stability from filling the medullary cavity. Rush and Lottes nails have a "spring" force binding the fracture site by impinging all three points on the internal aspect of cortical bone.

When sufficient callus has formed to hold the fracture the wire is removed, and gentle active motion begun. Several authors state that no joint disability follows, but if the extensor expansion has been immobilized some limitation of motion occurs. In the older age groups frequently traumatic arthritis develops when joint surfaces are traversed.

Compound fractures can generally be debrided, reduced and immobilized with a K wire, and the wound closed. The patient must receive adequate doses of antibiotics.

If there is loss of covering tissue or the wound is several days old, soft tissue coverage must be obtained first. The wound must be cleansed and allowed to heal before open reduction and fixation of the fracture.

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A great advantage of internal fixation is that early motion of all joints not involved in the fracture may be obtained. Frequently, with transverse and oblique pinning, active motion may be started immediately as in the transverse wiring of metacarpals.

There are certain elective procedures such as arthrodesis of joints which are well handled with the aid of a transfixing wire.

Dr. Bunnell[1] and Sir Reginald Watson-Jones[2] feel that a Bennett's fracture can be held until healed by a K wire. The transposition of a metacarpal ray may be immobilized with a K wire as in moving the fifth to the fourth position when there is loss of the ring ray. Bone grafts can be properly positioned and held with either single or crossed rigid wires.

The following series of pictures illustrate the material discussed.

BIBLIOGRAPHY

1. Bunnell, S.: Surgery of the hand, 2d ed. Philadelphia, J. B. Lippincott, 1948.
2. Watson-Jones, R.: Fractures and joint injuries, 4th ed. Baltimore, Williams & Wilkins, 1952-55. 2v.

The author expresses appreciation to Dr. R. Clifford and the Photography Department for assistance in the preparation of this paper.

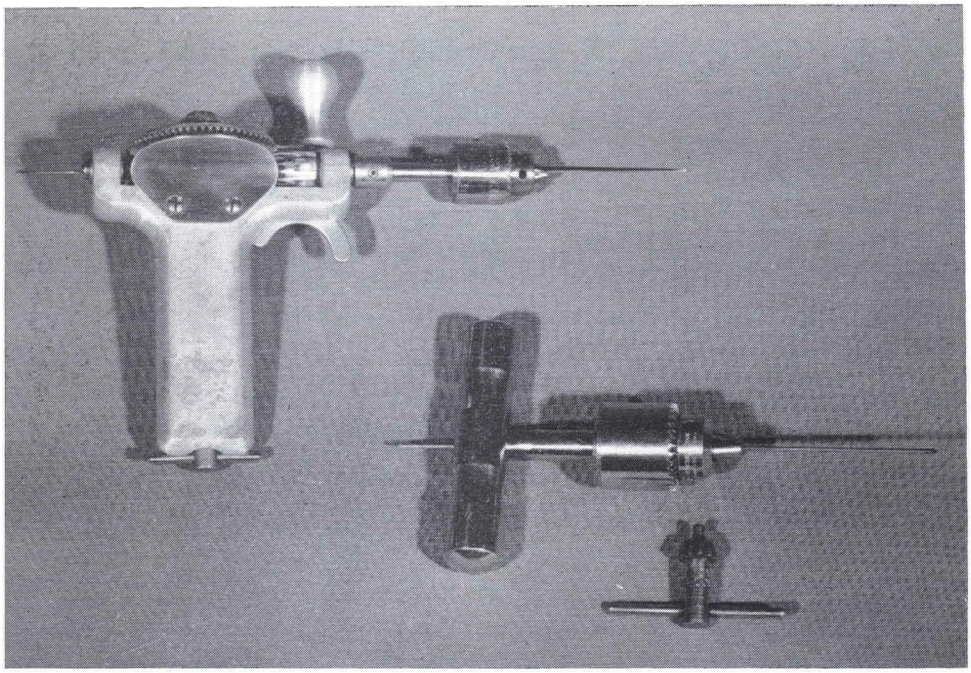

Figure 1
A. Steinman Pin Inserter (Awl principle). B. Bunnell Hand Drill.

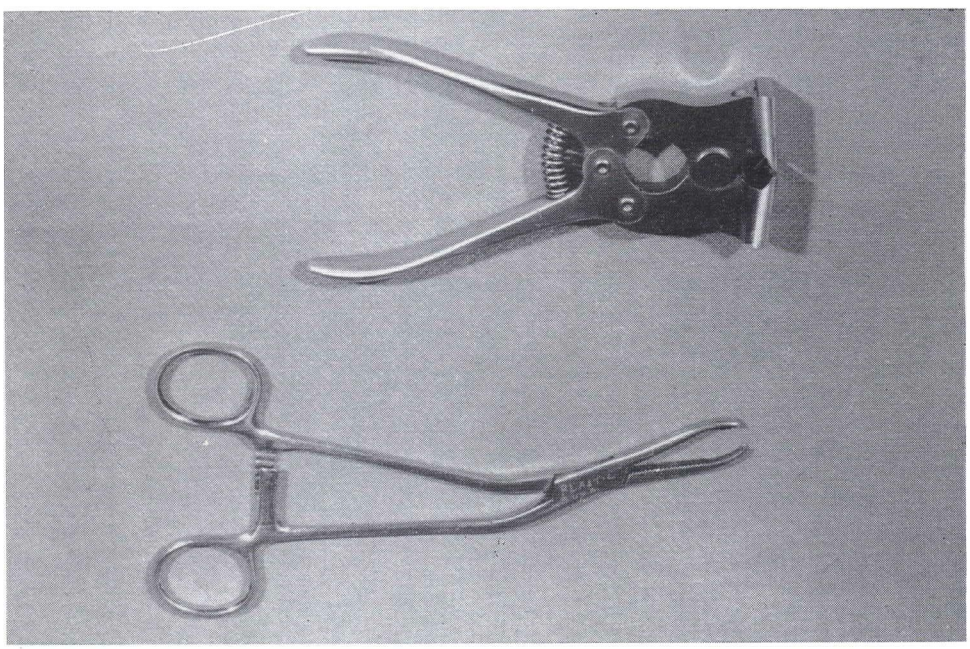

Figure 2
A. "End On" Wire Cutters. B. Dingman Bone Holding Forceps.

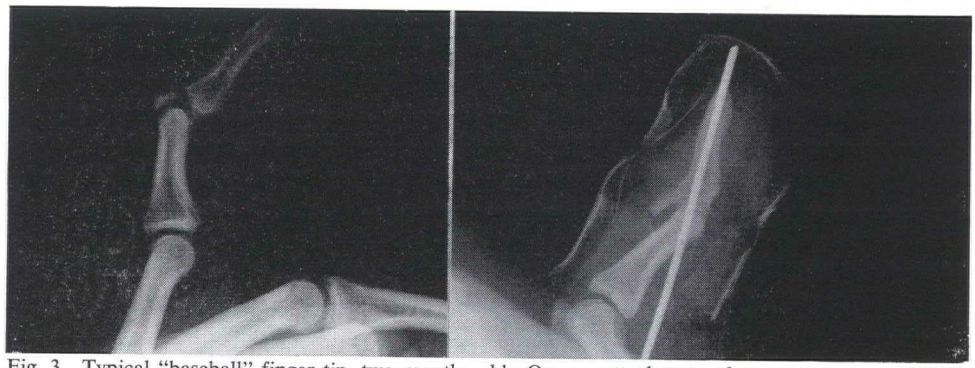

Fig. 3 Typical "baseball" finger tip, two months old. Open reattachment of extensor tendon. Immobilized in hyperextension with K wire passing through distal interphalangeal joint and missing proximal interphalangeal joint, but secured into proximal phalanx.

Fig. 4 Non union middle phalanx of ring finger. Banked bone graft immobilized with crossed wires. No movement of fragments, but no callus formation.
Four months later autogenous bone graft removing proximal fragment of middle phalanx.

Fig. 5a. Fracture of proximal phalanx of left little finger with rotation of distal fragment at right angles to proximal shaft. — Stiffness of joint one month post op. — Good motion in two months.

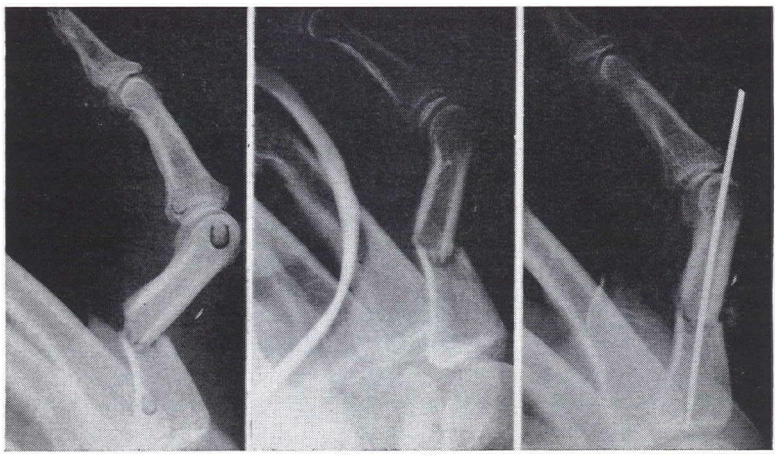

Figure 5b

Closed reduction of proximal phalanx of left finfer. *Open* reduction one month after accident. Fixation with intramedullary wire. Minamal stiffness in two months of proximal interphalangeal joint.

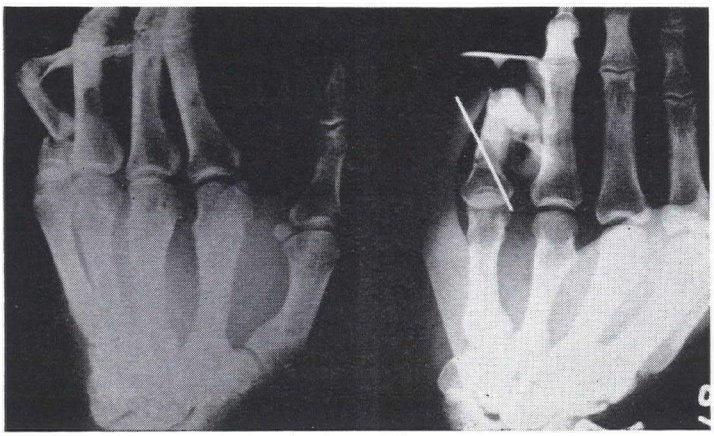

Figure 6

Three week old fracture of proximal phalanx, left little finger. Diagonal Kirschner Wire, proximal interphalangeal joint and M.P. joint movable.
Three weeks later limitation of P.I.P. joint of 60°. Two months, 40° limitation of motion.

Figure 7

Fracture of mid shaft of second metacarpal. Open reduction and intramedullary longitudinal wire fixation. Wire removed in one month; some stiffness. Good motion in two months.

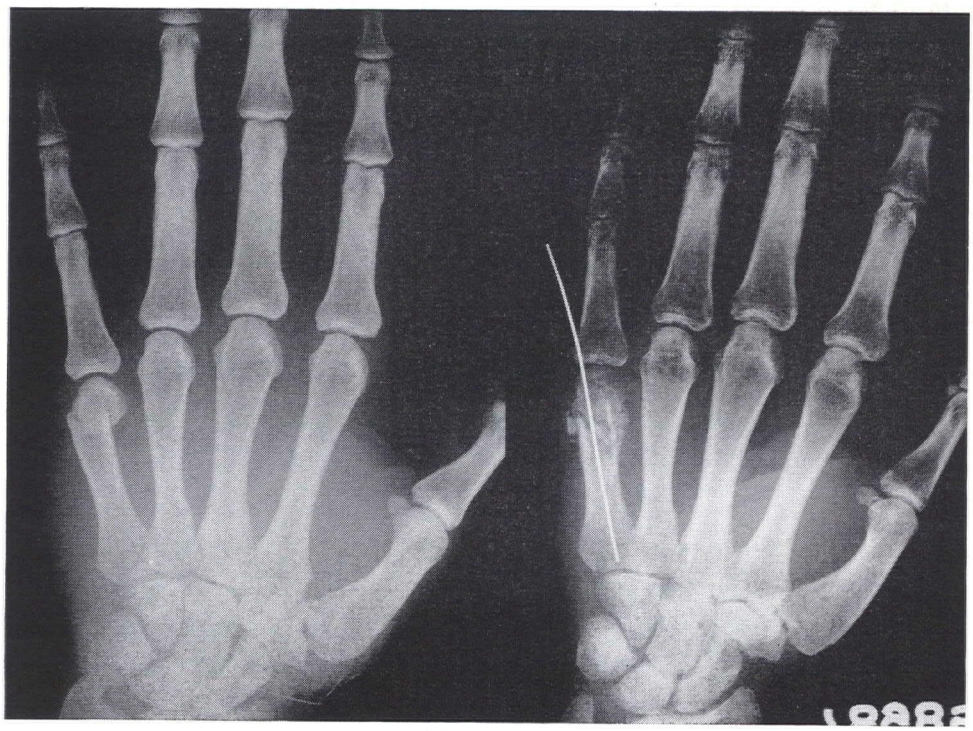

Figure 8

Fracture with volar displacement of head, fifth metacarpal. Closed reduction unsuccessful, fibrous union destroyed with an osteotome; and satisfactory alignment with a K wire.
No tenderness and good motion one month post op.

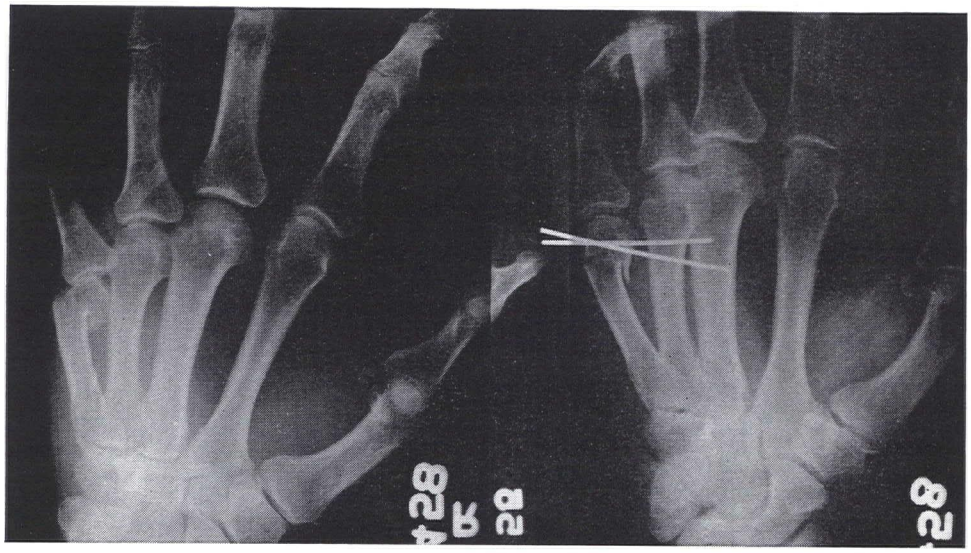

Figure 9

Open reduction of head of fifth metacarpal. Immobilized with two transverse wires. Motion of M.P. joint immediately post. op. Wires were removed in three weeks.
One month slight limitation of motion at m.p. joint.

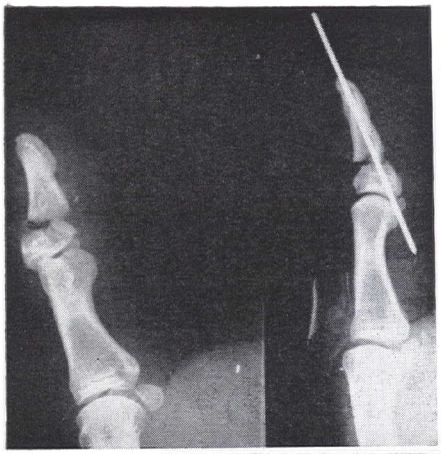

Figure 10a

Compound fracture of tuft of thumb. Alignment with K wire wounds sutured.
Pin removed in one month, and in six weeks patient was using thumb satisfactorily.

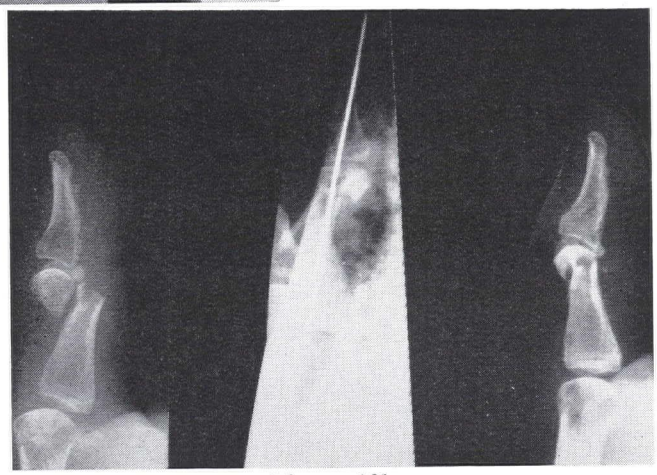

Figure 10b

Two months post trauma, mal union of proximal phalanx of thumb. Open reduction with removal of fibrous tissue.
Aligned with K wire and immobilized with plaster. Wire removed in one month. Good function in three months.

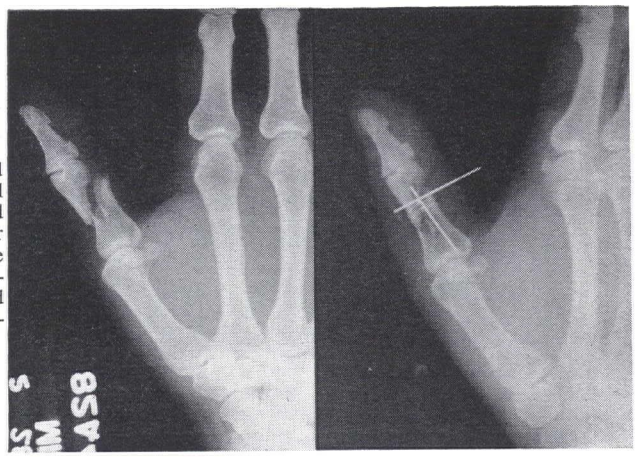

Figure 10c

Open reduction of a three day old compound fracture of proximal phalanx of thumb. Immobilized with crossed wires and circular braided wire. Removed wires due to infection six weeks later, secondary operation. Similar crossed wire immobilization, and satisfactory function obtained.

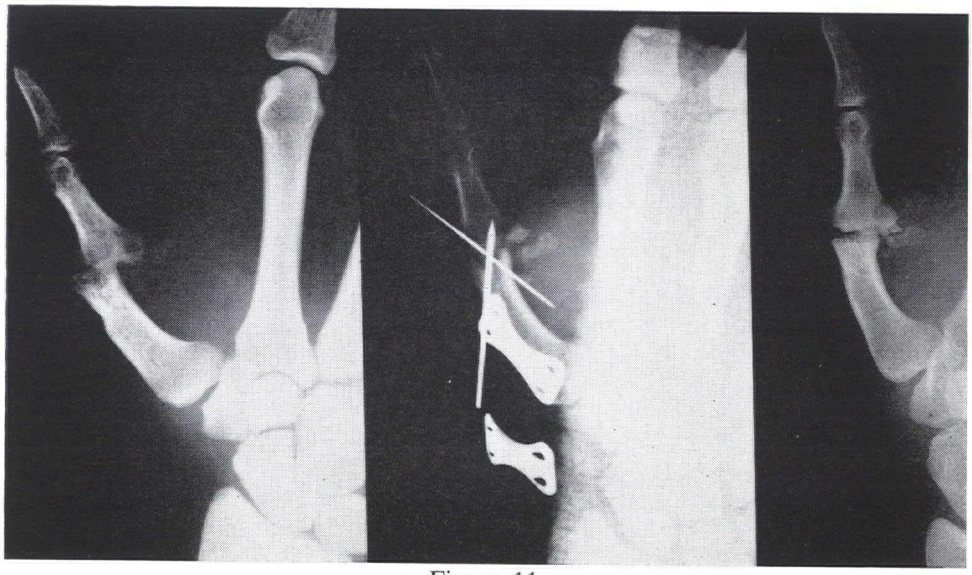

Figure 11

Compounded saw injury removing head of first metacarpal. Fusion of M.P. joint with aid of K wire. Good function of thumb, playing baseball three months later.

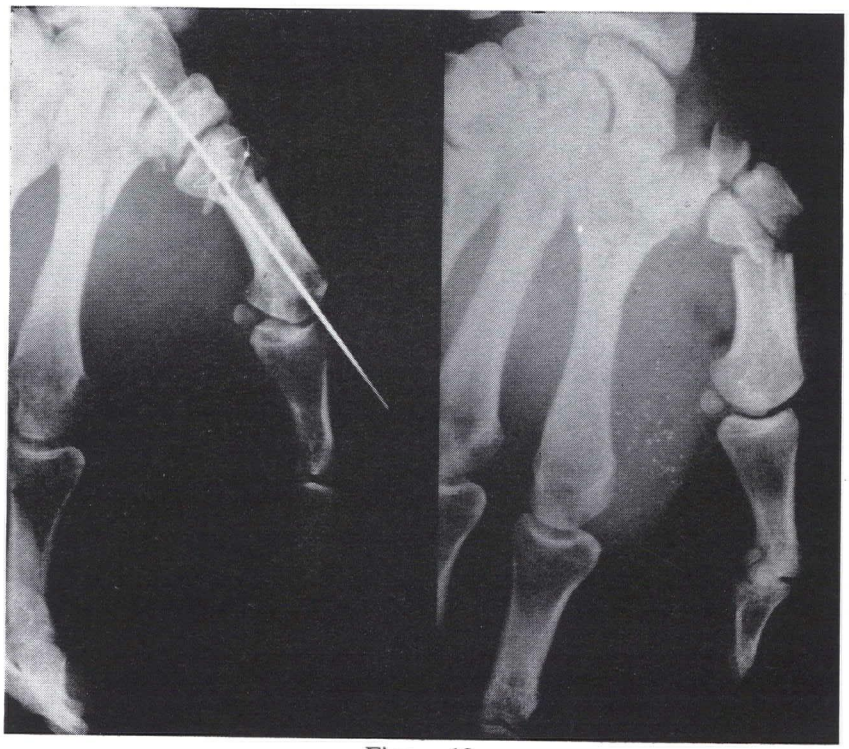

Figure 12

Compound comminuted fracture of the base of the first phalanx. Open reduction with K wire stabilization. Fragments immobilized with braided 5.0 wire.
Wire removed five weeks later. Capsulotomy, three months later.

Figure 13

Fracture dislocation of epiphysis of first metacarpal. Attempted closed reduction with transverse wire unsuccessful. Open reduction at carpo-metacarpal joint, with fixation of epiphysis; joint not involved.

Good function one month. Wire removed in situ for six weeks.

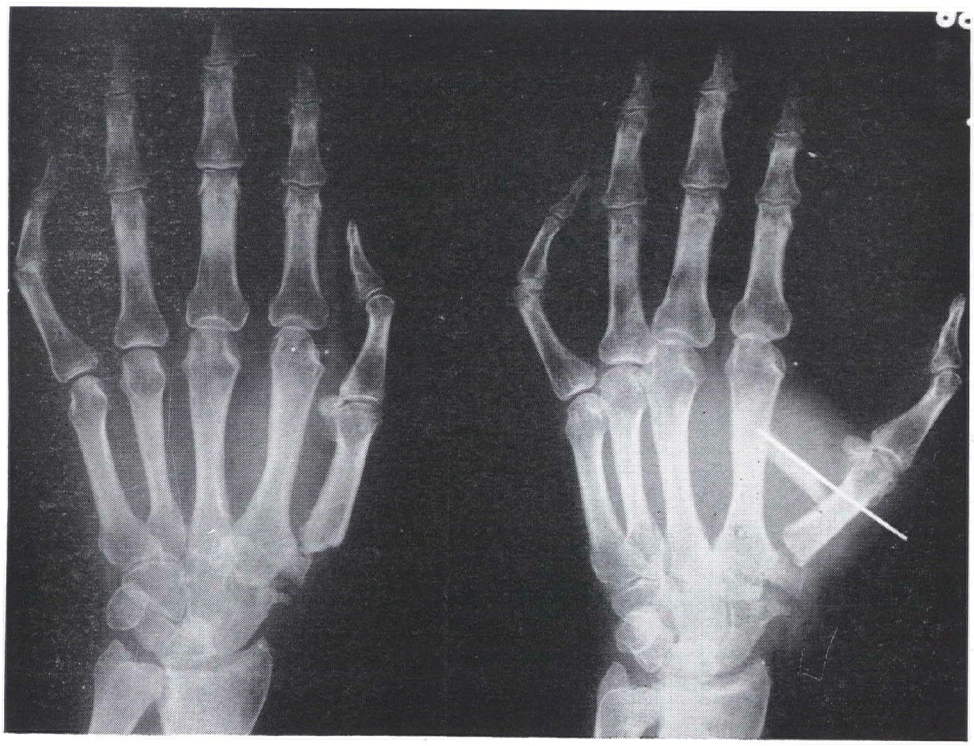

Figure 14

Compound injury to first M.P. and carpal bones, subsequent osteomyelitis. Thumb fused in abduction. Op., opened scar tissue, and inserted bone block between first and second metacarpal, thumb in position of function.