

Percutaneous Versus Open Release of Trigger Digit

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Abstract

Objectives: This study aimed to evaluate the safety and effectiveness of percutaneous release of trigger digit and compare the results with that of open surgery.

Methods: Those patients have been submitted according to Green grading severity (grade II & III), then divided into 2 groups randomly each with 26 patients. The 1st group has been treated with open release and the 2nd group has been treated with percutaneous release. Patients of both procedures have been followed up for 8 days and 28 days, to record and estimate pain of postoperative, infection, injury to nerve digits, repetition or continuation of triggering and movement of fingers.

Results: There was no differences in the statistical analysis of both groups, although there was a tendency to earlier return of daily living hand activities with full range of motion in the percutaneous group and also the complication rates where also low, the difference was insignificantly compared to the open group.

Conclusion: According to the study, both percutaneous and open techniques weren't significant statistically differences for postoperative pain, recovery of motor function, and patient satisfaction, but our study shows that percutaneous techniques are safer and more effective compared to open techniques.

Keywords: Percutaneous, versus open, trigger digit

Introduction

The Trigger digit is an inflammatory process that involves the flexor tendon sheath at the (A1) pulley. It is also known as stenosing tenosynovitis of the flexor tendon sheath.¹⁻³ However, the etiology is unknown, but it is more common with certain medical conditions such as diabetes, rheumatoid arthritis, and gout.⁴⁻⁶ Also, it occurs in people with forceful hand activities, especially among farmers and industrial workers. The thickening of the flexor tendon sheath restricts the normal gliding mechanism, and this leads to developing a nodule on the tendon getting stuck at the proximal edge of the (A1) pulley during digit extension, which makes the patient complain of a tender lump at the base of the finger with a catching, popping or locking sensation with finger movement.¹⁻³ According to statistics, females are more common with Trigger Finger than males, approximately 4 ratio females to 1 ratio males at age 40–60 years.⁴ Last but not least, treatment is either non-operative (splints, NSAIDs, activity modification or steroidal injection) or operative, successful open or percutaneous treatment depends on the skill of the surgeon to correctly determine the pulley (A1) site.^{7,8} The success rate of local injection ranges from 60% to 70% according to the studies carried out by Baumgarten-Lambert, and recent studies indicate that if local injection does not succeed, surgical treatment, either open or percutaneous, is preferable.⁹ The surgeon releases the A1 pulley by inserting a hypodermic needle under the skin. This technique is called percutaneous release, where the success of this technique ranges between 90–100% according to recent studies.¹⁰ As for the second technique, which is open release, the surgeon releases the A1 pulley through an incision between the proximal digital fold. And distal palmar, where the success rate of this technique ranged between 82% to 96% with a repetition rate of 3%,¹¹⁻¹³ and studies show when comparing both techniques that the first technique had excellent results compared to the open

release in terms of stiffness, residual pain, nerve injury, trigger digits, and patient conviction and recent studies show that the first method is safer, more effective, faster, and has better results than the open release.¹⁴⁻¹⁶

Materials and Methods

From 1st December 2020 to 15th March 2021, 52 patients have been attended by both genders, male and female, more than 18 years old, to the Orthopedic unit in the emergency teaching hospital in Duhok city were diagnosed with Trigger digits. After taking consent those patients have been submitted according to Green grading severity (grade II & III) [Table 1]. The 2 groups were then divided into 2 groups randomly, each with 26 patients. The 1st group had been treated with open release and the 2nd group had been treated with percutaneous release. Patients of both groups have been followed up for 8 days and 28 days, to record and estimate pain of postoperative, infection, injury to nerve digits, repetition or continuation of triggering and movement of fingers.

All the surgeries that were performed were after the approval of the Ethic committee of the KBMS at Orthopedic unit in the emergency teaching hospital in Duhok city, and the operations were performed in a sterile operating room, 2% lidocaine was used as a local anesthetic before the operations for both open and percutaneous techniques.

Open Release

All 26 patients underwent surgery in a sterile operating room, and the patients were lying on their backs with their hands on the armrests. With the pad on the folded towel with the MCP joint extended to the severely affected finger to make the neurovascular structure more displaced from behind. 2% lidocaine in a volume of 4–5 cc is used for local anesthesia between the crease of the proximal finger pad and the palm of the distal hand. A tourniquet is applied to the arm and after the

Table 1. Green grading severity

Grades	Green grading severity
I	Pain or tenderness at the A1 pulley
II	Catching, could actively extend digit
III	Locking, requiring passive extension
IV	Locking, unable to passively extend, fixed flexion contracture

anesthesia, the skin was cut longitudinally and with extreme precision. A blade 15 was used to reveal the A1 pulley and locate the tendons after bending the patient's finger and extending the injured finger to ensure the successful completion of the operation. The incision was sutured and bandaged, and finally, the patient was asked to do hand movements and perform exercises.

Percutaneous Release

All 26 patients underwent surgery in a sterile operating room, and the patients were lying on their backs with their hands on the armrests. With the pad on the folded towel with the MCP joint extended to the severely affected finger to make the neurovascular structure more displaced from behind. 2% lidocaine in a volume of 4–5 cc is used for local anesthesia between the crease of the proximal finger pad and the palm of the distal hand. After the anesthesia, the skin was used as a focal point, after inserting a hypodermic needle 18 gauge into the fold's sheath in the skin, and by moving it up and down to cut the beveled edge of the A1 pulley until the feeling of the grooved sound was lost, after bending the patient's finger and extending the affected finger to ensure the successful completion of the operation. During the procedure the fingers were kept in flexion to avoid tendon injury. The incision was sutured and bandaged, and finally the patient was asked to do hand movement and perform exercises

- After the surgery, all patients of open or percutaneous release received an oral course of antibiotic (cephalexin 500 mg capsule three times daily for 7 days) and painkiller (paracetamol 500 mg tablet on needed)
- All patients of open or percutaneous release were recommended to perform passive and active distance of exercises for the hand and once used to it, patients of both treatments have been followed up on 8 days and 28 days, to record and estimate for pain of postoperative, infection, injury of nerve digits, repetition or continuation of triggering and movement of Fingers.

Questions below have been recommended to be recorded and answered for patients postoperatively

1. When the pain was gone postoperative?
2. When finger started to be functional?
3. When returned to your daily routine for work?
4. Were satisfied postoperative?

Statistical Analysis

To differentiate the success of both techniques, open and percutaneous release, *t*-test independent sample was used for statistical analysis. Visual Analog Scale (VAS) and the outcome of clinical were recorded for both open and

percutaneous release techniques. The rates of success for both techniques weren't significant statistically. The satisfaction of patients Fisher test was also done, but the result was insignificant statistically as well.

Results

Patients of both techniques were 52 as a total they have been divided to 2 groups each with 26 patients and have been diagnosed in this study with trigger digits. 15 of them were male (30%) and 37 were female (70%) with 56.71 as average age more than 18 years old [Table 2].

In this study, there was no case of small finger, affected fingers with trigger digits ascending was index finger 5 cases (9.62%) followed by middle finger 8 cases (15.38%), ring finger 18 cases (34.62%) and the most common affected fingers was thumb with 21 cases (40.38%).

After following up on the patients who underwent surgery, the statistics show that patients get free of any signs of pain on average 8.71 days for the open technique, which is longer if compared to the percutaneous technique at an average of 6.29 days, and the average time for the hand to return to functioning completely was longer for the open technique, at 12.86 days compared to the percutaneous release technique, at 9.28 days. Also, for the rate of fully recovering finger movement, it was found that the average time was longer for the open technique, 20 days compared to the percutaneous release technique, 15 days [Table 3].

It was found that there were no statistical differences in pain severity when following patients after 8 and 28 days through the Visual Analog Scale parameter (0–10). At day 28, the open technique recorded 87.54% of patients being completely free of pain while the percutaneous technology recorded 93.76% [Table 4].

Table 2. Statistical of 52 patients (1st of December 2020 to 15th of March 2021)

Various		No.	Percutaneous	Open
Gender	Female	37	15	22
	Male	15	11	4
Age	Average	56.71	43–68	48–65
Finger	Index	5	2	3
	Middle	8	5	3
	Ring	18	7	11
	Thumb	21	12	9
Green Grading Severity	II	19	14	5
	III	33	12	21

Table 3. Clinical results in days [average] at 28 days follow-up

Clinical results	Postoperative pain	Work's return	Motor's function return
Percutaneous technique	6.29 (5–9)	9.28 (7–12)	15.16 (11–20)
Open technique	8.71 (6–10)	12.86 (9–14)	20.33 (13–27)
P-value	0.22298	0.51862	0.82195

Table 4. Visual Analog Scale follow up

Follow up	8 days	28 days
Percutaneous technique	3.42 ± 1.2	0.58 ± 0.3
Open technique	3.83 ± 1.6	0.75 ± 0.4
P-value	0.320935	0.10754

Table 5. Patient's satisfaction

Patient's satisfaction	Yes/No	Open release	Percutaneous release	P-value
Pain after surgery	Yes	25	25	1
	No	1	1	
Triggering	Yes	26	26	1
	No	0	0	
Digital nerve injury	Yes	0	0	1
	No	26	26	
Motor's function return	Yes	25	26	0.999
	No	1	0	
Infection	Yes	2	Nil	
	No	24		
Satisfaction	Yes	26	26	1
	No	0	0	

It has been recorded after following up on the patients who underwent surgery that there was no any infection for percutaneous technique while open technique has been recorded 2 cases of infections and patients have been treated with oral Ciprofloxacin and after four days the patients were care. No any digital of never injury case were recorded for both techniques in this study. At the end and after questionnaire the patients of both techniques were fully satisfy [Table 5].

Discussion

Subsequently, acquainted via Lorthioirat J Jr.¹⁵ 50 years prior, the A1 pulley released product percutaneous has been exercised and approved by various authors in research. Studies demonstrate the percutaneous technique to be a match for and possibly superior choice as in comparison to the typical open technique.^{10,12,17,18} However, it has been exerted by different hand and orthopaedic surgeons that a portion of reluctance to apply the percutaneous technique.

The literal senses are unknown. Being an uncontrolled process, surgeons tend to be concerned about the digital nerve injury and blood vessels and the possibility of inadequate discharge of the A1 release pulley. The current research correlated the percutaneous and open techniques in respect of postoperative discomfort, capacity to discharge the prompt, time to boost complete range of motion, time to fully functional hand movements, existence of digital nerve and vessel injury,

indication of infections, frequency of initiating and patient's well-being.

In several investigations, it was detected that patients experiencing commence discharge were brought back to sufficient functionality for preceding everyday living and their entire range of movement were faster than the percutaneous technique. However, it was found to be insignificant in statistics. It was interpreted that percutaneous technique was approximately constantly related to tendon damage amid stretching the needle on the A1 tendon sheath.¹⁹ The after effect of fibroses provoked by the damage and inflammation is the cause of the toughness and slowed range of movement in the percutaneous technique. Nonetheless, in an ongoing investigation, the patients going through percutaneous technique had a prior return to complete functionalities of everyday living as well as a faster range of movement in comparison to open technique.

Although there was the existence of surgical wounds in the open technique, the period and harshness of pain for the two groups were proportionate. It might be interpreted as having inflammation prompted by the percutaneous technique of A1 pulley. However, statistically insignificant, infection was solely in the open technique group. As the open technique was further interfering as being matched to the percutaneous technique, the immense surgical scar uncovered the deeper layer of tissues to the extraneous environment and thus the further extent of infection.

Through the open technique, 26 fingers were totally released and, via percutaneous technique, 26 were all exempted. The outcomes were a match with other investigations. The high levels of pain were assessed via operating the VAS score. Although the score was decreased in the percutaneous technique on each particular follow-up at 8 days and 28 days, the distinction was statistically insignificant.

One of the flaws in the ongoing research was the lack of standard calculation forms or mechanisms in our country. Hence, we made a survey to explore subjective and objective criticism and quizzed the patients to write the survey with respect to their grades of fulfillment for the methods they went through. Insignificant distinctions distinguish between the two techniques.

Patients' Satisfaction

The clinical outcomes were compared to many different research barring the investigation by Gilberts, E. C et al., that explained a significant positive distinguish for the percutaneous technique with reference to pain after operation and time to accomplish full functionality.^{12,13}

Conclusion

According to the study, both percutaneous and open techniques weren't significant statistically differences for postoperative pain, recovery of motor function, and patient satisfaction, but our study shows that percutaneous techniques are safer and more effective compared to open techniques. ■

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