ORIGINAL ARTICLE

Randomized Controlled Trial on Combined Percutaneous Release and Steroid Injection Versus Percutaneous Release Alone for Trigger Finger in Adults

Jerome David J. Sison, MD and Tammy L. dela Rosa, MD, MMedSc

Department of Orthopedics, Philippine General Hospital, University of the Philippines Manila

ABSTRACT

Introduction. Trigger finger is one of the most common causes of hand pain and disability. Surgical treatment consists of release of the A-1 pulley by open or percutaneous techniques. Many authors have noted that percutaneous release is convenient and cost-effective with a low complication rate. Only few studies have published results on combination of percutaneous release and steroid injection.

Objective. To compare the differences of outcomes in adults with trigger finger treated with combination of percutaneous release and corticosteroid injection to those treated with percutaneous release alone

Methods. We included all patients older than 18 years old in the UP-PGH Department of Orthopedics with a diagnosis of trigger finger who have consented to participate in this study. They were randomized into two treatment groups. One group was treated with percutaneous release only and the other group was treated with combined percutaneous release and corticosteroid injection. Outcomes measured were total active motion (TAM), postoperative pain, time to return-to-work, patient satisfaction, and complications.

Results. Post-procedure, both groups showed significant improvement in motion of the fingers ($p = 0.034$) and pain relief ($p = 0.001$). TAM scores of the combination group were better compared to the control at all time intervals ($p = 0.03, 0.008, 0.004, 0.019$) and better pain VAS scores in the 1st week ($p = 0.009$). Patients who received the combination treatment showed a trend toward better patient satisfaction, shorter duration of post-release pain and earlier return-to-work.

Conclusion. The addition of corticosteroid injections to percutaneous release of trigger finger significantly improves TAM and pain VAS scores.

Key Words: percutaneous release, tendon entrapment, trigger finger, steroid injections

INTRODUCTION

Trigger finger or stenosing tenovaginitis/tenosynovitis of the hand is one of the most common causes of hand pain and disability. It is a frequently encountered problem by orthopedic hand surgeons. The condition causes painful catching of the involved flexor tendon as the patient flexes and extends the digits. Over time, guarding and reluctance on the part of patients to fully range the digit can lead to secondary flexion contractures at the PIP joint.[1]

The problem is caused generally by a size mismatch between the flexor tendon and the first annular pulley (A-1). Conservative management includes splinting, corticosteroid injection, and other adjuvant modalities. Surgical

Paper presented and awarded 1st Place in the 2016 Philippine Orthopedics Association, Residents' Paper Presentation on November 2016, at Edsa Shangri-La Hotel, Manila, Philippines.

Corresponding author: Tammy L. dela Rosa, MD, MMedSc
Department of Orthopedics
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila 1000, Philippines
Email: tldelarosa@up.edu.ph

treatment consists of release of the A-1 pulley by open or percutaneous techniques. Complications are rare but include bowstringing, digital nerve injury, and continued triggering.[2]

The surgical methods (percutaneous and open) displayed similar effectiveness and proved superior to the conservative (corticosteroid injection) method in terms of trigger finger cure and relapse rates. However, patients in the conservative group experienced a lower incidence of pain in the first month of follow-up compared with those in the surgical group, which had similar incidences of pain.[3,4] Both surgical and conservative methods have their own advantages and disadvantages. This study prospectively investigated if combining these two methods as a single treatment approach for trigger fingers resulted in better outcomes in terms of earlier return-to-work, less post-operative pain, better patient satisfaction, and better total active motion (TAM), compared to percutaneous release alone.

METHODS

This prospective randomized controlled trial was conducted at the Department of Orthopedics, Philippine General Hospital-University of the Philippines Manila, from May to October 2015.

We included all patients older than 18 years old who were clinically diagnosed to have trigger finger with Green's Classification of Type II-IV in the UP PGH Department of Orthopedics, Section of Hand and Microvascular Surgery, who have consented to participate in the study. We excluded patients with infection and those who underwent any form of surgical treatment for trigger finger.

Eligible patients were randomly assigned to two treatment groups using a computer-generated table of random numbers. After informed consent, the next brown envelope in the randomization sequence was opened to reveal to which group the patient belonged. After explaining the procedure, a baseline data sheet was filled out.

One group was treated with percutaneous release only (control group) and another was treated with combined percutaneous release and corticosteroid injection (combination group). Percutaneous release consisted of release of the A1 pulley with a gauge 18 needle, The skin was prepared using an antiseptic technique. The skin overlying the A1 pulley was anesthetized by subcutaneous administration of 3–5 cc of lidocaine using an insulin syringe. The involved finger was hyperextended to facilitate palpation of the pulley. The needle was then introduced through the metacarpophalangeal crease and into the flexor tendon. The distal phalanx was slightly flexed and extended to observe needle movements, and the needle was slowly withdrawn until there was phalanx motion, but no needle motion. Then, using sweeping movements in the direction of the axis of the flexor tendon, the A-1 pulley was released.[5]

Corticosteroid injection consisted of a cocktail of 1 mL of methylprednisolone acetate 40 mg/ml solution and 1 mL of 2% lidocaine solution into the site corresponding to the A1 pulley, attempting to inject the solution within the peritendinous space.[1] For the combined approach, a percutaneous release was first done and the needle retained for injection of the corticosteroid solution.[6,7]

Patients were advised to do active and passive range of motion exercises immediately after the procedure to avoid post-operative adhesions. They were also given antibiotics and pain medications. Outcome measures such as total active motion (TAMM) of the digit, pain visual analogue scale (VAS) and any complications such as swelling, an increase or persistence of previous pain, recurrence of catching, infection, tendon attrition, numbness, and cyanosis, were recorded on follow- up at 1 week, 2 weeks, 4 weeks and 6 weeks. Time to return-to-work was also recorded. Patient satisfaction was obtained on the last follow-up.

RESULTS

Out of 36 patients with trigger finger seen in the orthopedic outpatient department, we excluded two who opted to have steroid injections and one who decided to have an open release. A total of 33 patients were enrolled in the study. Six patients (four from the control group and two from the combination group) were lost to follow up during the first week, resulting in only 27 patients with complete follow-up. Seventeen patients had the combination percutaneous release plus steroid injection, and 10 patients treated with percutaneous release only.

Preliminary results were derived using non-parametric statistical measures due to small sample size. Cross tabulation results with frequency counts and percentages were calculated for each group (control or combination). Measures of central tendency (e.g., mean and standard deviation) were computed to summarize data on age and duration in triggering (in days), as well as the numerical outcomes of TAM for both thumb and non-thumb groups , pain VAS, patient satisfaction, and time to return-to-work (in days). We analyzed differences in proportions using Fisher's exact test, continuous variables using Mann-Whitney t-test, and pre- and post-treatment outcomes using Wilcoxon signed rank test. Further, the responsiveness of patients to treatment in each group was computed in terms of acceptable effect size, defined as mean score change divided by the standard deviation of the initial scores. Effect sizes of greater than 0.8 (absolute value) were considered large and acceptable.

A total of 27 patients were analyzed in the study; 10 in the control group, and 17 in the combination group. There was no significant difference in baseline demographic characteristics between two groups, with p-values>0.05, except for gender distribution (p=0.018). The duration of triggering (in days) was longer among patients in combination versus control group (164.35 versus 82.4) but this difference was not significant (p = 0.08). (Table 1). More males belonged in the combination group while the control group was predominantly

Table 1. Demographic profile of study participants (N=27)

Characteristic	Control	Combination	Statistical value	P-value
Age, years, mean (SD)	53.0 (6.9)	54.6 (9.9)		0.66
Duration of triggering (days)	82.4 (59.8)	164.4 (132.9)		0.08
Sex				
Male	1 (10)	10 (59)	6.217	0.018
Female	9 (90)	7 (41)		
Co-morbidity	4 (40)	7 (70)	4.077	0.67
Handedness				
Dominant hand involved	8 (80)	12 (71)	0.29	0.678
Green's trigger finger classification			3.85	0.146
I	0	0		
II	4 (40)	3 (18)		
III	5 (5)	14 (82)		
IV	1 (10)	0		

**Fisher's exact test*

females. The most common co-morbidity for both groups was diabetes mellitus. Half of the patients in the control group belonged to Green's trigger finger classification III, which was also the prevalent classification in the combination group, followed by Class II. There was only 1 case of Class IV.

There were significant mean differences between control and combination groups in total TAM scores for digits other than the thumb starting 1 week onwards. Pain VAS scores also showed a significant difference between the two groups at 1 week but became similar in all subsequent time periods (Table 2).

The TAM responsiveness (effect size) of patients in control group was acceptable after 1 week only for both thumb and the non-thumb digits. In the combination group, responsiveness was observed at first week on TAM (thumb) and at all time periods in TAM (other than thumb). Patients showed responsiveness in pain VAS scores for each group at all time periods of observation. The effect sizes were all acceptable (greater than |0.80|). This meant that regardless of where the patients belonged, whether in control or combination groups, all were responsive (Table 3).

Table 2. Comparison of mean TAM and pain VAS between groups

Outcome	Control Group		Combination Group		P-value
	Mean	SD	Mean	SD	
TAM (Thumb)					
Baseline	83.3	27.5	69.0	30.5	0.550
1 week	128.3	2.9	132.0	28.0	0.170
2 weeks	85.0	73.7	80.0	74.5	0.880
4 weeks	85.0	73.7	80.0	74.5	0.880
6 weeks	85.0	73.7	82.0	75.6	0.880
TAM (other than the thumb)					
Baseline	164.3	26.8	195.0	30.5	0.070
1 week	201.4	941.0	261.3	20.0	0.030
2 weeks	172.9	120.2	274.6	12.5	0.008
4 weeks	177.9	122.9	281.3	16.1	0.004
6 weeks	182.1	126.0	260.8	83.3	0.020
Pain VAS					
Baseline	7.4	2.6	6.4	2.1	0.180
1 week	3.1	2.0	1.7	1.5	0.009
2 weeks	2.3	2.6	1.6	2.0	0.220
4 weeks	1.0	1.0	0.5	0.5	0.280
6 weeks	0.9	1.2	0.4	0.5	0.520

**Mann-Whitney t-test; TAM, Total active motion; VAS, Visual analogue scale*

Table 3. Comparison of responsiveness to treatment between groups

Time	Control	Combination
TAM (Thumb)		
1 week	1.634	2.066
2 weeks	0.061	0.361
4 weeks	0.061	0.361
6 weeks	0.061	0.426
TAM (Non-thumb)		
1 week	1.384	2.170
2 weeks	0.319	2.607
4 weeks	0.506	2.825
6 weeks	0.665	2.157
Pain VAS		
1 week	-1.630	-2.190
2 weeks	-1.940	-2.260
4 weeks	-2.430	-2.750
6 weeks	-2.480	-2.820

TAM, Total active motion; VAS, Visual analogue scale

The trend in TAM steadily increased for both groups. However, patients in the combination group had higher values than those in the control group. In addition, greater improvement in pain intensity VAS score was seen in the combination group (Table 3).

There was a significant improvement between baseline and post-release values in the TAM of the non-thumb digits. The mean pain intensity VAS scores was significantly reduced fromm pre- to post-treatment in both combination (P=0.001) and control group (P=0.02) (Table 4).

Patient satisfaction in the combination group was higher by 0.11 although this was not statistically significant (Table 5). Similarly, patients in the combination group had shorter mean time to return-to-work and to their regular activities (6.24 days ± 4.22) compared to control group (7.78 days ± 4.84), but this difference was also not statistically significant.

There were no complications observed in the two groups.

DISCUSSION

The present study showed that patients receiving the combination percutaneous release and steroid injection had a significant reduction in the pain VAS scores. None among the two groups had any recurrences. This was similar to the study of Cebesoy et al. who reported that 84% of their patients had total relief of symptoms with a painless full range of motion of the thumb, with no objective or subjective triggering sensation.[6]

There are a number of studies that compared outcomes of corticosteroid injection, percutaneous, and open-surgical A-1 pulley release of trigger fingers.[8-10] Studies that suggest using percutaneous release found common complications associated with open surgery such as infections, painful scar formation, bowstringing of the flexor tendons due to pulley injuries, joint stiffness, weakness, and digital artery or nerve damage.[11] Ucar et al. noted in his study that the percutaneous surgical release technique of Eastwood[12] is a convenient, cost-effective method with a low complication rate. This method has become more popular than open surgery.[13,14]

Wang et al. did a meta-analysis of available RCTs and concluded that patients treated with percutaneous release were less likely to have treatment failure and they all had a greater level of satisfaction than patients treated with corticosteroid injections alone. They also concluded that frequencies of treatment failure and complications between percutaneous release surgery and open surgery for trigger digits were not different.[15]

There are few published articles on the results of combination of percutaneous release and steroid injection, but their outcomes are only for the thumb. The mean time of pain duration was 3 days after the surgery, which was significantly shorter compared to a previous local study of 7.11 weeks for the percutaneous release group.[4] Pain after percutaneous release was reported by Pope et al. They noted painful tenosynovitis without triggering in patients after a percutaneous release. The rate of longitudinal laceration to the superficialis tendon in cadaveric studies has approached 100%.[14] This prompted authors to hypothesize that the use of a corticosteroid along with local anesthetic may prevent the post-procedure inflammatory reaction, and as a consequence, superficialis scoring may not appear to have any clinically remarkable consequences.[2] This was supported in our study. The pain which resulted from the scoring of the flexor tendons seemed to have been repressed by the addition of the corticosteroid injection, at least in the 1st week of follow up as shown by the significantly reduced pain VAS score in the combination group. However, during the succeeding weeks, no difference was seen.

There was a trend favoring the combination treatment over the control group for time to return-to-work and time to return-to-regular activities (mean 6.24 days versus 7.78 days).

Regarding inclusion of thumbs, current literature has shown conflicting results about the applicability of percutaneous release of trigger thumbs. However, the inclusion of these is based on the experience in our own institution where we have had no increase in digital nerve injury in percutaneous releases compared to open releases. In obtaining consent from patients with trigger thumb, an

Table 4. Differences in pre- and post-values per outcome between groups

	TAM (Thumb)		TAM (Non-Thumb)		VAS	
	Stat Value	P-value	Stat Value	P-value	Stat Value	P-value
Control	0	1	-0.41	0.69	-2.37	0.020
Combination	-3.31	0.74	-2.12	0.03	-3.19	0.001

** Wilcoxon signed rank test (before-and-after test); TAM, Total active motion; VAS, Visual analogue scale*

Table 5. Comparison of mean patient satisfaction and time to return-to-work and regular activities

Outcomes	Control			Combination			Stat Value	P-value
	N	Mean	SD	N	Mean	SD		
Patient Satisfaction	9	4.89	0.33	14	5	0	56.0	0.21
Time to Return -to-Work (in days)	9	7.78	4.84	17	6.24	4.22	63.5	0.48

** Mann-Whitney t-test*

explanation was given for the pros and cons and risks of each group - open or percutaneous. The thumb was discussed only in the sense that nerve injury may be a risk in both open and percutaneous release.

This present study shows that when steroid injection was added to percutaneous release of trigger finger, there was a significant improvement in the TAM scores and the post-treatment pain VAS scores of patients. Patients who received the combination treatment showed a trend towards shorter duration of post-release pain and earlier return-to-work.

CONCLUSION

The addition of corticosteroids during percutaneous release of trigger finger significantly improved TAM and pain VAS scores.

Statement of Authorship

We have been sufficiently involved in this work to take public responsibility for its validity and final presentation as an original publication. The authors certify that the contribution to the publication is accurate. Permission is granted by the authors that this article be included in the publication.

Author Disclosure

We declare that the article had informed consent for publication from the involved subjects, and had conformed with ethical standards, and had been reviewed by the appropriate ethics committee. This paper has been subjected to ethics review by the University of the Philippines Manila Research Ethics Board in 2015 and has been endorsed favorably by the said board or committee.

Funding Source

No financial payments shall be given to any of the participants of this project. The costs for any medications necessary were borne by the subject/participant.

REFERENCES

1. Wolfe S, Hotchkiss R, Pederson WC, Kozin SH. Green's Operative Hand Surgery 6th edition. 2009. Churchill Livingstone: London.
2. Ryzewicz M, Moriatis J, Wolf, Trigger Digits: Principles, Management, and Complications, J Hand Surg 2006; 31A:135-46
3. Chao M, Wu S, Yan T. The effect of miniscalpel-needle versus steroid injection for trigger thumb release. J Hand Surg Eur 2009; 34:522-5.
4. King E, de la Rosa T. Percutaneous Versus Open Release for Trigger Fingers in Adults. 2006 (Unpublished).
5. Sato ES, Gomes dos Santos JB, Belloti JC, Albertoni WM, Faloppa F et. al. Treatment of trigger finger: randomized clinical trial comparing the methods of corticosteroid injection, percutaneous release and open surgery. Rheumatology 2012; 51:93-9
6. Cebesoy O, Karakurum G, Kose KG, Baltaci ET, Isik M, Percutaneous release of the trigger thumb: is it safe, cheap and effective? Int Orthop. 2007: 31;345-9
7. Maneerit J, Sriworakun C, Budhraja N, Nagavajara P. Trigger thumb: results of a prospective randomised study of percutaneous release with steroid injection versus steroid injection alone. J Hand Surg Br. 2003 Dec: 28;586-9.
8. Guler F, Kose O, Ercan EC, Turan A, Canbora K, Open versus percutaneous release for the treatment of trigger thumb. Orthopedics. October 2013; 36(10);e1290-4.
9. Dala-Ali B, Nakhdjevani A, Lloyd M, Schreuder F. The efficacy of steroid injection in the treatment of trigger finger. Clin Orthop Surg. 2012; 4:263-8.
10. V Singh, S Chong, S Marriapan. Trigger finger: comparative study between corticosteroid injection and percutaneous release. 2006. Internet Journ Orthop Surg. 3(2)
11. Ucar B. Percutaneous surgery: a safe procedure for trigger finger? N Am J Med Sci. Sep 2012: 4(9);401-3
12. Eastwood DM, Gupta KJ, Johnson DP. Percutaneous release of the trigger finger: An office procedure. J Hand Surg Am. 1992; 17:114-7.
13. Ha KI, Park MJ, Ha CW. Percutaneous release of trigger digits: a technique and results using a specially designed knife. J Bone Joint Surg [Br]. 2001:83-B;75-7.
14. Pope D, Wolfe S. Safety and efficacy of percutaneous trigger finger release. J Hand Surg. 1995: 20A;280-3.
15. Wang J, Zhao J, Liang C, Percutaneous release, open surgery, or corticosteroid injection, which is the best treatment method for trigger digits? Clin Orthop Relat Res. 2013: 471;1879-86