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Effective Conservative Treatments for de Quervain's Tenosynovitis: A Retrospective Outcome Study

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Abstract

Study Design: Retrospective chart review.

Introduction: De Quervain's tenosynovitis is a repetitive stress disorder occurring at the first dorsal compartment of the wrist at the radial styloid and is commonly treated by hand therapists.[1-3] Conservative treatments include activity modification, modalities, orthotics, and manual therapy.[4-7] The literature is unclear regarding best practice for treating de Quervain's tenosynovitis with conservative methods.[5,8,9]

Purpose of the study: The purpose of this study was to identify which treatment or treatment combinations was most effective to reduce pain and improve functional outcomes for patients with de Quervain's tenosynovitis.

Methods: A retrospective chart review was conducted with 42 patients seen in outpatient therapy. Patient pain was measured using the Numeric Pain Rating Scale (NPRS) and the *Quick*DASH was utilized to assess functional outcomes.[10,11]

Results: Both iontophoresis with dexamethasone and therapeutic pulsed (20% or 50%) ultrasound (1.0-1.5 w/cm^2) were found to have clinical significance as well as statistical significance on the *Quick*DASH (p= 0.028) and NPRS (p= 0.046) respectively. Other treatment methods were found to be clinically significant but not statistically significant. Demographics of this sample were reflective of the literature as there were 32 women and 10 men.[6] The mean age of the sample was 39.13 years (range 19-63 years).

Conclusion: This study demonstrated that iontophoresis with dexamethasone may improve functional outcomes while therapeutic pulsed (20% or 50%) ultrasound (1.0-1.5 w/cm ^{2}) may be effective in decreasing pain in patients with de Quervain's tenosynovitis.

Level of Evidence: 4.[12]

Introduction

De Quervain's tenosynovitis is a condition characterized by inflammation at the first dorsal compartment of the wrist at the radial styloid.[2] Inflammation affects the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) tendons and each of their tendon sheaths and may result in thickening of the first dorsal extensor sheath. Individuals who perform repetitive activities of the wrist and hand and who repeatedly use their thumbs in grasping and pinching motions are most susceptible to de Quervain's tenosynovitis.[3] Population groups at an increased risk for the development of de Quervain's tenosynovitis include: women, parents of young children, and individuals with job tasks that involve repetitive movements of the hand and wrist.[6]

The main symptom of de Quervain's tenosynovitis is pain with motions of the wrist or thumb.[13] Decreased abduction of the carpometacarpal joint of the thumb, palpable thickening of the extensor sheath and of the tendons distal to the extensor tunnel, and crepitus of the tendons moving through the extensor sheath may also occur.[2] Studies have agreed upon diagnostic criteria for de Quervain's tenosynovitis including pain or tenderness over the radial side of the wrist and pain reproduced by resisted thumb extension or abduction. In addition, the Finkelstein's test is a physical assessment used to diagnose de Quervain's tenosynovitis, which is administered by folding the thumb across the palm and flexing the fingers over the thumb as the wrist is actively or passively deviated toward the ulnar side.[5] A positive test results in localized pain over the radial styloid and may indicate tenosynovitis of the APL and EPB tendons. Validity and reliability of this test has been questioned by several authors.[6,13-15]

De Quervain's tenosynovitis is one of the most common diagnoses treated by occupational therapists specializing in hand therapy; therefore, it is imperative that hand/ occupational therapists have knowledge of evidence-based tools and techniques specific to de

Quervain's tenosynovitis.[1] Conservative occupational therapy treatments for de Quervain's tenosynovitis include, but are not limited to, physical agent modalities (i.e. iontophoresis, ultrasound, and fluidotherapy), activity modification, manual therapy, anti-inflammatory medications, and a thumb spica or long opponens orthosis.[4-7] Although the existing literature provides information regarding tools and treatment methods, there is no consensus on the appropriate course of treatment for a patient with de Quervain's tenosynovitis.[5,8] Similarly, there are no useful evidence-based recommendations for the treatment of de Quervain's tenosynovitis as there are no randomized clinical trials available that assess the effectiveness of conservative treatment with this condition.[9] Effective treatment of de Quervain's tenosynovitis using fluidotherapy, iontophoresis, and ultrasound therapy is not well supported in the literature, but these modalities are commonly used in clinical settings. Activity modification is usually addressed following the diagnosis of de Quervain's tenosynovitis. Activity or worksite modifications may include rest, upper extremity orthoses, job and activity modifications, or physiotherapy.[16] Massage, joint manipulation, and joint stabilization techniques are the most common forms of manual therapy for treating de Quervain's tenosynovitis.[17,18]

This retrospective study was a collaboration between a university and a healthcare organization that explored the effectiveness of conservative hand/occupational therapy treatments and combination of treatments for individuals diagnosed with de Quervain's tenosynovitis. Prior to data collection, this study was approved by two review boards: the university review board and the healthcare organization review board.

Purpose of the Study

The purpose of the study was to identify which treatment or treatment combinations was most effective for patients diagnosed with de Quervain's tenosynovitis. Effectiveness was determined by improvement on the *Quick*DASH and the Numeric Pain Rating Scale (NPRS).[10,11]

Methods

Design and participants

The researchers, who are graduate occupational therapy students, completed a retrospective review of 403 electronic medical records and were assisted as needed by clinical care providers. These records were selected for study from the healthcare organization's electronic medical record database for dates of service between January 1, 2009 and January 1, 2013. Following chart selection, the researchers extracted, de-identified, and entered relevant electronic data into a password protected Excel Extraction Tool Spreadsheet. All identifiable data were stored on a secure drive only accessible at the healthcare organization. Data collection occurred from July 2013 to October 2013 and statistical analysis was completed in November 2013. A document was created to link patients to the de-identified data for continued reference. This document was password protected on a secure server.

Inclusion criteria

The inclusion criteria consisted of the following ICD-9 codes: de Quervain's tenosynovitis (727.04), other tenosynovitis of the hand and wrist (727.05), tenosynovitis-unspecified (727.00), wrist and hand sprain/strain (842, 842.10), and hand, wrist, and arm pain (719.44, 719.43, 729.5); additional evidence (i.e. positive Finkelstein's test) in the electronic medical record indicating de Quervain's tenosynovitis; also, services must have been provided by a hand/occupational therapist (Figs. 1 and 2).

Exclusion criteria

Charts were excluded if the diagnosis code was not one of the ICD-9 codes in the inclusion criteria, there was no additional evidence in the chart indicating de Quervain's tenosynovitis, the chart was assigned a new diagnosis (not related to de Quervain's tenosynovitis) during the course of treatment, the individual was not at least 18 years old at the time of service, the date of initial care was not between January 1, 2009 and January 1, 2013, the chart was not an occupational therapy chart, or the case was not closed (Fig. 2). Out of a total of 403 electronic medical records, 245 were excluded due to a lack of evidence for de Quervain's tenosynovitis, 110 records were excluded because they were not occupational therapy records, and 6 records were excluded because the individual was not at least 18 years old at the time of service. This left a total of 42 records (Figs. 1 and 2).

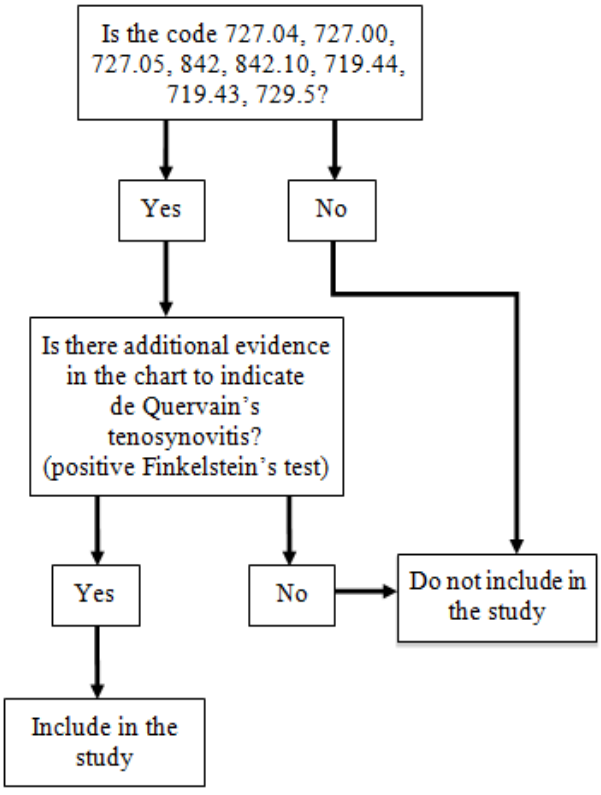

Fig. 1. De Quervain's tenosynovitis decision algorithm.

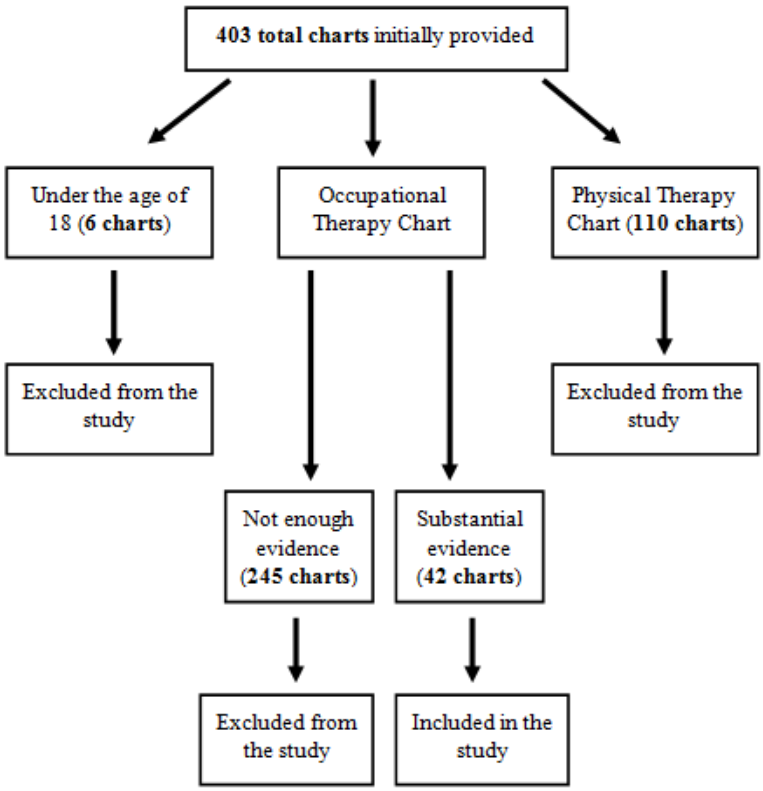

Fig. 2. Chart determination algorithm.

Equipment and instruments

Treatment effectiveness was determined by a clinically significant improvement on the *Quick*DASH and the NPRS.[10,11] The *Quick*DASH is a short, reliable, and valid measure of physical function that pertains to upper-limb musculoskeletal disorders and was adapted from the Disabilities of the Arm, Shoulder, and Hand Outcome Measure.[11,19,20] Only one study to date has assessed the minimum clinically important difference to mark significant improvement from clients' baseline *Quick*DASH scores.[21] A change exceeding eight points indicates a significant rate of improvement. The NPRS was used in the present study to identify the level of pain in individuals with de Quervain's tenosynovitis. The NPRS has been deemed reliable and valid.[2] Research indicates that a reduction of approximately two points or approximately 30% from the initial pain rating represents a clinically significant improvement.[23,24]

Procedure

Data management. Data was retrieved from electronic medical records and entered into the password-protected Excel Extraction Tool Spreadsheet, which was available only to the researchers. Any electronic transmission of identifiable data was performed over a secure server to IRB-approved study personnel. Only de-identified data was shared with other members of the research team who were not involved in the data collection process.

Provisions to maintain confidentiality. Electronic data were password protected on a secure drive only accessible at the healthcare organization. Dates of service were converted to whole numbers, with the initial visit considered Day 0, in the Excel Extraction Tool Spreadsheet. These whole numbers were used for statistical analysis. De-identified electronic data was stored indefinitely for future reference. Identifiable electronic data, including medical record numbers, names, dates of birth, and other identifiable information, were deleted from the data set when all analyses and publications were complete.

Statistical analysis. Statistical analysis of de-identified data was performed by the researchers and reviewed by an epidemiologist. Data was analyzed with SPSS 20. Descriptive statistics were obtained for all data collected. Chi-squared analysis was performed to determine which treatments had a statistically significant difference on the NPRS and the *Quick*DASH. The *Quick*DASH and NPRS scores for current level of pain considered in this analysis included those taken at intake and discharge.

Results

Of the 42 charts selected, there were 32 females (76.2%), 10 males (23.8%), and patients' ages ranged from 19 to 63 years of age, with a mean age of 39.19 years of age (standard deviation of 12.74). Thirty-five patients were right hand dominant; however diagnosis frequency

was similar between right and left sides, with a diagnosis of left de Quervain's tenosynovitis for 15 patients (35.7%), right for 20 patients (47.6%), and bilateral for 7 patients (16.7%). Patients sought treatment between two and 225 days following the onset of symptoms, with a mean of 75 days (standard deviation of 65.73). The mechanism of injury was classified as either sudden onset, such as following a fall, a gradual onset, such as a repetitive stress injury from work, or pregnancy-related onset. Five patients (13.5%) reported sudden onset, 31 (83.8%) patients reported gradual onset, and one subject (2.7%) reported pregnancy-related onset. Symptoms reported by patients were classified into the following categories: pain (83.3%), catching/popping (4.8%), paresthesias (23.8%), swelling (4.8%), weakness (11.9%), spasms (4.8%), and stiffness (2.4%). These categories were not mutually exclusive as patients may have experienced multiple symptoms (Table 1).

Table 1
Descriptive statistics for the sample and treatments received

Measure	Frequency	Valid Percent (%)
Gender		
Female	32	76.2
Male	10	23.8
Diagnosis side		
Left	15	35.7
Right	20	47.6
Bilateral	7	16.7
Mechanism of injury		
Sudden onset	5	13.5
Gradual onset	31	83.8
Pregnancy-related	1	2.7
Patient symptoms		
Pain	35	83.3
Catching/Popping	2	4.8
Paresthesias	10	23.8
Swelling	2	4.8
Weakness	5	11.9
Spasms	2	4.8
Stiffness	1	2.4

Fifteen patients (35.7%) reported the use of non-steroidal anti-inflammatory drugs (NSAIDs). There were a variety of co-morbid conditions recorded in the charts; however those relevant to the de Quervain's tenosynovitis diagnosis include arthritis (7.1%), CMC arthritis (9.6%), previous upper extremity fracture (2.4%), and carpal tunnel syndrome (2.4%). Pertinent surgical history of patients included unspecified hand/wrist surgery (4.8%), carpal tunnel syndrome release (2.4%), de Quervain's tenosynovitis corrective surgery (2.4%), and unspecified shoulder surgery (4.8%) (Table 2).

Table 2
Descriptive statistics for the sample

Measure	Frequency	Valid Percent (%)
NSAID use		
Yes	15	35.7
No	27	64.3
Co-Morbid Conditions		
Arthritis	3	7.1
CMC Arthritis	4	9.6
Previous upper extremity fracture	1	2.4
Carpal tunnel syndrome	1	2.4
Other unrelated conditions	33	78.5
Surgical History		
Unspecified hand/wrist surgery	2	4.8
Carpal tunnel syndrome release	1	2.4
De Quervain's surgery	1	2.4
Unspecified shoulder surgery	2	4.8

At the time of treatment, 35 patients (94.6%) were employed and two patients (5.4%) were students; employment information was not available for five patients. Patients reported activity limitations in both activities of daily living (52.4%) and instrumental activities of daily living (57.1%) (Table 3).

Table 3
Descriptive statistics for the sample

Measure	Frequency	Valid Percent (%)
Employment Status		
Employed	35	94.6
Student	2	5.4
Unknown status	5	n/a
ADLs limited		
Yes	22	52.4
No	20	47.6
IADLs limited		
Yes	18	42.9
No	24	57.1

The five conservative treatments used most frequently by hand/occupational therapists at the healthcare organization were selected to be analyzed in greater detail. These treatments included therapeutic pulsed ultrasound, iontophoresis with dexamethasone, fluidotherapy, manual therapy, and activity modification training.

Thirty-two patients (76.2%) received therapeutic pulsed ultrasound at some point during the course of treatment. Three out of the 32 patients received only 20% pulsed ultrasound, two out of the 32 patients received both 20% and 50% pulsed ultrasound, and 27 out of the 32 patients received only 50% pulsed ultrasound. The overall range for therapeutic pulsed ultrasound frequencies was 0.95-2.15 w/cm^2; however, the majority (87.5%) of frequencies ranged between 1.0-1.5 w/cm^2. Approximately 68% of patients treated with therapeutic pulsed ultrasound showed a clinically significant improvement on the *Quick*DASH; however, this was not statistically significant (p= 0.804). Contrary to the *Quick*DASH, approximately 44% patients who received pulsed ultrasound showed a clinically significant improvement for NPRS current level of pain and this improvement was statistically significant (p= 0.046) (Tables 4, 5, 6, 7, and 8).

Thirty-one patients (73.8%) received iontophoresis with dexamethasone (either with a 14-hour patch or in-clinic delivery methods) at some point during the course of treatment. Approximately 95% of patients who received iontophoresis showed a clinically significant improvement on the *Quick*DASH; this difference was also statistically significant (p= 0.028). Approximately 89% of patients who received iontophoresis showed a clinically significant improvement for NPRS current level of pain and this improvement was not statistically significant (p= 0.186) (Tables 4, 5, 6, 7, and 8).

Seventeen patients (40.5%) received fluidotherapy at some point during the course of treatment. However, there was not a clinically or statistically significant difference on the *Quick*DASH (p= 0.643) or the NPRS (p= 0.143) (Table 4).

Thirty-two patients (76.2%) received manual therapy at some point during the course of treatment. Types of manual therapy included cross friction massage, transverse friction massage, and soft-tissue massage. Approximately 79% of patients who received manual therapy showed a clinically significant improvement on the *Quick*DASH; however, this was not statistically significant (p= 0.698). Approximately 78% of patients who received manual therapy showed a clinically significant improvement for NPRS current level of pain and this improvement was not statistically significant (p= 0.778) (Tables 4, 5, 6, 7, and 8).

Twenty-six (61.9%) patients received activity modification training at some point during the course of treatment. Approximately 63% of patients who received activity modification training showed a clinically significant improvement on the *Quick*DASH; however, this was not statistically significant (p= 0.282). Approximately 67% of patients who received activity modification training showed a clinically significant improvement for NPRS current level of pain and this improvement was not statistically significant (p= 0.837) (Tables 4, 5, 6, 7, and 8).

Table 4
Conservative treatments utilized

Measure	Frequency	Valid Percent (%)
Ultrasound		
Yes	32	76.2
No	10	23.8
Iontophoresis		
Yes	31	73.8
No	11	26.2
Fluidotherapy		
Yes	17	40.5
No	25	59.5
Manual Therapy		
Yes	32	76.2
No	10	23.8
Activity Modification		
Yes	26	61.9
No	16	38.1

Table 5
Statistically significant response to treatment as determined by the *Quick*DASH

Treatment	P-value
Iontophoresis	**0.028**
Ultrasound	0.804
Fluidotherapy	0.643
Manual Therapy	0.698
Activity Modification	0.282

Table 6
Statistically significant response to treatment as determined by the NPRS for current pain

Treatment	P-value
Ultrasound	**0.046**
Iontophoresis	0.186
Fluidotherapy	0.143
Manual Therapy	0.778
Activity Modification	0.837

Table 7
Clinically significant response to treatment as determined by the *Quick*DASH (n=30)

Treatment	Percent clinically significant improvement *Quick*DASH (%)	Count
Iontophoresis	94.7	18
Manual Therapy	78.9	15
Ultrasound	68.4	13
Activity Modification	63.2	12
Fluidotherapy	36.8	7

Table 8
Clinically significant response to treatment as determined by the NPRS for current pain (n=26)

Treatment	Percent clinically significant improvement NPRS current pain(%)	Count
Iontophoresis	88.9	8
Manual Therapy	77.8	7
Activity Modification	66.7	6
Ultrasound	44.4	4
Fluidotherapy	44.4	4

Discussion

This study examined five conservative occupational therapy treatments in relation to clinical outcomes on the *Quick*DASH and the NPRS. According to the literature review, a change exceeding eight points indicates a clinically significant difference on the *Quick*DASH, while a reduction of approximately two points from the initial pain rating represents a clinically significant improvement on the NPRS.[23,24] For the present study, the clinically significant improvement on the *Quick*DASH from the initial visit to discharge ranged from 9.09 to 81.73. The clinically significant improvement on the NRPS ranged from 2 to 6 points. Among other findings, the present study identified two statistically significant treatment methods: iontophoresis with dexamethasone and therapeutic pulsed (20% or 50%) ultrasound (1.0 -1.5 w/cm^2).

Primary findings

Iontophoresis. The patients who received iontophoresis with dexamethasone demonstrated a clinically and statistically significant improvement on the *Quick*DASH. Both the patch applied in-clinic and worn at home for 14 hours, as well as in-clinic delivery methods with a 40mA/min dosage were utilized. This finding may be important for therapists treating de Quervain's tenosynovitis because of the significant improvement on the *Quick*DASH.

Ultrasound. The patients who received therapeutic pulsed ultrasound demonstrated a clinically and statistically significant improvement on the NPRS for current levels of pain. Only therapeutic pulsed (20% or 50%) ultrasound was utilized, and frequencies between 1.0 and 1.5 w/cm^2 were employed with 87.5% of the patients. Pain management is a key role for hand/occupational therapists and is necessary for the patient to return to daily occupations.[3,6] This finding is important for occupational therapists in that ultrasound appeared to play a role in clinically and statistically significant pain reduction which can facilitate participation in daily activities.

Manual therapy. Thirty-two of the 42 patients received manual therapy at some point during the course of treatment. While there was not a statistically significant difference found, 79% of patients who received manual therapy showed a clinically significant improvement on the *Quick*DASH and 78% of patients who received manual therapy showed a clinically significant improvement for NPRS current level of pain. These findings indicate that occupational therapists frequently treat de Quervain's tenosynovitis with manual therapy, and further research is needed to determine (a) its effectiveness and (b) which specific type of manual therapy treatment (i.e. soft tissue massage, cross friction massage, or transverse friction massage) is the most effective.

Activity modification. Activity modification is an area of practice frequently targeted by hand/occupational therapists.[25] In the present study, a large number of patients (63%) who received activity modification training showed a clinically significant improvement on the *Quick*DASH and 67% of patients who received activity modification training showed a clinically significant improvement for NPRS current level of pain; however, no statistical significance was found. Effectiveness of activity modification is an important consideration for further research.

Secondary findings

According to the literature, a thumb spica orthosis is primarily utilized to provide rest for the APL and EPB tendons. [3,6] In the present study, the majority of patients were provided with a pre-fabricated orthosis by their physician prior to beginning treatment. Few patients received orthotics during the course of treatment. Of the small number (9) of orthotics distributed, the majority of patients (80%) were fitted with a neoprene thumb spica orthosis, while the remaining patients were provided with a custom fabricated thermoplastic thumb spica orthosis. The flexibility of neoprene orthotics allows for some movement of the thumb, which may not completely rest the APL and EPB tendons.[26] Additionally, no information regarding compliance was documented following distribution of the orthoses, and, as a result, it is difficult to determine the effectiveness of the use of orthoses with the present study. Further research is needed, especially in the area of rigid orthoses and de Quervain's tenosynovitis.

Strengths and limitations

While the researchers are current graduate occupational therapy students, they were closely mentored by academic research advisors and other experienced clinicians. Although data was collected by the three researchers, the decision algorithm ensured a consistent process to accurately include charts based on a diagnosis of de Quervain's tenosynovitis. Furthermore, valid

and reliable outcome tools (the *Quick*Dash and the NPRS) were utilized. Despite the small sample size, clinical and statistical significance were demonstrated in the improvement of pain symptoms and function.

The limitations of this study are inherent to the retrospective design and small sample size. Information regarding discharge was limited, there were notable differences in clinician documentation, and information related to overall subject treatment compliance, which was unavailable in many cases. Another limitation to consider was the patients' use of NSAIDs. Fifteen of the 42 patients reported the use of NSAIDs at intake. It was unclear if NSAID use continued or was later initiated during the course of treatment, or if NSAID use was a contributing factor to improvement. Finally, the sample was selected from a single healthcare organization and therefore may not be generalizable.

Conclusion

The clinical contribution of the present study was demonstrating the effectiveness of two conservative treatment methods for de Quervain's tenosynovitis. Iontophoresis with dexamethasone was shown to be both clinically and statistically significant as evidenced by improvement on *Quick*DASH scores, while therapeutic pulsed (20 and/or 50%) ultrasound (1.0-1.5 w/cm^2) was shown to be both clinically and statistically significant as evidenced by improvement on NPRS current level of pain scores. This may demonstrate the efficacy of iontophoresis with dexamethasone and pulsed (20% or 50%) ultrasound (1.0 –1.5 w/cm^2) in the treatment of de Quervain's tenosynovitis. Further research is needed that focuses on iontophoresis administration (i.e. 14-hour patch versus in-clinic delivery methods and corresponding dosages), activity modification, manual therapy, and the use of orthotics. In

addition, studies with larger sample sizes that include information regarding patient compliance with each treatment is recommended.

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