SCIENTIFIC ARTICLE

Evaluation of Percutaneous First Annular Pulley Release: Efficacy and Complications in a Perfused Cadaveric Study

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Purpose Trigger finger is the most common entrapment tendinopathy, with a lifetime risk of 2% to 3%. Open surgical release of the flexor tendon sheath is a commonly performed procedure associated with a high rate of success. Despite reported success rates of over 94%, percutaneous trigger finger release (PFTR) remains a controversial procedure because of the risk of iatrogenic digital neurovascular injury. This study aimed to evaluate the safety and efficacy of traditional percutaneous and ultrasound (US)-guided first annular (A1) pulley releases performed on a perfused cadaveric model.

Methods First annular pulley releases were performed percutaneously using an 18-gauge needle in 155 digits (124 fingers and 31 thumbs) of un-embalmed cadavers with restored perfusion. A total of 45 digits were completed with US guidance and 110 digits were completed without it. Each digit was dissected and assessed regarding the amount of release as well as neurovascular, flexor tendon, and A2 pulley injury.

Results Overall, 114 A1 pulleys were completely released (74%). There were 38 partial releases (24%) and 3 complete misses (2%). No significant flexor tendon injury was seen. Longitudinal scoring of the flexor tendon was found in 35 fingers (23%). There were no lacerations to digital nerves and one ulnar digital artery was partially lacerated (1%) in a middle finger with a partial flexion contracture that prevented appropriate hyperextension. The ultrasound-assisted and blind PTFR techniques had similar complete pulley release and injury rates.

Conclusions Both traditional and US-assisted percutaneous release of the A1 pulley can be performed for all fingers. Perfusion of cadaver digits enhances surgical simulation and evaluation of PTFR beyond those of previous cadaveric studies. The addition of vascular flow to the digits during percutaneous release allows for Doppler flow assessment of the neurovascular bundle and evaluation of vascular injury.

Clinical relevance Our cadaveric data align with those of published clinical investigations for percutaneous A1 pulley release. *(J Hand Surg Am. 2016;41(7):e165−e173. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Percutaneous, trigger finger, A1 pulley release, perfused cadaver, ultrasound guidance.

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Trigger finger is the most common entrapment tendinopathy, with a lifetime risk of 2% to 3% for the general population and 10% for diabetic individuals.[1] Primarily affecting the first annular (A1) pulley at the metacarpal head, trigger finger is caused by a thickening and narrowing of the A1 pulley around its underlying flexor tendon.[2] Trigger finger presents with variable amounts of pain, clicking, catching, and locking at the metacarpophalangeal (MCP) joint on both flexion and extension.[2] Most cases are idiopathic, and the etiology and pathogenesis are still not completely understood. However, it is postulated that fibrocartilaginous metaplasia of the A1 pulley resulting from repeated friction and compression leads to narrowing that progressively restricts the motion of the flexor tendons.[2]

Initial nonsurgical management involves activity modification, nonsteroidal anti-inflammatory drugs, placement of an orthosis, and corticosteroid injections.[1] When there is failure of nonoperative management, standard therapy is open release of the flexor tendon sheath, which is associated with high rates of success.[3,4] Complications are rare but may include incision pain, infection, stiffness, nerve transection, flexor tendon bowstringing, reflex sympathetic dystrophy, and flexion deformity.

Lorthioir[5] first described percutaneous trigger finger release (PTFR) in 1958, and now is an office procedure that is purported to be associated with reduced time and cost to complete, faster recovery, and the absence of a painful incision.[6] Several percutaneous techniques employing different instruments have been shown in clinical studies to have successful resolution of symptoms in over 90% of patients.[7–10] A recent review of clinical studies published in *The Journal of Hand Surgery* by Zhao et al[11] revealed a 94% success rate among 2,114 published percutaneous procedures. Studies comparing open surgery with PFTR found no difference in treatment results and complication rates; both approaches outperformed corticosteroid injections alone.[12–15] Despite these high success rates, controversy remains regarding the use of PFTR owing to concern about tendon or neurovascular injury.[16,17]

Sonography allows direct visualization of the A1 pulley, flexor tendon, and underlying bony landmarks of the MCP joint.[18] It has been introduced as an adjunct to avoid tendon or neurovascular injury in PTFR but its efficacy remains unknown The review conducted by Zhao et al[11] found that ultrasound (US)-guided PTFR had significantly higher success rates than blind PTFR ($P = .01$). Three clinical studies found resolution rates of 91% to 100% in US PTFR.[19–21]

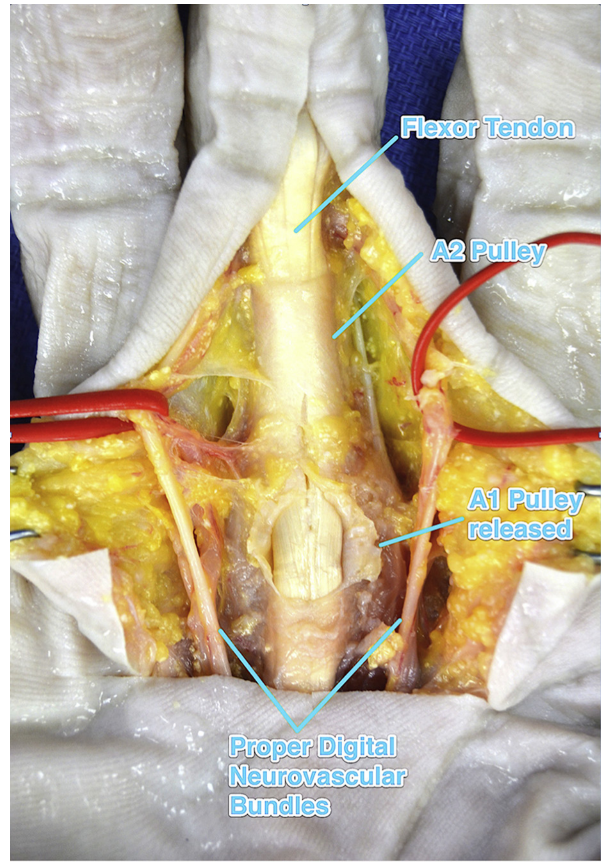

FIGURE 1: Open dissection of A1 pulley and surrounding structures. Each digit was carefully dissected after percutaneous A1 pulley release. Key structures were identified and visualized: A2 pulley, flexor tendon, and neurovascular bundles.

Gulabi et al[22] achieved a 90% resolution rate in a clinical study of US PTFR, but suggested that and sonography before and after surgery is not necessary because it does not affect clinical decision making. Cadaveric studies have had conflicting or inconclusive clinical recommendations regarding the added benefits of US.[18,23,24]

Cadaveric dissection has been used as an educational model for surgical simulation. The introduction of perfusion to a cadaveric teaching model increases the authenticity of tissue handling and vascular anatomy and has been shown to increase trainee confidence.[25]

This study aimed to assess and compare traditional PTFR and US-guided A1 pulley release performed on a perfused cadaveric model.

MATERIALS AND METHODS

General

We performed 155 percutaneous A1 pulley releases (124 fingers and 31 thumbs) on 22 un-embalmed cadavers (11 females and 11 males) obtained through our