Percutaneous Release of Trigger Digit With and Without Cortisone Injection

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Percutaneous release was done using the tip of an 18-gauge, 2.5-cm-long needle, mounted on a 3-mL[3] syringe in 225 trigger digits. It was successful in 92 (89%) of the digits without cortisone injection (n = 105) and in 115 (96%) of the digits with cortisone injection (n = 120). Negligible or intermittent pain persisted for 8 weeks in the noncortisone group and 6 weeks in the cortisone group after percutaneous release. Of the first 10 digits, 2 needed repeat percutaneous release. With modification of technique, the incidence of repeat percutaneous release was zero in both groups. Open release was needed in 8% in the noncortisone group and 3% in the cortisone group. The procedure was done under local infiltration anesthesia in the office. This reduced patient anxiety, inconvenience and hospital cost. (J Hand Surg 1997;22A:150–155.)

Cortisone injections are successful in 67%–94% of trigger fingers and thumbs when injected 1 to 4 times.[1–10] When the patient does not wish to have a cortisone injection, splinting the metacarpophalangeal joint in extension is successful in 70% of the index, middle, ring, and small fingers but requires 3–9 weeks of splinting.[11,12] Eastwood et al. reported a 94% success rate in 35 triggering fingers treated with percutaneous release.[13] He recommended against using this technique in trigger thumbs. We report our results of percutaneous release in 189 patients with 225 trigger digits. The minimum follow-up period was 12 months. We found the method successful in 54 (95%) of 57 trigger thumbs.

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Received for publication Jan. 20, 1995; accepted in revised form April 1, 1996.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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Materials and Methods

The entry criterion for inclusion in the study was idiopathic trigger digit, including that in diabetic patients. Patients with rheumatoid arthritis, trauma, renal dialysis, de Quervain syndrome, and carpal tunnel syndrome were excluded. Pain, mechanical symptoms, and patient satisfaction with outcome were graded to measure the results of treatment.

Grading of triggering used in our previous study[11] was simplified (Table 1), as there was no difference in results between digits that could be unlocked actively or passively. These 2 groups were merged into 1 group, grade 3. The digits that were locked were graded as grade 4. Only trigger fingers and thumbs in grades 2, 3, and 4 were included in the study, as successful release was instantly verifiable by the patient and the surgeon. Pain was graded on a numeric pain scale from 0 to 10, 0 representing no pain and 10 representing excruciating pain. Each mechanical grade was thus painful or painless. The result of release was graded as satisfactory (cured, or minimal symptoms that did not bother the patient) or unsatisfactory (the patient needed open surgery or the patient had significant symptoms that bothered him or her).

Table 1. Grading the Severity of Trigger Fingers and Thumbs

Grade	*Mechanical Problem*	*Locking*	*Noncortisone (n = 105)*	*Cortisone (n = 120)*
0	None	None	0	0
1	Uneven movements	None	0	0
2	Clicking	None	50 (47%)	47 (39%)
3	Locking	Active orpassive unlocking	48 (46%)	58 (48%)
4	Locked	Cannot be unlocked	7 (7%)	15 (13%)

One hundred eighty-nine patients with 225 trigger digits were divided into 2 prospective cohorts. The first 105 digits were treated with percutaneous release. The subsequent 120 digits were treated with percutaneous release after cortisone injection. The patients in both the groups had similar age, gender, hand dominance, and side and digits involved (Table 2). There were 15 painless digits (but with disabling mechanical symptoms) in the noncortisone group and 8 painless digits in the cortisone group. A single digit was involved in 135 patients, double digits were involved in 34 patients, triple digits were involved in 6 patients, and quadruple digits were involved in 1 patient. Grade 4 trigger digits included 3 middle digits locked in partial flexion, 8 thumbs locked in extension, and 2 thumbs locked in flexion.

Statistical Analysis

For statistical comparison of patient characteristics between cortisone and noncortisone groups, Student's unpaired (independent) *t*-test was performed on continuous-scale variables. The chi-square test was applied for tests on nominal variables. Findings with a p value < .05 were considered as statistically significant. Statistical analysis was done with statistical package for social sciences for Windows, version 6.01.

Table 2. Demographics of Noncortisone and Cortisone Groups

Characteristic	*Percutaneous Release Without Cortisone*	*Percutaneous Release With Cortisone*	*p Value*
Number of patients	86	103	
Number of digits	105	120	
Age (years)			.080
Average	67	64	
Range	30–90	31–87	
Standard deviation	13	12	
Sex ratio (F:M)	59/46	71/49	.800
Hand side (L:R)	41/64	17/23	.750
Dominance (R:L)	102/3	111/9	.130
Digit involved			
Thumb	24	33	.440
Index	12	1	.001
Middle	28	33	.800
Ring	34	44	.640
Small	7	9	.820
Duration of symptoms			.030
In months	15	7	
Range	1–240	1–120	
Average	31	13	
Standard deviation	—	—	—
Pain visual analog pain scale			.560
Average	5.8	6.1	
Range	0–10	0–10	
Standard deviation	3	2.6	
Multiple trigger digits	32 (30%)	21 (18%)	.020

Technique

The procedure was done in the office under local infiltration anesthesia. The patient sat comfortably and placed the hand on the examining table. The surgeon (M.R.P.) sat on the opposite side of the patient. We used Zaphrin or Betadine spray to disinfect the skin. We infiltrated the subcutaneous tissues and the flexor tendon sheath with equal amounts of 1% Xylocaine and 0.5% Sensorcaine. We inserted a 3.75-cm 22-gauge needle at the palmar digital crease (Fig. 1A) and extended it to 1 cm proximal to the stoma of the A1 pulley (Fig. 1B) and infiltrated the subcutaneous tissues. The flexor tendon sheath of the cortisone group was injected with 0.5 mL Celestone Soluspan (betamethasone phosphate and acetate, 6 mg/mL). The stoma of the A1 pulley is at the proximal palmar skin crease of the index finger and at the distal palmar crease of the ring and little fingers and midway between the two for the middle finger. An

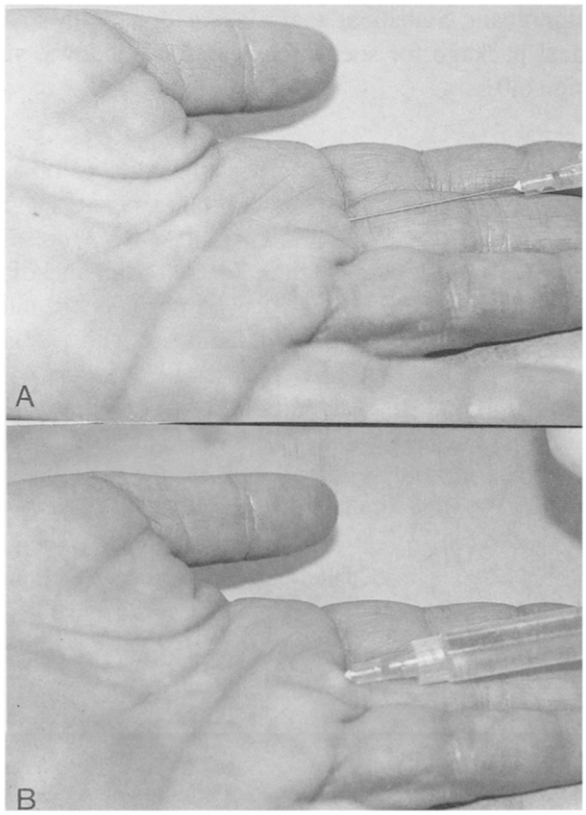

Figure 1. The surgeon sits on the side of the table from the patient opposite the trigger digit. Using a 22-gauge 3.75-cm needle, subcutaneous infiltration is done (A) from the palmar digital crease to (B) 1 cm proximal to the stoma of the A1 pulley. Long needle helps to infiltrate the entire area in one stick.

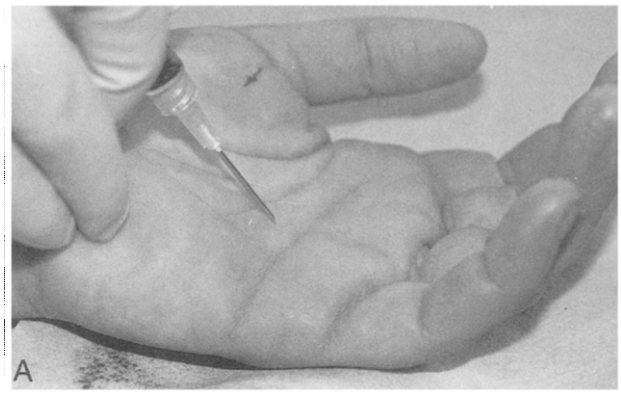

Figure 2. The needle is moved from proximal to distal and from superficial to deep over the A1 pulley. The initial location for introduction of the 18-gauge, 2.5-cm needle is 1 cm proximal to the distal palmar crease for the ring and small finger, to the proximal palmar crease for the index finger, and in between the two for the long finger. If the needle is inserted at the level of the distal palmar crease, the tip will miss the stoma of the A1 pulley.

18-gauge, 2.5-cm needle mounted on a 3-mL syringe was introduced 1 cm proximal to the stoma of the A1 pulley (Fig. 2). The bevel of the needle was placed parallel to the tendon sheath. The needle was introduced dead center over the flexor tendon sheath by palpating the tendon. The tip of the needle was used to identify the stepoff of the stoma of the A1 pulley. It was then moved from distal to proximal and from superficial to deep over the A1 pulley. Grating sensation and sound indicated the cutting of the A1 pulley. When the grating sensation and sound stopped, the needle was withdrawn and introduced farther distally. The procedure was repeated until relief of clicking or locking was confirmed by the patient as he or she actively flexed and extended the digit. The procedure took 5–10 minutes.

Eastwood et al.[13] used a 19- or 21-gauge needle. We found that they bend easily and do not cut well when the A1 pulley is thick and tough. They inserted the needle at the distal palmar crease or the middle palmar skin crease. We inserted an 18-gauge, 1-in. needle 1 cm proximal to the distal palmar skin crease or the middle palmar skin crease as necessary. The stoma of the A1 pulley was palpated with the tip of the needle as a stepoff over the flexor digitorum superficialis tendon. In addition, Eastwood et al.[13] used only 1 point of needle insertion. We reinserted the needle distal to the initial point of insertion at as many points as necessary until the clicking or lock-

ing was relieved. Often, 3 to 5 points of insertion were necessary before triggering was relieved.

The thumb flexor tendon sheath is at a right angle to the palmar surface. It needs to be outlined with patience and care. By positioning the patient's thumb in palmar abduction and flexing the wrist, the volar surface of the thumb was placed facing the surgeon. Subcutaneous tissues and the flexor tendon sheath were infiltrated with local anesthesia as shown in Figure 3. The cutting needle was inserted 1 cm proximal to the metacarpophalangeal joint crease, in the center of the volar surface of the thumb.

After surgery, an adhesive strip bandage was applied and the patient was advised to vigorously flex and extend the digit for several times a day until movement was restored. The patient assisted full flexion and extension of the digit with the opposite hand when necessary. For the purpose of this study, the patients were examined once a week for 1 month and then once every 4 months for a minimum of 12 months.

All the procedures were done by 1 surgeon (M.R.P.) in the office between June 1, 1992, and April 1, 1994. One hundred eighty patients were personally examined and 9 patients were reached by phone to determine if they had any pain or mechanical symptoms. No patients were lost to follow-up examination. The follow-up period ranged from 12 to 24 months.

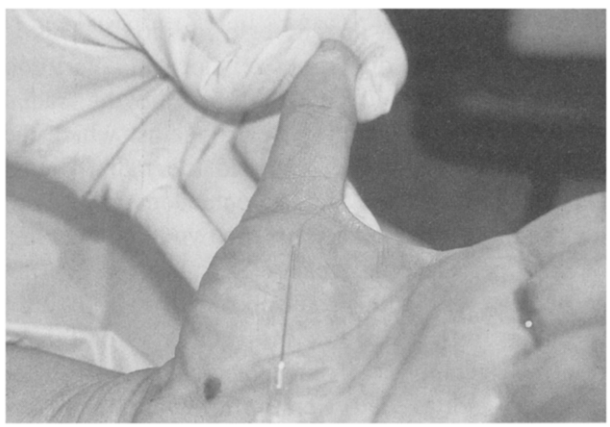

Figure 3. To release the trigger thumb, the needle is introduced 1 cm proximal to the metacarpophalangeal joint crease and is kept dead center over the thumb. Palpating the tendon prior to introduction of the needle helps. A common error is to introduce the needle radially, as the volar side of the thumb is at a right angle to the palm. Wrist flexion and thumb abduction make the approach to the volar surface of the thumb easier.

Results

The results were graded as excellent, good, fair, and poor based on pain and mechanical symptoms as outlined in Table 3. Ninety-three (89%) trigger digits in the noncortisone group and 115 (96%) trigger digits in the cortisone group had satisfactory results. The difference was statistically significant ($p = .04$). In the group with unsatisfactory results, 12 digits in the noncortisone group and 3 digits in the cortisone group needed open release. Of 15 digits that needed open surgery, 4 were found to have incomplete release of A1 pulley, 2 in each group. Eight had significant tenosynovitis and adhesion between flexor digitorum superficialis and flexor digitorum profundus. They were treated with tenosynovectomy and tenolysis. The A1 pulley did not have residual constrictions. The remaining 5 digits in the group with unsatisfactory results had pain > 1 on numeric pain scale without triggering. They refused further treatment. Pain without triggering persisted after percutaneous release, owing to persistent tenosynovitis in both the groups. This was relieved in 11 of 17 digits by subsequent cortisone injections.

When duration of symptoms was 4 or more months, 3 (7%) of 54 digits in the noncortisone group and 1 (2%) of 55 digits in the cortisone group needed open release. When duration of symptoms was less than 4 months, 5 (10%) of 51 digits in the noncortisone group and 2 (3%) of 65 digits in the cortisone group needed open release. The difference was not statistically significant ($p = .18$). In the single trigger digit group, 4 (6%) of 73 digits in the noncortisone group needed open release, while 2 (2%) of 99 digits in the cortisone group needed open release. In the multiple trigger digit group, 5 (16%) of 32 digits in the noncortisone group needed open release, while 1 (5%) of 21 digits in the cortisone

Table 3. Grading the Results of Percutaneous Release

	Pain	*Stage*
Satisfactory		
Excellent	None	0
Good	Minor/intermittent aches (VAP = 1)	0
Unsatisfactory		
Fair	Patient chose to live with the pain (VAP > 1)	≥ 1
Poor	Pain requring open trigger finger release (VAP > 1)	≥ 1

VAP, visual analog pain scale.

group needed open release. The difference was not statistically significant ($p = .20$).

Of 57 trigger thumbs (24 in the noncortisone group and 33 in the cortisone group), 54 (95%) had a successful outcome surgical; success was equal in both groups. We did not encounter any digital nerve injuries. The success rate for the thumb was not significantly different than that for other digits.

In the first 10 percutaneous releases, 2 digits were not relieved of triggering. Both required open release without tenosynovectomy and were cured. With a change in technique in the next 215 percutaneous releases, open release without tenosynovectomy was necessary in 2. Several digits had uneven movement and did not require any treatment.

Complications

Complications commonly related to open trigger finger and thumb release, such as injury to radial and/or ulnar digital nerves of the thumb,[14–17] tendon bow-stringing due to excessive flexor tendon sheath release,[18] painful scar,[19] infections,[15,16] and reflex sympathetic dystrophy were not encountered in our cases. Seven patients in the noncortisone group and 5 patients in cortisone group needed hand therapy for 1–2 weeks for stiff digits. One patient who needed open trigger finger release was found to have roughening on the palmar surface of the flexor digitorum superficialis tendon, but the tendon was intact. After tenosynovectomy, he was asymptomatic. One patient was found to have distal stenosing tenosynovitis after failed percutaneous release. Reduction tenoplasty was done after several months. He developed septic tenosynovitis. This was a complication of open trigger finger release, not of percutaneous release. He had no evidence of infection after percutaneous release.

Discussion

This study shows that percutaneous trigger finger and thumb release is satisfactorily successful. However, it is not a plea to treat all trigger fingers and thumbs with percutaneous release of the flexor tendon sheath. Our previous study[11] and the studies of many others[1–10] have demonstrated that 1 or more cortisone injections are highly successful in the treatment of trigger digits. In this study, 225 consecutive fingers were treated with percutaneous release to determine the procedure's success rate. The shortcoming of the study is that it was not limited to trigger digits that failed treatment with cortisone injections. The study was not designed to treat the failures from cortisone injections, because the failures are few and the random sample needed for the study would not be statistically significant. With a failure rate of 14% with cortisone treatment, we would have been required to treat 428 trigger fingers to have 60 fingers available for percutaneous release and be able to compare at least 30 trigger digits in 2 groups. The feasibility of such a study appeared limited.

We recommend that those patients who are not successfully treated with cortisone injections be treated with percutaneous release instead of open release. These patients may be given a cortisone injection prior to percutaneous release to improve the results of percutaneous release. This would eliminate the cost of using an operating room and would increase convenience and decrease patient anxiety, especially in the elderly.

The pain in trigger finger and thumb is caused by inflammation of the flexor tendon synovium. The inflammation may be caused by a mechanical component or the tenosynovitis may be of idiopathic origin. The difference in the success rate of percutaneous release without cortisone (89%) and with cortisone (95%) may be due to idiopathic tenosynovitis not related to stenosis. This may explain why residual pain persisting after percutaneous release with or without cortisone is relieved in 70% of cases by an additional cortisone injection.

Injury to the radial digital nerve of the thumb was reported by Carrozzella et al. with open trigger thumb release with a transverse incision.[14] This is because the radial digital nerve is located anterior to the radial sesamoid, and rigidity of the radial sesamoid acts as a cutting board against which the nerve may be divided. Injury to the radial digital nerve does not occur with percutaneous release, as the needle is inserted between the two digital nerves.

With percutaneous release, an incision is not needed, as it is with Froimson's technique,[20] and a special instrument, as used in Lorthioir's[21] or Tanaka et al.'s[22] techniques of subcutaneous trigger finger release, is not needed. Certain differences from the technique of Eastwood et al. help to maximize successful results: (1) use of 2.5-cm, 18-gauge needle (this needle is stiffer and does not bend); (2) insertion of the needle 1 cm proximal to the A1 pulley; (3) identification of the stoma of the A1 pulley as a stepoff by the tip of the needle; (4) maintenance of the position of dead center over the flexor tendon sheath;

and (5) use of 3 to 5 needle punctures instead of the single needle puncture advocated by Eastwood et al.

Patients should be warned that a second percutaneous release or open surgery may be necessary. We recommend that the surgeon perform the first few releases in the operating room by surgically exposing the A1 pulley and cutting it with the bevel of an 18-gauge needle to learn the use of the needle as a knifepoint. Then the surgeon should perform percutaneous release of trigger fingers and thumbs, followed by open release, until he or she is consistently successful. This will provide a safe transition from the ability to perform open to to the ability to perform percutaneous trigger digit release.

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