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Original Article

Open versus percutaneous release for trigger digits: Reversal between short-term and long-term outcomes

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Abstract

Background: There have been excellent outcomes reported with both open and percutaneous release of trigger finger. However, a comparison of short- and long-term outcomes between these two techniques has not been performed. The purpose of this study is to compare the short-term (3 months) and long-term (2 years) outcomes between open surgical release and percutaneous needle release of trigger finger.
Methods: Between 2009 and 2012, a total of 198 patients with trigger finger treated with either open ($n = 72$) or percutaneous ($n = 126$) release of the A1 pulley were enrolled in the study. Both short-term and long-term outcomes were evaluated, using the criteria established through Gilberts et al's questionnaire.
Results: The short-term satisfaction of patients with their results was significantly better in the percutaneous release group, whereas the long-term satisfaction rates were better in the open-release group, although not at a statistically significant level.
Conclusion: The percutaneous release method to release trigger finger does not have a better long-term satisfaction rate than the open release approach, although percutaneous release has a significantly better short-term satisfaction rate.

Keywords: open release; percutaneous release; pulley; treatment; trigger finger

Introduction

Surgical intervention to remedy trigger finger has been shown to be the best treatment to address this medical condition, and excellent outcomes have been achieved using both the open and percutaneous release methods.[1−15] However, the optimum treatment of trigger finger remains controversial because each method has its advantages and disadvantages. The disadvantages of open release include an elevated infection rate, slower recovery of range of motion (ROM), and scarring.[3,6,16] The drawbacks of percutaneous release are iatrogenic digital nerve injury,[7] incomplete release, and conversion to open release.[2,4,12]

Some studies have focused on short-term (3 months) results,[3,5,13] whereas others concentrated on long-term (2 years) outcomes only.[6,7,11,14−16] It has been shown to be difficult to assess residual pain and recurrent triggering in short-term studies, and also challenging to assess the rate of patient satisfaction related to wound problem in long-term

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investigations. We were unable to find any study that reported both short- and long-term outcomes for open and percutaneous release in the same patient group. The aim of this retrospective study was to compare the short- and long-term outcomes between conventional open surgical release and percutaneous needle release of trigger finger.

Methods

Patients

Informed consent was obtained from all patients prior to enrollment. Between January 2009 and October 2012, 215 patients with trigger finger in our facility underwent open or percutaneous release. To create a sufficiently homogenous patient group for comparison, we had established certain inclusion and exclusion criteria. Overall, 153 patients (198 fingers) were enrolled and evaluated retrospectively. There were 50 male and 103 female patients, whose mean age was 59.2 (25−86) years, and the average duration from onset of disease until treatment was 9.0 (4−40) months. Sixteen patients undergoing open release and 25 patients undergoing percutaneous release had two or more fingers affected, but these occurred on different occasions (Table 1).

Preoperative grading

The severity of trigger finger was assessed using the Quinnell[17] grading system. The system creates four distinct grades: Grade 0, normal movement; Grade I, uneven movement; Grade II, actively correctable, Grade III, passively correctable; and Grade IV, fixed deformity.

Patient selection

The inclusion criteria were as follows: (1) failing a previous steroid injection into the flexor sheath (at least once), (2) Grade III or IV, and (3) a history of triggering for at least 4 months. Correspondingly, the exclusion criteria were: (1) a history of cancer, (2) a tumor noted during open release, (3) rheumatoid disease, (4) recent trauma, (5) severe neurologic deficit of the involved upper extremity, (6) loss of follow-ups, (7) incomplete preoperative data, and (8) diabetes mellitus. We also did not include trigger thumb in this study because neurovascular bundles are much closer to the A1 pulley in the thumb and may lead to a different outcome.

The choice of whether the open or percutaneous method was utilized depended on the patient's decision. If the patient wanted to undergo the surgery just on the day of their clinic visit, percutaneous release would be performed. If the patient wanted to have the surgery on another scheduled day, open release would then be performed.

Table 1
Patient characteristics.

	Open release (72)	Percutaneous release (126)	*p*
Patient number	55	98	
Multiple trigger fingers	16 (29)	25 (25)	0.634
M/F, *n* (ratio)	17/38, 1/2.2	33/65, 1/1.9	0.729
Age (y)	58.8 (range, 25−83)	59.6 (range, 26−87)	0.638
Duration of symptom	9.4 (range, 4−30)	8.8 (range, 4−24)	0.479
Hand side (R/L), *n* (ratio)	44/28 (1.57)	75/51 (1.47)	0.435
Grade (II/III)	43/29	80/46	0.868
Last follow-up at outpatient clinic	52 (72.2)	81 (64.2)	0.255
Affected digit			
Index finger	9 (12.5)	7 (5.5)	0.384
Middle finger	32 (44.4)	64 (50.7)	
Ring finger	30 (41.6)	52 (41.2)	
Little finger	1 (1.3)	3 (2.3)	

Data are presented as *n* (%), unless otherwise indicated.
F = female; L = left; M = male; R = right.

Surgical techniques

All patients received open and percutaneous release on an outpatient basis. All open release procedures were performed by two hand surgeons, and all percutaneous release was done by a single hand surgeon at our institute. The level of expertise of both surgeons was assessed, and graded as Level III (experienced specialist) according to Tang's grading system.[18]

For the open release technique, landmarks were placed according to the study of Wilhelmi et al[19] to determine the location of the A1 pulley and avoid iatrogenic injury to the neurovascular structures. Local anesthesia was administered into the subcutaneous tissues at the skin markings. The skin incision was made at the location of the A1 pulley.[19] The neurovascular structures were protected by retractors. The A1 pulley was divided longitudinally. Patients were then asked to perform active flexion and extension of the affected finger to test for any residual triggering. The skin was closed with 5−0 nylon sutures.

The surgical procedure used to perform percutaneous needle release was the technique described by Pope and Wolfe[20] and Slesarenko et al.[21] At the location of the A1 pulley,[19] a 18-gauge needle tip is inserted through the A1 pulley and into the flexor tendon. Needle-tip position is checked by observing the paradoxical swing of the needle on passively flexing the finger. The needle is then slightly withdrawn until there is no longer a paradoxical swing. With the bevel of the needle rotated to along the longitudinal axis of the flexor tendon, the pulley is divided longitudinally by a sweeping motion of the needle tip on the A1 pulley, with characteristic gritting sensation. Complete release is confirmed by the disappearance of a grating sound and full active ROM after the end of the procedure. A compressive bandage is applied at the wound site, and immediate postoperative ROM exercises are suggested for both open and percutaneous releases.

Postoperative assessment

After the operation, both groups were followed up at 2 weeks and at 3 months at the outpatient clinic. Both groups were contacted at 2 years on average and provided their final

reviews by telephone and at the outpatient clinic. There was a special chart, listing detailed personal data and course of therapy, for each patient (including duration of symptoms, presence of early and late complications, and treatment of complications). The special chart was used to categorize every patient with trigger digit since the time of their first visit. All patients were evaluated by a project investigator, who was not involved in the treatment of patients. All patients in this study were evaluated at our clinic with 2-week and 3-month follow-ups. Although some patients were evaluated by telephone in the 2-year follow-up, they were all evaluated at least three times with the same special chart since the first visit. Errors from the telephone evaluation can be minimized by improved familiarity with the evaluation. The short-term follow-up period averaged 3 months, whereas the long-term follow-up period was 2 years on average. The questionnaire administered in the study of Gilberts and Wereldsma[6] was used to evaluate the short- and long-term results. The following questions were asked: Do you have triggering? Do you have pain? Do you have stiffness? Do you feel numbness? Do you have a scar? Are you dissatisfied, satisfied, or very satisfied with the treatment? (These questions and their related information are presented in Tables 2 and 3).

Statistical analysis

We used the SPSS program (SPSS version 17; SPSS Inc., Chicago, IL, USA) to perform the analysis. The details of patients in both groups were compared between the open technique and percutaneous needle technique using the Mann–Whitney *U* test for continuous variables as noted in Table 1. Categorical covariates were assessed individually with the chi-square test, and the Fisher's exact test was performed for samples with expected values <5. A p value < 0.05 was considered statistically significant.

Results

The two groups were statistically similar regarding multiple trigger finger, sex, age, duration of symptom, hand side involvement, and triggering grade prior to release (Table 1).There were three cases of infection (2 in the middle finger, 1 in the ring finger) in the open-release group, and the infection rate (4.1%) was significantly higher than that of the percutaneous-release group (0%; $p < 0.05$). Our procedures were performed by experienced senior hand surgeons, and no iatrogenic digital nerve injury was reported.

Table 2
Results after surgery in short term (3 months).

No. (%)	Open release (72)	Percutaneous release (126)	p
Triggering	0	0	NC
Pain	12 (16.6)	6 (4.7)	0.005
Stiffness	0	0	NC
Digital nerve injury	0	0	NC
Scar	6 (8.3)	0	<0.001
Satisfaction			
Dissatisfied	4 (5.5)	0	<0.001
Satisfied	14 (19.4)	6 (4.7)	
Very satisfied	54 (75)	120 (95.2)	

Data are presented as *n* (%).
NC = noncomputable.

Table 3
Results after surgery in long term (2 years).

	Open release (72)	Percutaneous release (126)	p
Triggering	1 (1.3)	5 (3.9)	0.308
Pain	4 (5.5)	14 (11.1)	0.190
Stiffness	0	0	NC
Digital nerve injury	0	0	NC
Scar	2 (2.7)	0	0.060
Satisfaction			
Dissatisfied	1 (1.4)	5 (3.9)	0.355
Satisfied	5 (6.9)	14 (11.1)	
Very satisfied	66 (91.7)	107 (84.9)	

Data are presented as *n* (%).
NC = noncomputable.

For the short-term outcomes, two cases (1.5%) of percutaneous release were converted to open release immediately when persistent triggering was found, so there was no recurrent triggering in the short term. There was no stiffness in the short term because immediate exercise was requested of the participants in both groups after release. The percentages of pain and scar in the open release group were 16.6% and 8.3%, respectively, which were significantly higher than those of the percutaneous release group ($p < 0.05$). For the percutaneous release group, the satisfaction rate was significantly better than that in the open release group ($p < 0.05$; Table 2). Four patients (open) who indicated short-term "Dissatisfied" result attributed this rating to wound infection (3 patients) and severe pain (1 patient). Twenty patients (14 in open, 6 in percutaneous) with short-term "Satisfied" result attributed their response to mild pain or scar.

For the long-term outcomes, the percentage of "triggering" and "pain" experienced by patients was higher in the percutaneous-release group, but not significantly so. The percentage of scar in the open-release group was higher, but again not significantly so. For the open-release group, the "Very satisfied" result was better than that in the percutaneous-release group, but the satisfaction level was not significantly different (Table 3). Five patients (percutaneous release) indicated that they were "Dissatisfied' in the long term—one in index finger, two in ring finger, and two in middle finger. The long-term "Dissatisfied" result in six patients (1 in open, 5 in percutaneous) was attributed to "recurrent triggering." Twenty-one patients (7 in open, 14 in percutaneous) with long-term "Satisfied" result noted mild pain or scar.

Discussion

In the short-term follow-up, the percentage of pain and scar formation in the open-release group was significantly higher than that in the percutaneous-release group ($p < 0.05$). The satisfaction level was also significantly worse in the open-

release group ($p < 0.05$) (Table 2). In the long-term follow-up, the percentage of recurrent triggering, scar formation, pain, and satisfaction in both two groups was not significantly different (Table 3).

In order to minimize the heterogeneity between the fingers in our study, patients with diabetes mellitus, Dupuytren's disease, and rheumatoid disease were excluded. Moreover, we excluded the trigger thumb because of the unique anatomy of the thumb. For those patients with multiple finger involvement, we happened to operate on the fingers at a different time.

In the long term, recurrent triggering and pain were higher in the percutaneous-release group than in the open-release group, although there was no statistically significant difference. In six patients (6 fingers) with "Dissatisfied" results, five patients (1 in open, 4 in percutaneous group) underwent the revised open release, whereas one patient refused to undergo further surgery. During the revision surgery, healed A1 pulleys with hypertrophic scar were found in all patients. The scarred and hypertrophic pulley were excised, and all the symptoms of triggering and pain were then resolved.

One cause of the increased percentage of pain and recurrent triggering in the percutaneous-release group in the long term may be ascribed to the incomplete release. In the percutaneous-release procedure, complete release is considered while the grating sound disappears and full active ROM can be achieved. However, incomplete release could still exist, even though the triggering has disappeared after the surgery, as reported in the literature.[6,20,22] Also, there could be other reasons causing the recurrent triggering and pain, e.g., persistent tenosynovitis and iatrogenic injury of the flexor tendon, although there are still no evident reports about this.

Comparison of the degrees of satisfaction between short term and long term has led to several interesting implications. In the short term, the degree of pain reported was greater in the open-release group, but this may not necessarily lead to a "Dissatisfied" result in the long term, because all of the short-term pain improved within 1 year after the surgery during follow-up. The "Very satisfied" results in the short term may become "Dissatisfied" in the long term because of the recurrence of triggering or pain. The outcome and satisfaction in the short term are significantly better in the percutaneous-release group. In the long term, however, there were no significant differences between the two groups. Although there could be additional possibilities for incomplete release (in percutaneous release), which may result in poorer outcomes, influence on the fingers does not appear to be very crucial in the long term.

This study has several limitations, including its retrospective nature, which could possibly cause bias. In addition, the sample size may not be large enough to achieve sufficient statistical power. Furthermore, we did not include the trigger thumb in this study. Further evaluation of the thumb and the difference between other fingers should be conducted.

For cases involving trigger finger, the percutaneous-release group has significantly better short-term outcome and lower infection rate than the open release group, but there is no significant difference in long-term outcome between the two groups. Prevention of complications is more important than performing a minimally invasive surgery. Young doctors or family practice doctors who are not familiar with the percutaneous technique should not feel uncomfortable about performing the open release procedure because it will not compromise long-term outcomes.

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