Ultrasound-Assisted Percutaneous Trigger Finger Release: Is it Safe?

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Abstract Trigger fingers can be treated by open or percutaneous division of the A1 pulley. The open approach allows for visualization of the pulley, the tendon, and the adjacent neurovascular bundles. The percutaneous trigger finger release (PTFR) lacks an incision and is thought to lead to a quicker recovery, but the safety and efficacy of this blind procedure are often questioned. Ultrasound imaging has recently been introduced as an adjunct for guiding the needle during percutaneous trigger finger release. This study was designed to evaluate the safety and efficacy of needle trigger finger release with added ultrasound imaging. Eighteen fresh cadaver A1 pulleys were divided percutaneously and then evaluated by converting to an open technique and examining the pulleys, the tendons, and the neurovascular bundles. This study's ultrasound images demonstrated repeated puncture of the tendon sheath and of the neurovascular bundle during PTFR. The subsequent dissection revealed three out of 18 tendons with visible lacerations and 15 out of 18 A1 pulleys with incomplete division. We concluded that ultrasound-guided PTFR can be complicated by flexor

tendon lacerations, potential injury to neurovascular bundles, and incomplete division of the A1 pulleys. While the clinical significance of these findings is unclear to us, it does raise questions regarding the safety and efficacy of percutaneous trigger finger release, even when adding ultrasound guidance.

Keywords Trigger finger · Percutaneous release · Ultrasound

Introduction

First described by Lorthioir in 1958, percutaneous trigger finger release (PTFR) has been advocated repeatedly as an alternative to open release [5]. The proponents of this technique argue that it allows for safe division without the need for incisions, resulting in decreased post-operative pain and shorter recovery [3, 1, 7]. Furthermore, many feel that it decreases costs, as it can be performed quickly with local anesthesia [3]. Controversy persists regarding the safety and efficacy of this procedure. Despite the proposed advantages, PTFR has not gained widespread acceptance due to concerns with injury to the tendon or neurovascular bundle during this blind procedure, inaccuracy of topographical landmarks, and potential for incomplete release.

In an innovative effort to improve the safety of PTFR, Jou and Chern introduced ultrasound imaging as an adjunct for guiding the needle [4]. Their series reported 97% of patients with complete resolution of symptoms and what they subjectively felt was increased safety [4]. With the intent to study the safety and efficacy of ultrasound-assisted (UA) PTFR, we used fresh cadaver hands and monitored the integrity of the neurovascular bundle, the tendons, as well as the completeness of the pulley division both with ultrasound images and subsequent open dissections.

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Figure 1 Ultrasound image of flexor tendon and A1 pulley.

Figure 3 Ultrasound image of needle tip in flexor tendon.

Materials and Methods

Five fresh cadaver hands were used to perform 18 UAPTFR. The flexor tendons were localized using a Philips HDI 5000 ultrasound using a CL 10-5 transducer (Philips, Bothell, WA, USA). An 18-gauge needle was introduced percutaneously just proximal to the A1 pulley under direct visualization with ultrasound. The beveled edge of the needle was then used to divide the pulley until the release was felt to be complete, both clinically and by ultrasound imaging. A longitudinal incision was then made to evaluate the integrity of the A1 pulley and possible associated injuries to the flexor tendon and neurovascular bundles.

Results

The flexor tendon and overlying annular pulleys were easily visualized with the ultrasound as demonstrated by Fig. 1. Despite this, complete A1 pulley release was achieved in only three of the 18 fingers, with incomplete releases in the remaining 83%. The undivided pulley tissue ranged from only a few transverse fibers to almost half of the tissue as seen in Fig. 2. The ultrasound images recurrently demonstrated the needle tip in the confines of the neurovascular bundles and within the flexor tendons (Fig. 3). The subsequent open dissection showed lacerations of the flexor tendons in three out of 18 cases but no gross injuries to the bundles (Fig. 4).

Figure 2 Flexor tendon with incomplete A1 pulley release.

Figure 4 Tendon laceration.

Discussion

UAPTFR turned out to be technically more challenging than we expected. While the images allowed us to properly position the needle without having to depend on (unreliable) landmarks, we found that the transducer was difficult to control and that the image often shifted resulting in loss of target visualization. Also, given the small size of the field, the probe was sometimes in the way of the operating surgeon's hand.

During the procedures, we noted the needle tip repeatedly entering the confines of the neurovascular bundles as well as entering the flexor tendons. While we were able to adjust our position using real-time imaging, these images opened our eyes to the potential for complications of blind releases. Without ultrasound imaging, we would potentially have caused more tendon injuries and placed the neurovascular bundles at greater risk. Even with the help of ultrasound imaging, 17% of the tendons sustained lacerations. These results are an improvement over those of Bain et al. who reported 90% of the flexor tendons sustained longitudinal lacerations during blind percutaneous release [2]. While this does not offer a direct comparison between both procedures, it might suggest some improved safety with ultrasound assistance for PTFR.

On open inspection, 83% of the pulleys in our series were incompletely divided. Since this was a cadaveric study, the clinical significance of these findings is unclear. In other clinical series, such as the one by Pope, 38% of fingers had remaining A1 pulley fibers despite immediate clinical success as defined by relief of triggering [6]. Division of the A1 pulley may be easier in live patients with active triggering and resolution of symptoms guiding the treatment.

In our hands, the use of ultrasound increased the operative time because of the frequent need to reposition the transducer. Additional experience may overcome this problem. The cost of the procedure was further increased by the need for ultrasound equipment. This likely negated

the potential savings of in-office UAPTFR over a minor surgery for open release.

Conclusions

The addition of ultrasound imaging allows visualization of the pulleys, tendons, the neurovascular bundles, and the operating needle, which may result in improved safety. In inexperienced hands, the procedure is technically challenging and time consuming. UAPTFR can be complicated by flexor tendon lacerations and potential injury to neurovascular bundles. In our hands, it leads to incomplete division of the A1 pulleys in the majority of cases. While the clinical significance of these findings is unclear, it does raise questions regarding the safety and efficacy of percutaneous trigger finger release, even when adding ultrasound guidance.

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