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Is This Going to Hurt, Doc? Predicting Pain with Corticosteroid Injections for Upper Extremity Conditions

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Background: Corticosteroid injections (CSIs) are used in a wide variety of upper extremity pathologies for both diagnostic and treatment purposes. Many patients ask about pain associated with the procedure before agreeing to proceed. The purpose of this study was to correlate perceived pain tolerance and resilience with patient-reported injection pain during and immediately after injection.
Methods: One-hundred patients indicated for a CSI for an upper extremity condition were recruited for the study. Patients completed a Brief Resilience Scale, Patient-Reported Outcomes Measurement Information System pain interference form, and assessment of pain tolerance before injection. Physicians predicted pain tolerance and resilience for each patient. Immediately after the procedure, patients completed a second survey, assessing pain during and 1 minute after injection.
Results: Physician-predicted patient resilience and pain tolerance was lower than that self-reported by patients. Pain with injection was inversely correlated with physician-predicted pain tolerance and resilience but not with patient-reported pain tolerance. Injection pain ratings did not correspond with patients' willingness to undergo subsequent injections.
Conclusions: Procedural pain is an important consideration for many patients, especially in awake procedures. Appropriate counseling is crucial to support informed consent and enhance patient outcomes. This study demonstrated that a physician's clinical experience can be used to predict a patient's pain with CSI and should be considered when counseling patients. *(Plast Reconstr Surg Glob Open 2023; 11:e5017; doi: 10.1097/GOX.0000000000005017; Published online 30 June 2023.)*

INTRODUCTION

Corticosteroid injections (CSIs) are common office-based procedures conducted for a variety of hand and upper extremity pathologies. CSIs can act as a definitive therapy for some conditions, serve a diagnostic purpose, or decrease pain as a temporizing treatment in chronic conditions.[1–4] These injections are generally thought of as safe with rare major adverse events. However, the thought of an injection can be daunting to patients, and CSIs can be painful during and after the injection. In some studies, up to 81% of patients report increased pain after injection, and 2%–33% of patients experience a flare reaction, defined as an increase in the visual analog scale (VAS) two points over preinjection pain.[3,5–7] Adjunctive techniques have been used to decrease pain associated with the procedure, including ice, ethyl chloride spray, transdermal local anesthesia, or injected local anesthesia. The reported effectiveness of these strategies for treatment of flare reactions and postinjection pain is variable.[3,5,8] Pain is an individual experience and can be influenced by numerous patients as well as clinical factors.

It is well established that patient psychologic factors and social determinants of health influence health outcomes.[9–11] This applies to hand and upper extremity conditions as well. Higher rates of upper extremity disability have been demonstrated in patients with pain anxiety, heightening illness concern, and fear of movement.[12] Furthermore, depression was shown to be correlated to disability and pain intensity after minor hand surgery.[11] Various constructs have been developed to better quantify and delineate psychologic factors. Pain interference

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describes the degree that physical, cognitive, social, and emotional activities are limited secondary to pain. The Patient-Reported Outcomes Measurement Information System (PROMIS) Pain Interference instrument is a validated computerized adaptive test developed by the NIH, which can be used to measure these consequences.[13–15] Pain interference is closely related to resilience, which is defined as the ability to bounce back, and can be described as a positive reframing of pain interference.[13] The Brief Resilience Scale (BRS) is a validated six-question survey used to quantify how patients perceive their ability to recover from stress. It can provide valuable information on patient resilience for health outcomes.[16,17]

The primary aim of this study was to compare physician- and patient-predicted pain tolerance with patient-reported pain during injection. Additionally, we aimed to study the relationship between predicted pain tolerance, resilience, pain interference, predicted pain of injection, and pain before injection. We tested the null hypothesis that patients with a lower predicted pain tolerance would not report a higher degree of pain during CSIs.

Takeaways

Question: Can physicians and patients predict the pain associated with corticosteroid injections for upper extremity conditions?

Findings: Pain with injection was inversely correlated with physician-predicted pain tolerance but not with patient-reported pain tolerance. Depending on the site, average injection pain was 3.1–4.5 on a 10-point scale.

Meaning: Many patients ask about pain associated with injections before agreeing to proceed. Appropriate counseling is crucial to support informed consent and enhance patient outcomes. This study demonstrated that a physician's clinical experience can be used to predict a patient's pain with upper extremity corticosteroid injections.

METHODS

After IRB approval, data were collected prospectively from patients seen in a combined orthopedic and plastic surgery hand clinic at a single institution. Before their appointment, patients completed the PROMIS Pain Interference adult form, Brief Resilience Scale, and a demographic form which is the standard of care at our institution. Patients who were identified as candidates for a CSI were first counseled on risks, benefits, and alternatives of the procedure. Patients who elected to proceed were then asked to participate in voluntary two-part survey before and after injection. Inclusion criteria included age older than 18 years and ability to complete the survey in English.

Before injection, the physician recorded their prediction of patient pain tolerance and perceived resilience using a five-point Likert scale. This prediction was based on the initial patient encounter, including the history and physical examination, the review of the risks, benefits, alternatives, and the explanation of possible complications for CSIs. All participating physicians were board-certified in their specialty with a subspecialty certificate in surgery of the hand (formerly Hand CAQ). Physicians were instructed on the use of the following five-point Likert scale denoted a value of 1 for "poor," 2 for "below average," 3 for "average," 4 for "above average," and 5 for "excellent." A score of 5 represented the highest 10% of patients; 4 represented 11%–33%, or the "upper third"; 3 represented 34%–66%, or the "middle third"; 2 represented 67%–90%, or the "lower third"; and 1 represented the lowest 10% of patients for standardization of scoring in terms of pain tolerance and resilience. Also before injection, patients confidentially completed the first part of a survey asking the following information: previous injections, prediction for how painful the procedure will be on a 10-point scale (1 no pain and 10 worst imaginable pain), pain tolerance compared with others on a five-point Likert scale, and current pain level on a 10-point scale. The patients then received the planned CSI using standardized techniques by one of three fellowship-trained hand surgeons at the single institution. All injections were prepared with a 1:1 ratio of 1% lidocaine without epinephrine and 40 mg triamcinolone injected using a 27-gauge needle. Ethyl chloride spray was used for 5 seconds on the skin overlaying the injection point before injection for all patients. Fluoroscopy was used for basilar thumb arthritis and hand or wrist arthritis diagnoses. For all other injections, anatomic landmarks were used without additional imaging.

One minute after injection, patients confidentially completed a postprocedural survey with the following questions: pain of the procedure on a 10-point scale, whether the injection was more or less painful than expected on a five-point Likert scale, current pain level on a 10-point scale, and likelihood of undergoing the procedure again. This study qualified as meeting criteria for quality improvement after evaluation by the institutional review board at the University of Virginia and was, therefore, approved.

All data were deidentified and exported into a secure RedCap database. Descriptive statistics were used to analyze patient characteristics, diagnoses, and pain outcomes. Kruskal-Wallis tests were performed to compare resilience and the pain outcomes to the predictions of pain tolerance based on below average, average, or above average groupings. Bivariate Spearman correlations were used to separately compare patient- and physician-perceived resilience and pain tolerance to the reported pain of the injection. Statistical significance was assigned a P value of less than 0.05 for all calculations.

RESULTS

A total of 100 consecutive patients receiving CSIs for hand and upper extremity conditions were included in this study. CSIs were given most frequently for stenosis tenosynovitis (47% of patients), followed by basilar thumb arthritis (18%), then hand or wrist arthritis (11%). Fifty-six percent of patients had received a prior steroid injection. Fluoroscopic guidance was used in 28% of cases (Table 1).

Table 1. Patient and Injection Characteristics

Factor	Number
Condition	
Carpal tunnel syndrome	9
DeQuervain tenosynovitis	9
Hand or wrist arthritis	11
Epicondylitis	2
Stenosing tenosynovitis	47
Basilar thumb arthritis	18
Other	4
Fluoroscopy used	
Yes	28
No	72
Previous injection	
Yes	56
No	44

Based on a five-point Likert scale, 10% of patients perceived their pain tolerance to be poor or below average, 39% average, and 51% above average or excellent. Physician-predicted pain tolerance was lower with 29% poor or below average, 50% average, and 21% above average or excellent. The average PROMIS pain interference score was 59.4±6.2. The average value for the BRS was 3.8 on a scale of 1–5. Based on this scale, 9% of patients had above average or excellent resilience, 68% of patients had average resilience, and 23% of patients had low or poor resilience. Again, physician-predicted resilience was lower than patient-reported resilience with 27% low or below average, 43% average, and 30% above average or excellent (Table 2).

Table 2. Patient and Physician Perceived Pain Tolerance and Resilience

Factor	Number
PROMIS pain interference score	
Mean	59.4±6.2
Patient perceived pain tolerance	
Poor (low pain tolerance)	1
Below average	9
Average	39
Above average	35
Excellent (high pain tolerance)	16
Physician perceptions of patient pain tolerance	
Poor (low pain tolerance)	5
Below average	24
Average	50
Above average	17
Excellent (high pain tolerance)	4
Brief resilience scale	
Mean	3.8
Low resilience	9
Average resilience	68
High resilience	23
Physician perception of patient resilience	
Poor (low resilience)	4
Below average	23
Average	43
Above average	24
Excellent (high resilience)	6

Table 3. Patient Pain and CSI Pain

Factor	Number
Pain before injection	
Mean	3.9±2.4
Minimum/maximum	0/10
Anticipated pain of injection	
Mean	4.8±2.4
Minimum/maximum	0/10
Injection pain compared with expectation	
Much more painful	2
More painful	17
As expected	19
Less painful	34
Much less painful	28
Injection pain rating	3.8±2.4
One-min post injection pain rating	1.6±2.1
Willingness to undergo future injections	
Yes	97
No	3
Pain by injection type	
Carpal tunnel syndrome	3.9±2.3
DeQuervain tenosynovitis	4.3±3.3
Hand or wrist arthritis	3.1±2.8
Stenosing tenosynovitis	3.7±2.1
Basilar thumb arthritis	4.5±2.8
Epicondylitis	4.0±2.8

Patients reported a mean pain from their upper extremity condition of 3.9 on a VAS of 0–10 before injection. Patients anticipated a mean pain of injection of 4.8. The most painful injection was an intra-articular injection for basilar thumb arthritis at 4.5 on a VAS of 0–10. Interestingly, the least painful injection was an intra-articular injection for hand or wrist arthritis at 3.1. Based on the postinjection survey, 19% of patients thought that the CSI was more painful than anticipated, 19% as painful as expected, and 62% less painful than expected. The average 1-minute postinjection pain score was 1.6. Interestingly, 97% of patients reported that they were willing to undergo the procedure again. Of the three patients who were unwilling, one patient thought the injection was as painful as expected, whereas the others thought it was more painful than expected (Table 3).

Patients who reported above average pain tolerance had lower pain before injection, lower pain interference, and higher resilience based on the BRS. They also endorsed lower pain with injection and 1 minute after injection. However, only a higher score on the BRS had a statistically significant correlation with higher perceived pain tolerance (Table 4). On the other hand, the surgeon predicted that the above average pain tolerance group had lower anticipated pain of injection, higher resilience based on BRS, and lower pain rating after injection. Here, predicted pain of injection was statistically correlated with surgeon predicted pain tolerance (Table 5).

On an average, the surgeon-predicted patient resilience was approximately one point lower than the brief resilience scale completed by the patient, and the surgeon-predicted patient pain tolerance was approximately one point lower than patient-predicted pain tolerance. Based

Table 4. Clinical Pain Outcomes by Patient Perception of Pain Tolerance

Pain Tolerance	Above Average	Average	Below Average	Sig
Patients	51	39	10	
VAS pain before injection (IQR)	3.5 (4.0)	4.3 (4.0)	4.0 (2.8)	0.59
Predicted pain of injection (IQR)	5.0 (4.0)	4.7 (4.0)	6.0 (3.5)	0.46
PROMIS pain interference (IQR)	57.7 (9.8)	59.8 (5.8)	60.9 (9.3)	0.22
Brief resilience scale (IQR)*	4.2 (1.0)	3.5 (0.8)	3.3 (0.6)	0.00
Injection pain rating (IQR)	3.0 (4.0)	4.0 (3.0)	4.0 (5.0)	0.12
One-min post injection pain rating	0	0	2.6	0.22

*Statistical difference between below average, average, and above average pain tolerance versus BRS.

Table 5. Clinical Pain Outcomes by Physician Perception of Patient Pain Tolerance

Pain Tolerance	Above Average	Average	Below Average	Sig
Patients	22	49	29	
VAS pain before injection (IQR)	3.5 (4.0)	3.0 (3.0)	5.0 (3.5)	0.06
Predicted pain of injection (IQR)*	3.5 (2.3)	5.0 (3.0)	6.0 (3.5)	0.00
PROMIS pain interference (IQR)†	57.9 (6.3)	57.6 (10.6)	62.0 (8.3)	0.03
Brief resilience scale (IQR)	4.0 (1.4)	3.8 (1.0)	3.5 (1.0)	0.11
Injection pain rating (IQR)	3.0 (4.0)	4.0 (4.0)	5.0 (5.0)	0.05
One-min post injection pain rating	1.0	0.0	1.0	0.66

*Statistical significance between below average, average, and above average pain tolerance and predicted pain of injection.
†No significant trend, but each group statistically significant from each other.

on Spearman correlations, physician-predicted resilience and physician-predicted pain tolerance were both significantly correlated to the VAS pain with CSI. Only patient-completed BRS had a significant correlation to the VAS injection pain.

DISCUSSION

Common upper extremity hand conditions place a significant burden on the health care system, effect functionality, and impair ability to return to work. Office-based CSIs are used by medical practitioners across multiple specialties for both therapeutic and diagnostic purposes in the upper extremity. It is common for patients undergoing nonsurgical procedures to inquire about pain associated with the procedure. This is a difficult metric for physicians to predict and communicate to patients. However, this is also a critical component of preprocedural counseling and setting expectations. We demonstrated that a physician's prediction of patient pain tolerance and resilience was inversely correlated to patient pain with upper extremity CSIs. This is a valuable conclusion and provides support to physicians that their predictions of injection-related pain can be valid.

When patients ask whether an injection will be painful, it is beneficial for providers to be able to offer the patient a data-driven response in addition to a prediction of pain from their clinical acumen. From this study, responses could include the following: most patients rate the pain of injection slightly less than a 4 of 10. The majority of patients (62%) rate the pain of injection as less painful or much less painful than expected. Patients rate their pain 1 minute after injection less than their pain before injection. These numbers may be able to help patients prepare for the injection and ease anxiety in patients hesitant to undergo the procedure.

This study also demonstrated that the BRS rating was inversely correlated to pain with injection; however, patient-predicted pain tolerance was not. The BRS is a validated tool used to assess the ability to bounce back after a stressful event and may be more useful in predicting pain than patient judgement alone.[16] Alokozai et al[18] demonstrated that patients have some ability to forecast postoperative disability but less so, postoperative pain.

Despite 19% of patients reporting the injection as more painful than expected, 97% of patients reported a willingness to undergo future injections on their 1-minute postprocedure survey. This is quite high because patients did not know the success of the injection at this time point. Injections for basilar thumb arthritis were reported to be the most painful. However, intra-articular injections of the hand or wrist were found to be the least painful injections. Therefore, no conclusion could be made based on pain levels and intra-articular versus extra-articular injections. However, knowing the relative pain with injection could assist surgeons with patient counseling and support.

There were several limitations to the study. Participation was limited to English-speaking patients older than 18 years of age and, therefore, may not be generalizable to the broader population. There were only three fellowship-trained hand surgeons at a single institution involved in the study to predict patient pain tolerance and resilience based on the patient encounters. Although this offered consistency with injection technique and patient counseling, a greater variety of providers could decrease any associated bias and again make outcomes more generalizable. Demographic data, such as income level, age, education level, and insurance status, were not collected and, therefore, not factored into the analysis, which could have influenced results. Future studies could investigate

relationships between social determinants of health, predicted pain of CSI, pain with injection, and pain immediately after injection.

Physician factors have been shown to be important for patient outcomes and decision-making.[10,13] We demonstrated that physicians have an important ability to predict patient pain with CSIs for common conditions of the upper extremity. This study provides support for physicians' clinical acumen when counseling patients before injection. The majority of patients found CSIs to be less painful than anticipated, and almost all patients were willing to undergo an injection in the future. Appropriate counseling is crucial to support informed consent, ease patient anxiety before procedures, and enhance patient outcomes.

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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

PATIENT CONSENT

The current study qualified as quality improvement by our institutional board review and did not require separate informed consent at our institution.

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