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Original Article

Orthopedics Section

Trigger Finger: A Prospective Randomised Control Trial Comparing Percutaneous Release versus Open Release

NIRAJ RANJEET[1], KRISHNA SAPKOTA[2], PABIN THAPA[3], PRATYENTA RAJ ONTA[4], KRISHNA WAHEGOANKAR[5], UPENDRA JUNG THAPA[6], HIMANSHU SHAH[7]

ABSTRACT

Introduction: Trigger Finger (TF) is frequently encountered problem by an orthopaedic surgeon which, if not managed, causes pain, discomfort and disability in hand function. Patient presents with pain at Metacarpo-phalangeal (MCP) or Proximal Inter-phalangeal (PIP) joint or clicking of the thumb, ring or long fingers. It is commonly caused by mismatch between the flexor sheath and the flexor tendon, which may be because of enlargement of the tendon or thickening of the fibrous flexor sheath of the first annular pulley.

Aim: To compare percutaneous release with that of open surgery in terms of its effectiveness in releasing the A1 pulley and their complications and also to determine if the results are comparable with those observed in other studies.

Materials and Methods: From January to December 2016, 56 patients presented to Manipal Teaching Hospital, Kaski, Nepal, with diagnosis of TF, were blindly randomised to two groups with 28 patients and 30 fingers each. One group was treated with percutaneous release while the other group was treated with open release. All the patients were followed up in OPD on two days, two weeks and eight weeks and were evaluated for postoperative pain, presence of infection, persistence or recurrence of triggering, presence of digital nerve injury and finger range of motion.

Results: There was no statistical difference between the two groups with regard to the above parameters. Although, there was a trend to earlier return to full activities of daily living and full range of motion in the percutaneous group and also the complication rates were low and without any surgical scar, the difference was insignificant compared to the open release group.

Conclusion: The present study recommend that both the open and percutaneous release is equally effective in treating TFs. Depending on the surgeon's preference and experience the surgeon may opt to choose any of the surgical procedure for his patients.

Keywords: Open release technique, Percutaneous release group, Stenosing tenosynovitis

INTRODUCTION

Stenosing Tenosynovitis (ST)/tenovaginitis of the finger, also known as TF, is one of the common presentation of patients to an orthopaedic surgeon. If not managed appropriately, it causes pain, discomfort and varying degrees of disability in hand function. Patients with TFs initially presents with pain localised to the metacarpophalangeal or proximal interphalangeal joints and later with locking or clicking, which may sometime progress to contracture of the proximal interphalangeal joint of the particular finger. The common causes are enlargement of the tendon from swelling or thickening of the tenosynovium, thickening of the fibrous flexor sheath or fibrocartilaginous metaplasia of the 1st Annular (A1) pulley. This causes a mismatch between the flexor sheath and the flexor tendon [1-3]. TF more commonly affects the thumb, ring or middle fingers. It is more commonly seen in adult female population (~F:M=4:1), in their 5th and 6th decades of life [4].

Although, there are many acceptable methods available, most of the TF cases are treated with conservative management as oral pain relievers, oral steroid or local steroid injection however, some of them undergo operative management i.e., surgical transection of A1 pulley either by the percutaneous or open method. The current recommendation for TF Types II-IIIb [4] is still by local steroid injection with reported 60% success rate after one injection in the study by Lambert MA et al., [5] and 72% success rate in the study by Baumgarten KM et al., [6] after injection and immobilisation. However, it was noted that surgical treatment for TF is recommended if conservative treatment failed, in Type IV TF, or if TF was secondary to diabetes mellitus, gout, rheumatoid arthritis, and other connective tissue disorders [7-9]. For the open technique, to release the A1 pulley the surgeon first makes a transverse incision on the skin between the distal palmar crease and proximal digital crease, then A1 pulley is directly visualised and transected. The success rates were reported to be 83% to 97% and recurrence rate was 3% [10-12]. Several percutaneous methods to release A1 pulley have been advocated since 1958. Authors [11,12] have advised to release the A1 pulley using a hypodermic needle with varying rates of success from 89% to 100%. Yet other study [13] comparing the long-term results of open surgery and percutaneous for TF have reported excellent long-term results for percutaneous release as compared to open release techniques in terms of residual pain, stiffness, recurrence of triggering, nerve injury and patient satisfaction. Other studies [12,14-18] have concluded that percutaneous release is safe, effective, less painful, quicker procedure, and has significantly better results in rehabilitation when compared to open release. The study by King EB and Delarosa T [18] found no significant difference for all the variables evaluated in terms of recurrence of triggering, postoperative pain, time to recovery of motor function, time to recovery of full range of motion and patient satisfaction with regards to the procedure done and amount of scar formation, functional recovery and complications such as infection and digital nerve injury.

Though recent literature [19-23] shows comparable success and complication rates for both the percutaneous and open release techniques, percutaneous release is still less preferred and less

performed by many Orthopaedic surgeons. This study aimed to compare percutaneous release with that of open surgery in terms of its effectiveness in releasing the A1 pulley and their complications and also to determine if the results are comparable with those observed in other studies.

MATERIALS AND METHODS

All 56 patients coming to Manipal Teaching Hospital, Department of Orthopaedics between January to December, 2016 were enrolled in present study. The inclusion criteria were patients older than 18 years of age, clinically diagnosed to have primary or secondary forms of TF with Green's Classification Type II-IV [4] for at least one month. Exclusion criteria were patients who did not consent to the study, patients with evidence of infection, patients noted to have flexion contracture of PIP joint and those who had already undergone a surgical release for their other trigger digit/s. Informed written consent for the study was obtained from each patient. Patients were divided into two Groups (28 patients in each group) using a table of random numbers to either percutaneous or open surgery using opaque sealed envelope system.

In a pilot study done prior to the original study with 10 sample size, it showed 90% of TFs had comparable outcomes. With a 95% CI, the sample required was 56 [24].

Ethical clearance was taken from the Ethical Committee of our hospital before commencing of this study.

All the surgeries were performed by a single surgeon in the operating room on an outpatient basis using local anaesthesia (2% lidocaine). In both techniques, adequate release of the pulley was confirmed through active flexion and extension of the triggered digit. In any case with incomplete release the patient then underwent revision open release.

Open technique: All 28 patients were operated in the operating room with patient placed in supine position with the hand on the hand rest. The hand was placed with palms facing up over a folded towel with the MCP joint of affected digits hyperextended so as to displace the neurovascular structures more dorsally. About 3-5 cc of 2% lidocaine was infiltrated into the skin between the distal palmar crease and proximal digital crease. A transverse surgical incision was placed on the skin. After a blunt dissection A1 pulley was exposed and incised longitudinally using a scalpel blade-15 to lay open the long digital tendons. The patient was then asked to do active flexion and extension of the affected digit so as to see any residual triggering. If there was no residual triggering than the skin was closed with a 4.0 nylon suture followed by compressive bandage and range of exercise of the finger started immediately.

Percutaneous technique: All 28 patients were operated in the operating room with patient placed in supine position with the hand on the hand rest. The hand was placed with palms facing up over a folded towel with the MCP joint of affected digits hyperextended so as to displace the neurovascular structures more dorsally. About 3-5 cc of 2% lidocaine was infiltrated into the skin between the distal palmar crease and proximal digital crease. A18-gauge hypodermic needle was inserted through the skin into the flexor sheath. Using skin as a pivot point the needle was moved up and down such that the bevelled edge of the needle cuts the A1 pulley, until the grating sound/feeling was lost. The patient was then asked to do active flexion and extension of the affected digit so as to see any residual triggering. If there was no residual triggering than a compressive bandage was applied and range of exercise of the finger started immediately.

After operation the patients from both the groups were advised to start active and passive range of motion exercises as soon as tolerated. Patients were advised to follow-up at two days, two weeks, and eight weeks after surgery. The patients were inquired and evaluated about postoperative pain, presence of infection, persistence or recurrence of triggering, presence of digital nerve injury and finger range of motion. Postoperative complications were scored during the visit to the outpatient clinic. Postoperatively patients were advised to record the answers for the following questions asked in Nepali language:

1. On what day they were pain free during active motion of the treated digit (duration of postoperative pain)

2. On what day they were able to fully flex and extend the treated digit (recovery of motor function)

3. On what day they were able to use the treated digit for their daily activities (return to work)

4. If they were satisfied with the operative procedure they had undergone and if they would recommend it to other relative and family members (patient's satisfaction).

STATISTICAL ANALYSIS

Statistical analysis was done using Independent sample t-test to compare success, clinical outcome and Visual Analog Scale (VAS) score for both the procedure. The difference in the success rates of both the groups was not statistically significant. Fisher exact test was done to analyse the patient's satisfaction for both groups which was statistically insignificant.

RESULTS

A total of 56 patients with 60 TFs in present study. About 40 (71.42%) were females and 16 (28.58%) were males with a mean age of 55.8 (44-67 years). There were 28 patients with 30 fingers in each group (two patients had involvement in two fingers in each group) [Table/Fig-1].

The most commonly affected finger was the thumb (31.66%) followed by the ring (28.33%), middle (23.33%) and index (16.68%). There were no cases of triggering of the small finger in our study. The TF was classified according to the system by Green [4].

About 7 (11.67%) patients had comorbid conditions, 4 with diabetes mellitus Type II, 2 with rheumatoid arthritis and 1 with Giant Cell Tumour of Tendon Sheath (GCT-TS). Overall the mean period of triggering was 57.3 days (35-104 days).

Out of the 60 fingers released, 29 of 30 (96.66%) were released completely in the open group and 28 (93.33%) were released completely in the percutaneous group. Both the failed fingers in the percutaneous group were then released by open mean with complete release. The patient with treatment failure in the open group had subsequent revision open release with a successful result [Table/Fig-2].

Variables		Open	Percutaneous
Sex	Male	7	9
	Female	21	19
Age (in years)	Mean (55.8)	50-67	44-64
Finger	Thumb (19)	12	7
	Ring (17)	8	9
	Middle (14)	6	8
	Index (10)	4	6
Green's Classification	II (22)	6	16
	III (32)	20	12
	IV (6)	4	2
Duration in days	Mean (57.3)	62-104	35-74
Comorbidity	6.67%	Diabetic-2	Diabetic-2
		Rheumatic Arthritis-1	Rheumatic Arthritis-1
		GCT-TS -1	

[Table/Fig-1]: Demographics of 56 patients (January to December 2016).

Surgical group	Fingers n=60	Successful primary release	Failed primary release	Successful revision open release
Open	30	29 (97.66%)	1	1
Percutaneous	30	28 (93.33%)	2	2
Total	60	57 (95%)	3	3

[Table/Fig-2]: Success of surgical release.

The mean time to full hand function, i.e., ability to do all activities of daily living, was shorter for the percutaneous release group (7.67 days) as compared to the open group (9.3 days). However, it was not statistically significant. However, there was a trend toward earlier return to full hand function for the patients who underwent percutaneous release. The amount of time required for full range of motion of the fingers i.e., recovery of motor function was slightly longer than the time to return to work for both the groups. The percutaneous release group achieved full motor recovery of the fingers at an average of 16.52 days as compared to 18.9 days in the open group. However, the difference was not significant. There appeared to be a trend toward earlier recovery of full motor recovery in the percutaneous group as compared to the open group [Table/Fig-3].

Clinical outcome	Open Release	Percutaneous Release	p-value
Duration of Postoperative pain	6.7 (6-11)	5.31 (4-10)	0.0583
Recovery of motor function	18.9 (12-32)	16.52 (10-21)	0.4333
Return to work	9.3 (8-15)	7.67 (6-11)	0.4208

[Table/Fig-3]: Clinical outcome in days [Mean (range)] at 8 weeks follow-up.

The patients were completely pain-free at an average of 4.41 weeks in the open group and 4.2 weeks in the percutaneous group. However, the difference was not statistically significant though it was shorter for the percutaneous group.

The severity of pain was measured using Visual Analog Scale (which is graded from 0-10) and was measured at two days, two weeks and eight weeks. The differences between the two groups for VAS scores in each follow-up was not significant. At eight weeks 88.5% of the patients from percutaneous group and 86.7% of the open group were completely pain free [Table/Fig-4].

Treatment given	2 days	2 weeks	8 weeks
Open release	5.4±2.5	2.76±1.5	0.46±0.2
Percutaneous release	4.7±2.2	2.57±1.3	0.21±0.1
p-value	0.2543	0.6021	0.2502

[Table/Fig-4]: VAS score on follow-up.

There were three postoperative infections, all in the open release group. There was no incidence of any complications in the percutaneous group. However, the difference was statistically not significant. All the infections occurred in patients with diabetes mellitus and developed within two weeks of operation. They were all treated with local irrigation and oral flucloxacillin. After five days all the infection resolved. There was no incidence of injuries to the digital vessels or nerves in either group in each follow-up.

The patients were also inquired and allowed to rate the surgical procedure they underwent in subjective terms, indicating whether they were satisfied with the procedure and the results. They were inquired in terms of the experience of the surgery, the postoperative pain and function, the surgical scar (if they underwent open release), and whether they would undergo the same procedure in the future if they suffer from TF in other finger and if they would recommend the same procedure to their friends or relatives. For each of the parameter there was no difference between the two groups. Scar formation was only applicable for the group who underwent open surgical release. Of the 30 patients in this group, 2 patients complained of scar tenderness at 8 weeks [Table/Fig-5].

Patient's satisfaction	Yes/No	Open release	Percutaneous release	p-value
Postoperative pain	Y	27	27	1
	N	1	1	
Degree of ROM of fingers	Y	28	27	0.999
	N	0	1	
Amount of Surgical scar	Y	26	N/A	
	N	2		
Satisfied	Y	27	27	1
	N	1	1	
Will they undergo the same treatment in the future if necessary	Y	28	28	1
	N	0	0	

[Table/Fig-5]: Patient's satisfaction.

DISCUSSION

After being introduced by Lorthioirat J Jr. [14] 50 years ago percutaneous release of A1 pulley have been practiced and validated by many authors in several studies. Studies show the percutaneous release to be comparable if not a better option as compared to the standard open surgical release [11,13,17,25-27]. Even though, it has been practiced by many hand and orthopaedic surgeons there still remains some reluctance to perform the percutaneous release. The exact reasons are not well documented but being a blind procedure the surgeons have the fear of injuring the digital nerves and vessels and the chance of having incomplete release of A1 pulley. The present study thus compared the percutaneous and open surgical procedures in terms of postoperative pain, ability to completely release the triggering, time to gain full range of motion, time for recovery of full hand function, presence of digital nerve and vessel injury, presence of infection, recurrence of triggering, and patient's satisfaction.

In some studies [18], it was observed that the patients undergoing open release returned to full activities of daily living earlier and full range of motion were quicker then the percutaneous release group, though it was statistically insignificant. It was explained that percutaneous release was nearly always associated with tendon injury during sweeping of the needle on the A1 tendon sheath [26] The resultant fibrosis caused by the injury and inflammation may be the reason for the stiffness and delayed range of motion in the percutaneous release group. However, in present study, the patients undergoing percutaneous release had earlier return to full activities of daily living and also quicker full range of motion compared to open group.

Though there was the presence of surgical scar in the open release group, the duration and severity of pain for both the groups was comparable. It may be explained by the presence of inflammation induced by the percutaneous release of A1 pulley.

Although not statistically significant, infection was only present in the open release group. As the open release is more invasive as compared to the percutaneous release the bigger surgical wound exposes the deeper tissues to the external environment and then the more incidence of infection.

By the open procedure 29 of 30 fingers were completely released and by percutaneous procedure 28 of 30 were completely released. The results were comparable to other studies. Severity of pain was evaluated by using the VAS score. Though the score was lower in the percutaneous release group on each follow-up at two days, two weeks and eight weeks, the difference was not statistically significant.

One of the drawbacks in present study was a lack of standard evaluation form or tool in our country. Thus, we made a questionnaire to evaluate the subjective and objective feedback and asked the patients to fill up the questionnaire with regards to their levels of satisfaction for the procedures they underwent. There was no

significant difference noted between the two groups with regards to patient's satisfaction. The results were comparable to most of the other studies except for the study by Gilberts EC et al., which found a significant positive differences for the percutaneous release group in terms of postoperative pain and time to achieve recovery of full function [11,12].

LIMITATION

The study is limited to not having big sample size despite TF being fairly common problem encountered in orthopaedics. The main reason being that most of the patients were treated conservatively with oral pain medications or steroid injection with good results. Surgical release is done only when these conservative measures fails. This severely limited the number of patients eligible for entering present study.

CONCLUSION

Both the subjective and objective criteria in comparing percutaneous release and open release for TF indicate no statistically significant differences; however, the postoperative pain, recovery of motor function, time to return to work and mean time to full hand function was better in the percutaneous release group.

This study recommend that both the open and percutaneous release is equally effective in treating TFs. Depending on the surgeon's preference and experience the surgeon may opt to choose any of the surgical procedure for his patients.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
2. Assistant Professor, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
3. Lecturer, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
4. Lecturer, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
5. Associate Professor, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
6. Lecturer, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.
7. Resident, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara, Kaski, Nepal.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Niraj Ranjeet,
Assistant Professor, Department of Orthopaedics, Manipal Teaching Hospital, Pokhara-1344, Kaski, Nepal.
E-mail: ranjitniraj@yahoo.com

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