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A Modified Technique of Using the Dynamic External Finger Fixation System. Case Study

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SUMMARY

Fractures of the phalangeal joints of the hand present a challenging problem because of the small size of the fracture fragments, limiting internal fixation, and their articular nature necessitating early mobilisation to ensure good results. We present a case of a patient presenting with an open displaced intraarticular fracture of the metacarpophalangeal joint that was managed with limited internal fixation with a Kirschner wire along with the Dynamic External Finger Fixation System (S-Quattro). The fracture united and the patient returned to his previous occupation with no limitations in his activities of daily living. This is the first instance of S-Quattro being described for the management of an open fracture with the additional use of limited internal fixation. The additional use of limited internal fixation ensured adequate fracture reduction and stabilisation. The S-Quattro application does not require significant soft tissue dissection, making it particularly suited to open fractures.

Key words: S-Quattro; open fracture; internal fixation

BACKGROUND

Fractures of the phalangeal joints of the hand present a challenging problem because of the size of the fragments, limiting internal fixation, and their articular nature necessitating early mobilisation [1]. Non-operative management with splintage produces poor results with pain, stiffness and reduced range of motion [2]. Early mobilisation is essential for optimal functional results, and immobilisation for longer than three weeks can result in a permanent loss of motion [1]. Anatomical reconstruction is difficult because of the small and often comminuted fragments. Open reduction and internal fixation has been described but is technically demanding and time consuming [3]. A number of dynamic external fixators have been developed that allow the reduction of intraarticular fracture fragments using ligamentotaxis but most of these are complex, not well-tolerated by the patients and have a high incidence of complications [4].

The Stockport Serpentine Spring System, abbreviated to the S-Quattro, is a dynamic external fixator that has been used for intraarticular phalangeal fractures with good results [5-7]. It consists of a unique dual, parallel but opposing action spring column system. It allows limited movement of the injured joint and free movement of the other digital joints, permitting quick recovery after removal. We present a case of a patient presenting with an open displaced intraarticular fracture of the metacarpophalangeal joint that was managed with limited internal fixation along with the S-Quattro.

CASE REPORT

A 36-year-old man sustained a twisting injury to his dominant right hand at his work-place when his hand got stuck in machinery. The patient attended the accident and emergency department with an open wound to the dorsum of his hand and a displaced intraarticular fracture of the ring metacarpophalangeal joint (Fig. 1). Following informed consent, the patient was taken to theatre and the wound was irrigated, debrided and left to heal by secondary intention. The patient also underwent a limited internal fixation of the fracture fragment using a 1.6 mm Kirschner wire, followed by application of the S-Quattro external fixator as previously described (Fig. 2) [6].

The wires were removed at six weeks' time. The patient was last seen in clinic twelve months following the injury. At that stage, the wound had healed and the fracture had united (Fig. 3). The patient had not required physiotherapy and had no limitations in his activities of daily living. Objective analysis revealed an arc of movement of the metacarpophalangeal joint of 95 degrees and a total active movement in the digit of 275 degrees. The patient had a Disabilities of the Arm Shoulder and Hand (DASH) score of four, a Patient Evaluation Measure (PEM) score of two, a Michigan Hand Outcome (MHO) score of five, and, using a visual analogue score (VAS), reported no pain. The patient was satisfied with the results and had returned to work.

Fig. 1. Antero-posterior (a) and lateral (b) radiograph of the fracture at presentation

DISCUSSION

The satisfactory management of intra-articular fractures relies on reduction and stabilisation of fragments to obtain good joint congruency and allowing early movement. The S-Quattro coupled with the limited internal fixation used in our case allows both joint congruency and early movement. The S-Quattro uses the principle of 'ligamentotaxis' to reduce the fragments by its action on the attached ligaments and the capsular structures and, as we have shown, its use can be supplemented with additional limited internal fixation. Early motion is important to pre-

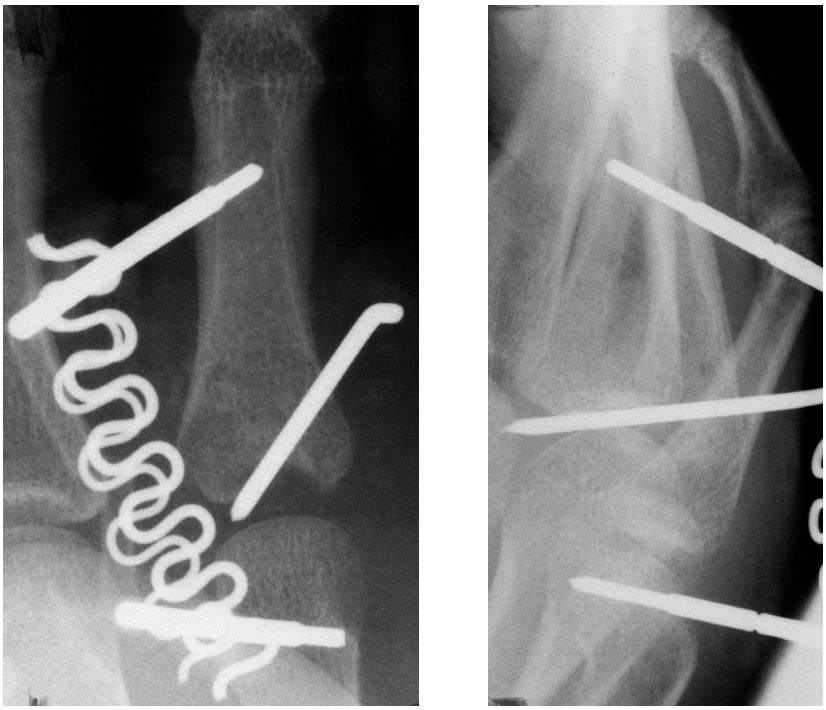

Fig. 2. Antero-posterior (a) and lateral (b) radiograph of the fracture following limited internal fixation with a Kirschner wire and S-Quattro application

Fig. 3. Antero-posterior (a) and lateral (b) radiograph of the fracture at final follow-up

vent joint stiffness and promote pain-free movements by allowing free gliding of adjacent tendons. This also helps reduce swelling and facilitates joint nutrition, surface remodelling, contouring and healing. These factors must account for the subjective and objective outcomes seen in our case.

Many other methods have also been described to treat these difficult fractures. Intra-articular fractures in which there is a single fragment of sufficient size can be fixed with a Kirschner wire alone or an AO screw and this can be achieved open or percutaneously [8,9]. Kirschner wire transfixion of the joint has also been described for fracture dislocations. Although this method was first described for the treatment of Bennett's fractures, it can be applied to any phalangeal fracture. In addition, it can be combined with open reduction and internal fixation [10,11]. Transfixing the joint allows the dislocation to be reduced and held even where the fractures fragments are too small to fix. This method, however, invariably causes further damage to the affected joint and the presence of the wire prevents early mobilization and encourages stiffness.

The S-Quattro is a versatile dynamic external fixation system that offers a number of positions in which the pins and springs can be placed, making it particularly well-suited to open fractures as seen in our case. This is the first instance of the technique being described for the management of an open fracture with the additional use of limited internal fixation. Although the S-Quattro is particularly suited in cases where the fragments are too small to fix and when there is comminution affecting the joint surfaces, the additional use of limited internal fixation in our case with a single Kirschner wire ensured that the fracture reduction and stabilisation of this displaced fracture was not totally reliant on ligamentotaxis. The limited internal fixation did not restrict joint movements. The pin positioning was easily modified in our case to avoid the healing soft tissue. The S-Quattro application does not require significant soft tissue dissection, making it particularly suited to open fractures and resulting in the excellent subjective and objective outcomes seen in our case.

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