A Comparison of Open and Percutaneous Pulley Release in Trigger Digits

Thana Bamroongshawgasame MD*

** Division of Orthopedic Surgery, Ratchaburi Hospital, Ratchaburi, Thailand*

Objective: *To compare the results of open surgery with those of percutaneous surgery in patients with trigger digits.*

Material and Method*: One hundred forty two patients with 160 trigger fingers and thumbs were prospectively randomized to either open (70 patients, 80 digits) or percutaneous (72 patients, 80 digits) surgeries at Ratchaburi Hospital. The operations were performed by one surgeon between May 1, 2007 and Dec 31, 2008. Operative time, postoperative range of motion of the finger proximal interphalangeal joint (PIP) or thumb interphalangeal joint (IP), patient satisfaction score, patient pain score, and surgical complications were assessed at weeks 1, 2, 3, 4, 6, and 8.*

Results: *Trigger digits were successfully treated in eighty digits (100%) of the patients who underwent open surgery and in seventy-nine digits (98.75%) of the patients who underwent percutaneous surgery. Mean operative time, mean postoperative range of motion of the finger PIP or thumb IP, mean postoperative satisfaction score, and mean postoperative patient pain score were not significantly different between the groups. No serious complications were observed in either group. One patient in the percutaneous surgery group underwent open surgery two months later due to pain and locking.*

Conclusion: *Percutaneous trigger digit surgery using the full handle knife 45° is effective and safe, and results functional outcomes equal to those with open trigger digit surgery.*

Keywords: *Trigger finger, Trigger thumb, Trigger digit, Percutaneous trigger surgery, Open trigger surgery*

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Most trigger digits in adults can be successfully treated nonsurgically with the use of splinting and local steroid injection[4,10,26]. When conservative treatment fails, surgical treatment is recommended. Open trigger surgery is the standard technique for general orthopedists, but several authors have reported that percutaneous surgery has better outcomes and fewer complications. This suggests that percutaneous trigger surgery is a safer alternative to traditional open surgery. Reported results of percutaneous surgery have shown success rates of 74 to 100% and fewer complications[26].

The present study was a prospective randomized study designed to compare the results of open trigger surgery using a #15 scalpel blade with those of percutaneous trigger surgery using the full handle knife 45°.

Correspondence to: Bamroongshawgasame T, Division of Orthopedic Surgery, Ratchaburi Hospital, Ratchaburi 70000, Thailand. Phone: 032-327-901 ext. 2105. E-mail: tb3010 @yahoo.co.th

Material and Method

Between May 1, 2007 and Dec 31, 2008, 142 trigger digit patients (160 digits) were prospectively randomized into two groups (open surgery, percutaneous surgery). The first group (70 patients, 80 digits) underwent open A_1 pulley release using a #15 scalpel blade, and the second group (72 patients, 80 digits) underwent percutaneous A_1 pulley release using the full handle knife 45°. The criteria for patient selection included failed nonsurgical treatment for three months, at least one local steroid injection, no clinically active osteoarthritis of the affected hand, and a grade 2,3, or 4 trigger digit as classified by Green DP, 1997. The procedure was performed by a single surgeon in an operating room under local anesthesia.

Surgical technique for open trigger surgery

After appropriate skin preparation and draping, a tourniquet was placed 10 cm proximal to the A_1 pulley, and 2 ml of 1% xylocaine was used to infiltrate the skin overlying the A_1 pulley. A 1-cm transverse incision was made over the involved metacarpal head. Blunt dissection was used to spread the subcutaneous tissues and the palmar fascia to expose the flexor sheath. The digital nerve and vessels were retracted with small right angle retractors. The proximal and distal edges of the A_1 pulley were identified, and a #15 scalpel blade was used to transect the A_1 pulley distally to proximally under direct observation. After release, the patient was asked to actively move the digit to confirm the completion of the surgery. The wound was closed with 4/0 nylon suture, and a compression dressing was applied before releasing the tourniquet.

Surgical technique for percutaneous trigger surgery

After appropriate skin preparation and draping, the A_1 pulley was palpated directly over the metacarpal head. The proximal and distal edges of the A_1 pulley were marked, and 2 ml of 1% xylocaine was injected. The tip of the full handle knife 45° was inserted 2 mm proximal to the proximal edge of the A_1 pulley 45° to the palmar skin on the midline flexor tendon line. The knife was rotated 90°, and the tip of it was used to dissect the subcutaneous tissue to the distal edge of the A_1 pulley. When the distal edge was reached, the knife was rotated to the first position to dissect to distal edge of the A_1 pulley. It was moved distally to proximally, taking care to observe a grating sensation and sound and was withdrawn when the grating sensation and sound could not be detected. The patient was asked to flex and extend the digit to clinically confirm the completion of the release. If release could not be confirmed, the knife was reinserted and additional manipulation was performed until clinical release was confirmed. A compression dressing was then applied to the wound and the wound was not sutured.

After surgery, all patients were instructed to keep the dressing dry and use the hand for activities as tolerated. The patients were followed up at the ends of 1, 2, 3, 4, 6, and 8 weeks. Patients in the open surgery group had their sutures removed at 2 weeks. The operative time, range of motion of finger PIP or thumb IP, patient satisfaction score, patient pain score, and surgical complications were recorded. The patient satisfaction score and the patient pain score were numerically rated based on patient responses at the time of follow-up.

Statistical analysis

Demographic characteristics are presented as number, mean, and range. The outcomes between open and percutaneous surgery were compared with an independent t-test. A p-value of less than 0.05 was considered significant.

Results

One hundred and forty-two patients (160 digits) were divided into two groups (open surgery, percutaneous surgery). The demographic characteristics of the two groups are summarized in Table 2. Demographic characteristics were similar between the two groups. The mean operative time of the open surgery was 2.2 minutes, and that of the percutaneous surgery was 1.8 minutes. This difference was not statistically significant. No serious complications were recorded.

One patient in the percutaneous surgery group had a clinically incomplete A_1 pulley release and experienced postoperative pain and locking. This patient underwent open surgery two months later. The

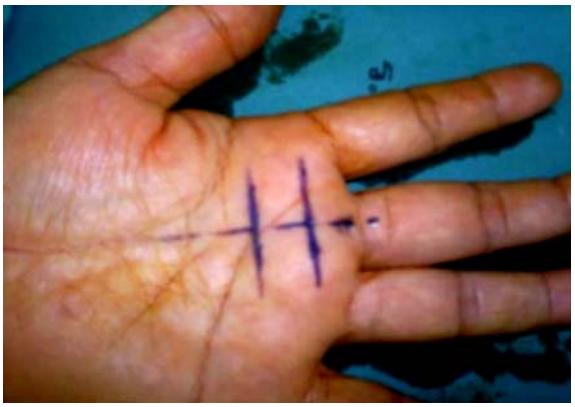
Table 1. Numeric rating of patient satisfaction score and the patient pain score

Point	Patient satisfaction score	Patient pain score
0	Unsatisfied	No pain
1	Somewhat satisfied	Mild pain
2	Satisfied	Moderate pain
3	Very satisfied	Severe pain

Table 2. Demographic data of patients (n = 142)

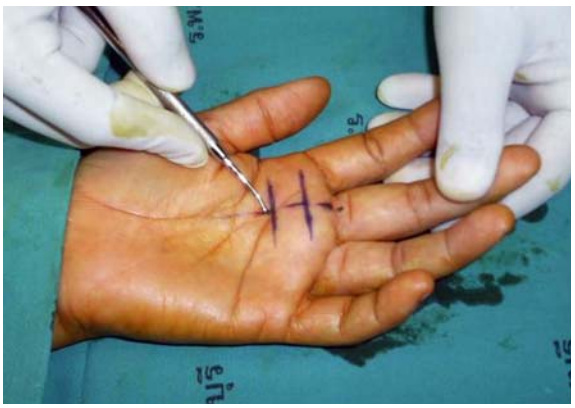
Characteristics	Open surgery	Percutaneous surgery
Number of patient	70	72
Age	24-76 (46.2)	22-72 (48.6)
Gender (Male:Female)	30:40	28:44
Digits	80	80
Thumb:Index:Long:Ring:Little	23:8:27:20:2	26:6:24:23:1
Grading of trigger (2:3:4)	36:38:6	38:37:5
Operative time (minutes)	2-4 (2.2)	1-3 (1.8)
Complication	None	Incomplete trigger release (one patient)

A: The full handle knife 45° or dental carver knife

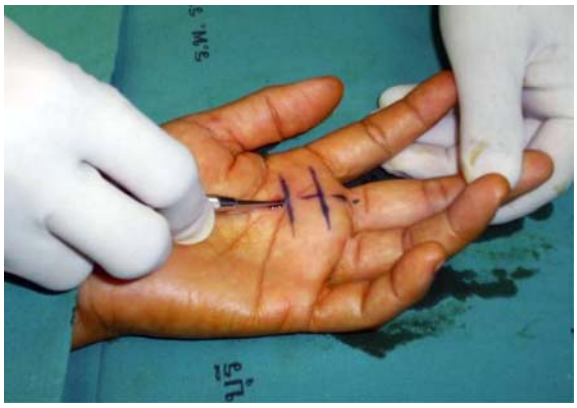


B: Clinical landmarks of the proximal and distal edges of the A_1 pulley by palpation

C: Insertion of the knife 2 mm proximal to the proximal landmark and 45° to the palm



D: Rotation of the tip of the knife 90° The tip of the knife is used to dissect the subcutaneous tissue up to the distal landmark of the A_1 pulley



E: Rotation of the tip of the knife to the same position as shown in C: The tip is pressed down to divide the A_1 pulley from distal to proximal edges

F: The knife was withdrawn when the grating sensation and sound stopped. The patient was asked to flex and extend the finger to confirm release of the A_1 pulley

Fig. 1 Surgical technique for percutaneous A_1 pulley release of a trigger long finger

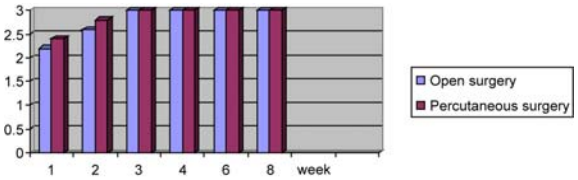


Fig. 2 Mean postoperative patient satisfaction score in both surgical groups

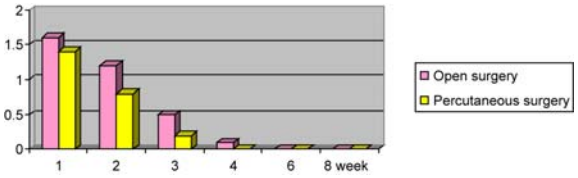


Fig. 3 Mean postoperative pain score in both surgical groups

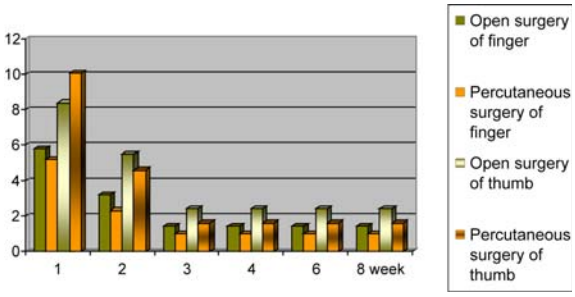


Fig. 4 Mean postoperative extension of IP of thumb and PIP of finger in both surgical groups

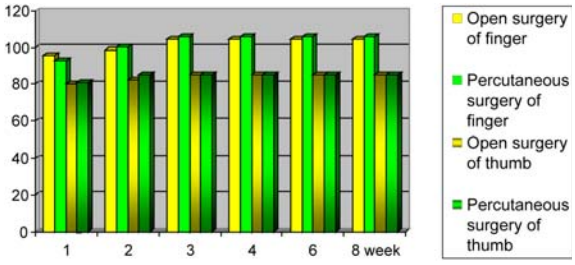


Fig. 5 Mean postoperative flexion of IP of thumb and PIP of finger in both surgical groups

mean postoperative patient satisfaction scores were similar (3.0) at 3 weeks. The mean postoperative patient pain scores were similar (0.0) at 6 weeks, and the percutaneous surgery group had a lower mean postoperative patient pain score than the open surgery group at 1, 2, 3, and 4 weeks. The mean postoperative extensions of finger PIP and thumb IP were similar at 3 weeks, and the mean postoperative flexion of finger PIP or thumb IP were similar at 4 weeks. Statistical analysis demonstrated no significant differences between the two groups.

Discussion

Stenosing tenovaginitis of the finger or thumb flexors is a common cause of hand pain and disability. Non-operative treatment, including splinting and local steroid injection, is useful for short-term stenosing tenosynovitis. Patients who do not respond to non-operative treatment can be successfully treated with surgery. Open trigger surgery is the standard technique for general orthopedists. Several authors have reported complications related to this surgery, including digital nerve injury, inadvertent sectioning of the A_2 pulley, recurrence of triggering, flexor tendon injury, and infection.

Lorthioir[16] first described a subcutaneous method of trigger finger release using a fine tenotome. Since then, several reports of percutaneous surgery using a variety of instruments and methods have been demonstrated with good results and few complications. Pope and Wolfe[20] performed percutaneous surgery using a 19 gauge needle in a cadaveric study. This procedure was not recommended for thumb and index finger release. Ha et al[13] used a custom hooked blade to perform percutaneous surgery and reported effective results for locked digits. Some authors described techniques that rely on skin creases to locate the A_1 pulley. However, subtle variations in skin creases can contribute to surgical error. Using the CO line or 5 mm. proximal to locate the palmar digital crease for distal release could facilitate complete A_1 pulley release[24,25]. Jongjirasiri[15] described a technique that identified the landmark of the proximal edge of the A_1 pulley that relates to the knuckle line in a perpendicular line to the palm. His report with 314 digits, and 92.90% had a complete resolution of symptoms at 6 weeks with few complications.

The present study reports a technique that identified landmarks of the proximal and distal edges of the A_1 pulley using clinical landmarks[11] (the A_1 pulley is palpated directly over the metacarpal head). After the edges were identified, the full handle knife 45° was used to perform percutaneous trigger release[2]. Using this method, it is generally easy and simple to identify the proximal and distal edges of the A_1 pulley, but may be difficult in some cases due to an obese

hand or grade 4 trigger digit. The mean operative time of the first forty percutaneous surgery cases (mean 2.5 minutes) was the same as the open surgery (mean 2.3 minutes). However, the last forty percutaneous surgery cases (mean 1.1 minutes) were faster than the open surgery (mean 2.1 minutes). This suggests that it takes time for a surgeon to learn the percutaneous method.

Eastwood et al[9] performed percutaneous trigger release in the office. The author agrees that this procedure can be done in the office, but the Ratchaburi Hospital system requires that all minor or major operations be performed in an operating room. Therefore, all of the percutaneous surgeries in the present report were done in an operating room. All authors agree that practice on cadaveric hands is recommended before attempting the procedure in patients, and the surgeon should know the landmarks of the A_1 pulley, and anatomy of the A_1 pulley and the related neurovascular structures of finger and thumb precisely. The author recommends that surgeons who perform percutaneous surgery know the biomechanics of the surgical instruments and have adequate experience with open trigger surgery. In the present study, no digital nerve injury, incisional scar pain, inadvertent sectioning of all or a portion of the A_2 pulley, or recurrence were recorded. One patient who underwent percutaneous surgery had an incomplete A_1 release and subsequent pain. He had an open trigger release two months later. To avoid these complications in both open and percutaneous trigger releases, the operation must be performed precisely. Successful release is facilitated by thorough knowledge of the anatomy and variation of the A_1 pulley and related structures. It is also helpful to understand the biomechanics of the instrument used for trigger release.

Conclusion

Percutaneous trigger surgery using the full handle knife 45° is effective and safe, and results in functional outcomes identical to those with open trigger surgery.

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เปรียบเทียบการผ่าตัดแบบแผลเปิด และแบบเจาะผ่านผิวหนังในผู้ป่วยโรคนิ้วล็อก

ธนา บำรุงเชาว์เกษม

วัตถุประสงค์*: เพื่อเปรียบเทียบผลการผ่าตัดแบบแผลเปิด และแบบเจาะผ่านผิวหนังในผู้ป่วยโรคนิ้วล็อก*

วัสดุและวิธีการ*: ศึกษาผู้ป่วยจำนวน 142 คน (160 นิ้ว) ที่เข้ารับการผ่าตัดโรคนิ้วล็อกเป็น 2 กลุ่ม กลุ่มที่หนึ่งผ่าตัดแบบแผลเปิด (ผู้ป่วย 70 คน, 80 นิ้ว) กลุ่มที่สองผ่าตัดแบบเจาะผ่านผิวหนัง (ผู้ป่วย 72 คน 80 นิ้ว) ได้บันทึกระยะเวลาการผ่าตัด, การวัดค่ามุมในการเหยียดงอข้อ proximal interphalangeal joint (PIP) ของนิ้วมือและ interphalangeal joint (IP) ของนิ้วหัวแม่มือ คะแนนความพึงพอใจของผู้ป่วย, คะแนนความเจ็บปวดหลังผ่าตัดและภาวะแทรกซ้อนโดยติดตามผลการรักษาที่ 1, 2, 3, 4, 6 และ 8 สัปดาห์*

ผลการศึกษา*: ผู้ป่วยที่ได้รับการผ่าตัดแบบแผลเปิดได้ผลดี 100% แบบเจาะผ่านผิวหนังได้ผลดี 98.75% ค่าเฉลี่ยระยะเวลาการผ่าตัด, ค่าเฉลี่ยมุมในการเหยียดงอข้อ PIP ของนิ้วมือและ IP ของนิ้วหัวแม่มือ, ค่าเฉลี่ยคะแนนความพึงพอใจหลังผ่าตัด, ค่าเฉลี่ยคะแนนความเจ็บปวด หลังผ่าตัดไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติทั้งสองกลุ่ม ผู้ป่วยหนึ่งรายที่ผ่าตัดแบบเจาะผ่านผิวหนังไม่ประสบความสำเร็จได้เข้ารับการผ่าตัดแบบแผลเปิดสองเดือนหลังจากการผ่าตัดครั้งแรก*

สรุป*: การผ่าตัดแบบเจาะผ่านผิวหนังในผู้ป่วยโรคนิ้วล็อกโดยใช้มีดปลายแหลม 45 องศา เป็นวิธีที่มีประสิทธิภาพ, ปลอดภัย และให้ผลการรักษาที่ไม่แตกต่างกับการผ่าตัดแบบแผลเปิด*