Corticosteroid injection therapy for trigger finger or thumb: a retrospective review of 577 digits

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Abstract

Background Stenosing flexor tenosynovitis of the digital flexor tendon (trigger digit) is a common condition encountered by hand surgeons. Our purpose was to determine the efficacy of corticosteroid injections and review the demographic profile of patients with trigger digits.

Methods We reviewed the records of 362 patients (577 trigger digits) treated with steroid injections (8 mg of triamcinolone acetonide in 1 % lidocaine) from 1998 through 2011. Follow-up (intervention to last visit) averaged 66.4 months. We assessed patient demographics (e.g., gender, age, diabetes mellitus, hand dominance, trigger digit distribution) and determined recurrence rate and injection duration of efficacy. If one injection failed, additional injections or surgical A1 pulley release were offered. Results were analyzed with Student's *t* test or Fisher's exact test (significance, $p < 0.05$). **Results** Women (258, 71.3 %) were affected significantly ($p < 0.001$) more frequently than men (104, 28.7 %) and at a significantly ($p < 0.001$) younger age (average, 58.3 versus 62.1 years, respectively). Eighty patients (22.1 %) were diabetic. We observed no correlation between trigger digit and hand dominance. The two most commonly affected digits were the right long finger (17.8 %) and right thumb (17.7 %). For 721 injections, the recurrence rate was 20.3 %; there were no major complications. For recurrences, the injection efficacy averaged 315 days. Surgery was required for 117 patients.

Conclusions Injection therapy is safe and highly effective (79.7 %). Women were affected by trigger digits more often than men and at a younger age. Surgical release provides a definitive therapeutic option if corticosteroid injection fails.

Keywords Corticosteroid injection · Efficacy · Open trigger finger release · Recurrence · Stenosing tendovaginitis · Stenosing tenosynovitis · Trigger digits · Trigger finger

Introduction

Stenosing tenosynovitis, also known as trigger finger or trigger digit (TD), is a very common condition that a hand surgeon encounters and treats. Patients usually present with clicking or locking of a digit most commonly caused by a size mismatch between the first annular pulley (A1) and the corresponding flexor tendon sheath, which consequently leads to a secondary entrapment of the tendon itself [10, 20]. The French physician Alphonse Notta first described trigger fingers in 1850 [24], resulting in the term “Notta's node” being assigned to the swollen nodule within the flexor tendon in symptomatic patients [8]. Among nondiabetic patients more than 30 years old, the lifetime prevalence of TD has been estimated to be 2.2 %, with middle-aged women most commonly affected [30].

Histologic analyses of the A1 pulley of trigger patients have shown fibrocartilaginous metaplasia and degenerative changes [10, 15, 20, 26, 32], which are believed to be adaptations to shear loads. Although TD is called tenosynovitis, histologic evaluations show minimal inflammatory changes within the synovial sheath [10, 15, 20]. The hypertrophy of the A1 pulley, which may triple in thickness secondary to fibrocartilaginous metaplasia, creates a size discrepancy between the tendon and its sheath [26, 30, 32]. Constriction of the flexor tendon and increased shear load may lead to a “pinching” of the tendon, causing a nodule to

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form, further aggravating the trigger symptoms [19, 21, 26] and restricting flexor tendon excursion, resulting in the inability to extend or flex the digit smoothly. Symptoms range from painless clicking to locking and triggering, with pain felt at the palm over the A1 pulley and distally at the PIP joint or the IP joint (thumb).

Although TDs are usually idiopathic, some authors argue about a possible correlation between excessive use of the hand and triggering of the finger [13, 35]. TD likely occurs more frequently in patients with diabetes mellitus, rheumatoid arthritis, carpal tunnel syndrome, Dupuytren's disease, hypothyroidism, mucopolysaccharide storage disorders, amyloidosis, and congestive heart failure [5, 7].

Nonoperative therapy includes rest, nonsteroidal anti-inflammatory medications, splinting, and corticosteroid injections. Some investigators have indicated that splinting may be a reasonable approach only for mild triggering [30]. The injection of long-acting corticosteroid into the flexor tendon sheath is a major treatment option for TD. Advantages include ease of administration, low complication rate, low morbidity, office setting applicability, and low cost [4, 19, 23, 26]. The exact mode of action of corticosteroids is not yet exactly understood. It is believed that the anti-inflammatory effect might reduce the swelling of the A1 pulley, despite a lack of evidence of inflammatory responses in histologic studies [10, 15, 20, 26].

Surgical treatment includes percutaneous or open A1 pulley release. Surgical release is considered an effective and definitive treatment option, but in comparison with steroid injection, it is associated with longer recovery time, higher costs [4, 36, 37], and rates of complications (e.g., nerve injury, flexor tendon bowstringing, tendon scarring) ranging from 11 to 43 % [34, 36, 37].

The purpose of this study was to determine the efficacy of corticosteroid injections, in particular recurrence rates, and to review the demographic profile of patients with trigger digits.

Materials and Methods

This retrospective study was approved by our institutional review board.

Patients and Definitions

We reviewed our patient database for those whose hands were treated between November 1998 and September 2011 and identified the ones with TDs treated with corticosteroid injection as first-line therapy by the senior author at a major American urban academic medical center. Of the 545 identified patients with TD in this time period, 183 were excluded. Exclusion criteria were as follows: (1) patients less than

18 years old who did not have congenital TDs ($n=1$), (2) presence of congenital TDs ($n=26$), (3) previous surgical release for triggering ($n=1$), and (4) previous injection therapy by other physicians and patients who wished to proceed with surgical release of the A1 pulley without an initial corticosteroid injection ($n=155$).

Therefore, 362 patients with 577 trigger digits formed our study group (Table 1). The average follow-up time was 66.4 months (range, 2–152 months). The follow-up time was defined as a time period between the date of each intervention (single injections, surgery) and their last visit.

Patient demographics (gender, age, hand dominance, distribution of TDs, and presence of diabetes mellitus) were recorded. The diagnosis was made based on history and physical examination with varying presentations of TDs, tenderness over the A1 pulley and along the flexor tendon, and a palpable Notta's nodule. Corticosteroid injections were offered to those patients who had (1) observed locking that was corrected with active motion (Quinnell grade 2), (2) locking with passive motion (Quinnell grade 3), or (3) uncorrectable locking (Quinnell grade 4). Those who had uneven finger motion (Quinnell grade 1) on examination were also offered an injection if they had a strong convincing history of locking (Quinnell grades 2–4). Patients who did not have a history of triggering/locking or observed abnormality (normal finger motion, Quinnell grade 0) were not offered the injection. TD recurrence was defined as return of preinjection symptoms requiring additional injections or surgery. We defined the duration of efficacy as the time interval between the previous injection and the patient's return office visit for reinjection or evaluation for surgery due to recurrence of symptoms.

Corticosteroid Injection Regimen

The injections were administered in a clean fashion. The skin was cleansed with alcohol over the A1 pulley region, and the injection was given via a 30-gauge, 0.5-in. hypodermic needle (Becton Dickinson & Co., Franklin Lakes, NJ) filled with 0.2 mL (8 mg) of triamcinolone acetonide (Kenalog-40, Bristol-Myers Squibb Co., Princeton, NJ) mixed with 0.6 mL of 1 % lidocaine hydrochloride (Hospira, Inc., Lake Forest, IL) (total volume, 0.8 mL). The needle was inserted through the palmar skin at a slight oblique angle at the A1 pulley region. The needle was advanced into the supratendinous space. The patient was asked to flex and extend the finger. If the needle and the syringe were still, then we gave the injection. This avoided accidental intratendinous injection, which can result in a tendon rupture secondary to collagen necrosis [30]. We used a 30-gauge needle primarily to decrease the discomfort from the pain. If the corticosteroid was in solution immediately before the injection, we did not encounter any problems with any precipitate lodging within the needle lumen. After the injection,

Table 1 Demographics by gender

Characteristics	Male	Female	Total
No. (%) of patients	104 (28.7)	258 (71.3)	362 (100)
Average (range) age (years)	62.1 (34–91)	58.3 ^a (22–96)	59.5 (22–96)
No. (%) of trigger digits	166 (28.8)	411 (71.2)	577 (100)
Average (range) number of simultaneous trigger digits affecting 1 hand	1.14 ^b (1–3)	1.17 ^b (1–4)	1.16 (1–4)

^a Significant^b Not significant

the patient was instructed to resume activity as tolerated. No further physical therapy or splinting was recommended. We instructed the patients to call the office for a follow-up if the triggers recurred after the injection. We informed the patients that it may take up to 1 month for the beneficial results to be noticed, although some patients saw beneficial results in a few days. If the symptoms did not improve or got worse after an initial improvement, we considered a repeat injection as early as 1 month from the initial injection. Up to three injections were offered for recurrent symptoms. A fourth injection was provided only on explicit patient request and only if there were medical contraindications to having surgery and patients knew that recurrence was likely. The patients were not required to have all three injections before proceeding with surgical decompression. We recommended surgical release if the patient did not obtain sufficient relief from the first, second, or third injection and had interference with hand function secondary to the trigger and wished to proceed with the surgery.

Statistical Analysis

Statistical analyses were generated using Microsoft Excel (Microsoft Corp., Redmond, WA) or QuickCalcs (GraphPad Software, Inc., La Jolla, CA). The significance of differences among various sets of data was calculated with a one-tailed Student's *t* test assuming equal variance or a two-tailed Fisher's exact test. A probability of error less than 5 % ($p < 0.05$) was considered significant, and a value of less than 1 % ($p < 0.01$) was significant. To display the variance, the standard deviation or standard error of the mean was calculated.

Results

Patient Demographics

There were 258 (71.3 %) women and 104 (28.7 %) men ($p < 0.01$). Of the 577 TDs, women had 411 (71.2 %) and men had 166 (28.8 %). The female/male ratios in patient demographics (2.5:1) and TDs (2.5:1) were identical. In contrast, within the same time period, there were 2,641 (55.7 %) female and 2,100 (44.3 %) male patients who presented with upper extremity diagnoses for evaluation in our hand clinic.

The mean presentation age was 59.5 years (range, 22–96 years). Women were significantly ($p < 0.01$) younger than men [58.3 years (range, 22–96 years) versus 62.1 years (range, 34–91 years), respectively]. Eighty patients (22.1 %) were diabetic.

Almost all (290, 91.5 %) patients were right-handed, 23 (7.2 %) were left-handed, and 4 (1.3 %) were ambidextrous. The hand dominance of 45 (14 %) was unknown. Of the 577 TDs, 332 (57.5 %) were in the right hand (Fig. 1).

Finger Distribution

The right long finger (103, 17.8 %) and the right thumb (102, 17.7 %) were the most affected (Fig. 1). Most patients presented with only one affected digit per hand (425 digits, 73.7 %). On average, there were 1.16 fingers (range, one to four fingers) affected simultaneously: men, 1.14 (range, one to three fingers); women, 1.17 (range, one to four fingers). This difference was not significant. No patient presented with simultaneous ipsilateral involvement of all five digits.

Corticosteroid Injections

After the 577 initial injections, 196 TDs (34.0 %) recurred. Of those 196 recurrences, 117 TDs were treated with a second injection, and 79 TDs were treated surgically. In the 117 digits treated with a second injection, 56 TDs (47.9 %) recurred, 23 of which were treated with a third injection, and 33 of which were treated surgically. After the third injection, six TDs (26.1 % of the 23) recurred, four of which underwent a fourth injection, and two of which were treated surgically. After the fourth injection, three TDs (75 %) recurred and were treated surgically. No patient received a fifth injection. In total, 721 injections were administered, and 117 TDs were treated surgically. The number of injections in the same finger averaged 1.25 injections/finger (range, one to four injections/finger) for our entire study group.

Recurrence after the first, second, third, and fourth injections was 34.0, 47.9, 26.1, and 75.0 %, respectively, the cumulative recurrence was 20.3 %. In other words, of all 577 TDs, only 117 TDs (20.3 %) failed injection therapy consisting of up to four injections/TD. These patients required surgical release of the A1 pulley. There was one injection done after a surgical

Fig. 1 Distribution of trigger fingers in male and female patients (total number of digits, 577). Values are illustrated as percentage of digits and number of digits (in parentheses)

release (see below). In cases of recurrence, duration of efficacy for the first, second, and third injections averaged 320 days (range, 15 days to 68 months), 300 days (range, 29 days to 43 months), and 286 days (range, 50 days to 34 months), respectively (Fig. 2). Although the efficacy of the third injection was reduced by 10.6 % in comparison to that of the first injection, the difference was not significant. The duration of efficacy for any steroid injection averaged 315 days (range, 15 days to 68 months) in those patients with recurrence. There were 117 open releases performed. On average, those patients who had surgery received 1.4 injections/finger (range, one to four injections/finger) before surgery.

No major complications or wound-healing problems occurred after corticosteroid injections. One patient reported a transient marked elevation of blood glucose levels (mid 300s mg/dL) after simultaneous injections to three affected fingers. We have not limited the number of injections in diabetics primarily because they usually have presented with only one or two symptomatic fingers. Three has been the

maximal number of fingers that have been injected in a diabetic patient. We inform all diabetic patients of the risks of transient glucose elevation.

Discussion

Since the first description of corticosteroid injection therapy in TDs in 1953 [14], multiple studies have analyzed its efficacy. Most had fewer than 120 patients [2, 3, 16, 18, 21, 23, 26, 29, 33]. The largest retrospective study we found contained only 235 patients (338 digits) [22]. Therefore, our study of 362 patients, with 577 TDs and 721 corticosteroid injections, is one of the largest retrospective analyses to date.

Investigators disagree with regard to the correlation between hand use and the development of triggering symptoms. Based on a TD prevalence of 14 % among 665 workers in a meat-packing plant, Gorsche et al. [13] claimed that intense hand tool use increased the risk of developing TD. Yet, Trezies

Fig. 2 Duration of steroid injection efficacy. Values are displayed as average days of efficacy and range of efficacy, in parenthesis. *d* days, *m* months, *yrs* years, *ns* not significant

et al. [35] found that most TDs developed for reasons other than occupation. Our finding that 91.5 % of patients were right-handed, whereas only 57.5 % of all TDs occurred on the right hand, may suggest a lack of direct correlation between hand use and triggering.

There was significant ($p < 0.01$) female dominance among patients with TD (71.3 %) and symptoms started significantly ($p < 0.01$) earlier in women (3.8 years younger than men at symptom onset). These data are consistent with those of multiple other studies [2, 10, 11, 17, 22, 25]. Nevertheless, little is known about the reasons for the increased incidence and earlier onset of TD in women; further investigations are needed.

In our study, 80 (22.1 %) patients were diabetic, which supports the association between TD and diabetes mellitus (“diabetic hand syndrome”) reported in the literature, with percentages of 7 to 22 % [5, 22, 23]. Patients with diabetes remain a treatment challenge because of the increased risks of side effects of steroid injection and surgery, such as elevated blood glucose levels and wound-healing problems.

In our study, the efficacy of the total injection therapy regimen was 79.7 %. Only 20.3 % of patients required an open surgical release. Symptoms resolved with one injection in 66 % of TDs; 34 % required additional intervention. Both values are within the ranges reported in the literature [2, 12, 19, 31], underlining the potent efficacy of this therapy. However, the retrospective nature of our study may have led to an incomplete follow-up, which may have additionally influenced the value of the recurrence rate. We found that if there was a recurrence, the efficacy of the first injection averaged 315 days. The high standard error of the mean for efficacy of the third injection may be explained by the fact that a fourth injection was administered to only three patients (four fingers) and that surgery after the third injection was performed in only two patients (two fingers), resulting in a total of only six recurrences after the third injection. This duration value should therefore be considered a potential trend, suggesting similar long-lasting effects for a third steroid injection. These results seem to indicate that even though some patients may require surgery, it could be delayed for 2.5 to 3 years with the help of multiple corticosteroid injections.

We did not observe a drastic diminishing effectiveness of multiple steroid injections as has been described in the literature [1, 22, 27, 29]; we noted only a minor and nonsignificant reduction in the duration of efficacy. Two studies reported the maximum duration as 6 weeks [29] and 12 months [27]. Our maximum duration was more than 5.5 times longer (68 months). Reasons for the other studies' short duration could include shorter follow-up time (3 months [29] and 12 months [27], respectively) and differing injection modalities (a dose of only 5 mg of triamcinolone acetonide, injected by three different hand surgeons around the sheath [29] and 1 mL of triamcinolone acetonide of unknown concentration injected by 21

different general practitioners around the sheath [27]). In our series, the dose of 8 mg was injected into the tendon sheath only by the senior author, a board-certified hand surgeon. The exact injection site is believed to be irrelevant for the treatment response [33]. However, we conclude that the outcome seems to be improved not only by the dosage but likely also by the exact injection site and by being performed by an experienced hand surgeon.

Another potential reason for our extended duration of efficacy might be our definition of recurrence. In our study, we set the date of recurrence as the date of the office visit for a repeat injection or for scheduling surgery. Although the symptoms of recurrence may have existed before the office visit, selecting this date eliminated the uncertainty of how long before the visit the symptoms recurred. What may be a few weeks to the patient may actually have been a few months or a few days. Although this definition and method do lengthen the duration of “efficacy,” we were unable to find another solution to this dilemma because some of the patients could no longer be contacted or, if they could, had difficulty recalling exactly when their recurrence was (in some cases, 10 years previously). This factor is one of the weaknesses of a retrospective study.

Because corticosteroids may additionally impair wound-healing capabilities, injections should be avoided immediately before surgery for patients with diabetes [9, 28]. The manufacturer's product information [6] indicates that following a single intramuscular dose of 60 to 100 mg of triamcinolone, adrenal suppression occurs within 24 to 48 h and gradually returns to normal, usually by 30 to 40 days; this timing correlated closely with the drug's duration of therapeutic action. In our practice, should the patient not have improved symptoms or had worsening symptoms, we recommended waiting at least 1 month after the most recent corticosteroid injection to perform surgery. This delay was likely sufficient to decrease any adverse wound-healing properties secondary to the injected 8 mg of kenalog.

In conclusion, our data confirm that TDs affect women more often than men and at a younger age. There seems to be no distinct correlation between the hand dominance and the appearance of TDs. Treatment with a corticosteroid injection therapy regimen appears to be safe and highly effective (symptom resolution in 79.7 %). Even patients with symptomatic recurrence benefited from corticosteroid injection, with an average injection efficiency duration of 315 days.

Conflict of Interest The authors declare that they have no conflict of interest.

Human Rights/Consent Statement All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008 [5]. Informed consent was obtained from all patients for being included in the study.

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