ABSTRACT

Purpose. To evaluate the outcome of percutaneous release of the A1 pulley in 40 cadaveric fingers using a modified Kirschner wire.

Methods. A 2.5-mm-diameter Kirschner wire measuring >12 cm in length was used. One end of the wire was sharpened into a ‘J’ shape using a grinder. The J-shaped tip featured a blunt, elongated lower tip, a sharp J-shaped curve, and a blunt upper tip. Completeness of A1 pulley release and injuries to the A2 pulley, flexor tendon, and neurovascular structures were evaluated in 40 cadaveric fingers.

Results. Complete release of the A1 pulley was achieved in 8 index, 7 middle, 8 ring, and 8 little fingers, whereas incomplete release of the distal part was noted in 2 index, 2 middle, 2 ring, and one little fingers; release was missed in one middle and one little fingers. Injury to the A2 pulley was noted in 2 index fingers; the injury was minimal and limited to the proximal 2 mm of the A2 pulley. There was no flexor tendon or digital nerve injury in any finger.

Conclusion. Percutaneous release of the A1 pulley using a modified Kirschner wire achieved complete release in 78% of cadaveric fingers, which is comparable to that using a specially manufactured push knife.

Key words: bone wires; trigger finger disorder

INTRODUCTION

Stenosing tenosynovitis of the A1 pulley also known as trigger finger is a common disorder. Its treatments include local steroid injection1–3 and open, endoscopic, or percutaneous release of the A1 pulley.4,5 Different kinds of instruments have been used for percutaneous release such as a fine tenotome,6 a 14-gauge angiocath, an 18-, 19-, or 21-gauge needle,7–10 a modified small aneurysm needle,8 an ophthalmic knife (15º full handle knife),14 a push knife (Biomet; Warsaw [IN], USA),11 and a HAKI knife (BK Meditech, Seoul, Korea).12 Endoscopic release enables visualisation of the A1 pulley, faster recovery, reduced pain during movement, and absence of scar-
related problems, compared with open release. However, the endoscopic instrument cost is high. We evaluated the outcome of percutaneous release of the A1 pulley in 40 cadaveric fingers using a modified Kirschner wire.

MATERIALS AND METHODS

This study was approved by the university’s ethics committee for human research. A 2.5-mm-diameter Kirschner wire measuring >12 cm in length was used. One end of the wire was bent into a triangular shape for easy handling and pushing. The other end was sharpened into a ‘J’ shape using a grinder. The wire was bent to 15° at 2 cm from the J-shaped tip to enable parallel (to the tendon) forward pushing of the device (Fig.). The J-shaped tip featured (1) a blunt, elongated lower tip to help sliding the device between the A1 pulley and flexor tendon while minimising injury to flexor tendon, (2) a sharp J-shaped curve to cut the thickened A1 pulley, and (3) a blunt upper tip to minimise injury to soft tissues overlying the sheath (Fig.).

Completeness of A1 pulley release and injuries to the A2 pulley, flexor tendon, and neurovascular structures were evaluated in 40 normal fingers from 10 thawed fresh-frozen cadaveric hands. The proximal edge of the A1 pulley of the fingers was marked, which was the proximal palmar crease of the index finger, halfway between the proximal and distal palmar crease of the middle finger, and the distal palmar crease of the ring and little fingers. A 3-mm stab longitudinal incision was made while the finger was held in extension. Small haemostat clamp was used to open the subcutaneous fat and advance to the flexor tendon. The device was then inserted into the same track to reach the proximal edge of the A1 pulley. The blunt, elongated tip helped to feel the proximal edge of the A1 pulley, and then the device was slipped into the space between the pulley and the flexor tendon beneath to minimise flexor tendon injury. The device was gently pushed distally to cut the A1 pulley with the sharp J-shaped curve. The blunt upper tip could prevent injury to the soft tissue overlying the A1 pulley. The device was pushed forward until the grating sensation of cutting the A1 pulley stopped.

RESULTS

Complete release of the A1 pulley was achieved in 8 index, 7 middle, 8 ring, and 8 little fingers, whereas incomplete release of the distal part was noted in 2 index, 2 middle, 2 ring, and one little fingers; release was missed in one middle and one little fingers (Table). Injury to the A2 pulley was noted in 2 index fingers; the injury was minimal and limited to the proximal 2 mm of the A2 pulley. There was no flexor tendon or digital nerve injury in any finger.

DISCUSSION

Percutaneous release of the A1 pulley for trigger finger avoids long incisions or scars in the palm. Results of percutaneous and open techniques are comparable. Both techniques report a 100% success
rate in terms of grip strength, active range of motion of the proximal interphalangeal joint, and residual pain.\textsuperscript{16} The cure and recurrent rates are superior after open or percutaneous treatment than corticosteroid injection.\textsuperscript{18}

Percutaneous release of the A1 pulley can be performed using various instruments. Although the use of a hypodermic needle has achieved a high symptom relief rate in clinical studies,\textsuperscript{7,9,10,19–22} open exploration after percutaneous release of trigger finger using a 19-gauge needle achieved complete release of the A1 pulley in only 8 of 13 digits.\textsuperscript{10} In 66 fresh-frozen cadaveric fingers, percutaneous release of the A1 pulley using a 14-gauge angiocath needle achieved complete release in 45 (68\%) fingers, incomplete release in 13 (20\%), and missed release in 8 (12\%).\textsuperscript{23} All but 8 fingers had injury to the flexor tendon; most were simple lacerations along the tendon fibres and 2 were severe lacerations.\textsuperscript{23} In another cadaveric study of percutaneous release of the A1 pulley using an 18-gauge needle, the rate of complete release was only 59\%, and incomplete release was more likely to occur in the thumb, index, and little fingers involving the proximal portion of the pulley.\textsuperscript{24} The rate of flexor tendon injury was 46\% but there was no injury to the neurovascular bundle.\textsuperscript{24}

To avoid incomplete release and flexor tendon injury during percutaneous release using needles, a push knife is designed with a straight blade, a tapered leading flange, and a smooth edge to enable percutaneous release of the A1 pulley without damaging the flexor tendon.\textsuperscript{31} Comparing the use of a push knife with a 19-gauge needle in 20 fresh-frozen cadaver fingers, complete release was achieved in 98\% and 38\% of fingers, respectively; missed release was noted in 2\% and 15\% of fingers, respectively; and flexor tendon injuries occurred in 0\% and 73\% of fingers, respectively.\textsuperscript{11} Using the Biomet push knife and the Dunn technique for percutaneous release of the A1 pulley in 20 fresh cadaveric hands, complete release was attained in 75\% of fingers.\textsuperscript{13}

In our study, complete release was achieved in 78\% of fingers, which is comparable to that using the Biomet push knife.\textsuperscript{13} As all cadaveric fingers had normal A1 pulley, it was more difficult to identify the proximal edge of the A1 pulley, as the pulley was not thickened and thus the grating sensation of the sectioned pulley was less pronounce. In the clinical setting, percutaneous release of trigger finger is usually continued until the triggering has ceased. Therefore, the rate of complete release in most clinical studies is higher than in cadaveric studies. The missed release in 2 fingers was due to the difficulty in identifying the normal pulley in cadaveric fingers with thick skin and subcutaneous tissue, whereas the minimal injury to the A2 pulley in 2 fingers was due to the difficulty in getting a sense of when to stop pushing the device. This may result in a cut that is too long. Nonetheless, there was no flexor tendon or neurovascular injury in our study.

For trigger thumbs, we prefer open release to percutaneous release, because of the potential risk of injury to the radial digital nerve (that passes across the tendon of flexor pollicis longus from ulnar to the radial side) near the A1 pulley.

\textbf{DISCLOSURE}

No conflicts of interest were declared by the authors.

\textbf{CONCLUSION}

Percutaneous release of the A1 pulley using a modified Kirschner wire achieved complete release in 78\% of cadaveric fingers, which is comparable to that using a specially manufactured push knife.

\textbf{REFERENCES}