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Corticosteroid Injection in Diabetic Patients with Trigger Finger

A Prospective, Randomized, Controlled Double-Blinded Study

By Keith M. Baumgarten, MD, David Gerlach, MD, and Martin I. Boyer, MD, FRCS

Investigation performed at Washington University School of Medicine, St. Louis, Missouri

Background: It is generally accepted that the initial treatment for trigger finger is injection of corticosteroid into the flexor tendon sheath. In this study, the efficacy of corticosteroid injections for the treatment of trigger finger in patients with diabetes mellitus was evaluated in a prospective, randomized, controlled, double-blinded fashion and the efficacy in nondiabetic patients was evaluated in a prospective, unblinded fashion.

Methods: Thirty diabetic patients (thirty-five digits) and twenty-nine nondiabetic patients (twenty-nine digits) were enrolled. The nondiabetic patients were given corticosteroid injections in an unblinded manner. The cohort with diabetes was randomized into a corticosteroid group (twenty digits) or a placebo group (fifteen digits). Both of these groups were double-blinded. Additional injections, surgical intervention, and recurrent symptoms of trigger finger were recorded. Treatment success was defined as complete or nearly complete resolution of trigger finger symptoms such that surgical intervention was not required.

Results: After one or two injections, twenty-five of the twenty-nine digits in the nondiabetic group had a successful outcome compared with twelve of the nineteen in the diabetic corticosteroid group ($p = 0.03$) and eight of the fifteen in the diabetic placebo group ($p = 0.006$). With the numbers studied, no significant difference was found between the diabetic groups. Surgery was performed in three of the twenty-nine digits in the nondiabetic group compared with seven of the nineteen in the diabetic corticosteroid group and six of the fifteen in the diabetic placebo group. There was a significant difference in the prevalence of surgery between the nondiabetic group and both the diabetic corticosteroid group and the diabetic placebo group ($p = 0.035$ and $p = 0.020$, respectively). With the numbers studied, no difference was found between the diabetic groups with regard to the persistence of symptoms. Nephropathy and neuropathy were significantly associated with the need for surgery ($p = 0.008$ and $p = 0.03$, respectively).

Conclusions: Corticosteroid injections were significantly more effective in the digits of nondiabetic patients than in those of diabetic patients. In patients with diabetes, corticosteroid injections did not decrease the surgery rate or improve symptom relief compared with the placebo. The use of corticosteroid injections for the treatment of trigger finger may be less effective in patients with systemic manifestations of diabetes mellitus.

Level of Evidence: Therapeutic Level I. See Instructions to Authors for a complete description of levels of evidence.

The prevalence of trigger finger in the general population has been reported to be 3%¹. It is generally accepted that the initial treatment of choice for trigger finger is an injection of corticosteroid into the affected flexor tendon sheath²⁻⁶. This treatment has been shown to decrease local

pain, tenderness, and locking as well as to improve grip and function. Since the treatment was first described by Howard et al. in 1953⁷, consistent success rates of up to 80% have been reported^{4,5,8}. These studies have also demonstrated that a second or third injection may increase success rates to 97%. A

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recent prospective study demonstrated that 64% of patients treated with a single corticosteroid injection had relief of symptoms compared with 20% of patients treated with a placebo injection⁶. This study did not include patients with diabetes mellitus; therefore, these findings do not demonstrate whether the clinical course of such patients is different from that of nondiabetic patients.

Several studies have demonstrated that the prevalence of trigger finger in patients with diabetes is significantly higher than that in the general population. In one comparative prospective study, 23% of patients with insulin-dependent diabetes mellitus and 16% of non-insulin-dependent diabetics were diagnosed with a trigger finger compared with 2% of normoglycemic control patients ($p < 0.01$)⁹. In another case-control study, the prevalence of trigger finger in diabetic patients was 17%, whereas only 3% of nondiabetic patients had a trigger finger ($p < 0.05$)¹.

Observational studies have suggested that corticosteroid injection for the treatment of trigger finger is not as effective in diabetic patients as it is in the general population¹⁰⁻¹². One retrospective review showed that diabetic patients responded less favorably to corticosteroid injection, with only 50% having relief after one, two, or three injections¹⁰. A second study demonstrated a clinical success rate of only 66% at one year after multiple injections¹¹. A third retrospective case-control study showed that corticosteroid injection for trigger finger was significantly more effective in nondiabetic patients than in diabetic patients ($p < 0.0001$), with rates of symptom resolution of 76% and 49%, respectively ($p < 0.0001$)¹². These studies, supported by empiric or retrospective data, cause one to question the use of corticosteroid injections for the treatment of trigger finger in diabetic patients.

The purpose of this double-blinded, randomized, placebo-controlled, prospective study was to evaluate whether (1) corticosteroid injection into the flexor tendon sheath is as effective in alleviating the symptoms of trigger finger in patients with diabetes mellitus as it is in nondiabetic patients, (2) corticosteroid injection into the flexor tendon sheath is more effective than placebo injection for alleviating the symptoms of trigger finger in diabetic patients, and (3) the degree of glycemic control (as determined by measurement of serum hemoglobin A_{1c} level at the time of the initial injection) affects the relief of symptoms of trigger finger with corticosteroid injection in diabetic patients. The two null hypotheses of this study were (1) a diagnosis of diabetes mellitus does not change the effectiveness of corticosteroid injection for the treatment of trigger finger, and (2) corticosteroid injection(s) into the flexor tendon sheath have no significant effect on the resolution of trigger finger symptoms in patients with diabetes mellitus.

Materials and Methods

Inclusion and Exclusion Criteria

The study subjects were selected from a consecutive group of patients seen at the offices of four fellowship-trained hand surgeons at one institution from March 2003 to July 2005. All patients who were older than eighteen years of age

and had subjective symptoms of pain, catching, or triggering along the A1 pulley, consistent with sterile flexor tenosynovitis, were eligible. These symptoms were confirmed with objective findings such as tenderness over the A1 pulley, a palpable nodule at the A1 pulley or between the A1 and A2 pulleys, pain along the flexor tendon with resisted flexion or with passive stretch in extension, and reproducible locking, triggering, or catching. Both patients with and those without diabetes mellitus were eligible for inclusion in this study. To be included in the diabetes cohort, the patient had to have a diagnosis of either insulin-dependent or non-insulin-dependent diabetes and be under the care of an internist or endocrinologist prior to his or her initial presentation to us for inclusion.

Exclusion criteria for this study were (1) previous treatment of the trigger finger with surgical release of the A1 pulley or with corticosteroid injection; (2) an inflammatory or potentially pathologic etiology, such as rheumatoid arthritis, of the trigger finger(s); the patient's unwillingness to consider operative management of the trigger finger (as surgery was one of the end points of this study); and (4) an inability to tolerate injections into the flexor sheath or venipuncture for determination of hemoglobin A_{1c} levels or previous adverse reactions to corticosteroids or local anesthetics.

All patients who met the criteria were offered enrollment, and fifty-nine (twenty-nine nondiabetic and thirty diabetic) patients agreed to participate. There were twenty-one men and thirty-eight women. After the study rationale was explained by the treating hand surgeon and an informed consent form approved by the human studies committee at our institution was signed, a standardized initial study interview and examination were performed. Data that were recorded for all patients included age, handedness, occupation, presence of diabetes, type of diabetes, duration of diabetes, amount and type of insulin used per day, other systemic diabetic manifestations (retinopathy, neuropathy, or nephropathy), carpal tunnel syndrome, Dupuytren disease, affected hand(s), affected digit(s), and symptoms. All patients, including those without a diagnosis of diabetes, had blood drawn to determine the hemoglobin A_{1c} level at the initiation of the study.

Randomization

Diabetic patients were randomized into either the corticosteroid or the placebo group by a blinded, prestudy drawing of cards labeled as either "corticosteroid" or "placebo." All injections were prepared by the study coordinator and administered, by a fellowship-trained hand surgeon, in opaque syringes that hid the appearance of the injectate from both the surgeon and the patient. Both investigators (K.M.B. and D.G.) responsible for data analysis were blinded to the treatment method as well. All patients in the nondiabetic control arm of the study were treated with corticosteroid injection in a non-blinded fashion.

Injections

Patients assigned to the corticosteroid arm were injected with a mixture of 1.0 mL (6 mg) of betamethasone sodium

phosphate/acetate solution (Celestone Soluspan) and 0.5 mL (5 mg) of 1% lidocaine. Placebo injections consisted of 0.5 mL (5 mg) of 1% lidocaine and 1 mL of sterile saline solution.

Patients with partial relief or recurrence of symptoms were treated with a second and/or third injection with at least three months between injections. These additional injections all consisted of corticosteroid, even in the placebo group. We thought that it was unethical to continue with placebo treatment if patients had major, persistent symptoms that required a second injection. However, the surgeon remained blinded to the contents of the original injection.

Follow-up

Patients were interviewed and reexamined at six weeks, three months, and one year, or at more frequent intervals if they were having increased or persistent symptoms. Follow-up included evaluation of the subjective symptoms and physical findings consistent with trigger finger (objective triggering, tenderness at the A1 pulley, and presence of a painful nodule) as well as any complications related to the treatment.

Failure of Treatment

If symptoms recurred following a third injection of corticosteroid or if the patient obtained no relief from any of the three injections, the patient was offered surgical release of the A1 pulley. Treatment failure was defined as persistence of local pain, tenderness, and locking of the flexor tendon that the patient believed warranted surgical intervention. Treatment success was defined as either complete or nearly complete resolution of local pain, tenderness, and locking of the flexor tendon that obviated the need for surgical release or another injection into the A1 pulley. The decision to pursue surgery instead of continuing the injections was subjectively determined by the patient and the hand surgeon on the basis of the degree and duration of symptom relief and the recurrence of symptoms.

Power Analysis

A prestudy statistical analysis was performed to determine the number of digits required in each trial group to achieve an alpha value of 0.05 (degree of significance) and a power of 0.8 (a beta value of 0.2). If the proportion of diabetic cases treated with corticosteroids that eventually undergo surgery is approximately 0.5, as reported by Griggs et al.¹⁰, and the proportion of untreated cases that eventually undergo surgery is 1.0, as reported by Murphy et al.⁶, a minimum sample size of approximately seventeen digits in each group (diabetic corticosteroid, diabetic placebo, and nondiabetic), for a total sample size of fifty-one digits, is required to achieve the stated power per group. These cohort sizes are based on an assumed difference in population means of 0.5, a within-group standard deviation of 0.5, and approximately equal numbers of study participants in each group. The study was powered sufficiently to demonstrate (1) at least a 50% difference between the results of corticosteroid injection and those of placebo injection among diabetic digits and (2) at least a 50% difference between

diabetic digits and nondiabetic digits with regard to symptom resolution resulting from corticosteroid injection.

Data Analysis

An intention-to-treat analysis was performed. According to the principles of this analysis, digits in the placebo group that received additional injections that included corticosteroid were analyzed within the placebo group. Analysis of variance was used to compare continuous data, and the chi-square test was used to compare discrete data. Survival analysis was performed with use of proportional hazards regression techniques. All analyses were two-tailed, and $\alpha = 0.05$ was used to determine significance.

Results

Demographic Characteristics

Fifty-nine patients were initially enrolled in the study. Twenty-nine patients (twenty-nine digits) did not have diabetes mellitus and thus served as the control subjects. Thirty patients had a prior diagnosis of diabetes mellitus; fourteen of them (fifteen digits) were randomized into the placebo group and seventeen (twenty digits), into the corticosteroid group. One patient with involvement of two digits was randomized into both groups, with one digit assigned to the diabetic placebo group and one assigned to the diabetic corticosteroid group.

Three digits crossed over from the diabetic placebo group to the diabetic corticosteroid group. One received one corticosteroid injection, one received two corticosteroid injections, and one received one corticosteroid injection and then underwent a subsequent surgical release of the A1 pulley. These three digits were kept in the diabetic placebo group for the intention-to-treat data analysis¹³. One patient (one digit) in the diabetic corticosteroid group was lost to follow-up after six weeks; this patient was not included in the study analysis.

There were no significant differences between the nondiabetic and diabetic patients with regard to age, gender, handedness, affected hand, or affected digits ($p > 0.05$). These two groups did differ significantly with regard to the mean hemoglobin A_{1c} level (0.059 compared with 0.073; $p = 0.0001$) and the prevalence of nephropathy, retinopathy, neuropathy, and other pathologic conditions involving the hand (such as carpal tunnel syndrome, Dupuytren disease, and joint contractures) ($p < 0.05$). There were no significant differences between the diabetic placebo and diabetic corticosteroid groups with regard to age, gender, handedness, affected hand, affected digits, or hemoglobin A_{1c} level or the prevalence of insulin-dependent diabetes, other hand diseases, neuropathy, nephropathy, or retinopathy (Table I).

A final follow-up evaluation was performed for fifty-eight patients between thirteen and forty-one months. The mean duration of follow-up (and standard deviation) was 28 ± 7 months for the nondiabetic group, 23 ± 9 months for the diabetic corticosteroid group, and 26 ± 10 months for the diabetic placebo group ($p > 0.05$). Fifty-eight (98%) of the original fifty-nine returned for final follow-up.

TABLE I Demographic Characteristics

	Nondiabetic Group	Diabetic Corticosteroid Group*†	Diabetic Placebo Group†
No. of patients	29	16	14
No. of digits	29	19	15
Male‡	9	6	7
Female‡	20	10	7
Age§	63.1 ± 11.7	62.9 ± 9.00	61.4 ± 9.12
Right-hand dominant#	27	19	15
Left-hand dominant#	2	0	0
Right hand affected#	21	10	7
Left hand affected#	8	9	8
Involved digit#			
Thumb	7	4	2
Index finger	3	2	0
Long finger	8	8	6
Ring finger	10	4	7
Small finger	1	1	0
Hemoglobin A _{1c} level§**	0.059 ± 0.0055	0.0726 ± 0.0044	0.0728 ± 0.0098
Other hand disease‡**	1	5	1
Carpal tunnel syndrome‡	1	1	1
Dupuytren disease‡	0	1	0
History of trigger finger in other digits‡	0	2	0
Carpometacarpal osteoarthritis‡	0	1	0
Non-insulin-dependent diabetes mellitus#**	0	12	10
Insulin-dependent diabetes mellitus#	0	7	5
Nephropathy#**	0	5	1
Retinopathy#**	0	2	0
Neuropathy#**	0	1	4

*One patient (one digit) was lost to follow-up and is not included. †One male patient (two digits) was randomized to both the diabetic placebo group and the diabetic corticosteroid group. ‡The values are given as the number of patients. §The values are given as the mean and standard deviation. #The values are given as the number of digits. **There was a significant difference between the nondiabetic and diabetic groups ($p < 0.05$). (There was no significant difference in any characteristic between the diabetic corticosteroid group and the diabetic placebo group.)

Success of Injection Treatment

Twenty-two (76%) of the twenty-nine digits in the nondiabetic group responded to a single corticosteroid injection. Six digits required a second injection. After one or two injections, twenty-five (86%) of the twenty-nine digits had relief of symptoms, obviating the need for surgical intervention. Eleven of the nineteen digits in the diabetic corticosteroid group responded to a single corticosteroid injection. One digit required a second injection. After one or two injections, twelve of the nineteen digits had relief of symptoms, obviating the need for surgical intervention. Seven of the fifteen digits in the diabetic placebo group responded to a single placebo injection. Three patients (three digits) requested unblinding after the initial placebo injection and subsequently received a corticosteroid injection

(Table II). After one or two injections, eight of the fifteen digits in the diabetic placebo group had relief of symptoms so that they did not require surgical intervention. One patient (one digit) in the diabetic placebo group received a second corticosteroid injection (three injections in total). After one, two, or three injections, nine of the fifteen digits in the diabetic placebo group had relief of symptoms that obviated the need for surgery (Fig. 1). The outcomes of the injections in the diabetic corticosteroid group and the diabetic placebo group were similar after both the first ($p = 0.52$) and second injections ($p = 0.56$). There was no significant difference in the results after the first injection between the nondiabetic group and either the diabetic corticosteroid group ($p = 0.30$) or the diabetic placebo group ($p = 0.09$). However, there were significant differences

in the results after the second injection between the nondiabetic group and the diabetic corticosteroid group ($p = 0.03$) and the diabetic placebo group ($p = 0.006$).

Surgery was performed in three (10%) of the twenty-nine digits in the nondiabetic group. (An additional patient [one digit] requested surgery, but it had not been performed by the time of final follow-up.) Seven of the nineteen digits in the diabetic corticosteroid group and six of the fifteen digits in the diabetic placebo group required surgical management ($p = 0.035$ and $p = 0.020$, respectively, for the comparisons with the nondiabetic group). With the numbers studied, there was no significant difference in the frequency of surgery between the two diabetic groups ($p = 0.76$).

Although many patients were considered to have had successful treatment because they avoided surgery, not all of them remained symptom-free at the time of final follow-up. Twenty of the twenty-six digits that were not treated with surgery in the nondiabetic group were asymptomatic at the time of final follow-up compared with ten of the twelve digits without surgery in the diabetic corticosteroid group ($p = 0.65$) and seven of the nine digits without surgery in the diabetic placebo group ($p = 0.96$). With the numbers available, there was no significant difference between the diabetic groups ($p = 0.75$).

In the intention-to-treat analysis, digits that had had surgical intervention at the time of final follow-up were con-

TABLE II Injections and Surgical Treatment			
	Nondiabetic Group	Diabetic Corticosteroid Group	Diabetic Placebo Group
No. of patients	29	16	14
No. of digits	29	19	15
No. of crossovers (patients/digits)	0/0	0/0	3/3
No. of digits requiring a 2nd injection (corticosteroid)	6	1	3
No. of digits requiring a 3rd injection (corticosteroid)	0	0	1
No. of patients/digits treated with surgery	3/3	5/7	6/6
No. of crossovers requiring surgery	0	0	1

sidered to have been symptomatic. Twenty of the twenty-nine digits in the nondiabetic group were asymptomatic at the time of final follow-up compared with ten of the nineteen digits in the diabetic corticosteroid group ($p = 0.25$) and seven

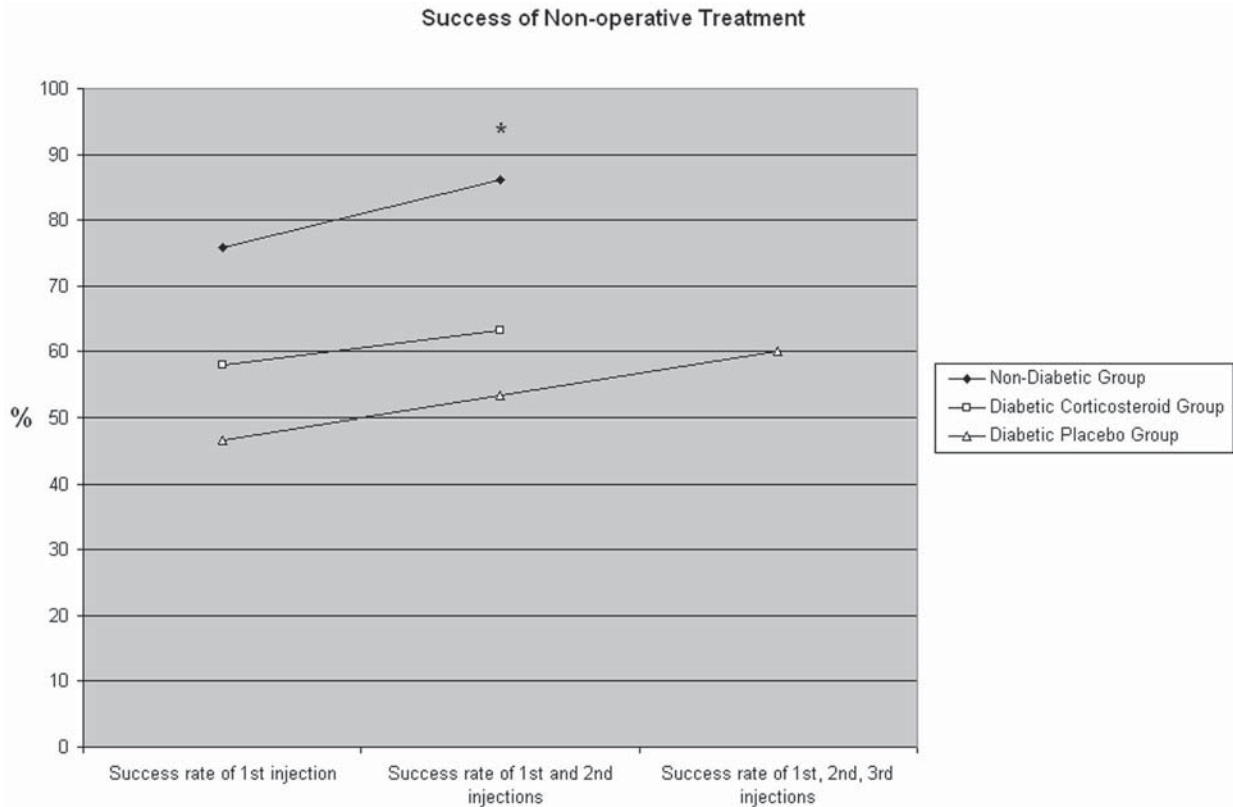


Fig. 1 Success of nonoperative treatment. *There was a significant difference between the nondiabetic group and the diabetic corticosteroid group ($p = 0.03$) and the diabetic placebo group ($p = 0.006$).

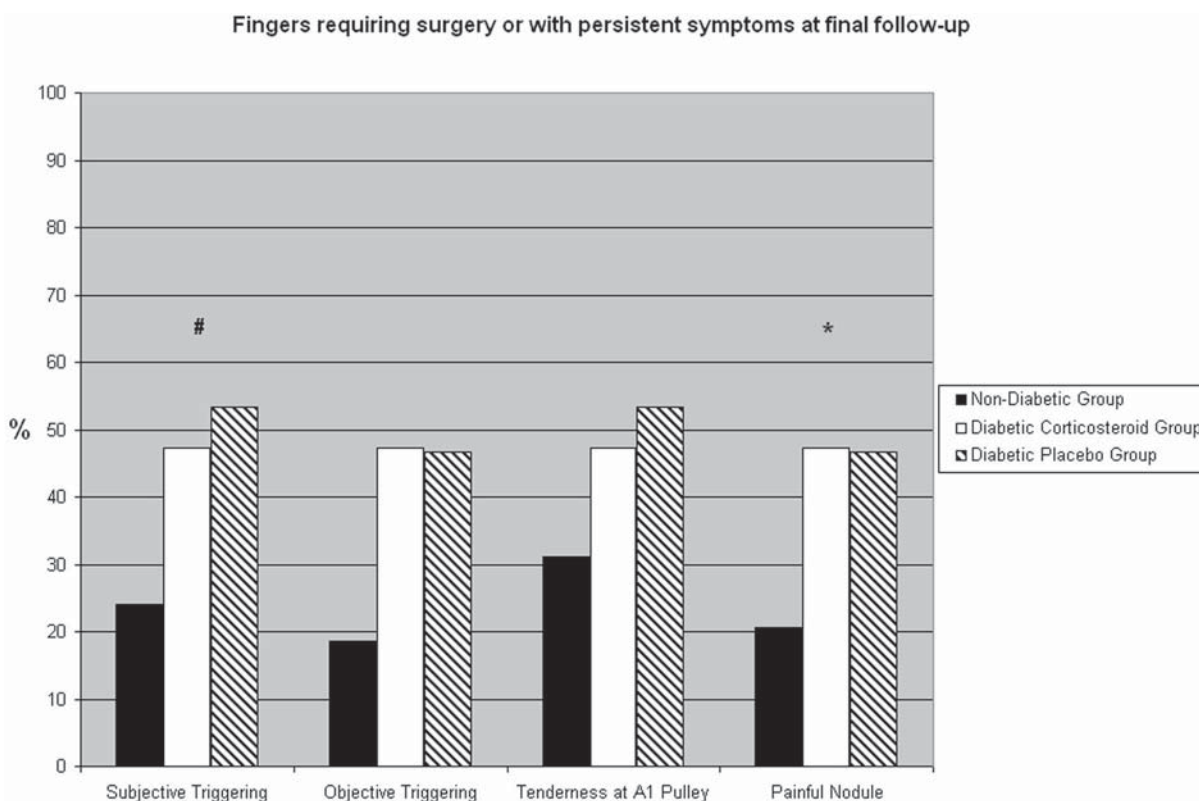


Fig. 2

Persistence of trigger finger symptoms at the time of final follow-up. *There was a significant difference in the prevalence of a palpable, painful nodule between the nondiabetic group and the diabetic corticosteroid group ($p = 0.05$). #Subjective triggering at the time of follow-up was significantly more prevalent in the diabetic placebo group than in the nondiabetic group ($p = 0.05$).

of the fifteen in the diabetic placebo group ($p = 0.15$). Again, there was no significant difference between the two diabetic groups ($p = 0.73$).

At the time of final follow-up, there was no difference between the two diabetic groups with regard to the persistence of trigger finger symptoms, including subjective triggering ($p = 0.72$), objective triggering ($p = 0.97$), tenderness at the A1 pulley ($p = 0.73$), and a palpable, painful nodule ($p = 0.97$). There was a significant difference in the prevalence of a palpable, painful nodule between the nondiabetic group and the diabetic corticosteroid group ($p = 0.05$). Subjective triggering at the time of follow-up was more prevalent in the diabetic placebo group than in the nondiabetic group ($p = 0.05$) (Fig. 2).

Effect of Hemoglobin A_{1c}

The serum hemoglobin A_{1c} levels were determined at the time of the patients' initial office visit and consent to enter into the study. The mean hemoglobin A_{1c} level was significantly higher in the diabetic groups (0.073) than in the nondiabetic group (0.059) (normal = 0.040 to 0.060) ($p = 0.0001$). There was no difference in the initial hemoglobin A_{1c} levels between the two diabetic groups (0.0726 compared with 0.0728; $p = 0.95$). The only significant interaction found between treatment success and hemoglobin A_{1c} levels was in the diabetic placebo group.

Diabetic patients who responded to the placebo injection had a lower mean hemoglobin A_{1c} level than those who did not respond to the initial injection and had a repeat injection (of corticosteroid) or surgical intervention (0.068 compared with 0.076; $p = 0.03$).

Type of Diabetes and Diabetic Comorbidities

There was no significant difference in the prevalence of surgery ($p = 0.55$) or the response to the first corticosteroid injection ($p = 0.51$) between the patients with insulin-dependent diabetes mellitus and those with non-insulin-dependent diabetes mellitus. Patients with diabetic neuropathy ($p = 0.03$) and those with diabetic nephropathy ($p = 0.008$) were more likely to undergo surgical intervention. Patients with diabetic nephropathy were less likely to obtain symptom relief after the first injection and thus more likely to require either another injection or surgical intervention ($p = 0.04$). However, no significant association was found between treatment outcome and the presence of diabetic retinopathy. Although this study demonstrated a significant relationship between nephropathy and neuropathy and decreased efficacy of corticosteroid injection for the treatment of trigger finger, these evaluations should be considered as suggestive because of the small sample sizes.

Complications

There were no adverse events or complications associated with the corticosteroid injections administered during this study.

Discussion

We performed a prospective, randomized study to evaluate the efficacy of corticosteroid injection into the flexor tendon sheath for the treatment of trigger finger in both diabetic and nondiabetic patients. Our findings confirm that corticosteroid injections are, in general, more effective in nondiabetic patients than in diabetic patients, as has been previously shown¹⁰⁻¹². Specifically, nondiabetic patients were significantly more likely to avoid surgery than were diabetics treated with corticosteroid injection and diabetics treated with a placebo (surgical rates, three of twenty-nine compared with seven of nineteen and six of fifteen, respectively).

Prospective studies in the endocrinology literature have implied that if diabetic patients manage their disease aggressively and maintain nearly normal hemoglobin A_{1c} levels, they will exhibit fewer symptoms of retinopathy, neuropathy, and nephropathy compared with diabetics who have higher hemoglobin A_{1c} levels¹⁴. We had hypothesized that poorly controlled diabetes mellitus might be a barrier to effective nonoperative management of trigger finger, since diabetic patients experience trigger finger more often than does the general population and high blood glucose levels portend more diabetic-related complications and comorbidities. This study did demonstrate that diabetic patients who responded to the placebo injection had a significantly lower mean hemoglobin A_{1c} level than did patients in the diabetic placebo group who had persistence of symptoms requiring either surgery or a second injection (crossover to corticosteroid treatment). This finding suggests that patients with lower hemoglobin A_{1c} levels are more likely to have spontaneous resolution or amelioration of trigger finger symptoms than are patients with poorly controlled diabetes mellitus. Further investigation may elucidate a threshold of glycemic control in diabetic patients, above which nonoperative management of trigger finger may be significantly less effective.

We also hypothesized that patients with systemic manifestations of diabetes mellitus would not respond as well to the corticosteroid injection as would patients without nephropathy, neuropathy, or retinopathy. Patients with diabetic nephropathy had a higher prevalence of surgical intervention ($p = 0.008$) and fewer successful responses to the first corticosteroid injection ($p = 0.04$). In addition, patients with diabetic neuropathy had a significantly higher prevalence of surgical intervention ($p = 0.03$). This suggests that the efficacy of intra-sheath corticosteroid injection may be decreased in patients with systemic manifestations of diabetes. This may be due to either a longer duration of the diabetes or less stringent glycemic control.

Several potential limitations regarding the interpretation of these data should be noted. Taras et al. reported that 17% of corticosteroid injections failed to enter the tendon sheath,

with the injectate remaining subcutaneous¹⁵. Despite confirmation of a fluid wave along the flexor tendon with the injection in all of our subjects, we did not obtain definitive proof of accurate, intra-sheath injection. However, it has been shown that resolution of trigger finger symptoms following subcutaneous injection is similar to that following injection into the flexor sheath¹⁵. Thus, while it is not impossible that inaccurate injection played a role in the poor outcomes, it is unlikely. A second potential limitation of the study lies in the statistical analysis of the three patients who had involvement of multiple digits. None of the nondiabetic patients had involvement of multiple digits, but three patients with diabetes did. One had involvement of four digits, all of which were treated with a steroid injection; another had involvement of two digits, both of which received a placebo injection; and a third had involvement of two digits, one of which was treated with a steroid injection and the other of which had a placebo injection. Because so few patients had involvement of multiple digits, statistical analysis of this subgroup was not performed, and these digits were by necessity analyzed as separate entities.

The results of this study should be interpreted in light of the fact that three patients crossed over from the diabetic placebo group to the corticosteroid treatment group. For the purpose of data analysis, these three crossovers remained in the diabetic placebo group according to the intention-to-treat principles¹³, in order to protect the integrity of the initial randomization process. Two of these patients did not require surgery after corticosteroid treatment, and one did. It is important to note, however, that there was no significant difference between the diabetic corticosteroid group and the diabetic placebo group with regard to the success of the injection treatment before or after the crossovers occurred.

The lack of a proscribed objective criterion for surgical intervention should be noted. Clinical decision-making regarding the transition from nonoperative treatment to operative treatment of trigger finger is by necessity subjective and based on a discussion of risks and benefits between the patient and surgeon. Although the lack of a specific criterion for surgery is a limitation of a scientific study, it reproduces the clinical decision-making process in the treatment of trigger finger. A final limitation of the study is that patients for whom one injection failed were not required to have a second or third injection prior to considering surgical intervention. Although additional injections were offered and may have indeed obviated the need for surgery, we did not believe that it was ethical to withhold surgery if the patient did not want to undergo repeat injection.

Although no complications of corticosteroid injection were found in this study, a previous study showed transient hyperglycemia after corticosteroid injection into the flexor tendon sheath for the treatment of trigger finger¹⁶. Post-injection blood glucose levels were not examined in our study.

In conclusion, given the absence of side effects in our patients, we recommend corticosteroid injection as a sound, low-risk primary treatment option for trigger finger in diabetic patients irrespective of their glycemic control. However, it

should be emphasized that the efficacy of corticosteroid injection in diabetic patients is significantly decreased compared with that in nondiabetic patients. In addition, this study suggests that patients with systemic diabetic manifestations may have a poorer response to corticosteroid injections for the treatment of trigger finger. ■

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