Almwuad'a, M. H., Yemeni J Med Sci. 2025; 19(3):42 -49
https://doi.org/10.20428/yjms.v19i3.2725
https://journals.ust.edu/index.php/yjms

OPEN ACCESS ORIGINAL ARTICLE

Percutaneous Release of Trigger Finger Functional Outcomes and Complications

Mohammed Hussein Hatem Almwuad'a [1]

[1] *Department of Orthopedic, Faculty of Medicine and Health Sciences, Amran University, Yemen*

ABSTRACT

Background: Trigger finger results from thickening of the A1 pulley, restricting tendon movement, causing pain and finger locking. Percutaneous release is a minimally invasive alternative to open surgery, offering quicker recovery and fewer complications.
Objective: To evaluate the outcomes of percutaneous release for trigger finger regarding pain relief, finger range of motion, and complications for the period between September 2021 and September 2023.
Methods: This prospective study included 49 patients (57 fingers) treated with percutaneous release at Amran General Hospital. Patients with Grade ≥2 according to Quinnell's classification were included. The procedure used local anesthesia and a 19-gauge needle for A1 pulley release. Follow-up assessments at 1, 6, and 12 weeks for pain relief, range of motion, and complications were evaluated.
Results: The procedure was successful in 54 of 57 digits (94.7%). Most cases (68.4%) showed complete resolution (Grade 0), while 26.3% had occasional pain (Grade 1). Three patients required open surgery due to incomplete release. No infections, nerve damage, or other complications were reported. The average recovery time was 1.5 ± 0.5 days.
Conclusion: Percutaneous A1 pulley release is a safe, effective treatment for trigger finger, with a 94.7% success rate, minimal complications, and rapid recovery, making it a reliable alternative to open surgery.

Keywords: Trigger Finger, Stenosing Tenosynovitis, Percutaneous Release, A1 Pulley, Functional Outcomes, Complications.

**** Corresponding author address:*** *malmwuadam@gmail.com*

Almwuad'a, M. H., Yemeni J Med Sci. 2025; 19(3):42 -49
https://doi.org/10.20428/yjms.v19i3.2725
https://journals.ust.edu/index.php/yjms

INTRODUCTION

Trigger finger or stenosing tenosynovitis is a common condition caused by thickening and stenosis of A1 pulley and result in incompatibility between the digital flexor tendon and its sheath, which no longer allows smooth movement of the tendon. This leads to increased friction and the formation of nodules in the tendon. The result is pain and tenderness of the A1 pulley, and inability to bring a finger or fingers smoothly through range of motion, eventually progressing to the finger catching or even locking (1, 2). Over time patient tends to avoid a painful trigger finger, resulting in the development of secondary proximal interphalangeal flexion contracture (3). The most common cause is an overuse injury to the hands from gripping, which puts more strain on the flexor tendons (4). The incidence is approximately 2.2% in the nondiabetic population and can be as high as 10% in those with diabetes (5, 6). The condition most commonly affects the dominant hand, with the middle and index fingers being the most frequently involved. It is also more commonly observed in females (7). The ratio of right hand to left hand cases is 3:2, while women are affected six times more often than men (8). The severity of trigger finger is commonly assessed using Quinnell's classification (Table: 1) (9). Tenosynovitis can be a symptom of an inflammatory disorder such as rheumatoid arthritis, psoriatic arthritis, or apatite crystal deposition disease (9).

Table 1: Quinnell grading of trigger finger

Grade	Clinical Findings during flexion and extension
0	Normal Movement
1	Uneven Movement
2	Actively correctable
3	Passively correctable
4	Fixed deformity

Various approaches have been established for managing trigger finger. In the HANDGUIDE study, expert consensus recommended different treatment modalities based on the severity of the condition. These include orthotic devices, physical therapy, nonsteroidal anti-inflammatory drugs, corticosteroid injections, and surgical release (10). The success rate of conservative and surgical methods of treatment are 50%-92% and 100%, respectively (11, 12). Percutaneous release of the A1 digital pulley offers an alternative to the conventional open surgical method (13). Percutaneous techniques may offer advantages such as reduced complications, faster recovery, and the ability to treat several trigger fingers at the same time, without the need for multiple scars or increased post-operative stiffness (14). Percutaneous techniques were first developed by Lorthioir et al. in 1958, who recommended a blind release of the A1 pulley (15). Because trigger finger is a common condition that impacts daily activities and work, and there is a growing demand for minimally invasive, cost-effective treatments with rapid recovery. This study aimed to evaluate the functional outcomes and complications of percutaneous release of the A1 for the treatment of trigger finger.

METHODS

This prospective study analyzed 49 patients (57 fingers) who underwent percutaneous release of trigger finger from September 2021 to September 2023 in orthopedic department in Amran General Hospital. The research was approved by the Research Ethics Committee at Amran General Hospital in adherence to the Declaration of Helsinki, Informed consent has been obtained from all patients for the surgical procedure, the use of clinical data, and the publication of the study. The inclusion criteria consisted of patients showing symptoms above Grade 2 based on the Quinnell's grading system (Table: 1) who had not responded to conservative treatment as well as those who have not received any local injections or surgical procedures. The exclusion criteria included patients with post-traumatic finger injuries or those with inflammatory arthritis in their fingers. A total of 57 digits in 49 patients were studied, consisting of 33 females and

16 males, with a mean age of 44 years (ranging from 26 to 62 years). All patients in this study were right-handed. 6 patients had trigger finger in both hands, so a total of 43 right hands and 12 left hands were affected. The affected digits included 24 thumbs, 19 ring fingers, 11 middle fingers, 2 index finger, and 1 little finger. The average duration of triggering was 6 months, with a range from 2 months to 3 years. Associated medical conditions included diabetes mellitus in 19 patients and Carpal tunnel syndrome in 3 patients.

Surgical Procedure

All surgery performed at the clinic. Before surgery povidone-iodine solution applied to the area to sterilize it, patients received local anesthesia, with 2 mL of 2% lidocaine. Under strict antiseptic conditions. The finger was securely held and hyperextended at the metacarpophalangeal joint. Hyperextension is crucial as it positions the flexor tendon sheath directly beneath the skin and allows the digital neurovascular bundles to shift to either side (16) the senior surgeon used a 19-gauge hypodermic needle to insert it at the A1 pulley (the metacarpophalangeal crease of the thumb, the proximal palmar crease of the index finger, the midpoint between the proximal and distal palmar creases of the middle finger, and the distal palmar creases of the ring and little fingers (17). at an angle of around 50 degrees, ensuring the needle reached the correct depth, The position of the needle within the tendon sheath was verified by actively flexing the finger and observing the needle's movement. The needle was then withdrawn slightly until it no longer moved with the flexion of the fingertip. The needle was then moved along the tendon sheath, making a longitudinal cut parallel to the tendon. After cutting the A1 pulley, a compression-confirming test (CCT) was conducted. This involved pressing on the A1 pulley and having the patient flex and extend the affected finger to check for any incomplete release. If the tendon moved smoothly, the A1 pulley was considered fully divided. If clicking or snapping was detected, the procedure was repeated until full release was achieved. Patients returned for follow-up visits at 1, 6, and 12 weeks after the procedure. Each visit included objective evaluations of pain relief, finger range of motion (ROM), and complications, along with subjective assessments, such as the patient's return-to-work date and change the Quinnell grade. If there is limited ROM, additional finger rehabilitation was recommended. The rehabilitation involved passive hyperextension stretching of the metacarpophalangeal (MP) and proximal interphalangeal (PIP) joints. Each stretch was held for 30 seconds, repeated 30 times per session, with three sessions a day, to promote full finger extension.

Statistical Analysis

Data from the study were analyzed using SPSS version 17. Descriptive statistics (frequencies, percentages, means, and ranges) were used to summarize patient demographics and clinical characteristics. To compare pre- and post-operative outcomes such as pain relief and range of motion, **paired t-tests** and the **Wilcoxon Signed-Rank Test** were used.

RESULTS

Percutaneous release was successful in 54 out of 57 trigger digits (94.7%). According to the Quinnell grading system (Table 1), 39 digits (68.4%) show grade 0, and 15 digits (26.3%) had grade 1. In three digits (5.2%), the procedure did not fully resolve the triggering, two ring and one middle fingers. The 15 digits with grade 1 showed normal movement but experienced occasional pain, which improved within 3 months with the use of pain relievers. None of the patients with grade 0 or 1 experienced long-term pain or discomfort. On average, patients took 1.5 ± 0.5 days to return to their normal work activities. The three digits with persistent triggering underwent open surgery, which completely resolved their symptoms. Incomplete release of the distal portion of the A1 pulley was found in all three cases. No complications, such as infections, nerve injury, blood vessel damage, or tendon bowstringing, occurred in any patients (Table 2). Table 3 is showing paired samples T test analysis of results, and it is significantly different (*P< 0.000*) for Quinnell Grade preoperative compared to postoperative.

https://doi.org/10.20428/yjms.v19i3.2725
https://journals.ust.edu/index.php/yjms

Table 2: General Characteristics of Patients

Sex	No.	Percentage
Male	16	32.7%
Female	33	67.3%
Age		
Less than 30 years	8	16.3%
40 to 60 years	28	57.2%
More than 60	13	26.5%
Duration of symptoms		
Less than 6 months	10	20.4%
More than 6 months	39	79.6%
Affected digit		
Thumb	24	42.1%
Index fingers	2	3.5%
Middle fingers	11	19.3%
Ring fingers	19	33.3%
Small fingers	1	1.8%
Disease severity (Quinnell grading)		
Grade 2	18	31.6%
Grade 3	31	54.4%
Grade 4	8	14%
Associated conditions		
Carpal tunnel syndrome	3	6.1%
Diabetes Mellitus	19	38.8%
Success rate (Week 12)	54	94.7%
Persistent triggering		
Ring finger	2	---
Middle finger	1	---
Complications		
Infection	0	---
Neurapraxia	0	---
Vascular injury	0	---
Tendon bowstring	0	---
Return to normal work (days)	1.5 ± 0.5	

Table 3: Paired Samples T Test analysis of results

		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Quinnell Grade preoperative – postoperative	2.49	0.63	0.08	2.32	2.66	29.84	56.00	0.000

The following pictures for the location for introduction of the 19-gauge needle in the metacarpophalangeal crease of the thumb (Figure 1), while (Figure 2) showing the A1 pulley is cut by moving bevel of the needle longitudinally from proximal to distal.

https://doi.org/10.20428/yjms.v19i3.2725
https://journals.ust.edu/index.php/yjms

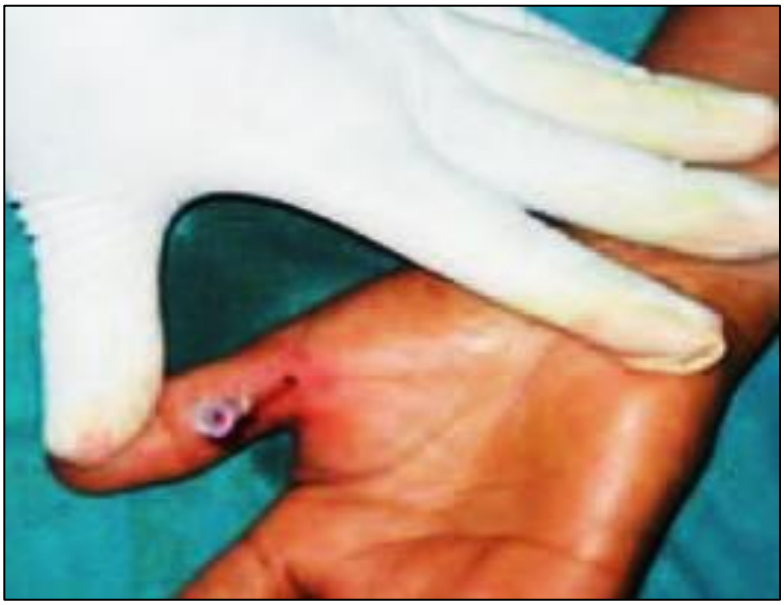

Figure 1: The initial location for introduction of the 19-gauge needle in the metacarpophalangeal crease of the thumb.

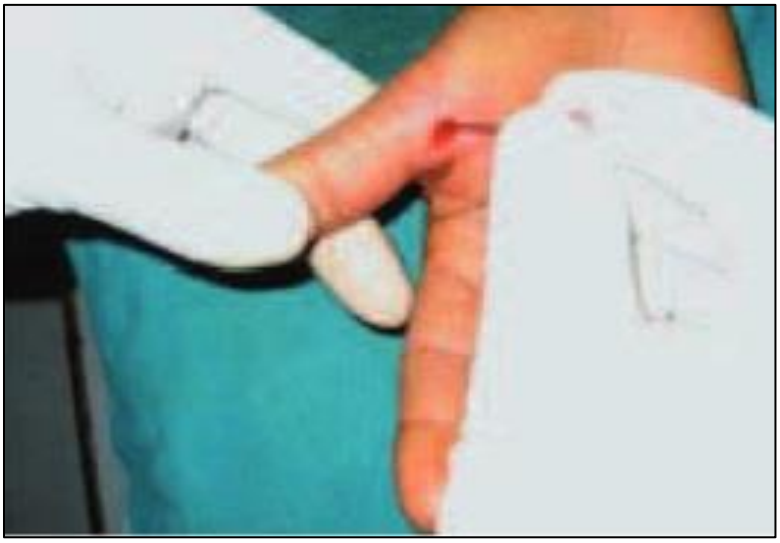

Figure 2: The A1 pulley is cut by moving bevel of the needle longitudinally from proximal to distal.

DISCUSSION

Trigger finger, or stenosing tenosynovitis, is a condition that can be treated with several different methods. Treatments like nonsteroidal anti-inflammatory drugs (NSAIDs), splints, and steroid injections have been recommended by several researchers. These conservative treatments have been found to be effective in 50% to 92% of patients (11, 12). Open release surgery for trigger fingers has a high success rate, ranging from 94% to 100% (18, 19). Due to the complete removal of the A1 pulley with direct visualization. However, it is associated with incision pain, potential complications such as digital artery or nerve injury, and a longer recovery period. Although percutaneous release (PR) is a less invasive procedure, both percutaneous and open release have shown similar success rates and low complication rates (20, 21, 22). In comparing the results of current study with those of Pandey et al

(23), Cebesoy et al., (24) and Colberg et al. (25), they reported high success rates for percutaneous A1 pulley release. The current study achieved 94.7% success rate, while Pandey et al (23), reported 97% and Colberg et al. (25) 100% success rate. However, Cebesoy et al. (24) had a lower success rate (84%) and a higher need for open surgery (16%). Regarding complications, all studies found no significant issues such as infections or nerve injury, highlighting the safety of the procedure. In terms of post-operative recovery, patients in all studies experienced rapid improvement, with most returning to normal activities within a few days. Long-term results showed significant pain relief and functional improvement.

CONCLUSION

This study demonstrates that percutaneous release is an effective and safe treatment for trigger finger, with a high success rate of 94.7%. The majority of patients achieved significant improvement, with 68.4% of digits showing complete resolution of symptoms (Grade 0) and 26.3% showing good results (Grade 1) with minimal discomfort. The procedure was well tolerated, with patients returning to work within an average of 1.5 days. Although three cases had incomplete release and required open surgery, this complication was associated with an incomplete release of the distal A1 pulley. No major complications, such as infections or nerve damage, were observed in any patients. These results suggest that percutaneous release is a reliable option for treating trigger finger, with minimal recovery time and low complication rates.

Study Limitations

The Study Conducted at a single hospital, the findings may not reflect outcomes at other institutions with different patient populations or healthcare resources. The absence of a control group (e.g., comparing percutaneous release with other treatments like open surgery or corticosteroid injections) limits the ability to directly compare the effectiveness of different interventions. Small sample size and short follow-up period of up to 12 weeks may not provide sufficient data on long-term outcomes and potential late complications.

Recommendations

Percutaneous release is an effective and safe treatment for trigger finger, particularly for patients who have not responded to conservative treatments. Given its high success rate, minimal complications, and quick recovery time. Further studies with larger sample sizes and longer follow-up periods are recommended to confirm long-term outcomes and refine patient selection criteria.

Acknowledgment

We sincerely thank Amran University and Amran General Hospital's administration for providing facilities to complete this research.

Ethical Approval

The research was approved by the Research Ethics Committee at Amran General Hospital in adherence to the Declaration of Helsinki.

Patients Consent for the Publication of Data

Informed consent has been obtained for the surgical procedure, the use of clinical data, and the publication of the study.

Conflict of Interest and Competing Interests

The authors declare that there is no conflict of interest.

Financial Disclosure

This Research received no funding.

REFERENCES

[1] Abdoli A, Hashemizadeh Aghda SM, Abrisham SMJ. Comparing the corticosteroid injection and A1 pulley percutaneous release in treatment of trigger finger: A clinical trial. J Hand Surg Asian Pac Vol. 2021;26(3):508-514. doi:10.1142/s2424835521500193.

[2] Sato ES, Gomes Dos Santos JB, Belloti JC, Albertoni WM, Faloppa F. Treatment of trigger finger: randomized clinical trial comparing the methods of corticosteroid injection, percutaneous release and open surgery. Rheumatology (Oxford). 2012;51:93-99.

[3] Makkouk AH, Oetgen ME, Swigart CR, Dodds SD. Trigger finger: etiology, evaluation, and treatment. Curr Rev Musculoskelet Med. 2008;1:92-96.
[4] Sekar N, Kumar RS, Rakesh M, Krishnan A, Subash Y. Comparing the corticosteroid injection and A1 pulley percutaneous release in treatment of trigger finger: A clinical trial. Int J Orthop Sci. 2023;9(3):268-272. doi:10.22271/ortho.2023.v9.i3d.3435.
[5] Gancarczyk SM, Jang ES, Swart EP, Makhni EC, Kadiyala RK. Percutaneous trigger finger release: A cost-effectiveness analysis. J Am Acad Orthop Surg. 2016;24(7):475-482. doi:10.5435/JAAOS-D-15-00481.
[6] Fleisch SB, Spindler KP, Lee DH. Corticosteroid injections in the treatment of trigger finger: A level A and level II systematic review. J Am Acad Orthop Surg. 2007;15:166-171.
[7] Makkouk AH, Oetgen ME, Swigart CR, et al. Trigger finger: etiology, evaluation, and treatment. Curr Rev Musculoskelet Med. 2008;1:92-96.
[8] Putra AANB, Kesuma AANR. Trigger finger management, comparison of conservative and surgical treatment approach in hospital decision making: A case report. Intisari Sains Medis. 2019;10(1):105-107. doi:10.1556/ism.v10i1.316.
[9] Aref HA, Fatemeh S, Hosein KM. Comparison between corticosteroid injection and surgery in the treatment of trigger finger. J Transl Intern Med. 2014;2:132-135.
[10] Huisstede BM, Hoogvliet P, Coert JH, Friden J, European HG. Multidisciplinary consensus guideline for managing trigger finger: results from the European HANDGUIDE Study. Phys Ther. 2014;94:1421-1433.
[11] Bonnici AV, Spencer JD. A survey of 'trigger finger' in adults. J Hand Surg Br. 1988;13:202-203. doi:10.1016/0266-7681_88_90139-8.
[12] Urbaniak JR, Roth JH. Office diagnosis and treatment of hand pain. Orthop Clin North Am. 1982;16:0030-5898. doi:10.1016/S0030-5898(20)30248-0.
[13] Bonnici AV, Spencer JD. A survey of 'trigger finger' in adults. J Hand Surg Br. 1988;13:202-203. doi:10.1016/0266-7681_88_90139-8.
[14] Gil JA, Hresko AM, Weiss AC. Current concepts in the management of trigger finger in adults. J Am Acad Orthop Surg. 2020;28:e642-650. doi:10.5435/JAAOS-D-19-00614.
[15] Paulius KL, Maguina P. Ultrasound-assisted percutaneous trigger finger release: is it safe? Hand (N Y). 2009;4:35-37. doi:10.1007/s11552-008-9137-8.
[16] Cebesoy O, Karakurum G, Kose KC, Baltaci ET, Isik M. Percutaneous release of the trigger thumb: is it safe, cheap and effective? Int Orthop. 2007;31:345-349.
[17] Saldana MJ. Trigger digits: diagnosis and treatment. J Am Acad Orthop Surg. 2001;9:246-252.
[18] Benson LS, Ptaszek AJ. Injection versus surgery in the treatment of trigger finger. J Hand Surg Am. 1997;22:138-144.
[19] Turowski GA, Zdankiewicz PD, Thomson JG. The results of surgical treatment of trigger finger. J Hand Surg Am. 1997;22:145-149.
[20] Sato ES, Gomes Dos Santos JB, Belloti JC, Albertoni WM, Faloppa F. Treatment of trigger finger: randomized clinical trial comparing the methods of corticosteroid injection, percutaneous release and open surgery. Rheumatology (Oxford). 2012;51:93-99.
[21] Will R, Lubahn J. Complications of open trigger finger release. J Hand Surg Am. 2010;35:594-596.
[22] Wang HC, Lin GT. Retrospective study of open versus percutaneous surgery for trigger thumb in children. Plast Reconstr Surg. 2005;115:1963-1970.
[23] Pandey BK, Sharma S, Manandhar RR, Pradhan RL, Lakhey S, Rijal KP. Percutaneous trigger finger release. Nepal Orthop Assoc J. 2010;1(1):1-6.

[24] Cebesoy O, Karakurum G, Kose KC, Baltaci ET, Isik M. Percutaneous release of the trigger thumb: is it safe, cheap and effective? Int Orthop. 2006 Jul 18;31(3):345-349. doi:10.1007/s00264-006-0180-1.

[25] Colberg RE, Pantuosco J, Fleisig GS, Drogosz M. Ultrasound-guided microinvasive trigger finger release technique combined with three tests to confirm a complete release. Am J Phys Med Rehabil. 2020 Jun; Publish Ahead of Print:1-7. doi:10.1097/PHM.0000000000001510.