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Effectiveness of Corticosteroid Injections for Treatment of de Quervain's Tenosynovitis

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Abstract

Background: Although surgery can provide definitive treatment for de Quervain's tenosynovitis, nonoperative treatment could be preferable if symptoms are predictably relieved. We sought to determine the effectiveness of corticosteroid injections as treatment for de Quervain's tenosynovitis and to evaluate patient characteristics as predictors of treatment outcome. **Methods:** A retrospective study was conducted using our institutional database International Classification of Disease, version 9 (ICD-9) code list for de Quervain's tenosynovitis. Treatment success was defined as relief of symptoms after 1 or 2 injections. Relief was defined as resolution or improvement to the extent that the patient did not seek further intervention. Failure was defined as a subsequent surgical release or a third injection. Logistic regression analyses were performed to look for univariate associations between patient demographics/comorbidities and risk of treatment failure. **Results:** The treatment outcome of 222 limbs from 199 patients was studied. Of the 222 limbs, 73.4% (95% confidence interval [CI], 66.9%-79.1%) experienced treatment success within 2 injections, and 51.8% (95% CI, 45.0%-58.6%) experienced success after 1 injection. Body mass index (BMI) >30 and female sex were found to be significantly associated with treatment failure, with a 2.4-fold increase (95% CI, 1.02%-5.72%) in odds and 3.23 times greater (95% CI, 1.08%-9.67%) odds of failure, respectively. Although not reaching statistical significance, African American race, hypothyroidism, and carpal tunnel syndrome suggested increased odds of failure. **Conclusions:** This study indicates that corticosteroid injections are a useful treatment for de Quervain's tenosynovitis, leading to treatment success 73.4% of the time within 2 injections. This study also suggests that female sex and BMI >30 are associated with increased treatment failure.

Keywords: de Quervain's tenosynovitis, first dorsal compartment tenosynovitis, nonsurgical treatment, corticosteroid injection, predictor of treatment outcome

Introduction

de Quervain's tenosynovitis is caused by stenosis of the extensor pollicis brevis and abductor pollicis longus tendons within the first extensor compartment.[3] It has been described in medical literature as early as 1882.[7] Nonoperative treatment options include thumb spica splinting, nonsteroidal anti-inflammatory drugs (NSAIDs), therapy exercises, and corticosteroid injections into the first dorsal compartment.[3] Surgical release is the definitive treatment when nonoperative treatment fails to relieve symptoms. Although surgery can provide definitive treatment, nonoperative treatment could be preferable if symptoms could be predictably relieved.

Despite the high prevalence of de Quervain's tenosynovitis, the literature describing the effectiveness of nonoperative treatment in larger study cohorts is limited.[3] Weiss et al[13] reported that the use of a splint did not provide added benefit in addition to an injection, whereas a randomized prospective study by Mardani-Kivi et al[8] demonstrated that the combination of thumb spica splinting/casting with corticosteroid injection yielded more satisfactory results when compared with injection alone. There has also been a case report of refractory de Quervain's tenosynovitis treated with an injection of platelet-rich plasma.[9] In addition, a randomized double-blind trial demonstrated that concomitant treatment with nimesulide, a nonsteroidal anti-inflammatory agent, did not lead to an improved outcome when compared with triamcinolone acetonide injection alone.[4] Due to the invasive nature of surgical treatment, and the associated longer recovery

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period and potential complications, use of noninvasive treatment such as steroid injection should be better studied to understand maximal benefit.

Our hypothesis is that corticosteroid injection may be an effective treatment for de Quervain's tenosynovitis. The purpose of our study was to evaluate the effectiveness of 1 or 2 corticosteroid injections and determine whether specific demographic or comorbidity factors could be predictive of treatment success or failure.

Materials and Methods

A retrospective study was conducted using a patient list obtained from the department database International Classification of Disease, version 9 (ICD-9) codes for de Quervain's tenosynovitis based on clinical exam. After institutional review board (IRB) approval, patient charts were reviewed, and a Microsoft Excel for Mac 2011, version 14.5.9, was used to create a spreadsheet populated with variables of interest (Copyright 2010 Microsoft Corporation). All patients in the collected cohort had at least 1 injection. At this first injection, the ages of the patients ranged from 17.75 to 84.76 years. Treatment success was measured as relief from symptoms as reported by the patient after 1 or 2 injections. Relief from symptoms is defined as resolution or improvement to the extent that the patient did not seek further intervention. Failure was defined as receiving a third injection or undergoing a surgical release procedure following the first or second injection. Preparation of betamethasone (3-6 mg), triamcinolone (10-40 mg), or dexamethasone (4 mg), based upon provider preference, was used for the injection, and lidocaine (5-10 mg) was the local anesthesia of choice. Injections were performed by hand surgeons, nurse practitioners, and physician assistants.

The study included a chart review of 222 cases of de Quervain's tenosynovitis from 199 patients treated with corticosteroid injections. The following information was collected during the chart review: age, sex, race, ethnicity, body mass index (BMI) when available, injected limb side, injection dates of service, type of corticosteroid injected, content of follow-up clinical note when present, surgery date of service if applicable, presence of comorbidities (carpal tunnel syndrome, diabetes, rheumatoid arthritis, Dupuytren's, hypothyroidism, mucopolysaccharide storage disease, amyloidosis, congestive heart failure), and presence of insurance covered by worker's compensation. Patients with incomplete information were excluded, and we continued until an adequate number of patients was obtained. There were no other exclusions. The earliest injection date captured in the review was in 2003, and the most recent date of service was in 2015. One hundred ninety-nine observations allotted for a 2-sided 99% confidence interval (CI) with a lower limit of 66.3% and an upper limit of 82.5%, or, equivalently, with an 8% margin of error. This met the preset requirement of an estimated rate of success of at least 65% with a 97.5% CI (69%-81%) with a 2-sided 95% CI, as a success rate of 75% was anticipated, indicating that the 222 observations in 199 patients allow for a reasonable estimate of success.

Logistic regression analyses were used to estimate probabilities of treatment success and associated 95% CIs, as well as to assess the significance of univariate associations between patient characteristics and treatment failure. Patient characteristics include sex, age at first injection, race, ethnicity, BMI, injection side, and comorbidities including diabetes, hypothyroidism, Dupuytren's, and carpal tunnel syndrome. Due to the fact that measurements were performed on both hands for some patients, the data could not be treated as independent. A generalized estimating equations (GEEs) approach was employed to account for the clustering effects due to right and left hands from the same patients. All hypothesis tests were 2-sided, and P values smaller than or equal to .05 were considered statistically significant. All analyses were carried out using SAS/STAT software, version 9.4, of the SAS System (Copyright 2002-2012; SAS Institute Inc) on a Windows 7 platform.

Results

The treatment outcomes of 222 limbs from 199 patients were analyzed. Of the 222 patients, 187 patients were female and 35 patients were male. At the first injection, the median age of the treatment success group was 49.15 years (SD, ±15.04) and 46.48 years (SD, ±13.98) in the treatment failure group (Table 1). Of the reviewed cases, sufficient relief (ie, treatment success) was reached in 73.4% (95% CI, 66.9%-79.1%) of the interventions within 2 injections. With a single injection, the estimated rate of treatment success was 51.8% (95% CI, 45.0%-58.6%). The range of time between injections for those patients who received 2 injections was 28 to 1031 days, with a mean time of 183 days (SD, ±184 days). Logistic regression analyses performed to look for univariate associations between patient demographics/comorbidities and treatment failure identified BMI (<30 vs ≥30) and sex as significantly associated with treatment failure (P = .046 and P = .036, respectively), with a 2.4-fold increase (95% CI, 1.02%-5.72%) in odds of requiring further intervention (treatment failure) for BMI ≥30, and 3.23 times greater (95% CI, 1.08%-9.67%) odds of treatment failure in females (Table 2). Although not reaching statistical significance, African American race, hypothyroidism, and carpal tunnel syndrome suggested increased odds of treatment failure. With the exception of age, the odds ratios of all other variables were in the direction of increased failure.

Table 1. Main Demographics of Study Patients (Observations = 222, *N* = 199).

Variable	No.	Mean (±SD)
Demographics		
Sex		
Female	187	
Male	35	
Age at first injection		
Treatment success group	163	49.15 (±15.04)
Treatment failure group	59	46.48 (±13.98)
Race		
Caucasian	187	
African American	24	
Asian	4	
Other	3	
Ethnicity		
Hispanic	6	
Non-Hispanic	212	
BMI[a]		
>30	50	
<30	98	
Injection side		
Left	118	
Right	104	
Comorbidities		
Diabetes	26/195	
Hypothyroidism	33/188	
Dupuytren's	7/214	
Carpel tunnel syndrome	58/163	

Note. BMI = body mass index.
[a]Did not have BMI information on all patients.

Table 2. Unadjusted Association With Treatment Failure.

Variable	OR	95% CI	*P* value
Demographics			
Sex			
Female vs male	3.23	1.08-9.67	.036
Age			
For each year of increased age at first injection	0.99	0.97-1.01	.253
Race (vs Caucasian)			
African American	2.07	0.84-5.11	.116
Asian	0.97	0.08-11.40	.978
Ethnicity			
Hispanic vs non-Hispanic	1.36	0.15-12.44	.786
BMI >30	2.41	1.02-5.72	.046
Comorbidities (yes vs no)			
Diabetes	1.54	0.59-3.99	.379
Hypothyroidism	2.01	0.84-4.78	.116
Dupuytren's	2.12	0.57-7.81	.261
Carpal tunnel syndrome	1.67	0.84-3.36	.144

Note. OR = odds ratio; CI = confidence interval; BMI = body mass index.

Discussion

Our study supports existing smaller studies that corticosteroid injections are a more efficacious treatment for de Quervain's tenosynovitis. A study by Zingas et al[15] evaluated outcomes of steroid injection into the tendon sheath of the extensor pollicis brevis and/or the abductor pollicis longus through a double-blind prospective study. Despite its small sample size of 19 patients, the study indicated that perhaps injecting both tendon compartments might lead to the most desirable outcome, with injection accuracy potentially playing a critical role in treatment outcome.[15] However, the necessity of having the medication within the compartment is not clearly understood, and it has been demonstrated in other tenosynovitis conditions that injections can be effective even when not within the sheath.[12] In contrast, a more recent study by Kume et al[5] reported a greater decrease in pain at follow-up in the ultrasound-guided group compared with the traditional injection group as measured by the visual analog scale. This supports that injection into this exact anatomical location, made more precise by technology, is an efficacious treatment for de Quervain's tenosynovitis. Furthermore, Lane et al[6] reviewed their treatment of 300 patients (319 limbs) with de Quervain's tenosynovitis, comparing custom orthosis, naproxen 500 mg, and corticosteroid injections with 4-mg betamethasone. They grouped patients based on severity as assessed by the authors, classifying as minimal, mild, and moderate to severe.[6] There were 249 patients in the moderate to severe group who received injections, with 53 requiring 2 injections and 17 requiring 3 injections.[6] Complete relief was reported in 76% with 7% improved, and 4% not improved.[6]

Corticosteroid injections are not completely benign, and adverse reactions can occur. Stepan et al[11] reported that type I diabetics and insulin-dependent diabetics experienced elevated blood glucose levels for 2 days following an injection. Goldfarb et al[2] determined in a double-blind randomized study that despite 33% of patients experiencing a flare reaction, patients responded to extra-articular injections for trigger digits and de Quervain's tenosynovitis with no difference between standard or pH-balanced injections. This 125-patient study included 37 patients with de Quervain's tenosynovitis and 88 patients with trigger finger.[2] We also investigated the use of different types of corticosteroid preparations, but more data are required to study any potential relationship with treatment outcome or side effects.

For patients who received more than 1 injection within the study period, the time between the first and second injections is variable. Earp et al,[1] in a prospective study of 50 patients, showed that 82% of enrolled patients experienced a decrease in symptoms after 1 injection. Of these patients, more than half did not experience recurring pain for 12 months. Upon analysis of our study, there was not an

apparent pattern concerning duration between injections and treatment success or failure. In the future, it would be interesting to investigate patients who received at least 2 injections to note whether time frame may also serve as a predictor of outcome.

In addition, there is limited literature evaluating demographics as predictors of treatment outcome, in spite of information describing predisposing factors to developing de Quervain's tenosynovitis. Wolf et al[14] reported in a retrospective study of military personnel that an age of greater than 40 years, black race, and female gender are risk factors for developing de Quervain's tenosynovitis. Obesity may also increase the risk of failure as there may be physiological and anatomical factors associated with obesity that either make such patients less responsive to treatment or predispose them to a more severe condition. One possible explanation for higher failure rates in patients with BMI ≥30 is difficulty in placing the medication within the first extensor compartment due to increase in presence of subcutaneous adipose tissue.

We did not see a relationship between patients who filed for worker's compensation and treatment success, but a larger study may help to further investigate this relationship, as we did not have adequate power to answer this question.

As with all retrospective studies, there are limitations to this review. Our data are only as good as that recorded in the medical record. In addition, the 199 patients were chosen at random, favoring more recent dates of service, which could introduce potential bias. Some variables were not always available, such as BMI, hand dominance, or medical comorbidities. We used a variety of medications and dosages for injections, and there may be differences in the effectiveness between them that we were not able to identify. However, good results have been reported with different preparations.[10] In addition, some patients, based on patient preference or provider recommendation, opted to use an orthosis whereas others did not. Furthermore, resolution of symptoms is completely subjective, and we rely on the patient's report of symptom relief. We do not have a definitive time point for the criteria of success or failure, but patients are often instructed to return for follow-up within 6 to 8 weeks, or if needed. Some patients may have recurrence of symptoms following discharge, and if they did not return to the institution, we would not have access to this information. In addition, some patients could have sought care elsewhere within the community. However, we are a larger referral institution, and we believe that although some patients may seek treatment elsewhere, the substantial majority remain within our system, returning for further treatment of other hand conditions as they occur. Furthermore, some of the patients may have been satisfied with incomplete relief or may have preferred surgery following 1 injection. It is also possible that some of the practitioners may have recommended surgery after 1 injection and thus not have followed the more traditional clinical practice of offering 2 injections, followed by surgical intervention for refractive pathologies. Finally, some patients did exhibit concurrent symptoms of basal joint arthritis, but wrist pain from this pathology is likely to be localized to a region that is distinct from the area that is exacerbated by de Quervain's tenosynovitis. In spite of the limitations, we feel this information is helpful for the health care provider treating this condition and the variability described above represents real treatment scenarios.

Our study demonstrates that corticosteroid injections are an effective clinical treatment for de Quervain's tenosynovitis with a short-term success rate following 2 or fewer injections of greater than 70%. Further investigation is needed to better evaluate other potential predictors of treatment success and whether symptoms recur at a later point in time.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

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.

Statement of Informed Consent

This was a retrospective chart review and institutional review board (IRB) approval was obtained, but because there was no patient contact, additional informed consent was not required by the IRB.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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