

LONG OBLIQUE/SPIRAL MID-SHAFT METACARPAL FRACTURES OF THE FINGERS: TREATMENT WITH CERCLAGE WIRE FIXATION AND IMMEDIATE POST-OPERATIVE FINGER MOBILISATION IN A WRIST SPLINT

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The cerclage wire technique of internal fixation for displaced long oblique/spiral metacarpal shaft fractures has not gained popularity for two reasons: many believe that wire migration is a real possibility and that the fixation technique is not rigid enough to allow immediate postoperative finger mobilisation. In this report, the authors review the results of 19 cases of long oblique/spiral mid-shaft metacarpal shaft fractures of the fingers treated by cerclage wires and immediate postoperative mobilisation of all finger joints. The study included 17 men and two women with a mean age of 35 (range 18–45) years. After a mean follow-up of 8 weeks, all patients regained full range of motion of the fingers and no complications were noted. It is concluded that cerclage wire fixation of long oblique/spiral mid-shaft metacarpal fractures requires neither scoring of the bone (a technique recommended by other authors to prevent wire migration) nor finger immobilisation and that the technique consistently achieves good functional results.

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Minimally displaced long oblique/spiral fractures of the metacarpal shaft without rotational malalignment can be treated adequately using conservative measures (Eglseder et al., 1997). Furthermore, metacarpal shaft fractures with significant angular displacement (along the longitudinal axis of the bone) can be managed successfully with closed reduction, a short hand cast and immediate mobilisation of all joints of the hand and wrist (Debnath et al., 2004). In fractures requiring open reduction (either because of failure of closed reduction, in severely displaced fractures or for scissoring secondary to rotational malalignment), common internal fixation techniques include lag screws, plates and screws, multiple intramedullary pre-bent K-wires, interosseous loop wires or sutures and tension band wiring (Al-Qattan, 2006; Bruser et al., 1999; Crawford, 1976; Diao, 1997; Faraj and Davis, 1999). More than 20 years ago, Gropper and Bowen (1984) described the use of cerclage (dental) wires in the management of spiral and oblique metacarpal shaft fractures. This technique did not gain popularity for two reasons. Firstly, the authors believed that the bone always needed to be scored with a side-cutting burr so that migration of the wire following tightening did not occur and this complicated the technique. Secondly, the authors believed that the fingers needed to be immobilised for 10 to 14 days after surgery, since the fixation was not rigid.

In this paper, we report on a series of 19 long oblique/spiral metacarpal shaft fractures treated with cerclage dental wires to demonstrate that neither scoring of bone nor finger immobilisation is required for mid-shaft oblique/spiral fractures to achieve satisfactory results

from this simple and inexpensive means of internal fixation.

PATIENTS AND METHODS

All patients with long oblique/spiral metacarpal shaft fractures of the fingers treated by the senior author between 2000 and 2005 were reviewed retrospectively. Patients with insufficient data and those who were lost to follow-up before 6 weeks were excluded.

The following data were documented from medical records: age, sex, aetiology of injury, site of fracture, number of cerclage wires used, complications and time to return to work. Total active motion (TAM), viz, active flexion of the metacarpophalangeal, proximal interphalangeal and distal interphalangeal joints minus the extension deficit in these joints, was used to assess range of motion of both the injured and uninjured fingers of the involved hand at final follow-up. All patients had plain X-rays taken at final follow-up and fracture displacement was documented.

Patient selection and indications for surgery

The management of spiral and oblique metacarpal shaft fractures by the senior author for the last 10 years has used the following protocol consistently. Minimally displaced fractures without rotational malalignment are usually treated conservatively. Patients are informed that some further shortening at the fracture site is expected with the risk of minimal extension lag at the

metacarpophalangeal joint. Significantly displaced fractures and all fractures associated with rotational malalignment of the fingers are treated by open reduction and dental wire fixation. The choice of technique of dental wire fixation varies according to the fracture site and configuration. Short oblique fractures are fixed with interosseous loop wires (Al-Qattan, 2006). Long oblique/spiral fractures of the mid-shaft are treated by the cerclage wire technique, while those occupying the proximal, or distal, parts of the shaft are treated by a combination of cerclage and interosseous loop wires. The current paper specifically investigates the results in the former mid-shaft group.

Surgical Technique and Postoperative Mobilisation Protocol

Surgery was performed under either general, or axillary block, anaesthesia. The fracture was exposed through a longitudinal dorsal incision. The periosteum was reflected and the fracture reduced. Fracture fixation was done using two, or three, cerclage dental wires. No drill holes or bone scoring was done and, hence, no special equipment was required. The size of the dental wire used was either 0.3 or 0.35 mm in diameter. We found it easier to pass the wires around the fractured shaft using right-angled mosquito forceps. The wires were then twisted. No special attention was made to the site of the base of the twisted wire, but the wire ends were always turned laterally to avoid impinging on the extensor tendons. Plain X-rays were obtained intraoperatively, prior to closure, to ensure accurate reduction. On the rare occasion of inaccurate reduction (such as residual shortening), the wires were untwisted (one or two untwists only) and re-twisted again following adequate reduction. The periosteum was partially closed with interrupted sutures (it was impossible to completely close the periosteum over the wires). In the operating room, a palmar wrist plaster splint, maintaining the wrist in 20° of extension, was applied, leaving the distal palmar crease free to allow motion of the metacarpophalangeal and interphalangeal joints. Mobilisation of the finger joints was started by the patient, without formal physiotherapy consultation, immediately after surgery. The plaster splint was removed at 10 to 14 days and mobilisation of the wrist initiated. The patient was instructed not to carry heavy objects for 6 weeks.

RESULTS

A total of 26 patients were treated but only 19 had sufficient documentation and follow-up (minimum of 6 weeks) to include in this study. There were 17 men and two women with a mean age of 35 (range 18–45) years. Ten cases had rotational malalignment and the remaining nine cases had significant displacement, with failure of closed reduction. The fractured metacarpal was the

index metacarpal in two patients, the middle metacarpal in six patients, the ring metacarpal in nine patients and the little finger metacarpal in two patients. The injuries occurred as a result of car accidents ($n = 13$), industrial injuries ($n = 3$), fighting ($n = 2$) and falls ($n = 1$). All patients had long, mid-shaft oblique/spiral metacarpal fractures.

The number of cerclage wires used was either two ($n = 9$ fractures) or three ($n = 10$ fractures). No cases of infection, CRPS Type 1 (syn. Reflex Sympathetic Dystrophy, Algodystrophy), dorsal digital nerve neuromas, malunion or non-union were noted. No complications relating to the wire, such as impingement on the extensor tendons, extrusion, wire migration or wire breakage, occurred and none of the patients required late removal of the wires.

All patients obtained a full range of motion of the injured and uninjured fingers (TAM = 260°) at a mean final follow-up of 8 (range 6–12) weeks. This full range of motion was reached in all patients between 2 and 3 weeks after surgery and none required formal physiotherapy consultation (Fig 1). Almost all dorsal hand scars were wide and about 50% were slightly hyperpigmented, but none of the patients had cosmetic concerns. The average time to return to work was 5 (range 3–8) weeks.

DISCUSSION

In the English literature, we could find only one study which treated spiral/oblique metacarpal fractures with cerclage wires (Gropper and Bowen, 1984). These authors treated 21 fractures with two cerclage wires per fracture. The authors included long and short oblique, as well as spiral, fractures at various locations on the metacarpal shaft in their series. The bone was scored (in all cases) with a side-cutting burr. Scoring was done following open reduction, but prior to wire fixation. The cerclage wire was then placed at the site of the scored cortex (to prevent wire migration). The fingers were immobilised for 10 to 14 days after surgery. Seventeen patients had a full range of motion at final follow-up and the remaining four patients had minor (less than 15°) losses of range of motion. The average time to return to work after surgery was 7 weeks.

The cerclage wire technique did not gain popularity and no other clinical series have been reported using this fixation technique over the last two decades. One reason is probably the recommendation by these authors to score the bone to avoid wire migration. Scoring the metacarpal bone, which is fractured in a spiral or long oblique pattern, may fracture the single remaining cortex on each side of the fracture site. We believe that the anatomical shape of the metacarpal should be taken into consideration in respect of consideration of possible wire migration. The metacarpal shaft is fairly thick proximally and distally, but remains thin, with a

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