Using a TightRope® to treat a complex fracture of the trapezium

ME Shenouda, A Mohan, T Sarkhel

Ashford and St Peter's Hospitals NHS Foundation Trust, UK

ABSTRACT

We present the case of a 23-year-old man with a combined scaphoid fracture and comminuted trapezium fracture, treated surgically with percutaneous fixation of the scaphoid fracture and concomitant Arthrex Mini TightRope® stabilisation of base of thumb metacarpal to base of index finger metacarpal. The patient made a good functional recovery, returning to usual activities within six weeks. We suggest that this technique could be used to treat complex trapezium fractures that cannot be reconstructed with surgery.

KEYWORDS

Hand surgery – Trapezium fracture – TightRope®

Accepted 11 July 2014; published online XXX

CORRESPONDENCE TO

Michael Shenouda, E: m.shenouda@nhs.net

Trapezium fractures are relatively uncommon, comprising 1–5% of all the carpal fractures, and are usually associated with other carpal injuries.¹ Among the various patterns of fractures of the trapezium (vertical transarticular fractures, horizontal fractures, fractures of the dorsal radial tuberosity, fractures of the anterior medial ridge and comminuted fractures),² it is extremely rare to have a comminuted fracture of the trapezium. Displaced or comminuted carpal bone fractures are usually treated surgically with the aim of restoring joint congruity. We report this rare injury, with an associated scaphoid fracture, treated with percutaneous scaphoid fixation and an improvised Mini TightRope® (Arthrex, Naples, FL, US)³ technique to achieve stabilisation of the thumb carpometacarpal joint.

Case History

Following a motorcycle collision, a 23-year-old car mechanic presented with a scaphoid waist fracture and concomitant highly comminuted fracture of the trapezium (Figs 1 and 2) of his dominant hand. There was no associated neurovascular or soft tissue deficit. He was managed initially with cast immobilisation and referred to the fracture clinic. He underwent operative fixation eight days after the injury, once the soft tissue swelling had resolved significantly. The scaphoid was fixed percutaneously through a volar approach with a single screw. The base of the thumb metacarpal was stabilised to the base of the second metacarpal using a Mini TightRope® (Fig 3).

Through two small incisions on the dorsum of the hand and under fluoroscopy control, a 1.6mm K-wire was advanced through four cortices from the ulnar aspect of

the base of the index metacarpal to the dorsoradial aspect of the thumb metacarpal. A 2.7mm cannulated drill was used over the K-wire to drill the bone tunnel. A number 2 FiberWire® Mini TightRope®, threaded twice over between the suture button and toggle to make a four-strand construct, was advanced through the bone tunnel from the ulnar aspect of the index metacarpal to the radial aspect of the thumb metacarpal. The construct was tensioned under direct fluoroscopy control, checking the position of suspension of the thumb metacarpal to prevent overtightening, and a knot tied on the ulnar side to secure the position.

The patient was immobilised in a thumb spica for one week, followed by gentle range of motion exercises with the hand therapists. He resumed light duties as a mechanic at three weeks and full duties without restriction at six weeks. He made good progress with rehabilitation and by six weeks, he had regained full range of motion of the thumb carpometacarpal joint and the trapezium fracture showed radiological evidence of healing (Fig 4). At clinical review at six months, he had a QuickDASH score of 5, a Kapandji score of 9, a power grip strength of 42kg (unaffected side 40kg) and a pinch strength of 9.4kg (unaffected side 12kg). He remains well at eight months following surgery and is pleased with the outcome (Fig 5).

Discussion

The use of TightRope®-style techniques has become increasingly popular in orthopaedic practice, initially in ankle surgery and more recently in upper limb surgery.⁴ In hand surgery, these techniques have been advocated in conjunction with trapeziectomy for thumb carpometacarpal

Figure 1 Initial radiography showing scaphoid waist fracture and concomitant fracture of the trapezium

Figure 3 Intraoperative image intensifier radiography showing screw fixation of the scaphoid with TightRope® stabilisation of the base of the thumb metacarpal to the base of the second metacarpal

Figure 2 Subsequent computed tomography confirming scaphoid waist fracture and showing highly comminuted fracture of the trapezium

Figure 4 Radiography at six weeks showing evidence of radiographic healing

Figure 5 At six months following surgery, the patient has made a full functional recovery. (Right hand operated on.)

joint arthritis.⁴ To the best of our knowledge, there have been no previous reports describing the use of a TightRope® for operative management of a trapezial fracture.

Fractures of the trapezium constitute 1–5% of all the carpal fractures and are the third most common carpal fractures encountered.¹ Walker *et al* described five different fracture patterns to the trapezium including vertical transarticular fractures, horizontal fractures, fractures of the dorsal radial tuberosity, fractures of the anterior medial ridge and comminuted fractures.² The comminuted fracture pattern similar to the case described is one of the rarest fracture patterns seen. Bridging external fixation is described as a method of treatment in one case report.⁵

The trapezium fracture reported here was highly comminuted with reasonable secondary congruency of articular surfaces. In view of the high degree of comminution, it was not amenable to open reduction and internal fixation. Our surgical aim was to maintain the height of the trapezium as the fracture healed and our options therefore included external fixation or K-wire fixation of the metacarpal to maintain height and protect the healing fracture.

The Mini TightRope® provides a method for stabilisation of the thumb metacarpal following trapezium resection in the treatment of carpometacarpal joint arthritis. The TightRope®

supports and maintains the thumb and index metacarpals in their proper relationship while scar tissue forms in the trapezium space,³ thereby maintaining the height of the trapezium. The construct consists of four strands of number 2 FiberWire®, which are fixed with two oblong stainless steel buttons for cortical fixation. In our case, the use of the TightRope® helped to offload the trapezium, allowing it to heal without losing height and shape despite the gross comminution. The advantages of this technique included the lack of percutaneous wires and their associated complications, minimal immobilisation enabling early return to activities and excellent functional recovery without any hand stiffness.

The patient was rehabilitated rapidly with early movement, minimal immobilisation and full, unrestricted return to activity by six weeks. He remains clinically well at the latest follow-up visit, with good functional outcomes and no complications.

A potential complication seen with TightRope®-style techniques is tunnel widening, which may lead to subsequent fractures. One case report describes tunnel widening and an index finger metacarpal fracture through the hole drilled for the TightRope® four weeks after a trapeziectomy with TightRope® suspension.⁶ We continue to follow up the patient with interval radiography, with a plan for TightRope® removal at 18 months to minimise this risk.

Conclusions

The use of a TightRope® could be a valuable surgical technique in treating complex trapezium fractures, in order to maintain joint height and stability as well as to permit early mobilisation and rehabilitation. However, potential reservations about this option include the expense of the implant, the need to follow the patient up regularly and the requirement for a second operation to remove the device.

References

1. Pointu J, Schwenck JP, Destree G, Séjourné P. Fractures of the trapezium. Mechanisms. Anatomic-pathology and therapeutic indications. *Rev Chir Orthop Reparatrice Appar Mot* 1988; **74**: 454–465.
2. Walker JL, Greene TL, Luneth PA. Fractures of the body of the trapezium. *J Orthop Trauma* 1988; **2**: 22–28.
3. Mini TightRope®. Arthrex. <http://www.arthrex.com/hand-wrist/mini-tightrope> (cited August 2014).
4. Yao J, Song Y. Suture-button suspensionplasty for thumb carpometacarpal arthritis: a minimum 2-year follow-up. *J Hand Surg Am* 2013; **38**: 1,161–1,165.
5. Pehlivan O, Cilli F, Mahirogullari M, Ozyurek S. Management of combined open fractures of thumb metacarpal and trapezium (surgical tip). *Hand* 2007; **2**: 48–50.
6. Khalid M, Jones ML. Index metacarpal fracture after Tightrope suspension following trapeziectomy: case report. *J Hand Surg Am* 2012; **37**: 418–422.