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Use of a Percutaneous Needle Release Technique for Trigger Thumb: A Retrospective Study of 11 Patients from a Single Center

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Background: Trigger finger is a very common disorder that occurs in both adults and children. Trigger finger presents mainly as pain and limited movement of the affected digit. This report describes a modified percutaneous needle release and an evaluation of its clinical efficacy to treat trigger thumb.

Material/Methods: Trigger thumb of 11 patients was released percutaneously using a specially designed needle (0.8×100 mm) with a planus tip. Complete release was ensured when no more grating sound was heard and the needle moved freely at the tip. Pain-related functional score was evaluated preoperatively and at 3 months postoperatively. Resolution of Notta's node, triggered or locked, Quinnell's criteria, and patient satisfaction were also assessed at 3 months after the operation.

Results: After the percutaneous trigger thumb release, the overall visual analog scale (VAS) and pain-related functional scores declined significantly ($P<0.01$). There was no recurrence of thumb locking or triggering or Notta's node. Only the first patient had incomplete release of the first annular pulley, and all patients showed high satisfaction with the procedure at 3 months after their operation. During the study, patients did not experience any complications such as inflammation, edema, or digital nerve injury.

Conclusions: This study demonstrated that the percutaneous technique is effective, less time-consuming, and safe for treating trigger thumb. Our release technique using a specially designed percutaneous needle is a valuable treatment for trigger thumb.

Keywords: *Actinoplanes digitatis* • Biopsy, Fine-Needle • Trigger Finger Disorder

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Background

Trigger finger is a very common disorder that occurs in both adults and children. It presents mainly with pain and limited movement of the affected digit [1]. The main triggering mechanism is on the first annular (A1) pulley, following long-term friction and compression leading to an obstruction of the flexor tendon gliding in the fibrous sheath. It generally involves the thumb [2].

Various conservative treatments have been confirmed effective to treat this bothersome condition [3-5], but not all cases can be resolved entirely. Overall, the success rate ranges from 35% to 80% with regard to resolution of patients' pain and triggering [6-8]. Once conservative treatments fail, surgery is offered as an option to release the A1 pulley. Although high success and satisfaction rates have been reported, complications such as infection, digital artery, or nerve injury sometimes occur [9]. A previous study used a large percutaneous trigger thumb release in patients, but insufficient A1 pulley release occurred in severe cases, which required multiple releases [10].

Percutaneous release using a fine tenotome to treat trigger finger has been widely accepted among patients [7]; however, when higher triggering or nodules are present, more suitable instruments are needed for resolution of the symptoms [11]. Hence, the percutaneous release method should be considered. In this study, we present a modified percutaneous release technique using a specially designed needle to treat trigger thumb in 11 patients at a single center.

Material and Methods

From January 2020 to August 2020, 6 women and 5 men with an average age of 50.7 years (range 35-66 years) were enrolled at the outpatient Orthopaedic Clinic at Zhejiang Rongjun Hospital. Patient profiles are presented in **Table 1**. All patients were previously unresponsive to treatment by steroid injection and had grade III or higher triggering according to the Quinnell grading system (**Table 2**). Among the 11 patients, 7 right and 4 left thumbs were involved, and patients experienced typical symptoms of painful triggering for an average of 7.2 (range 3-15) months. None of the patients had rheumatoid arthritis, diabetes mellitus, or chronic systemic disease, and all patients provided informed consent for study participation.

Needle and Procedure

We treated trigger thumb using a specially designed needle (small needle, Beijing Huaxiatex Co. Ltd., Beijing, China), 0.8 mm in diameter and 100 mm in length (**Figure 1**). The needle is straight and stiff. The tip is planus to facilitate insertion into the skin. The width of the blade is 0.8 mm, and it can be used to safely release the A1 pulley with less damage.

For the procedure, the patients lay on a table in supine position, and the affected thumb was cleaned and placed on the table with the palm facing upward. The affected thumb was numbed using 1% plain lidocaine injected at the metacarpophalangeal joint crease. The thumb was then held in a hyperextended position and the tip of the specially designed needle was inserted through the skin into the triggering point of the A1 pulley. The needle tip was confirmed to be on the underside of the pulley when a grinding sensation was heard and felt and the bevel of the needle was parallel to the flexor

Table 1. Profiles of the patients who underwent the percutaneous release technique for a trigger thumb.

Patient	Age (years)	Sex	Affected thumb	Pain duration (months)	Grade
1	46	F	Right	12	V
2	49	M	Right	7	IV
3	54	M	Left	3	III
4	41	M	Right	6	III
5	35	F	Left	6	V
6	62	F	Right	15	IV
7	49	M	Right	4	III
8	59	F	Right	10	V
9	44	F	Left	3	III
10	66	M	Left	8	IV
11	53	F	Right	7	IV

The grade of triggering according to the Quinnell grading system.

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Table 2. Severity of triggering according to the Quinnell grading system.

Grade	Clinical findings
I	Normal movement, no pain
II	Normal movement, occasional pain
III	Uneven movement
IV	Intermittent locking, actively correctable
V	Locking, only passively correctable

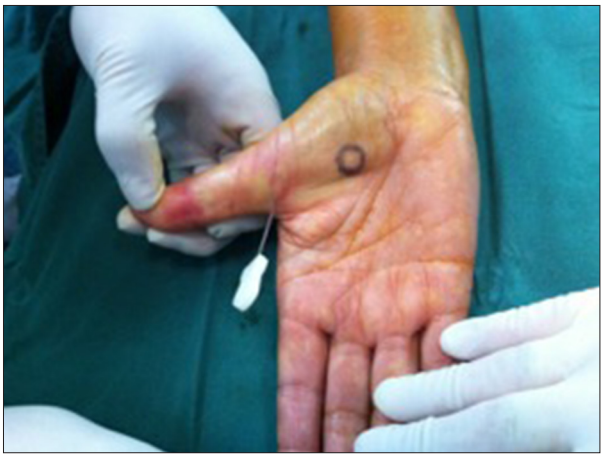

Figure 1. The site used for the needle to treat trigger digit in patients.

sheath. The triggering release was done longitudinally, with several lifting movements from distal to proximal in the direction of the A1 pulley. When no more grating sound was heard, the needle moved freely at the tip of needle, ensuring a complete release. A 2-mg/mL steroid injection was injected into the sheath before the needle was withdrawn. A soft dressing was applied after the procedure was complete, and oral nonsteroidal anti-inflammatory drugs (NSAIDs) were prescribed for 3 days for pain control. All patients were interviewed by telephone at 3 months after the operation.

Clinical Evaluation

Outcome measures were analyzed based on visual analog scale (VAS) pain scores, the occurrence of triggering, the status of Notta's node, patient satisfaction with treatment outcome, and the grade of trigger according to Quinnell's criteria. Pain-related functional status was evaluated using a 10-cm VAS, on which 0 indicated no pain and 10 indicated severe pain. All patients were also asked to rate their pain based on 3 functional situations: at rest, active flexion or active extension, and grasping an object (over 4 kg). The overall VAS score was summed, with a maximum of 30 points for each patient. Pain scores were recorded preoperatively and at 3 months postoperatively. The Quinnell grading system for trigger finger [12,13] was based on the following scores: 0, normal movement; 1, uneven movement; 2, actively correctable locking of the digit; 3, passively correctible locking; and 4, fixed deformity.

All patients were interviewed at 3 months after the operation to learn whether the treated thumb no longer clicked or locked in a position of flexion or extension, the status of Notta's node, and the grade of trigger according to Quinnell's criteria using a questionnaire. The patients were also asked to rate their level of satisfaction from 0 to 5 (0 being unsatisfied and 5 being extremely satisfied).

Statistical Analysis

The resultant data were calculated using a SPSS version 13 statistical software program. The VAS scores (the difference between the baseline and last assessment) were analyzed using a pair-wise *t* test, with $P<0.05$ being regarded as significant.

Results

The Technique Effectively Treated Trigger Thumb

The mean time of surgery for trigger thumb was 4.5 min (ranging 3-7 min), including the time for local anesthesia. Initially, the 11 patients experienced triggering of stage III or higher. Eight patients had stage I or II triggering shortly after surgery, and they felt no triggering sensation and had full range of motion of the thumb at the final follow-up at 3 months. The first 2 patients had residual triggering with a grade of stage III. The sixth patient experienced persistent pain at the site of release (right thumb) at 1 week after the operation in spite of successful release. However, the pain resolved after 6 days by taking oral NSAIDs. None of the patients experienced significant complications from the percutaneous release technique.

VAS Score Analysis Showed Good Progress After Treatment

The preoperative mean VAS was about 21.6 (16-23), 7.2 points at rest, 8.5 points at flexion or extension, and 9.3 points when grasping objects. After the patients underwent percutaneous trigger thumb release, the mean VAS score decreased to 3.8 points at the third week postoperatively. Relative to the preoperative scores, the VAS scores decreased significantly ($P<0.05$) by 3 months after treatment: 0.6 points at rest, 1 point at flexion or extension, and 2.3 points when grasping objects. The comparison of the pain-rated functional situation VAS scores between preoperative and 3 months postoperative revealed a significant decrease ($P=0.000$; **Table 3, Figure 2**).

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Table 3. Mean pre- and postoperative pain-rated functional situation scores of the affected thumb.

Variance	Pre	Post 3rd month	*p*-value
Pain-rated functional situation			
Overalla (VAS)*	21.6±2.7	3.8±0.6	.0000
Pain at rest**	7.2±1.1	0.6±0.3	.0000
Pain at flexion or extension**	8.5±1.3	1.1±0.2	.0000
Pain at graping object**	9.3±0.5	2.3±0.2	.0000

* Evaluated using the visual analogue scale (VAS) pain score; ** Evaluated using the pain-rated functional situation scores.

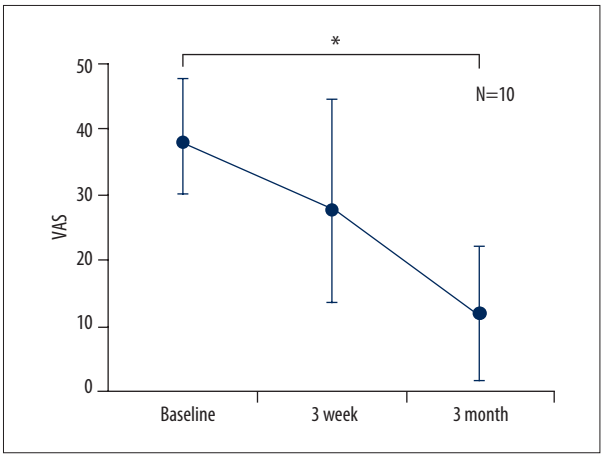

Figure 2. The visual analog scale scores in patients at different time points postoperatively using the needle treatment for the trigger thumb. * Indicated a significant difference at $P<0.05$.

Patients Were Satisfied with Needle Treatment Outcomes

When all patients were interviewed by telephone at 3 months postoperatively, 3 patients were satisfied and 8 patients were extremely satisfied with the results of the percutaneous release technique and had no recurrent triggering or nodules. All patients returned to their normal daily activities by 3 months after surgery. None of the patients had any complications such as inflammation, edema, or digital nerve injury (**Table 4**).

Discussion

The treatment applied in this study used the planus tip of a specially designed needle that was 0.8 mm in diameter to avoid damage to the adjacent neurovascular bundles. None of the 11 patients had complications. In contrast to other described percutaneous interventions in which a needle or knife

Table 4. Results of telephone questionnaire at 3 months postoperatively.

Patient	Recurrent triggering or locking	Resolution of nodule	Grade	Overall satisfaction
			(0=unsatisfied; 5=extremely satisfied)	
1	N	Y	III	4
2	N	Y	I	5
3	N	Y	I	5
4	N	Y	I	5
5	N	Y	I	5
6	N	Y	I	4
7	N	Y	I	5
8	N	Y	II	4
9	N	Y	I	5
10	N	Y	I	5
11	N	Y	I	5

The grade of triggering according to the Quinnell grading system.

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is inserted to release the A1 pulley, this percutaneous operation for trigger thumb could be completed in 4.5 min on average by an adept operator. In comparison with an open procedure, it took less time and cost less. The planus tip of the specially designed needle enabled the operators to target the A1 pulley accurately, and the lift and thrust-cut technique was a safer and more effective method to completely resolve the trigger. Because each lifting action does not move at the same point, to minimize excessive damage to tendons during the procedure, the procedure was concluded as soon as the triggering disappeared. We were able to avoid damage to the adjacent neurovascular bundles. In cadaveric studies, percutaneous release was reported to cause less damage to the flexor tendons with small longitudinal tears [14-16].

Many similar percutaneous release techniques have been reported because of highly satisfactory results and few adverse effects, but the exact mechanism is still elusive [17-26]. The treatment approach is well accepted by patients. Although some authors have not favored percutaneous release because it poses a risk of injuring the digital nerves, we considered that such risk is likely due to the shape of the needle tip being similar to a hook or knife [26-28]. Such a shape may cause excessive damage to the A1 pulley, particularly since the process of releasing the A1 pulley is not visible. A previous study using a large percutaneous trigger thumb release in patients reported that insufficient release was obtained in severe cases, requiring multiple releases [10].

All patients in our study expressed overall satisfaction with the procedure at 3 months postoperatively. They experienced less pain, suggesting that patients should limit use of the treated thumb for 1 month after the operation. We believe that the percutaneous release technique is a better choice when severe triggering cannot be managed by steroid injection. We would also recommend it for patients whose symptoms have been occurring for less than 6 months or are below grade III triggering. The value of technique can be suitable for a broader population, including diabetic patients. However, this study had some limitations. It had a short-term follow-up and did not determine if patients had a recurrence of symptoms after several years. In addition, there is a lack of randomized clinical trials to evaluate the efficacy of percutaneous release technique compared with other treatments.

Conclusions

We developed a percutaneous technique using a specially designed needle to release trigger thumb. The procedure was used to treat 11 patients with trigger thumb. The specially made needles (ie, planus tip) and a validated release position (ie, A1 pulley release) were used in the procedure. The treatment outcomes suggested that this percutaneous release technique using a specially designed needle is effective for managing trigger thumb.

Acknowledgments

We thank the patients for consenting to their photographs being shown in this article.

Conflict of interest

None declared.

Declaration of Figures Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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