CHAPTER ELEVEN

FINGER FRACTURES

THE finger fracture which of all others demands most expert mechanical treatment is that of the proximal phalanx. The reputation of a surgeon may stand as much in jeopardy from this injury as from any fracture of the femur.

In the subsequent paragraphs a method is described which I believe to be of value, though it involves a rather heretical doctrine. It is important, therefore, that the spirit of this method should be fully understood because it contains a potential danger if the doctrine is misapplied.

ANATOMY OF THE FRACTURE

Fractures of the proximal phalanx are often compound, because they are so commonly the result of industrial injuries. The characteristic deformity is an angulation concave to the dorsum, and for the purpose of reduction the soft-tissue ' hinge ' is to be regarded as being on the dorsal aspect of the fracture.

Mechanics of Treatment

The reduction of these fractures as a rule offers no great difficulty; the real difficulty lies in the application of a retentive apparatus which will hold securely the reduction so easily obtained by the surgeon's fingers.

Manipulative reduction is obtained by first applying traction and hyper-extension; then, with the thumb applied as a fulcrum to the volar aspect of the fracture, the traction is followed by a movement of flexion, following which the traction is released (Fig. 120). After release of the traction the reduction can be held by a simple three-point arrangement of forces designed to maintain the finger flexed over a fulcrum.

Sometimes difficulty in reduction may be experienced when the distal fragment is rotated through 90 degrees (Fig. 121, A); in these cases the method of increasing the dorsal concavity before straightening the finger will usually succeed. This procedure is so important, as a general principle, that the description is worthy of repetition, though I have described it in detail for fractures of the distal third of the femoral shaft (p. 185). With the proximal fragment held in a horizontal position the distal fragment is drawn vertically upwards to lie at right angles to it (Fig. 121, B); in this position the distal fragment is drawn powerfully upwards and the proximal fragment is pushed powerfully downwards, in the hope of getting the distal fragment to lie above the dorsal surface of the proximal; from this

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position the fracture is gently straightened and the fragments should then be in alignment. This step is of great value in attempting that very difficult reduction

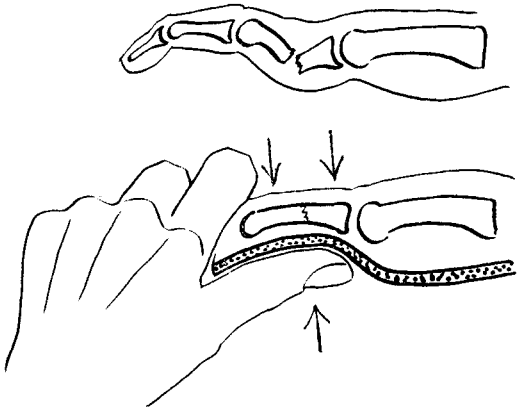

FIG. 120

Reduction of a fracture of the proximal phalanx with a three-point system of forces. Note the hold when the wet plaster slab is interposed between the surgeon's thumb and the fracture and pressure maintained until it is set.

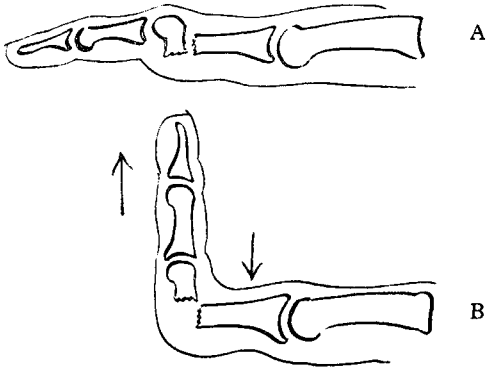

FIG. 121

Reduction of a phalangeal fracture by increasing the initial angulation and then flexing.

of the supracondylar phalangeal fracture in which there is 90 degrees of rotation of the distal fragment.

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Splintage

The natural difficulty of splinting finger fractures is made even more difficult by the popular desire to leave adjacent digits free and so capable of independent movement. The use of traction is convenient because it enables a three-point system to be applied without bulky encircling dressings to impede the movement of adjacent fingers. Traction used in this way is not needed to maintain length but merely to hold the finger in contact with the curved surface of the volar splint which moulds the fracture into its correct alignment. This method can give excellent results *provided that the traction is not applied by the abominable method of transfixing the pulp of the finger with wire.* In order to prevent rotational deformity in this method it is often advised that in all fingers the traction should be directed towards the tubercle of the scaphoid.

The method to be advocated here does not employ traction. In this method **the adjacent uninjured finger is used as a splint and mould for the injured digit.** By splinting the injured finger to the adjacent normal finger the correct alignment of the fracture is automatically obtained. The fixation enforced on the adjacent normal finger enhances the immobilisation of the injured finger which is important in compound injuries.

Alignment

If an attempt be made to splint an isolated finger by a circular padded cast it is likely that two deformities will ensue, namely, angulation and rotation. In the case of the index finger radial displacement of the distal fragment may be produced because *the attempt to pass turns of bandage within the cleft between the index and the adjacent finger makes parallel alignment impossible* (Fig. 122). The other deformity likely to follow from isolated splintage of one digit is rotation. It is often said that rotational deformity can be prevented by aligning the fingers towards the tubercle of the scaphoid; but with so many other things to think about at the moment of reduction this advice is often overlooked. *If the injured finger lies side-by-side with the next normal digit, using a plaster cast which encircles both, rotary alignment cannot be lost.*

Rest

The time during which a fractured finger must be absolutely fixed need never be longer than three weeks. After this time intermittent splintage can be allowed for a further two or three weeks and then all splintage can be abandoned.

Fixation of the normal finger for three weeks can cause no permanent disability; indeed a normal finger is better capable of tolerating a period of fixation without permanent harm than is any abnormal digit.

In finger injuries the commonest cause of permanent and crippling joint stiffness can be traced to the effects of sepsis or nerve injury. In a simple finger fracture stiffness from fixation alone, in the absence of sepsis, may need weeks or months to rehabilitate, but *the ultimate prognosis is good.* By contrast,

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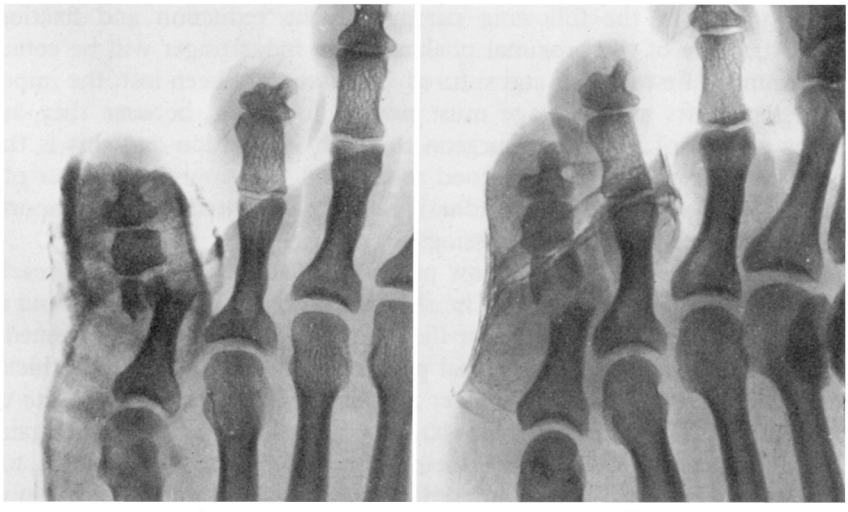
the stiffness resulting from sepsis or complicating nerve injury is permanent and irreparable. If the injured digit becomes septic its ultimate fate is largely out of the surgeon's control. The ultimate function of a septic finger will depend on how swiftly the sepsis is resolved by rest and chemotherapy.

Even more serious than sepsis localised to the injured digit is the effect of sepsis on the tendons of adjacent fingers threatening stiffness of the whole hand. It should be obvious that attempts to move a septic finger will in no way prevent stiffness of that digit. When sepsis is established in the injured digit



A B

FIG. 122

A, Showing the deformity which results when a digit is splinted separately, due to the bulk of dressings interposed in the cleft between the adjacent normal digit.

B, Showing improvement in the alignment when the fractured digit and the normal adjacent digit are splinted together without bulky dressings interposed in the cleft between them. This same procedure also eliminates the danger of a rotary deformity.

attempts to keep the *normal fingers mobile* are highly to be commended. The splintage of normal and injured fingers alike is therefore only to be entertained while an open fracture is still fresh and free from sepsis; **during the first three weeks after a compound fracture the enhanced rest enforced on the whole hand by this method may be the determining factor in preventing sepsis.** Late movement, by avoiding aggravation of sepsis, may thus result in better ultimate function than early movement. It is a grievous mistake to believe that the use of antibiotics will allow fundamental principles of surgery to be transgressed; rest of an open wound must always be the first surgical principle and chemotherapy the second.

It will be seen from the above reasoning (1) that the complete fixation of normal fingers can do no harm *in the absence of sepsis*; (2) that if the fracture is freshly compound the fixation of adjacent normal fingers may be the deciding factor in preventing infection.

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If infection should ensue in the injured finger, encouragement of movement of adjacent fingers becomes of paramount importance. The possibility that amputation of the septic finger may eventually have to be undertaken must not be too long ignored if there is any risk of the infection impairing the mobility of adjacent normal digits.

TECHNIQUE

The use of a quick-setting plaster is to be recommended in the treatment of finger fractures. In the following paragraphs the reduction and fixation of a compound fracture of the proximal phalanx of an index finger will be considered.

The wound is first excised and sutured. If tissue has been lost, the importance of small skin grafts at this stage must not be forgotten, because they are well within the powers of a casualty surgeon to stitch in position and this is the time when they are most likely to give good results. A dressing of one layer of gauze is applied to the wound with an adhesive such as Mastisol; it is important to leave the finger free from bulky dressings.

A quick-setting plaster slab is now prepared of sufficient length to reach from the wrist to the end of the finger. The slab is folded so as to be thick and narrow in the distal part and wide and flat at the proximal part where it is fastened to the volar aspect of the wrist. In the distal part the slab should be $\frac{1}{2}$ inch thick, so as to offer a solid foundation for the finger; thin and flexible slabs are quite useless.

The wet slab is laid under the volar aspect of the digit and held against the wrist by an assistant. The surgeon seizes the distal part of the finger, together with the slab, in his right hand and applies traction. The thumb of the surgeon's right hand is applied to the volar aspect of the fractured phalanx to act as a fulcrum; the wet plaster slab thus lies between the thumb and the fracture (Fig. 120). In securing this grip it will be found that the end of the injured finger is gripped in the crook of the surgeon's index and ring fingers. The final movement of reduction is now carried out as previously described, and as though no plaster were intervening. From the position of traction and slight hyperextension the finger is flexed over the fulcrum provided by the surgeon's thumb and the traction force is then relaxed. While waiting for the plaster to set, with the surgeon's fingers still in the above position, the assistant bandages the proximal part of the slab to the wrist with circular turns of wet cotton bandage.

When the plaster has set, the surgeon releases his grip and lays the adjacent uninjured ring finger at the side of the injured digit. The dorsal aspect of both digits is now covered with wool and a gauze bandage applied *to encircle both fingers and the slab* (Fig. 123, A, B, C,). It will be seen that the injured finger is lying directly on the plaster slab without bulky dressings to interfere with the positive action of the splint as a fulcrum or mould. The plaster slab controls angulation in the sagittal plane, the adjacent finger controls lateral angulation and rotary deformity. The dorsal pad of wool keeps the finger pressed against the curved splint and permits swelling without constriction. If the wound is

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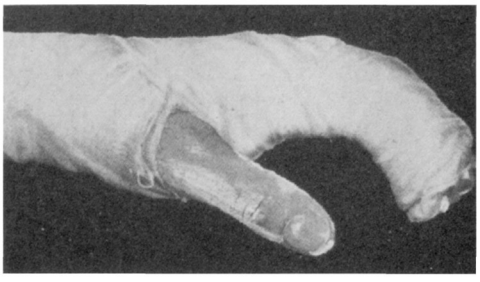
A



B

C

FIG. 123

A, Showing the palmar plaster slab used for a fracture of the proximal phalanx of the index finger. The slab is thick under the finger and has set in the position imposed on it by pressure of the surgeon's fingers.

B and C, Showing the final appearances when the adjacent normal middle finger is bandaged against the fractured digit to ensure correct alignment and to enhance the fixation.

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sealed with a suitable adhesive dressing there should be no fear of soiling the wound with wet plaster over gauze; quick-setting proprietary plasters are practically sterile.

The radiological appearance of a fractured index finger lying side-by-side in

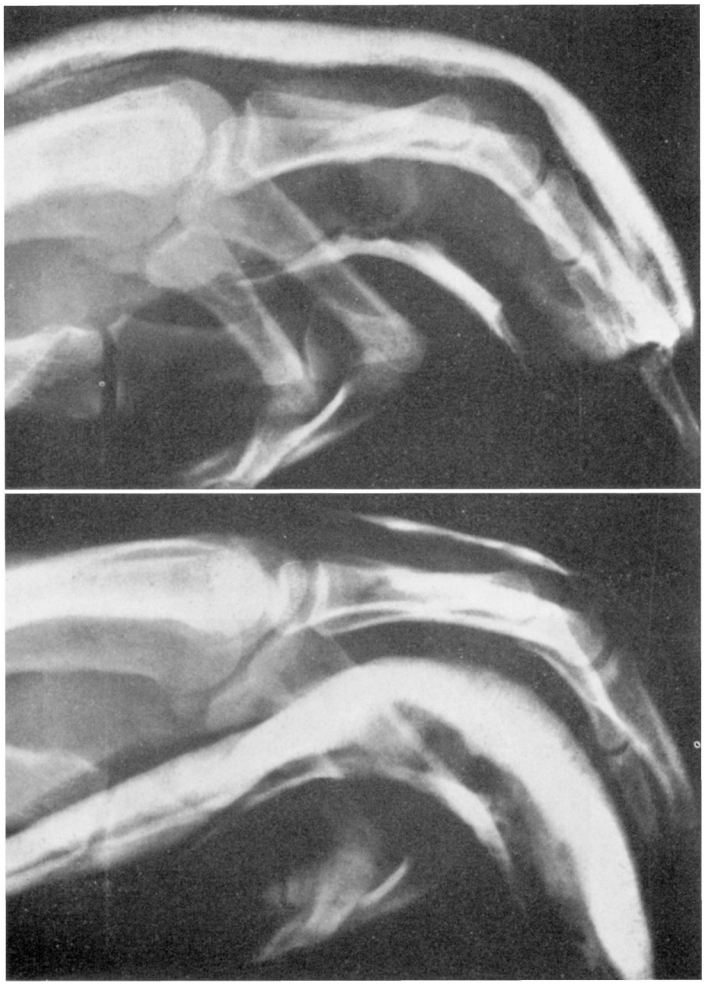

FIG. 124

Dorsal plaster slab, A, does not offer fulcrum to correct concave dorsal angulation as does palmar slab, B.

parallel alignment with the normal ring finger, and bandaged to the same volar plaster slab, is illustrated in Fig. 124, C.

The importance of using a plaster slab on the palmar aspect of the digit is illustrated in Fig. 124, A and B. In the upper figure there is slight residual angulation in the proximal fragment, concave on the dorsal aspect; the finger

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had been splinted with a plaster slab on the dorsal surface of the digit. Because a dorsal slab does not exert a three-point system of forces I was unhappy about this slight angulation and, though this amount of angulation in itself would be acceptable, the dorsal slab might permit this angulation to increase. I therefore changed the dorsal plaster slab to a thick *palmar* slab strong enough to act as a fulcrum under the site of angulation ; an appreciable improvement in the alignment of the fracture

C

FIG. 124

Fractured digit plastered side-by-side with intact digit to control later angulation.

was obtained as well as much greater certainty of maintaining this alignment (Fig. 124, B). The *thickness* of the palmar slab should be noted.

A Warning on Radiographic Control

In the treatment of finger fractures I have noticed a common error in the acceptance of post-reduction radiographs which are not true lateral views of the digit. It is often difficult to get a perfect lateral radiograph of a finger without the shadow of the adjacent finger being superimposed. For this reason, radiographers have a tendency to take oblique views so as to project the shadow of each digit separately on the film. These oblique views can be misleading and it is preferable

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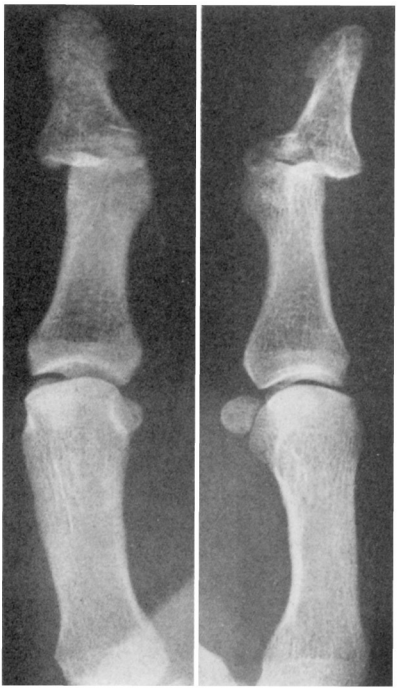
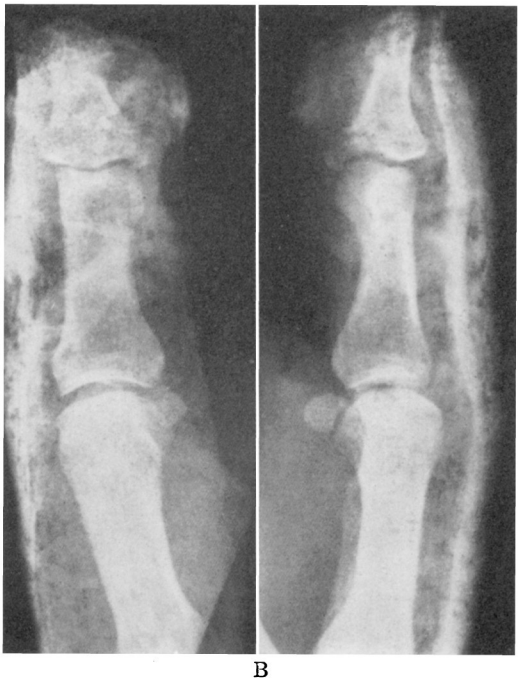
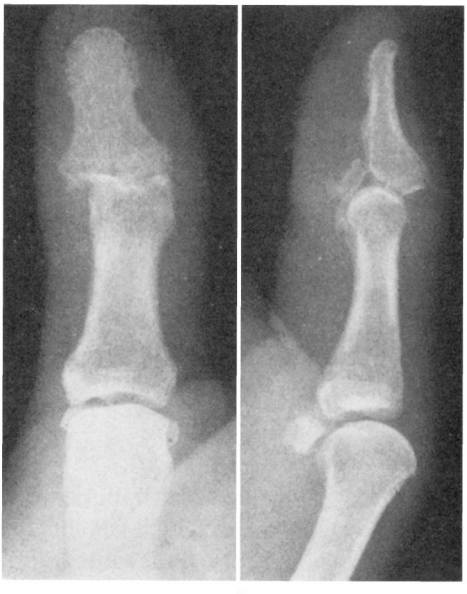


A



B



C

FIG. 125

See text for the series of technical errors leading to this bad result.

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to have the shadows of two digits superimposed and attempt, even with difficulty, to trace out the appropriate shadows.

The fracture-dislocation of the terminal interphalangeal joint of a thumb shown in Fig. 125 is interesting because the errors committed illustrate some fundamental features of fracture treatment :

1. The direction of the force needed to secure any reduction is always the opposite of that causing the injury. If extension caused the injury, then flexion is needed to reduce and to hold it and vice versa.
2. The violence which caused this injury was easily elicited : during a game of football the ball which the player was holding in his hand was kicked by another player, forcing his thumb into hyperextension. The ruptured soft parts would therefore be on the palmar aspect of the joint and the intact structures in the dorsal aspect. Thus the *distal joint ought to have been splinted in flexion to tighten the dorsal structures.*
3. The final mistake was to accept a post-operative X-ray which was not perfectly centred. This is a common mistake in the handling of finger fractures because of the difficulty of getting true lateral views if other digits are superimposed. If necessary a dental film placed between the fingers should be used to settle the matter if any doubt exists.

Rehabilitation

After three weeks of fixation the finger can be started on intermittent exercise substituting the plaster with a detachable slab. The detachable plaster is discarded when test indicates that union is sound, which may take a further two to three weeks. A useful method of guarding a finger, at the same time as permitting function, is to strap it to the adjacent finger so as to leave the joints free. In gaining confidence for the early removal of splintage in finger fractures the small mechanical strains on the callus should be appreciated (p. 58). The late deformity of soft callus is related, among other factors, to the weight of the distal limb and the length of the distal fragment ; it will be readily appreciated that a finger will expose its callus to infinitely less strain than will a fracture of a femur, and therefore movement can be countenanced at a much earlier stage without the danger of spontaneous deformity.

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