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Comparative Study between Percutaneous Release and Open Surgery for Treatment of Trigger Fingers

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Abstract

Trigger finger (also known as "stenosing tenosynovitis") refers to a mechanical impingement of the flexor tendon of the hand**.** The aim of this paper was to compare the outcome between 15 cases undergoing open surgical release and 15 cases undergo percutaneous needle release of trigger finger. A Prospective randomized study that included 30 adult patients diagnosed by clinical assessment and will be managed by open or percutaneous release of A1 pulley of the diseased finger. There was no statistically significant difference found between the two groups regarding triggering, nerve affection, satisfaction and stiffness, and there was a highly statistically significant difference found between the two groups regarding scar. The same results were obtained after 2 weeks, 3 months and 6 months. According to this study, trigger finger can be successfully managed by either open or percutaneous release, especially in terms of pain, function, return to work and patient satisfaction. However, percutaneous release offers advantages of shorter duration and less severity of postoperative pain, quicker return to work and better cosmesis. Nevertheless, these advantages might be overshadowed by significantly higher rates of residual finger triggering and of recurrence of finger triggering following percutaneous release compared with its open counterpart.

Keywords: Trigger finger, Tendinopathy, Conservative treatment, Corticosteroid injections, Percutaneous needle.

1. Introduction

Trigger finger (also known as "stenosing tenosynovitis") refers to a mechanical impingement of the flexor tendon of the hand. This condition can lead to restricted motion of the affected finger, and is a common cause of hand pain, discomfort, disability. Trigger finger is the most common entrapment tendinopathy, with a lifetime risk of 2% to 3% for the general population and 10% for diabetic individuals. Primarily affects the first annular (A1) pulley at the metacarpal head [1]. Various causes of trigger finger have been described. It may be due to repetition of digital flexion and power gripping, causing friction and inflammation as the tendon passes beneath the A1 pulley. It is also suggested that there is a discrepancy in size between the flexor tendon and A1 pulley, believed to be the result of

inflammation or thickening of the tissues. Trigger finger also appears to be linked to other diseases, such as rheumatoid arthritis, gout and diabetes [2]. Single or multiple corticosteroid injections have been shown to be effective in approximately 93% of patients. If conservative treatment methods fail, surgical release of the A1 pulley is indicated, this can be performed using conventional open surgery or percutaneous release techniques. There have been excellent outcomes reported with both open and percutaneous release of trigger finger. The optimum treatment of trigger finger remains controversial because each method has its advantages and disadvantages [2]. The aim of this study was to compare the outcome between 15 cases undergoing open surgical release and 15 cases undergo percutaneous needle release of trigger finger.

2. Patients and Methods

A Prospective randomized study that included 30 adult patients diagnosed by clinical assessment and will be managed by open or percutaneous release of A1 pulley of the diseased finger.

2.1 Inclusion criteria

History of triggering for at least 3 months, failure of conservative treatment including previous steroid injection into the flexor sheath at least once and adult patients > 16 years.

2.2 Exclusion criteria

History of recent trauma associated rheumatoid disease, children less than 16-year, presence of local infection and uncontrolled diabetes mellitus.

2.3 Ethical consideration

A written informed consent obtained from all patients' guardians and all data of patients confidential with secret codes and private file for each patient.

2.4 Pre-Operative assessment

Patients will be evaluated clinically according to Quinnell classification as shown in Table .1 [3] and DASH score [4].

Table (1): Quinnell classification.

Type	Clinical symptoms
0	Normal movement
I	Uneven movement
II	Actively correctable
III	Passively correctable
IV	Fixed deformity

2.5 DASH score

It is a questionnaire of 30 questions that can help in assessment of upper limb joint function. Arabic application was used in this study.

2.6 Operative Procedure

Group (A) patients were managed by open trigger finger release as follows: **Position:** The procedure was performed while patient in supine position with the upper limb extended and the hand resting on a hand table. **Anesthesia:** All patients were operated under local anesthesia. **Antibiotic:** It was administered with induction of anesthesia in the form of intravenous 1 gm. of second-generation cephalosporin. **Approach & Technique of release:** Through 1-cm transverse skin incision centered over A1 pulley (over the MCP joint in the thumb (21) and head of the other four metacarpal [5], the subcutaneous tissue was dissected and while protecting both neurovascular bundles by retractors, A1 pulley was incised in line with flexor tendon. **Closure:** The wound was sutured with a # 4/0 nylon suture. **Splint:** No splint was used; however sterile dressing was placed. Creep

bandage was applied and then removed after 2 weeks in order to start finger motion as early as possible. **Group (B)** patients were managed by percutaneous trigger finger release as follows: **Position:** The procedure was performed while the patients in supine position with upper limb extended and the hand resting on a hand table. **Anesthesia:** All patients were operated under local anesthesia. **Antibiotics:** No antibiotics were administrated in group (B) patients.

2.7 Approach & Technique of Release

An 18-G syringe needle was used to prick the skin at the center of an imaginary square whose boundaries are: Transverse line 1 cm from the proximal digital crease, transverse line 2 cm from the proximal digital crease, imaginary line across the medial digital nerve, imaginary line across the lateral digital nerve. The needle was moved in proximal and distal directions along the longitudinal axis of the tendon to release the A1 pulley.[6] Splint: No splint was used; however, sterile dressing was placed. A creep bandage was applied and then removed after 2 hours to start finger motion as early as possible.

Figure (1): Open release of trigger ring finger.

2.8 Post-Operative assessment

After the operation, both groups will be followed up at one week, 2 weeks, 3 months and finally at 6 months to final scoring in the outpatient clinic. There will be a special chart, listing detailed personal data and the course of therapy for each patient (including duration of symptoms, presence of early and late complications, and treatment of complications).

2.9 Follow Up

Post-operative follow-up occurred according to DASH score and Gilberts and Wereldsma questionnaire [7]. Gilberts and Wereldsma questionnaire. The questionnaire includes six items: Pain: level of postoperative pain, triggering: is it still triggering or not? stiffness: if there is any post-operative stiffness, digital nerve injury: if there is numbness, Scar and level of satisfaction.

2.10 Statistical Analysis

Data was collected, revised, coded and entered into the Statistical Package for Social Science (IBM SPSS) version 20. The qualitative data were presented as numbers and percentages while quantitative data were presented as mean, standard deviations and ranges when their distribution was found parametric.

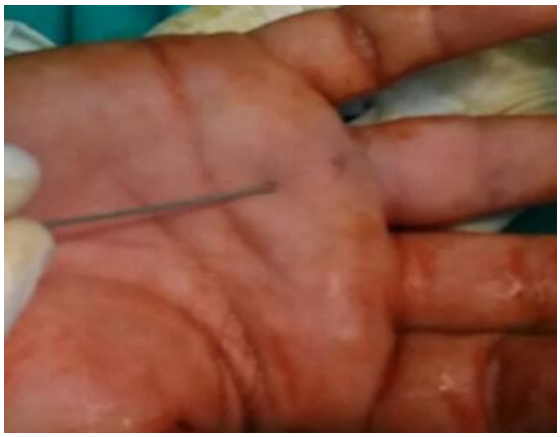

Figure (2): 18-gauge needle is introduced percutaneously.

3. Results

Demographic data varies between the two groups with no statistical difference. Age in the open group varies between 45 – 67 years (Mean ± SD is 55.20 ± 5.58). While in the percutaneous group, age varies between 44 – 64 years (Mean ± SD is 57.07 ± 6.37).11 females were operated by open technique versus 10 in percutaneous one. The table shows that there was no statistically significant difference found between the two groups regarding age, sex and duration of symptoms Table .2. There was a highly statistically significant difference found between the two groups regarding the pre-operative duration of pain symptoms Table 3. There was no statistically significant difference found between the two groups regarding Triggering, Nerve affection, Satisfaction and Stiffness, and there was a highly statistically significant difference found between the two groups regarding Scar. The same results were obtained after 2 weeks, 3 months and 6 months Table .3. Group (A): Preoperative DASH score was 88.7(Between 75-90) which improved to 46.5(Between 40-65) 6 months postoperative in Group (A) Statistically, there was a highly significant improvement in 6 months postoperative DASH score compared with preoperative DASH score in a group (A) with (P-value ≤ 0.01) Table 5. Group (B): Preoperative DASH score was 91 (Between 40-95) which improved to 41.9 (Between 35-55) 6 months postoperative in Group (A) Statistically, there was a highly significant improvement in 6 months postoperative DASH score compared with preoperative DASH score in group (B) with (P-value ≤ 0.01) Table .6. There was no significant difference between the studied groups as regards 6 months postoperative DASH score with (P-value >0.05) Table .7.

Table (2): Comparison between Group A (no. =15) and Group B (no. =15) regarding Age, Sex and Duration.

		Open Group	Percutaneous group	Test value	P-value	Sig.
		No.= 15	No.= 15			
Age	Mean ± SD	55.20 ± 5.58	57.07 ± 6.37	-0.853•	0.401	NS
	Range	45 – 67	44 – 64			
Sex	Female	11 (73.3%)	10 (66.7%)	0.159*	0.690	NS
	Male	4 (26.7%)	5 (33.3%)			
Duration	Mean ± SD	4.40 ± 1.55	4.13 ± 1.19	0.529•	0.601	NS
	Range	3 – 8	3 – 7			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS) *: Chi-square test, •: Independent t-test.

Table (3): Comparison between group A (no. =15) and group B (no. =15) regarding Grade and Pain duration pre-operative.

		Open Group	Percutaneous Group	Test value	P-value	Sig.
		No.= 15	No.= 15			
Grade	I	1 (6.7%)	0 (0.0%)	3.086*	0.379	NS
	II	3 (20.0%)	7 (46.7%)			
	III	8 (53.3%)	6 (40.0%)			
	IV	3 (20.0%)	2 (13.3%)			
Pain in months	Mean ± SD	8.20 ± 1.74	6.00 ± 1.89	3.317•	0.003	HS
	Range	6 – 11	4 – 10			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS) *: Chi-square test, •: Independent t-test.

Table (4): Comparison between group A (no. =15) and group B (no. =15) regarding Triggering, Post- operative pain, Nerve affection, Scar, Satisfaction and Stiffness.

		Open Group		Percutaneous Group		Test value	P-value	Sig.
		No.	%	No.	%			
Triggering	No	14	93.3%	12	80.0%	1.154	0.283	NS
	Yes	1	6.7%	3	20.0%			
Post-operative pain	No	15	100%	14	93.3%	1.034	0.309	NS
	Yes	0	0%	1	6.7%			
Nerve	No	15	100.0%	14	93.3%	1.034	0.309	NS
	Yes	0	0.0%	1	6.7%			
Scar	No	9	60.0%	15	100.0%	7.5	0.017*	S
	Yes	6	40.0%	0	0.0%			
Satisfaction	No	2	13.3%	1	6.7%	0.370	0.543	NS
	Yes	13	86.7%	14	93.3%			
Stiffness	No	13	86.7%	14	93.3%	0.370	0.543	NS
	Yes	2	13.3%	1	6.7%			

P-value >0.05: Non-significant (NS); P-value <0.05: Significant(S); P-value< 0.01: highly significant (HS), *: Chi-square test, •: Independent t-test

Table (5): Preoperative and postoperative DASH score among group A.

DASH score	Group (A)		Paired t-test	P-value
	Preoperative	6 months postoperative		
Mean ± SD	88.7 ± 1.99	46.5±2.3	68.92	< 0.001
Range	75-90	40-65		

Table (6): Preoperative and postoperative DASH score among group B.

DASH score	Group (B)		Paired t-test	P-value
	Preoperative	6 months postoperative		
Mean ± SD	91.0 ± 3.2	41.9 ± 1.5	84.99	< 0.001
Range	40-95	35-55		

Table (7): Six months postoperative DASH score of the studied groups.

6 months postoperative DASH score	Group (A)	Group (B)	Total	Unpaired t-test	P-value
	No.= 15	No.= 15	No.= 30		
Mean ± SD	46.5±2.3	41.9 ± 1.5	44.2 ± 1.9	3.44	0.169
Range	40-65	35-55	35-65		

3.2 Case 1: Open release

A 51-year-old female patient, a teacher, with insidious onset of pain and triggering in the right (dominant hand) ring for 4 months, with no history of trauma, she has no diabetes mellitus. On examination, she was grade three. Her DASH score was 92

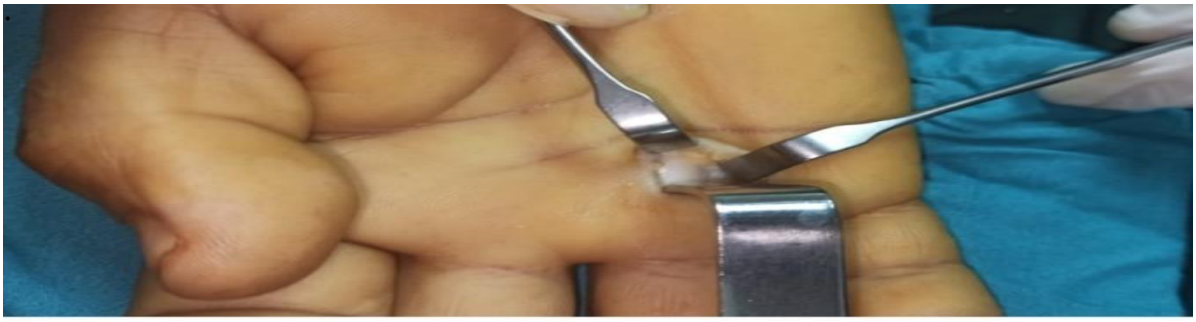

Figure (3): Open release of trigger ring finger.

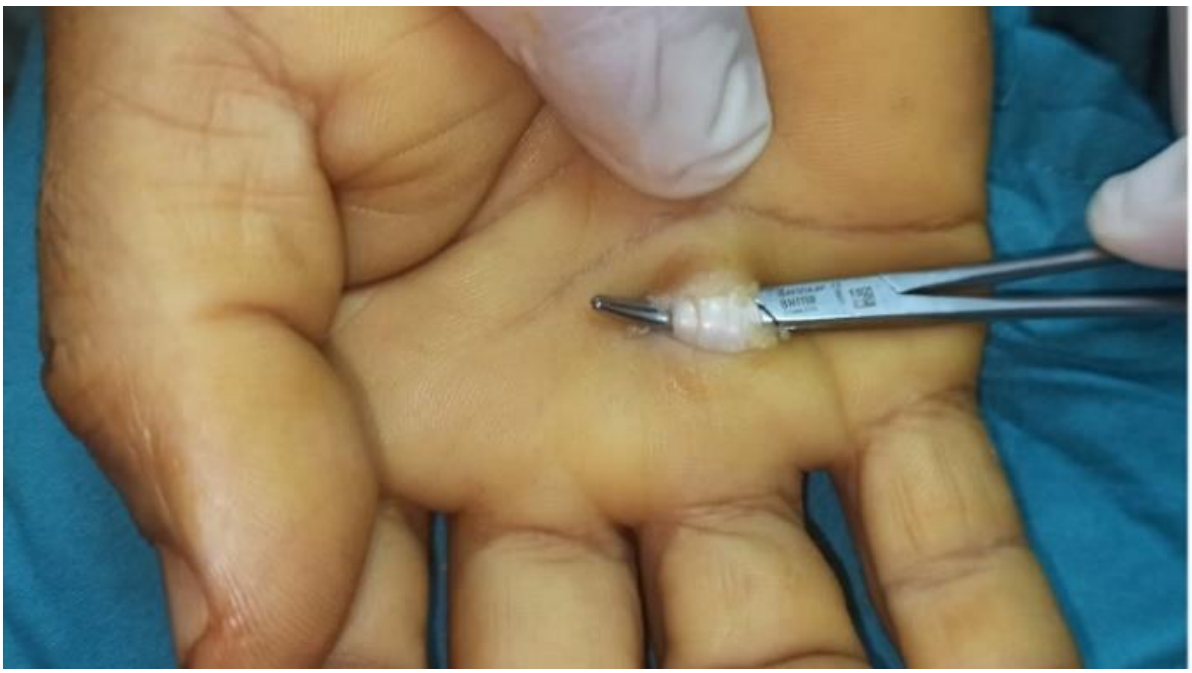

Figure (4): Transverse incision shows the tendon after the release.

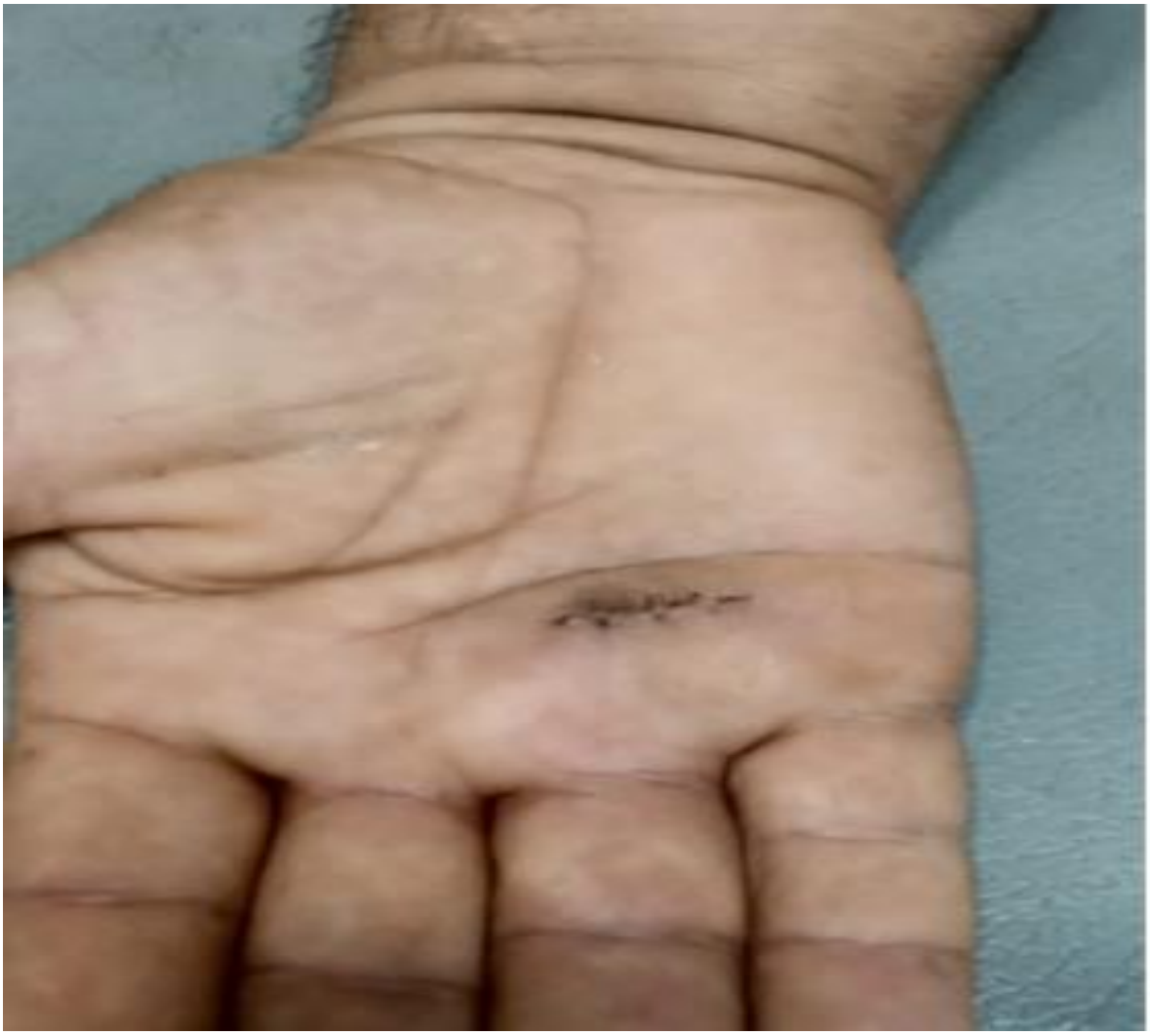

Figure (5): Two weeks follow up after removal of sutures.

3.3 Case 2: Percutaneous release

A 54-year-old female patient, a housewife, with insidious onset of pain and triggering in the left (non-dominant hand) ring for 10 months, with no history of trauma, has diabetes mellitus. On examination, she was grade three. Her DASH score was 91. In the follow-up, the patient had neither locking, limitation of motion, pain on movement, swelling, tenderness nor operative scar. Her last follow-up (after 6 months) DASH score was 73.

Figure (6): Last follow-up after 6 months (no triggering with extension)**.**

Figure (7): Last follow-up after 6 months (no triggering with flexion).

Figure (8): Ring finger before the release.

Figure (9): Ring finger after the release.

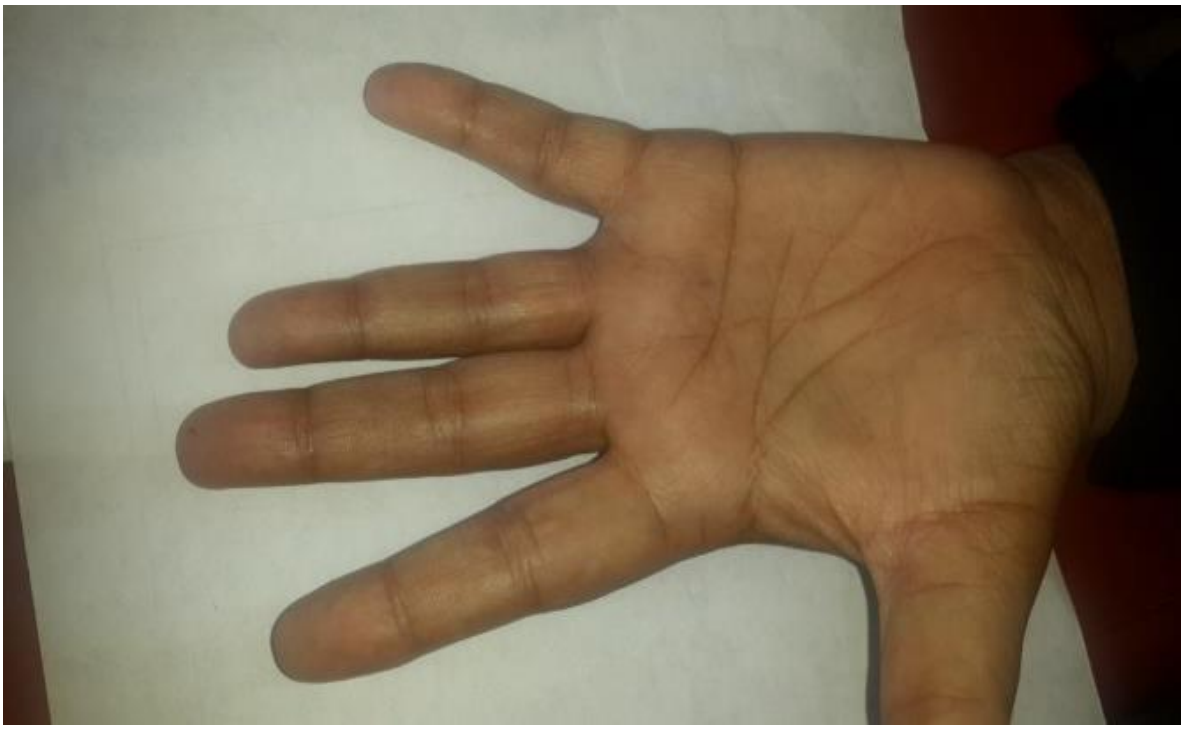

Figure (10): Last follow up after 6 months (no triggering with extension).

4. Discussion

The most important outcome of the current study is that the trigger finger can be successfully managed by either open or percutaneous release, especially in terms of post-operative triggering, stiffness and patient satisfaction. However, the percutaneous release offers advantages and cosmetic features.

These outcomes follow that of Chin-Jung Lin et al. [8] who reported excellent outcomes with both open and percutaneous release of trigger finger in 198 patients treated with either open release in (72) patients or percutaneous release in (126) patients. 8

Guler et al. [10] retrospectively studied to compare the outcomes and complications of conventional open surgical release and percutaneous needle release in the treatment of trigger thumb. The study comprised 84 patients with trigger thumb who were treated with either open pulley (n=52) or percutaneous (n=32) release between 2008 and 2011. All patients were reevaluated at a mean follow-up of 22.769.6 months (range, 9-44 months) [10]. The main outcome measures were the rate of recurrence, pain on movement or tenderness over the pulley, infection, digital nerve injury, tendon bowstringing, joint stiffness or loss of thumb range of motion, and patient satisfaction. The groups were statistically similar regarding age, sex, laterality, dominant side involvement, and trigger thumb grade on initial admission. At final follow-up, no patient had recurrence, tendon bowstringing, joint stiffness, or loss of thumb range of motion. No patients in the open pulley release group and 2 (5.7%) patients in the percutaneous release group had a digital nerve injury (*P* 5.159). No statistical difference was found in the infection rate between groups (*P* 5.354). A total of 98.1% of patients in the open pulley release group and 97.1% of patients in the percutaneous release group were satisfied with treatment (*P* 5.646). Both techniques resulted in similar therapeutic efficacy, and the rate of potential complications was also statistically similar in each group [10].

Toprak et al. [11] compared patients who underwent open or percutaneous trigger finger release in terms of clinical outcomes, time to return to activities, and recurrence between 2012 and 2018 and retrospectively reviewed. The patients were divided into two groups: 33 patients who underwent percutaneous trigger finger release (Group PR) and 48 patients who underwent open release of A1 pulley (Group OR). The mean age of the patients was 55.95 ± 11.73 (27–82) years; 71.6% (n = 58) were female. The left side was involved in 56.8% (n = 46) patients, and 81 patients underwent percutaneous or open trigger finger release with a mean follow-up duration of 37.40 ± 16.22 (12–72) months. The time to start daily activities was shorter in Group PR than in Group OR, and the difference was statistically significant ($p < 0.001$). A comparison of the upper extremity functional scores between the two groups revealed no statistically significant difference (PR; 15.21 ± 6.17, PO; 12.99 ± 6.89, $p = 0.142$). Although the rate of complications was higher in Group OR, there was no statistically significant difference between the two groups (PR; 12.12%, PO: 20.83%, $p = 0.217$). Percutaneous trigger finger release can be preferred in adult trigger finger surgery due to increased risks regarding wound healing and infections associated with advanced age, presence of diabetes and inflammatory arthritis, and the expectation of rapid return to daily activities [11].

Dierks et al. [12] did a prospective randomized trial for release of the first annular pulley (A-1 pulley) in trigger fingers with a percutaneous technique versus the open surgical technique is presented. Thirty-six patients were randomized to either open (n = 16) or percutaneous (n = 20) release of the A-1 pulley. Both groups showed a slight decrease in pain level and in grip strength

immediately after operation and an increase in grip strength after 12 weeks. But there were no significant differences between the 2 groups. A decrease in active ROM of the PIP joint was noticed in both groups 1 week after surgery. In the open technique, a significantly better active ROM was measured. Twelve weeks after surgery, the active ROM returned to normal values in both groups. The mean time for percutaneous release of the A1-pulley was 26 seconds. The open surgical technique took 10 times more time, and this was a significant difference. One patient in the percutaneous group had transient inflammation. No complications occurred. The patient had no complaints related to sensory disturbances. They concluded that percutaneous release of the A-1 pulley in trigger fingers is a safe technique. This technique gives a cheaper, quicker, less scary, more comfortable treatment with a quicker return of PIP motion [12].

Lin et al. [8] evaluated both short-term and long-term outcomes of 198 patients with trigger fingers treated with either open (n = 72) or percutaneous (n =126) release of the A1 pulley between 2009 and 2012. They found that 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. 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%). No iatrogenic digital nerve injury was reported.

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 scars 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. Five patients (percutaneous release) indicated that they were “Dissatisfied’ in the long term done in the 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” results noted mild pain or scar [8].

Nikolaou et al. [13] investigated the effectiveness of ultrasound-guided release of the first annular pulley and compared results with the conventional open operative technique in a prospective randomized, study on 32 patients with trigger finger or trigger thumb, grade II-IV according to the green classification system, were recruited [73].

Two groups were formed; Group A (16 patients) was treated with an ultrasound-guided percutaneous release of the affected A1 pulley under local anesthesia. Group B (16 patients) underwent an open surgical release of the A1 pulley. Patients were assessed pre- and postoperatively (follow-up: 2, 4 and 12 wks.) by physicians blinded to the procedures.

The success rate in group A was 93.75% (15/16) and in group B 100% (16/16). Mean times in group A patients were 3.5 d for taking pain killers, 4.1 d for returning to normal activities, and 7.2 and 3.9 d for complete extension and flexion recovery, respectively. Mean Quick DASH scores in group A were 45.5 preoperatively and, 7.5, 0.5 and 0 after 2, 4, and 12 wk postoperatively. Mean time in group B patients were 2.9 d for taking pain killers, 17.8 d for returning to normal activities, and 5.6 and3 d for complete extension and flexion recovery. Mean Quick DASH scores in group B were 43.2 preoperatively and, 8.2, 1.3 and 0 after 2, 4, and 12 wk postoperatively. The cosmetic results were found to be excellent or good in 87.5% (14/16) of group A patients, while 56.25%

(9/16) of group B patients were evaluated as fair or poor [13].

Sato et al. [14] did a randomized clinical trial comparing the methods of corticosteroid injection, percutaneous release and open surgery in the treatment of trigger finger. Forty-nine patients were assigned to the conservative group to undergo CS injections, whereas 45 and 56 were assigned to undergo percutaneous release and outpatient open surgery, respectively.

The percentage of patients experiencing topical pain in the injection group was statistically lower than those in the percutaneous and open surgery groups after 1 week, 2 weeks and 1 month of follow-up. After 2, 4, and 6 months of follow-up, the percentage of patients experiencing topical pain was similar among the three groups. The percentage of patients complaining of articular pain in the injection group was statistically lower than those in the percutaneous and open surgery groups after 1 week, 2 weeks and 1 month of follow-up. After 2, 4 and 6 months of follow-up, the percentage of patients complaining about pain was similar among the three groups. [14].

In our study, we compared open versus percutaneous release of trigger finger. We compared 15 patients in each group.

Pre-operative evaluation using Quinnell classification was done. In open group, 15 patients were done (3 index, 1 little, 2 middle,4 ring and 5 thumb). It varies according to its grading (1patient was grade one, 3 patients were grade two, 8 patients were grade three and 3 patients were grade four). In percutaneous group, Anther 15 patients were done (2 index, 5 middle,4 ring and 4 thumb). It varies according to its grading (7 patients were grade two, 6 patients were grade three and 2 patients were grade four).

Pre-operative DASH score was 88.7 ± 1.99 in group A while in group B it was found to be 91.0 ± 3.2.

Post-operative evaluation was done using Gilberts and Wereldsma questionnaire after 1 week, 2 weeks and 3 months. It was observed no change in questionnaire result between all of them. It was found that there was no statistically significant difference found between two groups regarding Triggering (P-value=0.283), post-operative pain (P-value=0.309), Nerve affection (P-value=0.309), Satisfaction (P-value=0.543) and Stiffness (P-value=0.543), and there was a statistically significant difference found between two groups regarding Scar (P-value=0.017).

Statistically, there was a highly significant improvement in 6 months postoperative DASH score compared with preoperative DASH score in group A and B with (P-value $\leq$ 0.01). but there was no significant difference between the studied groups as regards 6 months postoperative DASH score with (P-value >0.05). In the current study, there was no significant difference between the studied groups as regards postoperative residual triggering of the operated finger due to complete release done in both techniques.

Currently reported rates of residual triggering are in accordance with the study of Gilberts et al. [7] conducted to evaluate long-term outcomes of open and percutaneous release for trigger fingers. It showed that (15%), (17%) of patients still had mild residual triggering following open and percutaneous release respectively with no significant difference between both groups.

The preceding outcomes might be supported by study of Sato et al. [14] who concluded that open and percutaneous release techniques are indifferently effective (i.e. can achieve complete release) in management of trigger finger.

According to the current study, there was no statically significant difference in terms of postoperative patient's satisfaction at final follow up.

Guler et al., [10] also showed a non-significant difference in patient satisfaction between open-release and percutaneous-release groups (98.1% vs. 97.1%) respectively [75].

Meanwhile, Lin et al., [8] revealed that short-term (i.e. 1 month) patient satisfaction was significantly better in the percutaneous release group compared to the open release group; however, at long-term follow-up, there were no significant differences between the two groups.

5. Conclusion

In conclusion, according to this study, trigger finger can be successfully managed by either open or percutaneous release especially in terms of pain, function, return to work and patient satisfaction. However, percutaneous release offers the advantages of shorter duration and less severity of postoperative pain, quicker return to work and better cosmesis. Nevertheless, these advantages might be overshadowed by significantly higher rates of residual finger triggering and of recurrence of finger triggering following percutaneous release compared with its open counterpart.

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