Global Journal of Medical Research: H
Orthopedic and Musculoskeletal System
Volume 16 Issue 1 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Comparison of the Short-Term Treatment Outcome among Watchful Waiting, and Soluble and Insoluble Corticosteroid Injections in Idiopathic Trigger Finger

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Methods: Fifty-six patients (16 men and 40 women; age, 38–79 years; mean age, 60.0 ± 8.8 years) who initially diagnosed with idiopathic trigger finger in our clinic were assigned to watchful waiting, local injection of triamcinolone acetonide (insoluble preparation), or that of dexamethasone sodium phosphate (soluble preparation). The examined digits included 30 thumbs and 1 index, 17 middle, and 8 ring fingers. All patients scored the visual analogue scale (VAS), and were graded according to clinical findings at the timing of initial diagnosis and four weeks following the diagnosis. Statistical analyses focused on the difference of the VAS score and clinical grades between initial and the 4-week evaluation in each treatment group, and also on the comparison of these difference among treatment groups.

Keywords: *trigger finger; corticosteroid injection; triamcinolone acetonide; dexamethasone sodium phosphate.*

GJMR-H Classification: *NLMC Code: WE 168*

Strictly as per the compliance and regulations of:

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Results: Whereas the VAS score significantly improved in two injection groups, a significant difference in the improvement of the VAS score and clinical grade was revealed between the group of triamcinolone acetonide and other two groups. We could not find any advantages in the injection of dexamethasone sodium phosphate comparing with watchful waiting.

Conclusions: The injection of triamcinolone acetonide in idiopathic trigger finger had better short-term outcome when comparing with the injection of dexamethasone sodium phosphate and watchful waiting.

Keywords: trigger finger; corticosteroid injection; triamcinolone acetonide; dexamethasone sodium phosphate.

I. Introduction

Corticosteroid injections are commonly used in the management of trigger finger. In general, they have been recognized as considerable first lined treatment before the patients decide to undergo surgery, with the expectation of 60% effectiveness in relieving pain of idiopathic trigger finger[1,2].

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Corticosteroid injections can be easily performed without specialized technique in outpatient clinic; it was reported to have no difference in effectiveness between intrasheath and subcutaneous injections[3].

Injectable steroid preparation can be roughly classified into two categories; soluble or insoluble formulations. Soluble forms tend to diffuse rapidly from injection site and to exert a higher degree of systemic effects when compared to insoluble formulations, whereas insoluble forms aggregate to be crystal formation and have theoretical advantage being longer duration of effect[4]. On the other hands, crystal deposits that remain in the tendon sheaths might disrupt smooth gliding, leading to suboptimal function[5]. Treating physician should be also aware of previously reported adverse events including tendon rupture[6], flare reaction[7], and the atrophy of subcutaneous fat[8] which are more commonly associated with insoluble steroid injection. Ring et al. randomized 84 patients to receive either triamcinolone (insoluble preparation) or dexamethasone (soluble preparation), and triamcinolone had a more rapid but less durable effect[9].

In this study, we aimed to compare the short-term result of local corticosteroid injections in the treatment of idiopathic trigger finger between previously reported proper amount of soluble and insoluble steroids; dexamethasone sodium phosphate and triamcinolone acetonide. We also aimed to compare these results with that of the patients who did not undergo the corticosteroid injection as control group.

II. Methods

The institutional review board approved this study protocol. All patients were informed of the study aims and procedures and signed a consent form that included a description of the protocol. During the period from January 2014 to August 2015, consecutive patients clinically diagnosed with idiopathic trigger finger in our clinic were recruited. Patients with multiple trigger fingers, diabetes mellitus, rheumatoid arthritis, dialysis treatment, fingers with a history of local gouty/pyogenic disease, major hand trauma, prior treatment in other

institute were excluded from this study. Plain radiographs were evaluated in all patients. We confirmed that none of the included patients had a history of trauma, tumors, calcium deposits, or severe osteoarthritis.

At the time of initial diagnosis, each patient scored the visual analogue scale (VAS) to assess their subjective pain using measuring equipment. Patients were asked to make a mark on a line between the two extremes of complete painless and the maximum pain they could imagine. The distance of entire line was of 100 mm, and the score was measured as the distance between complete painless and the point they marked. In addition, each finger was graded according to clinical findings, resulting in four groups10. Grade I represented a vague sense of tightness and tenderness around the metacarpophalangeal joint, and patients did not exhibit triggering; grade II represented intermittent triggering; grade III represented continuous triggering with or without interphalangeal (IP) joint contracture and locking reduced with active extension; and grade IV represented continuous triggering with or without IP joint contracture. Grade IV patients required passive assist to achieve maximal extension and could not completely flex actively.

We separated the affected digits into the group of thumb and other digits to equalize the number of each finger in the study cohort using a quasirandomized approach as below. In each group, one of the following treatments was assigned to each affected digit in the order of (1), (2) and (3) according to the new diagnosis of idiopathic trigger finger, and this process was repeated; (1) watchful waiting without local corticosteroid injection, (2) local injection of the mixed preparation of triamcinolone acetonide (Kenacort-A 50mg/5mL, Bristol-Myers Squibb K.K, Japan) 1mg/0.1mL and 1% Mepivacaine Hydrochloride (Carbocain Injection 1%, AstraZeneca K.K, Japan) 0.9mL, (3) local injection of the mixed preparation of dexamethasone sodium phosphate (Orgadrone Injection 1.9mg, MSD K.K, Japan) 3.8mg/1.0mL and 1% Mepivacaine Hydrochloride (Carbocain Injection 1%) 0.5mL. With regards to the proper amount of each corticosteroid injection, we referred to the description of previous review article (Dahl and Hammert, 2012); proper dosages for the small joint such as finger and wrist is 4-10 mg in dexamethasone sodium phosphate, and 0.8-1.0 mg triamcinolone acetonide, respectively. The injections were performed at the timing of initial diagnosis, and placed into and around the flexor sheath using a 27-gauge needle at the level of the A1 pulley. All patients were also recommended joint stretching of the affected digit and activity modification if they had overused their affected hand. They were explained to revisit our clinic for reevaluation with a 4- week interval following the injection regardless of the improvement or exacerbation of their symptoms. In the reevaluation, the same measurement of the VAS score and same clinical grading with initial evaluation were performed. All diagnoses, evaluations and corticosteroid injections were performed by a senior hand surgeon with 15 years of experience in surgery.

As a result, 56 patients (16 men and 40 women; age, 38–79 years; mean age, 60.0 ± 8.8 years) who actually revisit our clinic at four weeks after initial visit were evaluated in statistical analyses. The examined digits included 30 thumbs and 1 index, 17 middle, and 8 ring fingers.

We confirmed there was no difference in patients' initial symptom among treatment groups using the Kruskal-Wallis test for the VAS score and Friedman test for the clinical grade, respectively. With regards the treatment outcome, statistical analyses focused on the difference of the VAS score and clinical grades between initial and the 4-week evaluation in each treatment group, and also on the comparison of these difference among treatment groups. On the comparisons among treatment groups, we calculated the improvement of the VAS score using the following formula; [(reevaluated VAS score – initial VAS score) / initial VAS score] x 100 %, and also classified each digit into three groups according to the change of clinical grade; (1) improved (2) unchanged (3) exacerbated. Comparisons of the VAS score and the improvement of the VAS score were performed using the Wilcoxon signed-ranks test in each treatment group and using the Kruskal-Wallis test and Sheffe's F test among treatment groups. Comparisons of clinical grades and their changes were performed using the Mann-Whitney U test. Results were deemed significant if $P < .05$.

III. Results

Table 1 presents the patients' demographics and finger information in each treatment group. No patients who had injection revealed steroid-induced adverse event. There was no difference in patients' initial VAS score and clinical grade among treatment groups. Figures 1 and 2 present the results of the VAS score and the improvement of the VAS score, respectively. In the groups of triamcinolone acetonide and dexamethasone sodium phosphate, the VAS score significantly improved at the 4-week evaluation. There was a significant difference in the improvement of VAS score between the group of triamcinolone acetonide and other two groups. Table 2 presents the result of clinical grading at initial and the 4-week evaluation. At the 4-week evaluation of clinical grade, three digits were improved, 12 digits were unchanged, and three digits were exacerbated in the group of watchful waiting. In the group of triamcinolone acetonide, 15 digits were improved, two digits were unchanged, and no digits were exacerbated. In the group of dexamethasone sodium phosphate, seven digits were improved, nine digits were unchanged, and

five digits were exacerbated. With regards to the change of clinical grade, there was a significant difference between the group of triamcinolone acetonide and other two groups ($P<.01$), and there was no difference between the group of watchful waiting and that of dexamethasone sodium phosphate.

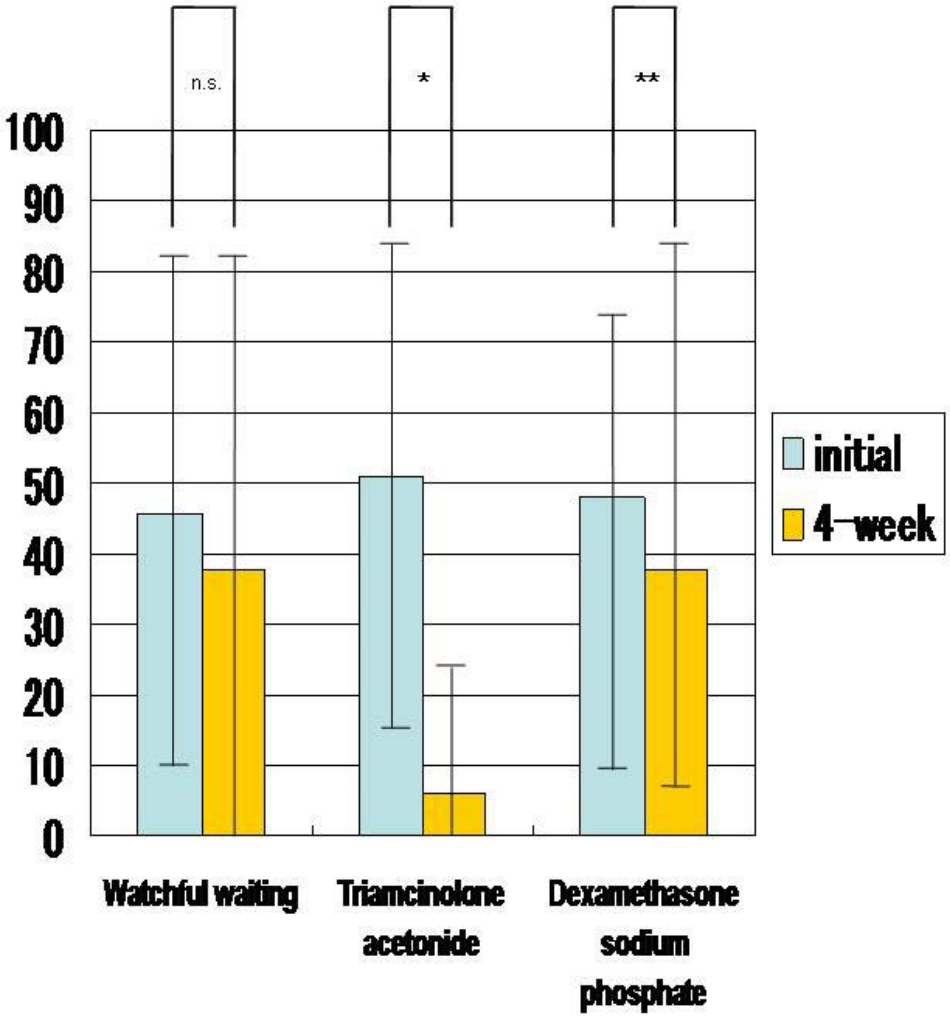

Figure 1 : The results of the VAS score.

* $P<.01$, ** $P<.05$, n.s.: not significant. Statistical significance was examined by the Wilcoxon signed-ranks test.

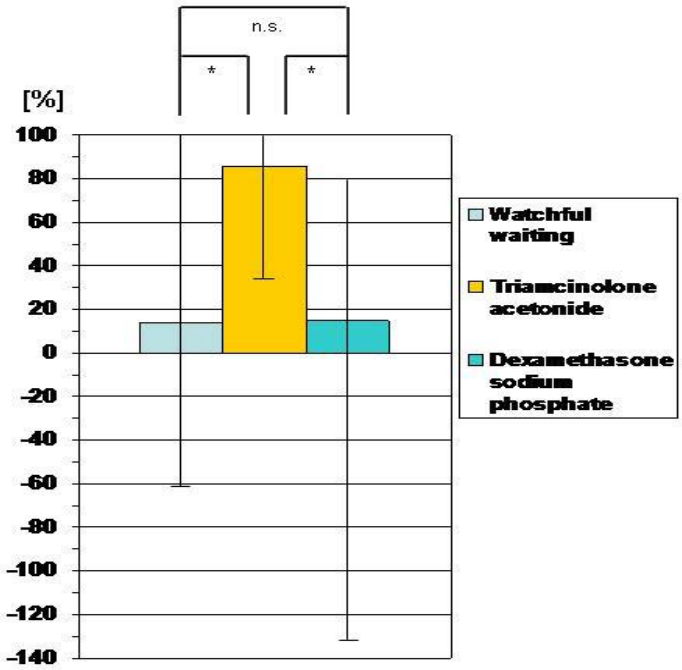

Figure 2 : The results of the improvement of the VAS score.

* P<.01, n.s.: not significant. Statistical significance was examined by the Sheffe's F test.

Table 1 : Patients demographics and finger information

Finger information					
	Gender (male/female)	Age (years)	(right/left)	(d/nd)*	(T/I/M/R)**
Watichful waiting	5/13	58 (SD 8)	9/9	10/8	8/1/7/2
	-	(40-73)			
Triamcinolone acetonide	4/13	65 (SD 8)	11/6	13/4	10/0/5/2
		(51-79)			
Dexamethasone sodium phosphate	7/14	58 (SD 9)	11/10	12/9	12/0/5/4
		(38-75)			

A number of the patient and affected digit is described in the box of gender and finger information. The mean value (standard deviation), and value range is described in the upper and lower box of age, respectively.

* dominant hand/non dominant hand

** thumb/index finger/middle fingr/ring finger

Table 2 : Clinical grade at initial and the 4-week evaluation

Grande					
	N/A*	I	II	III	IV
Initial evaluation					
Watichful waiting	-	4	8	6	0
Triamcinolone acetonide	-	3	4	6	4
Dexamethasone sodium phosphate	-	0	9	8	4
4-week evaluation					
Watchful waiting	1	3	9	3	2
Triamcinolone acetonide	5	5	4	3	0
Dexamethasone sodium phosphate	2	5	6	6	2

A corresponding number of the affected digit are described in the box.

*N/A represents "not applicable". There is no vague sense of tightness and no tenderness around the MP joint, and patients did not exhibit triggering.

IV. Discussion/Conclusion

In this study comparing two corticosteroid injections for idiopathic trigger finger in previously described proper dose, local injection of triamcinolone acedonide was significantly more effective than that of dexamethasone sodium phosphate at the 4-week evaluation. At this point, we could not find any advantages in the injection of dexamethasone sodium phosphate comparing with watchful waiting without injection.

We have several limitations in this study. First limitation is small number of patients. Secondly, the assignment of treatment was a quasirandomized and control patients did not underwent placebo injection in our study. Third, we did not consider the cost effectiveness and adverse events in each corticosteroid. We deeply recognize that a treatment that is more effective but has higher cost and higher complication rate may not be the best option.

Local corticosteroid injection has been popular treatment of trigger finger by its simplicity, applicability in an office setting, and low cost[11]. A review of level I and II studies reported one corticosteroid injection were effective in relieving pain in 57% of the patients with trigger finger1. In the study of long-term follow up in one year of 130 patients with trigger finger who underwent corticosteroid injection of 40mg triamcinolone, younger age, insulin-dependent diabetes mellitus, involvement of multiple digits at the time of injection, and a history of other tendinopathies of the upper extremity were associated with a higher rate of failure; they were all independent predictors of a future surgical release[12].

Soluble steroid forms are salt formulations that are freely water-soluble, have a clear, nonparticulate preparation. They tend to diffuse rapidly from injection site and to exert a higher degree of systemic effects when compared to insoluble formulations. Insoluble steroid forms contain esters that cause them to be highly insoluble in water, which causes aggregation and crystal formation. Insoluble compounds require hydrolysis by host esterases to release the active compounds, with the theoretical advantage being longer duration of effect4. In the previous study of short- and middle-term follow up in the 84 patients with idiopathic trigger finger randomly underwent the injection of dexamethasone or triamcinolone[9], triamcinolone had significantly better absence of triggering rates, clinical grades, and patient satisfaction at the 6-week evaluation but not at the 3-month evaluation. Ring et al included the patients with diabetes and multiple digit involvement in order to increase the generalizability whereas we did not include these patients. In addition, we used dexamethazone sodium phosphate as soluble preparation and triamcinolone acetonide as insoluble preparation. Triamcinolone acetonide is a more potent derivative of triamcinolone, and we used 1 mg triamcinolone acetonide which is smaller amount comparing with the 5-7.5 mg triamcinolone used in the study of Ring et al.

Insoluble corticosteroids such as triamcinolone acetonide might be more prone to adverse events. The most common side effect is known as post-injection flare, which is thought to be the result of an acute inflammatory response to the injected steroid ester crystals[13,14], and can occur in up to 33% of patients with trigger finger or de Quervain's disease who underwent extra-articular steroid injection[7]. Subcutaneous atrophy is more commonly associated with insoluble compounds[15]. Direct intratendinous toriamcinolone injection has been associated with tendon rupture, likely due to an inhibitory effect on tenocyte function, and should be avoided[16]. Dexamethasone sodium phosphate is about 5.3 times as potent as triamcinolone acetonide; equivalent dose is 7.5 mg in dexamethasone sodium phosphate and 40 mg in triamcinolone acetonide, respectively[4]. However, the comparison of effectiveness among two different corticosteroid injections and watchful waiting showed better outcome in the injection of triamcinolone acetonide although the current study evaluate only the short-term outcome in four weeks. Small amount of insoluble steroid might be also safe in the current study despite of previous high rate steroid-induced adverse event.

In conclusion, the injection of triamcinolone acetonide in idiopathic trigger finger had better short-term outcome when comparing with the injection of dexamethasone sodium phosphate and watchful waiting without injection either on the improvement of patients' pain and triggering. At least, its effectiveness might be expected to continue for four weeks. This information might be useful in the decision of treatment and the choice of steroid preparation.

V. Funding Acknowledgements

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of Conflicting Interests

All authors declare no conflict of interest in preparing this article.

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