Modification of tension band wiring of displaced intra-articular phalangeal fractures

Margaret Pugh BSc, Robert S Richards MD FRCSC

Division of Plastic Surgery, Department of Surgery, The University of Western Ontario; and Hand and Upper Limb Centre, St Joseph's Health Centre, London, Ontario

M Pugh, RS Richards. Modification of tension band wiring of displaced intra-articular phalangeal fractures. Can J Plast Surg 1996;4(3):137-138. Numerous techniques have been described for internal fixation of displaced intra-articular fractures of the phalanges, including percutaneous pinning, microplating, interosseous wiring and tension banding techniques. One method, described by Rayhack and Bottke, is a modified tension banding method using a K-wire and a stainless steel wire. Although this technique has been found to be very useful, certain complications have led to the development of a modification of this technique.

Key Words: Fracture fixation, Phalanges, Tension band

Modification de l'embrochage avec mise sous tension dans les cas de fractures intra-articulaires des phalanges

RÉSUMÉ : De nombreuses techniques ont été décrites pour la fixation interne de fractures intra-articulaires déplacées des phalanges, y compris le brochage percutané, les microplaques, l'embrochage interosseux et les techniques d'embrochage avec mise sous tension. Rayhack et Bottke ont mis au point une méthode d'embrochage avec mise sous tension modifiée à l'aide d'une broche K et d'un fil d'acier inoxydable. Bien que cette technique se soit révélée très utile, certaines complications ont mené à sa modification.

Numerous techniques have been described for internal fixation of displaced intra-articular fractures of the phalanges (1-6), including percutaneous pinning, microplating, interosseous wiring and tension banding techniques. One method, described by Rayhack and Bottke (1), is a modified tension banding method using a K-wire and a stainless steel wire. Although this has been found to be very useful, certain complications have led to a modification of this technique.

TECHNIQUE

The original technique involves drilling a K-wire across the fracture site. A second K-wire is used to drill a hole parallel to the first. Stainless steel wire is passed through the hole, and the ends of the wire are wrapped around the K-wire, thereby compressing the fracture.

Figure 1) **A** A typical bicondylar fracture in which this technique is used. **B** After fracture reduction, a Keith needle is drilled across the fracture line, leaving the eye of the needle exposed. A second hole is then drilled parallel to the first. **C** Stainless steel wire is passed through the hole, threaded through the eye of the needle, and then passed back through the hole. **D** The Keith needle is then countersunk until the eye is flush with the bone. The ends of the steel wire are wrapped around the far end of the Keith needle and tightened by twisting the ends together. The wire and needle are then trimmed

The suggested modification of this technique uses a Keith needle in place of the K-wire. After fracture reduction (Figure 1A), a Keith needle is drilled across the fracture line, leaving the eye of the needle exposed (Figure 1B). A second hole is then drilled parallel to the first. A stainless steel wire is passed through the hole, threaded through the eye of the needle and then passed back through the hole (Figure 1B). The Keith needle is

then countersunk until the eye is flush with the bone (Figure 1C). The ends of the steel wire are wrapped around the far end of the Keith needle and tightened by twisting the ends together (Figure 1D). The wire and needle are then trimmed.

DISCUSSION

This modification of the modified tension banding method technique was developed in response to some of the complications of the original method, including slippage of the stainless steel wire off the end of the K-wire and pain at the site where the K-wire protrudes from the bone. This pain is especially bothersome when the K-wire is in an area of frequent pressure and friction, such as the radial side of the index finger or the ulnar side of the small finger. These problems have occasionally required removal of the hardware.

This modification retains the advantages of the original technique (1), but minimizes the complications from slippage of the wire and protrusion of the K-wire. By countersinking the needle into the bone on one side of the fracture, one avoids having an end protruding from that side. This makes this technique useful for fingers because of their potential pressure points. The eye of the needle prevents slippage of the wire. To date this procedure has been done on three patients, with no complications and no need to remove hardware.

REFERENCES

1. Rayhack JM, Bottke CA. Intraosseous compression wiring of displaced articular condylar fractures. *J Hand Surg* 1990;15A:370-3.
2. Greene TL, Noellert RC, Belsole RJ, Simpson LA. Composite wiring of metacarpal and phalangeal fractures. *J Hand Surg* 1989;14A:665-9.
3. Hastings H, Carroll C. Treatment of closed articular fractures of the metacarpophalangeal and proximal interphalangeal joints. *Hand Clin* 1988;4:503-27.
4. Jabaley ME, Freeland AE. Rigid internal fixation in the hand: 104 cases. *Plast Reconstr Surg* 1986;77:288-98.
5. Margles SW. Intraarticular fractures of the metacarpophalangeal and proximal interphalangeal joints. *Hand Clin* 1988;4:67-74.
6. Freeland AE, Behoist LA. Open reduction and internal fixation for fractures at the proximal interphalangeal joint. *Hand Clin* 1994;10:239-50.