Night Splinting for Idiopathic Trigger Digits

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Abstract

Background: This study assessed nighttime splinting for 6 weeks as treatment for recent onset idiopathic trigger fingers. **Methods:** Patients over 18 years with a Quinell grade 1 or 2, idiopathic trigger finger or thumb causing symptoms for less than 3 months were eligible for a custom-made hand-based orthoplast night orthotic. Improvement of symptoms and/or resolution of triggering were recorded. Patients also completed the short version of the Disabilities of the Arm, Shoulder and Hand and a numerical rating scale for pain at the initial visit, after 6 to 8 weeks, and after 3 months. **Results:** Thirty-four patients wore a night orthotic for at least 6 weeks. At final evaluation, there was a substantial reduction in disability and pain. Symptoms of triggering resolved completely in 18 patients (55%). Sixteen patients did not resolve their triggering after splinting and therefore underwent a steroid injection. **Conclusion:** Night splinting is a noninvasive treatment option for idiopathic trigger fingers/thumb with symptoms for less than 3 months.

Keywords: trigger finger, treatment, night splint, QuickDASH

Introduction

A trigger finger, formally known as digital stenosing tenosynovitis or stenosing flexor tenosynovitis, is a condition in which finger movement is associated with a “snap” or “trigger” sensation which may be visible or palpable or both. Swelling or formation of a nodule of the tendon (or sheath) may also be palpable. Ryzewicz and Wolf describe this condition as “a mismatch between the volume of the flexor tendon sheath and its content.”¹¹ Most frequently, the A1 pulley at the metacarpophalangeal (MCP) joint is affected.³

Treatment options include splinting, corticosteroid injections, or surgery. The rationale for orthotic immobilization is that reduction of tendon excursion through the A1 pulley may help to diminish any local synovial hypertrophy.^{1,11} The few uncontrolled studies of splinting as a primary treatment for trigger digit have demonstrated a benefit.^{4,5,9,10}

In this study, we aim to assess whether nighttime splinting using a custom-made orthotic, applied for 6 weeks, is an effective treatment for patients with an idiopathic trigger finger with a Quinell grade 1 or 2⁸ and symptom duration of less than 3 months.

Methods

Patient Selection

Under an institutional review board–approved protocol, we prospectively included patients 18 years and older with one

or more idiopathic trigger fingers between December 2011 and March 2014 treated by 2 hand surgeons in a level I urban trauma center in the United States. Patients were included if they had a Quinell grade 1 or 2 trigger finger or thumb,⁸ for no more than 3 months. In patients with Quinell grade 1, there is no triggering, but uneven finger motion (as originally described by Quinell) is observed which manifests as finger flexion which is not smooth or synchronous. In Quinell grade 2, triggering is actively correctable by the patient themselves. Patients were excluded if pregnant (institutional review board mandated), if received prior treatment on the same finger, or if the patient was diagnosed with diabetes mellitus.

Initial Visit and Follow-Up

At the initial visit, after the trigger finger was diagnosed, patients received a custom-made, volar hand-based orthoplast orthotic the same day (MCP joint in neutral position and interphalangeal joints free; Figures 1 and 2). Every orthotic was fabricated by a certified hand therapist. Patients

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Figure 1. Volar view of night orthotic.

Figure 2. Dorsal view of night orthotic.

with a trigger thumb received a custom-made hand-based thumb spica orthotic that extended past the tip of the thumb (Figure 3). Treatment consisted of wearing the orthotic every night for 6 consecutive weeks. Details about the patient (such as age and sex) and trigger finger (such as start of symptoms, if the patient had sought help before, etc) were recorded. Patients were asked to fill out the short version of the Disabilities of the Arm, Shoulder and Hand (QuickDASH) questionnaire to measure upper extremity-related disability² and a numerical rating scale (NRS) for pain intensity from 0 (no pain) to 10 (worst possible pain). During a second visit, 6 to 8 weeks after the initial visit, patients rated their treatment satisfaction on an ordinal scale from 0 (complete dissatisfaction) to 10 (complete satisfaction), how much the night orthotic helped relief of locking or triggering measured on an ordinal scale from 0 (no help at all) to 10 (helped completely), how much the night orthotic helped for pain relief measured on an ordinal scale from 0 (no help at all) to 10 (helped completely), and self-reported treatment

Figure 3. Thumb orthotic.

compliance on a 4-point scale from “not at all,” “less than half of the nights,” “more than half the nights,” and “nearly every night.” They also filled out the QuickDASH and NRS for pain intensity again. Those patients who were dissatisfied with the orthotic at the second visit, or whose symptoms persisted despite orthotic wear, were offered a corticosteroid injection during the same visit. The last evaluation was performed by a phone interview, 3 months after treatment initiation with a maximum of 3 attempts. Of the 41 patients, 7 patients were excluded because of no contact, not receiving the night orthotic at all (1 patient), or not understanding the study questions (1 patient). These patients only filled out the first visit questionnaire (Table 1). Of the remaining original 34 patients, 5 patients were lost to follow-up, leaving us with a patient pool of 29 patients. However, our institutional review board gave us permission to include 5 more patients as the study was being conducted. Thus, 34 patients who participated in this study are being reported on.

Outcome Measures

Our primary outcome measure was the QuickDASH score. Explanatory variables were age, sex, hand dominance and affected side, duration of symptoms, and prior treatment of the same finger. Response variables were pain, triggering, locking, compliance, patient treatment satisfaction with orthotic, and additional treatment (surgery or injection) according to the intention to treat principles. If patients were unsatisfied with orthotic treatment after 6 weeks or did not resolve their triggering after 6 weeks of splinting, the option of a corticosteroid injection was discussed.

Statistical Analysis

An a priori power analysis using a 2-tailed Student *t* test estimated that 34 patients could detect a medium effect size

Table 1. Enrolled Patients.

	Number	%
Completed all	28	68
Completed visit 1 and 2 only	2	4.9
Completed visit 1 and 3 only	4	9.8
Excluded during study ^{a,b}	2	4.9

^aExcluded from study.

^bOne patient did not wear splint, 1 patient did not understand questions. Visit 1: Inclusion moment. Visit 2: 6-week visit. Visit 3: 3-month phone call follow-up.

(0.5) in change in QuickDASH scores with 80% power at a significance level of .05. Anticipating a possible 20% loss to follow-up, 41 patients were originally enrolled in this study, as described before.

Descriptive statistics were used to describe the data; frequencies with percentages were used for categorical variables, and mean and standard deviation (SD) were used for normally distributed continuous variables. For patients who completed the QuickDASH and/or NRS for pain during the second and third visit, the average of both scores was used as only 2 patients completed the first and second visit questionnaires and only 4 patients completed the first and the third. The other patients completed all questionnaires.

The Wilcoxon signed rank test was used to determine the significant effect on the QuickDASH and pain before and after wearing the night orthotic.

Results

Of the 34 patients, 22 patients were women, with a mean age of 61 years (SD $\pm$ 12, range 41-85) (Table 2). The digits affected included a trigger thumb (n = 14), followed by long finger (n = 10), ring finger (n = 7), index finger (n = 2), and small finger (n = 1). In 53% of patients, the trigger finger affected the dominant hand (n = 18). The mean duration of symptoms was 45 days (SD $\pm$ 26, range 4-90). Three patients (8.8%) sought (nonmedical) help prior to presentation at our facility (Table 3).

Twenty-four patients wore the orthotic more than two-thirds of the nights, 4 wore the orthotic more than half the time, and 5 wore it several nights. Patients had a mean satisfaction of 5.8 points (SD $\pm$ 3.3, range 0-10 points) (Table 4). The mean QuickDASH score decreased from 24 (SD $\pm$ 19, range 2.3-70) at enrollment to 16 (SD $\pm$ 1.6, range 0-53) after 4 to 6 weeks of splinting. The mean pain intensity score decreased from 3.8 (SD $\pm$ 2.6, range 0-9) at enrollment to 2.6 (SD $\pm$ 2.3, range 0-8) after splinting. Eighteen patients (53%) out of 33 reported complete resolution of triggering (Table 5). Sixteen patients received an injection at the second visit because of either dissatisfaction with the orthotic or noncompliance or for failure to resolve their triggering. At the second visit, one of the orig-

Table 2. Patient Characteristics (n = 34).

	Mean	SD	Range
Age (years)	61	12	41-85
Education (years)	16	2.8	10-20

	Number	%
Sex		
Male	12	35
Female	22	65

Note. SD = standard deviation.

Table 3. Trigger Digits Characteristics (n = 34).

	Number	%
Affected digit		
Thumb	14	41
Index	2	5.9
Long	10	29
Ring	7	21
Small	1	2.9
Sought treatment before		
Yes	3	8.8
No	31	91
Trigger digit on dominant hand side		
Yes	18	53
No	16	47
Received injection due to lack of symptom resolution		
Yes	16	47
No	18	53
Symptoms resolved with splinting	18	53

Table 4. Splint Characteristics.

	Mean	SD
Splint satisfaction (n = 34)	5.8	3.3
Thumb (n = 14)	6.2	3.9
Other fingers (n = 20)	5.5	3.0

	Number	%
How much did you wear night splint? (n = 30)		
Not at all	0	0
Several nights	5	17
More than half the nights	4	13
Nearly every night	21	70

Note. SD = standard deviation.

inal 34 patients claimed to have never had a trigger, which therefore left us with a revised total patient pool of 33 patients who underwent treatment either with an orthotic or who received an injection for failure of splinting or lack of resolution of triggering or both. However, for the purposes

Table 5. Outcome Variables (n = 34).

	Before			After			P value
	M	SD	Range	M	SD	Range	
QuickDASH	24	19	2.3-70	16	16	0-53	.0069
Pain (NRS)	3.8	2.6	0-9	2.6	2.3	0-8	.039
Triggering (n = 33)	^a	^a	^a	4.9	3.5	0-10	<.001
				Number		%	
Trigger finger resolved (n = 33) ^b	^a	^a	^a	18		55	

Note. Bold P value indicates a statistically significant difference. M = mean; SD = standard deviation; DASH = Disabilities of the Arm, Shoulder and Hand; NRS = numerical rating scale.

^aInclusion criteria.

^bOne patient denied ever having a trigger digit at the second visit.

of statistical analysis, we have maintained the final patient pool size of 34 patients.

Discussion

This study assessed night splinting for idiopathic trigger digits with a Quinnell grade 1 or 2 trigger⁸ and symptoms for fewer than 3 months. These Quinnell grades are least associated with established pathophysiologic mechanisms of trigger fingers. Some authors suggest that friction between the flexor tendon and the sheath creates an intratendinous nodule which may be the cause of triggering,⁷ while histologic studies of diseased A1 pulleys and flexor digitorum superficialis tendons done by others have shown fibrocartilaginous metaplasia.¹²

A 55% resolution of triggering was shown in a review by Fleisch et al when a distal interphalangeal (DIP) orthotic was used in combination with nonsteroidal anti-inflammatory drugs.⁶ Tarbhai et al compared 2 types of orthotics: a custom MCP joint blocking orthotic and a DIP joint blocking orthotic which were worn 24 hours a day.¹³ They found that treatment with the MCP joint blocking orthotic was successful in 77% of subjects, whereas use of the DIP joint orthotic was effective in about 50%. Colbourn et al studied the effectiveness of splinting and found that in 92% of the patients triggering resolved with the low-profile custom thermoplastic MCP blocking (ring) orthotic.⁵ In the current study, splinting of a mild trigger digit with a short duration of symptoms reduced or resolved symptoms of triggering in just over half of the patients (53%). Our study therefore seems to concur with other studies that address splinting, even though none of the previously published studies used a night orthotic in adults. Our rationale for splinting only during the night was compliance in night orthotic wear anecdotally noted by one of us and the same author had also anecdotally noted a lack of compliance with full-time (day and night) orthotic wear. While it may seem intuitive that full-time orthotic wear might be a better treatment option, the lack of compliance in full-time wear can certainly undermine that premise.

Limitations of this study were that during the study we had more patients lost to follow-up than expected. Therefore, our institutional review board gave us permission to include more patients. The orthotic for the fingers left the interphalangeal joints free while that for the thumb went past the tip. This difference in splinting types may be considered a weakness as well. However, based on the anecdotal (but statistically unproven) experience of one of the authors, patient satisfaction for thumb orthotics has been higher when the orthotic extends past the thumb tip to avoid flexion in the thumb at the interphalangeal joint. For the thumb, this orthotic may even be considered to be analogous to those blocking finger DIP joints, used in the studies by Fleisch et al and Tarbhai et al.^{6,13} Therefore, we chose to use orthotic designs that were slightly different for the thumb and fingers.

The true rate of resolution of triggering might be lower as patients could have come back after our study period for additional treatment. However, we did not have any further follow-up. One of our concerns with instituting further mandatory follow-up as part of this study was the increased cost of the visit to the patient and the health care system as well as attritional loss of patients who simply chose not to return as they had no further symptoms. In addition, anecdotally the senior author (C.S.M.) has noted spontaneous symptom resolution in some of these patients, but so far has not been able to identify any common features in such patients, other than the short duration of symptoms.

Mean patient satisfaction with splinting was 5.8, which is low. However, according to our data in patients where triggering resolved, a high satisfaction with the orthotic was reported. It would certainly seem appropriate to study this patient group further and obtain a subanalysis for the satisfaction rates. However, given the current small cohort we did not do this as it would in all likelihood not give us any meaningful data. A larger patient cohort of a similar nature will be subanalyzed in the future. Patients in whom triggering did not resolve were less satisfied. The relatively low satisfaction with this treatment might reflect frustration

with the orthotics or persistent symptoms, or might reflect characteristics of the population of patients who choose to use an orthotic and avoid painful treatments like an injection or surgery. In addition, the cost of this additional treatment must be judiciously considered in the overall setting of health care delivery costs. One could argue that the cost of an injection is comparable to that of a hand therapy visit and the making of a custom-molded thermoplastic orthotic. Certainly for those who responded to splinting and maintained durable relief of symptoms, the overall cost of care is less than that of surgery.

At this time, it appears to us that further studies, which identify and differentiate patients who may maintain durable symptom relief from those who do not, are required. Once this distinction is made, targeted treatment can be offered which could then lead to an overall benefit to the health care delivery mechanism and reduction of health care costs. In conclusion, based on our data, it appears to us that in carefully selected patients with a Quinell grade 1 or grade 2 trigger digit with symptom duration of less than 3 months, resolution of symptoms can be expected in over half the patients, utilizing a regimen of night splinting for 6 weeks.

Authors' Note

The first 2 authors contributed equally.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

Our institutional review board approved the protocol for this study.

Statement of Informed Consent

All patients provided written consent to participate in this trial.

Declaration of Conflicting Interests

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