

Closed reduction intermetacarpal Kirschner wire fixation in the treatment of unstable fractures of the base of the first metacarpal

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ABSTRACT

The purpose of this study was to describe the results of extra-articular and intra-articular fractures, at the base of the first metacarpal, treated with closed reduction and percutaneous fixation with intermetacarpal Kirschner wires. Outcome was evaluated by experienced pain, functional outcome and radiographic indications for arthritis. In total, 25 patients with unstable fractures at the base of the first metacarpal underwent closed reduction and percutaneous fixation of the fracture. Prospectively collected data of 25 consecutive patients were evaluated retrospectively, assessing stability of fixation, operation time and the occurrence of fracture dislocation during and after treatment.

All patients were assessed at 1, 3, 6 and 24 months. Follow-up included questionnaires: functional tests including grip and pinch measurement and radiographic analysis for post-traumatic arthritis, using the modified Eaton–Little classification.

In total, 15 patients with extra-articular fractures and 10 patients with intra-articular fractures were treated with this technique. In the group of extra-articular fractures of 15 patients, only one patient had loss of grip strength greater than 20% in comparison with the contra-lateral side (corrected for hand dominance). No clinically important difference was found for pinch strength. One patient experienced functional limitations and was unable to return to a previous hobby.

In the patients group with intra-articular fractures, seven patients had a Bennett fracture and three a Rolando fracture. One patient with a Bennett fracture had a loss of pinch strength greater than 20% corrected for hand dominance. One of the three patients with a Rolando fracture had grip loss greater than 20%. None of the patients with intra-articular fractures experienced any functional limitations.

The described fixation procedure results in a stable fixation of the fracture fragments, and no secondary dislocation of the fracture occurred. Fractures consolidated within 32 (26–50) days and no new fractures were observed.

These results suggest that this technique can be safely used in the treatment of extra-articular fractures as well as intra-articular fractures at the base of the first metacarpal.

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Unstable first metacarpal base fractures are usually treated surgically; however, it is still debated whether closed or open reduction gives optimal results.^{1–5} Various surgical procedures have been described, including intra-articular positioned osteosynthesis.^{6–13} In the late 1980s, a retrospective study described the treatment of fractures at the base of the first metacarpal bone with parallel extra-articular positioned Kirschner wires.¹⁴ In the article by van Niekerk, two of the 23 included patients could not be treated with closed reduction and K-wire fixation, and open reduction and Kirschner wire fixation were necessary. The treatments of three other patients were not defined. During follow-up (6.25 years, range

1.5–9 years), nine patients reported slight complaints of which three patients reported these complaints to interfere with daily activities, hobby or sport. On the basis of these results, the authors advocated the closed reduction and fixation method, as open reduction and fixation would be more difficult.

Several other percutaneous fixations have been described placing the Kirschner wires through the base of the first metacarpal and into the trapezium.^{15,16} Intra-articular Kirschner wires give additional damage to the articular surface. This seems contradictory in the treatment of intra-articular fractures with the aim of anatomical reduction and preventing the development of post-traumatic arthritis.

As the reported results by van Niekerk are incomplete and nine out of 23 patients reported complaints, the current study evaluated the closed reduction and extra-articular fixation method to see if

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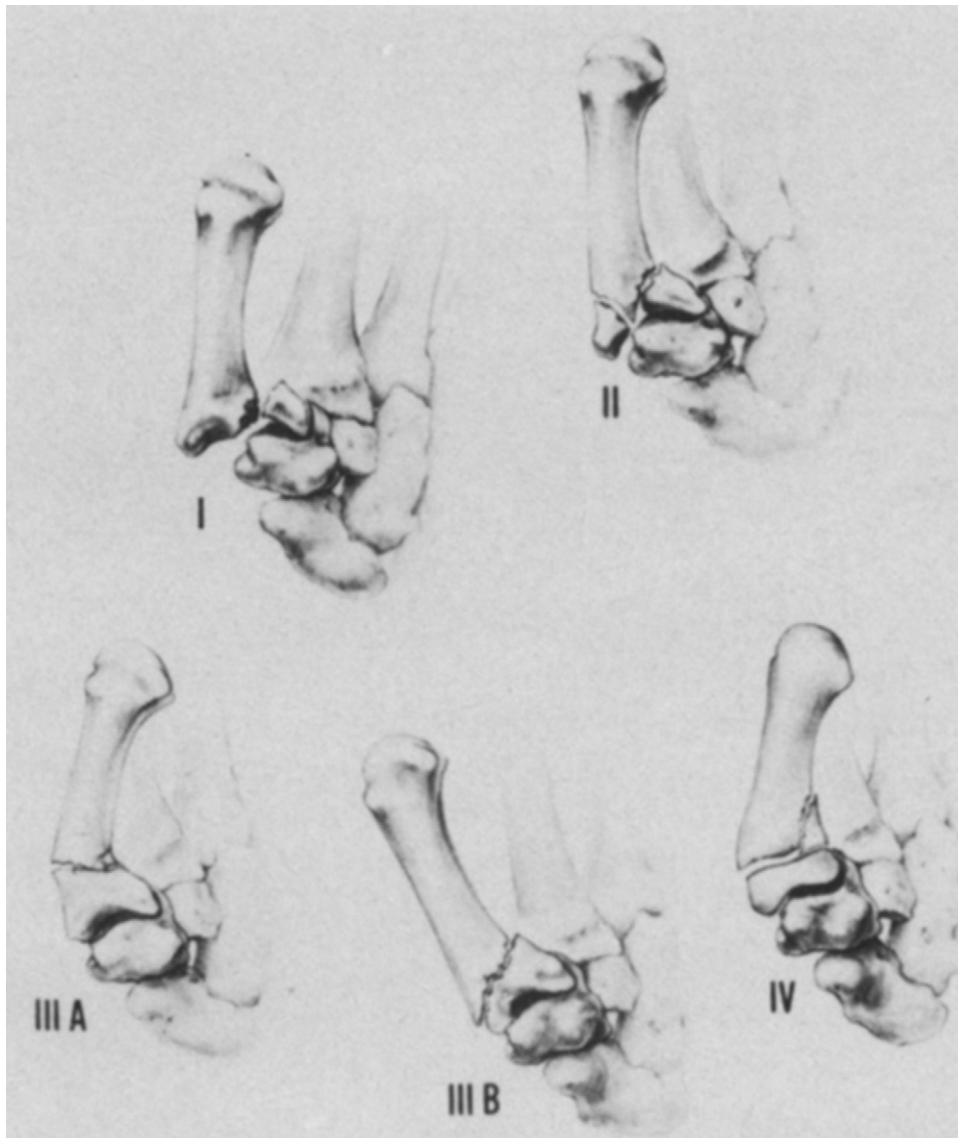


Fig. 1. Classification of thumb fractures. Type I Bennett's fracture. Type II Rolando's fracture. Type IIIA Transverse extra-articular fracture. Type IIIB Oblique extra-articular fracture. Type IV Epiphyseal fracture. Reproduced by the kind permission of Elsevier Publisher from van Niekerk and Ouwens [14].

there is still medical evidence for its wide use in the Netherlands. The purpose of this study was to evaluate the clinical and radiological outcomes of the closed reduction and percutaneous fixation method described by van Niekerk in patients with intra- and extra-articular fractures of the base of the first metacarpal.

Materials and methods

The medical ethics committee of the Groene Hart Hospital approved this study. Prospectively collected data of patients presenting with unstable fractures of the base of the first metacarpal at our Accident and Emergency Department between 1998 and 2008 were retrospectively reviewed. The 1972 Green and O'Brien classification was used to describe all fractures¹⁷ (Fig. 1).

In total, 25 patients were operated for unstable fractures at the base of the first metacarpal. Under fluoroscopy, closed reduction was achieved by longitudinal traction, abduction and extension of the thumb in combination with pronation of the metacarpus. By keeping traction on the thumb, the reduction was maintained allowing two parallel 1.6 mm Kirschner wires to be placed. The

K-wires were positioned approximately 2 cm apart, through the first metacarpal with a 90° angle and also through the second metacarpal (Fig. 2).

A maximal inter-articular step-off of 2 mm was accepted. Stability of the fixation was evaluated under fluoroscopy by moving the thumb. In patients where movement in the fracture was still possible, whilst maintaining adequate reduction, an additional cast was applied. Patients were operated by one of the staff (trauma) surgeons and a surgical resident within 24 h of the trauma.

Patients were seen for follow-up after 1, 3, 6 and 24 months. At 1-month follow-up, radiographs were made to confirm consolidation. When callus formation was present, the K-wires were removed under local anaesthesia. In the absence of callus formation, the patient was re-examined with radiographs 1 or 2 weeks after the first evaluation.

At 3- and 6-month follow-up, wound healing and functional recovery were evaluated.

At 24-month follow-up, patients were asked to answer a questionnaire describing pain and function. To evaluate pain, a

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