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COMPRESSION FIXATION OF BENNETT'S FRACTURE

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A procedure that ensures exact reduction and internal fixation of Bennett's fracture is presented. In cases with a large tubercular fragment, the internal fixation is performed with a lag-screw technique. If the fragment is small, a Kirschner wire is used as an implant. A special set of instruments that keeps the reduced fragment in position and guides the implant during the internal fixation process is also described.

Key words: Bennett's fracture; small fragment fracture; metacarpal fracture; thumb injury; internal fixation; internal fixation of small fragments; lag-screw fixation

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Ever since 1882, when the Irish surgeon E. H. Bennett described a fracture of the palmar tuberculum of the first metacarpal, causing subluxation in the first metacarpal joint (Figure 1), this injury has attracted great interest, in spite of the fact that it is relatively uncommon. In a large number of fracture injuries, Bennett's fracture accounts for only 0.4 per cent (Gedda 1954). There are two main reasons for this interest:

1. A neglected or incorrectly treated Bennett's fracture will cause a posttraumatic osteoarthritis in the first metacarpal joint. The loss of stability in the joint considerably reduces the force of the thumb and with it the gripping ability of the hand. The injury tends to affect the hand of preference in people in their most active age and can considerably impair their capacity for work.

2. The fracture has earned the reputation of being easy to reduce but difficult to keep in position.

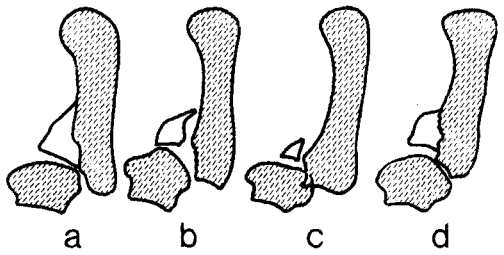

Figure 1. Bennett's fracture. Classical forms (a and b), with small fragment (c) and impact fracture (d).

A great variety of treatments, open as well as closed, have been described and recommended (Moberg 1952, Lataste & Cédard 1959, Lemerle 1960, Pollen 1968). The underlying principles are difficult to evaluate because none of the published series has exceeded 15 cases, with the exception of the monograph by Gedda (1954). This work on Bennett's fracture is the most extensive and important, discussing comprehensively the history, mechanics, pathophysiology, diagnosis and

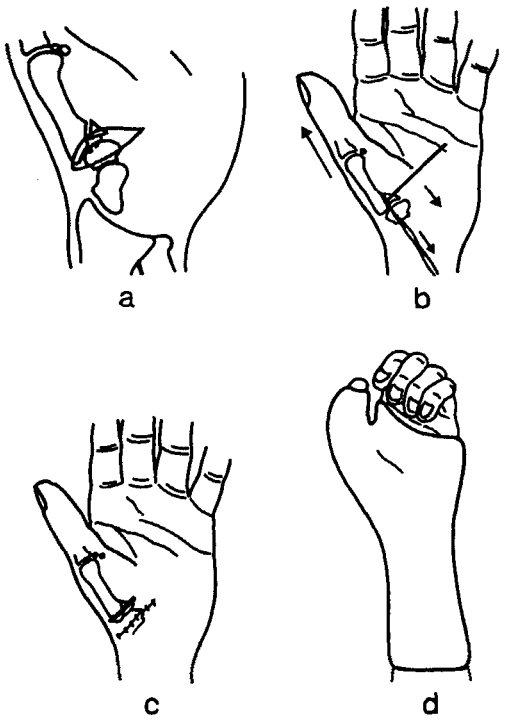

Figure 2. Internal fixation ad modum *Gedda & Moberg (1953).*

treatment and presenting a great many cases. Subsequent progress in the field of internal fixation has made it possible to develop the method of treatment described by Moberg (1952) (Figure 2).

Gedda pointed out that the prognosis for Bennett's fracture depends to a great extent on the choice of therapy. If exact or almost exact reduction can be achieved, the results are very good.

The internal fixation of Bennett's fracture can be performed by means of a screw (Rüedi et al. 1971) or a Kirschner wire (Moberg 1952), depending on the size of the tuberculum fragment. The purpose of screw fixation is to achieve a rigid internal fixation. Difficulties arise, however, in maintaining the reduction of the fracture during the insertion of the implant and in securing an ideal position for the implant. With the instruments described below, the operation is simplified and there is less need for assistance.

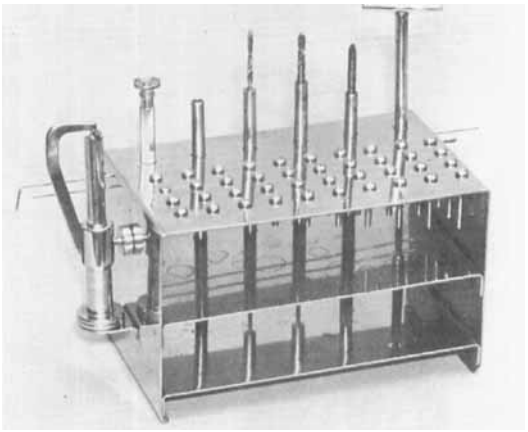

Figure 3. Instrumentarium.

MATERIAL AND METHODS

The set of instruments (Figure 3)

The instrumentarium consists of the following:

1. A guide and fixation instrument, with a guide-hole that is some tenths of a mm wider than the head of the osteosynthesis screw (Figure 4).
2. One 2.7 mm and one 2.0 mm wide drill, fitted to batons that are slightly smaller than the hole in the guide instrument (Figure 5 a + b).
3. A threaded tap, fitted to a baton of the same thickness as those for the drills (Figure 5 c).
4. A screw-driver of the Phillips type for the osteosynthesis screw (Figure 5 d).
5. A guide for the Kirschner wire, resembling a thick-walled tube. Its external diameter is the same as that of the hole in the guide and fixation instrument and its internal diameter is some tenths of a mm larger than the Kirschner wire (Figure 5 e).

In the case of big fragments, the internal fixation is performed with a lag-screw technique by means of a cortex screw of the AOI-type, diameter 2.7 mm (Müller et al. 1965). A cortical screw is used because it is less likely to cause rotation and damage to the fragment than a cancellous screw. In cases of small fragments, the internal fixation is performed by means of a 2 mm Kirschner wire. Whether a screw or a wire is used, it must run perpendicular to the fracture surface.

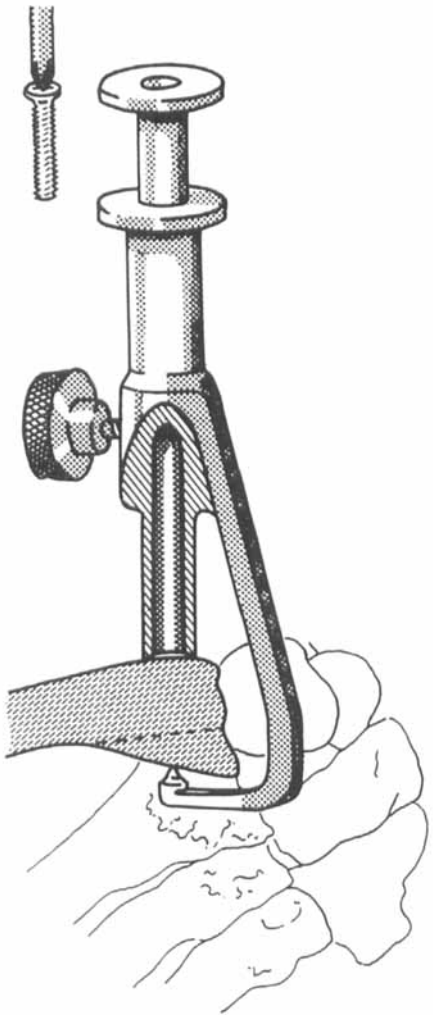

Figure 4. Guide and fixation instrument.

Procedure

The fracture is exposed as described by Moberg (1951) and Gedda & Moberg (1953) (Figure 2 a). The operation is performed under general or regional anaesthesia. An arched incision (Figure 2), approximately 3 cm long, is made over the base of the thenar muscles at right angles to the line of the thumb, on the volar side of the tendon to adductor pollicis longus. The thenar muscles must be partially dissected from the aponeurosis. The joint is opened and the fracture haematoma and small crush fragments are removed. Traction is applied along the axis of the thumb at about 60° to the axis of the forearm. Thus, the subluxation and the fracture are reduced under visual control. In order to maintain traction, a silk netting for finger traction (Silk finger grip, Zimmer, G.B.) may be used. This netting can be fastened to the operation table so that the reduction is maintained while the osteosynthesis is carried out. The sharp tip of the main instrument is placed on the palmar fragment and the cylinder is pressed down against the main fragment (Figure 4). In this way, the fracture is temporarily fixed, while fully visible and a check can be made that continuity of the joint surface is restored. A lock-screw in the main instrument is used to keep the cylinder in place.

The 2.7 mm drill is fitted to a hand surgery drill and inserted into the hole in the cylinder. A hole is drilled through the cortex of the main fragment (Figure 6 a). After this, a hole is drilled in the same way through the cancellous bone and the cortex of the palmar fragment with the 2 mm drill (Figure 6 b). The tip of this drill passes close to the tip of the main fragment. The tap is used to produce a thread in the drilled tunnel (Figure 6 c). The two plates on the main instrument are now as far apart as the length of the drilled tunnel, in-

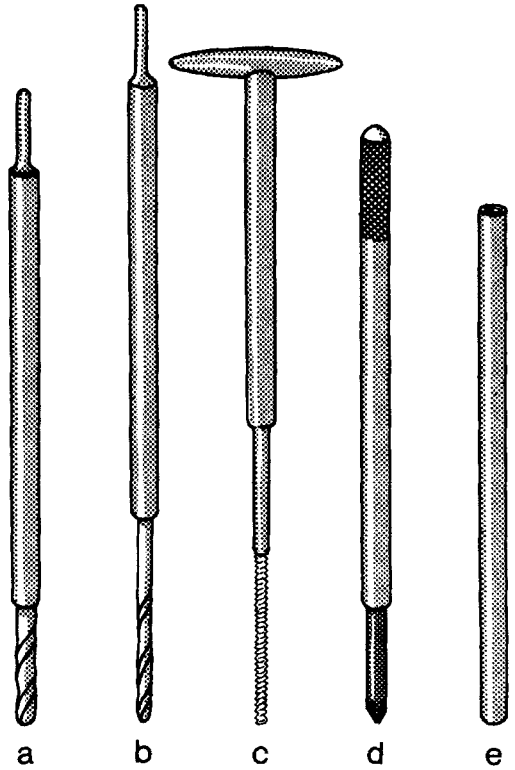

Figure 5. Auxiliary instruments for internal fixation. a) 2.7 mm drill b) 2.0 mm drill c) tap d) screw driver, Phillip's type e) guide for Kirschner wire.

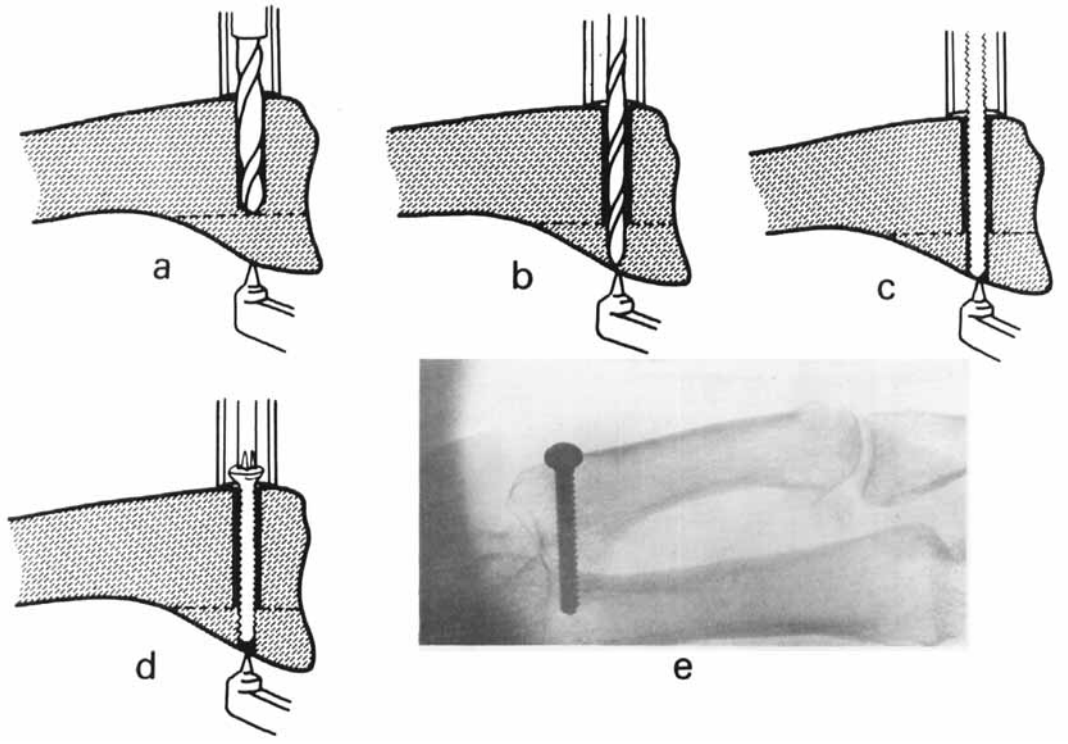

Figure 6. Performance of internal fixation. a) drilling through main fragment b) drilling through palmar fragment c) tapping d) inserting screw e) screw applied.

dicating the length of the screw required (Figure 4). The screw, temporarily fixed to the screw-driver with albumin, for example, is inserted through the main instrument and screwed into the bone tunnel (Figure 6 d). This results in rigid fixation of the fracture and compression between its surfaces. The muscles are sutured and the incision closed.

If the palmar fragment is too small to be screwed, internal fixation with compression must be abandoned. The fragment is instead fastened with a Kirschner wire, as described by Moberg (1952). This can be successfully accomplished with the instruments described above. When the fracture has been temporarily reduced, the tubular guide (Figure 5 a) for the Kirschner wire is inserted into the tunnel in the main instrument. The wire is fastened into a hand surgery drill and placed in the tubular guide, so that it can be drilled through the cortex of the main fragment and out through the cortex of the palmar fragment (Figure 7 a). The wire is passed out of the palmar fragment close to the tip of the main instrument. The main instrument is then removed and the wire cut off.

The joint is immobilized in a plaster bandage extending from the interphalangeal joint of the thumb, engaging the entire middle hand and up onto the forearm. The operated hand is kept in an elevated position.

With internal fixation by means of a screw, the plaster is removed after 3 weeks and the screw after 2 months. With Kirschner wire fixation, the plaster must be retained for at least 4 weeks and the wire extracted after a further 2 months. As soon as the plaster has been removed, the patient should start to exercise the hand and fingers.

The operation need not be performed in the acute stage, but preferably within 1 week after the accident. This allows time for preoperative preparation of the skin and for the traumatic oedema to decrease. The internal fixation material should be removed 4 months after operation—a procedure for the outpatient department.

Patients

During a 5-year period the instruments described have been used in 11 patients, all men between 23 and 54 years of age. All the injuries had involved the hand of preference and caused

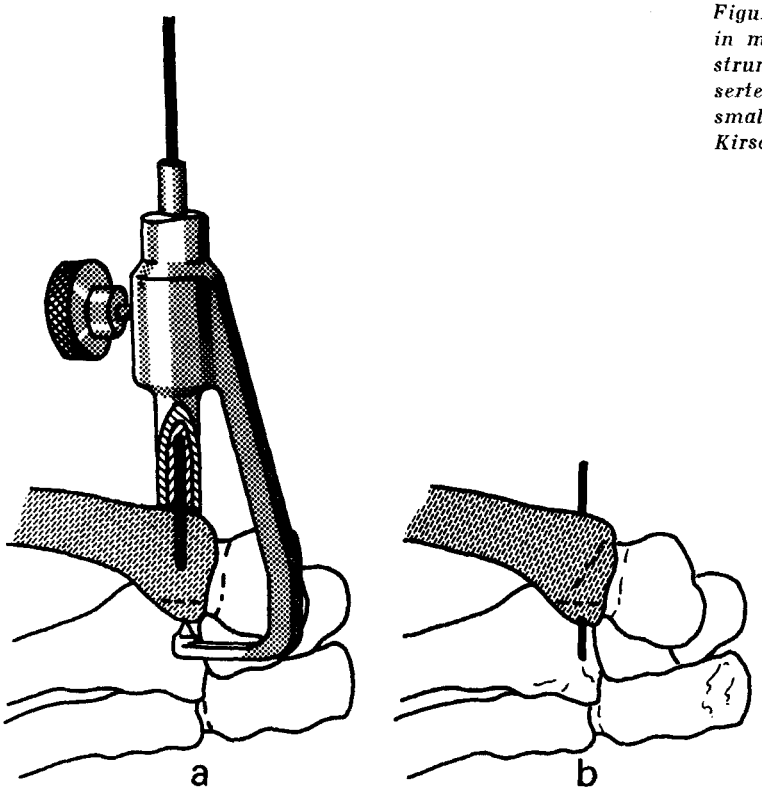

Figure 7. Kirschner wire guide in main guide and fixation instrument. a) Kirschner wire inserted b) internal fixation of a small palmar fragment with a Kirschner wire.

fractures of the palmar tuberculum of the first metacarpal bone with concomitant subluxation of the thumb.

Nine of the cases were treated by means of the lag-screw technique and two with Kirschner wires as internal fixation material. All the patients presented good primary results, and 2 years after the operation there was no residual incapacity of the thumb in 10 patients. In one patient, who was notoriously rowdy, the internal screw fixation and the good reduction achieved was eliminated in a new fight some days after the operation.

None of the cases have been followed for more than 2 years postoperatively. The implants were removed 4 months after surgery in all cases except the one, where the internal fixation was ruined.

DISCUSSION

All reports of Bennett's fracture point out the necessity of reducing both the subluxation in the metacarpal joint and the fracture. It is generally considered and postulated that exact reduction and reconstruction of the joint surface in intra-articular fractures prevents postfracture osteoarthritis.

It is impossible to determine during the operative procedure whether the reduction achieved is exact without opening the joint capsule and evacuating the haematoma (Gedda 1954). Furthermore, the small fragments of cancellous bone must be removed to enable exact reduction and performance of a rigid internal fixation.

The treatment of Bennett's fracture with internal fixation, as described above, decreases the risk of postfracture osteoarthritis by increasing the chance of achieving and maintaining exact reduction. The method permits reduction under visual control and the reduction is maintained during the fixation procedure. The fixation is accomplished either

by means of the lag-screw technique or with the aid of a Kirschner wire, and the method described reduces the need for assistance.

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