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Conservative Treatment of de Quervain's Tenosynovitis in Occupational Therapy: A Retrospective Outcome Study

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A Retrospective Outcome Study

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ABSTRACT

Objective: De Quervain's tenosynovitis (DQ) is a painful condition characterized by pain and inflammation at the first dorsal compartment of the wrist. This condition affects the wrist and thumb, and generally decreases an individual's performance and engagement in daily occupations. Conservative management with occupational therapy (OT) can assist to diminish the associated symptoms and facilitate recovery of function; however, it is unclear what interventions are the most effective. The purpose of this study was to determine the effectiveness of conservative OT interventions for individuals diagnosed with DQ.

Study Design: An exploratory retrospective review of 148 de-identified electronic medical records provided by a national rehabilitation organization was performed investigating applied OT interventions, and their outcomes for patients diagnosed with DQ. Initial and discharge outcome scores from pain and function assessments were analyzed to determine change pre and post treatment.

Results: Therapeutic exercise revealed a statistically significant change from initial to discharge scores of pain with activity as measured by the Visual Analogue Scale (VAS) ($p = .038$). In addition, 92.9% of patients who received orthotic training/management during the course of treatment clinically improved in pain with activity as indicated by the VAS.

Conclusion: Therapeutic exercise may improve pain caused by DQ. Orthotic training/management may also be beneficial for improving pain during activity in patients with DQ. Further research is necessary with more detailed information regarding each treatment utilized, in order to provide further clinical insight for occupational therapists regarding improvement of pain and function in patients with DQ.

Level of Evidence: 4.

Key Words: Inflammation, Pain, Function, Occupation, First Doral Compartment, Conservative Treatment, DQ, Tenosynovitis, Tendinitis, Thumb

INTRODUCTION

De Quervain's tenosynovitis (DQ) is a painful condition characterized by inflammation of the first dorsal compartment, along the radial styloid of the wrist. Two major tendons, the abductor pollicis longus (APL) and extensor pollicis brevis (EPB) comprise the first dorsal compartment of the wrist.[1] The APL is responsible for abducting the thumb, and assisting with radial deviation of the wrist. The EPB is responsible for extending the metacarpophalangeal joint and slightly abducting the thumb.[2] DQ usually presents itself through a gradual onset of pain or tenderness at the first dorsal compartment, which is exacerbated by grasping, thumb abduction, and ulnar deviation of the wrist.[2]

Although the exact etiology of DQ is unknown, it is thought to be secondary to repetitive or sustained tension on the tendons of the first dorsal compartment.[3] Individuals who engage in repetitive activities that include pinching, wringing, lifting, and grasping with their wrist and hand are more susceptible to DQ.[4] The condition is most prevalent in middle-aged women and is associated with the dominant hand.[2] Females typically engage in activities such as typing, piano-playing, sewing, housekeeping, knitting, weaving, and cutting more than men, therefore females are more predisposed to DQ.[5] High-risk populations include pregnant women, musicians, dental hygienists, assembly workers, golfers, machinists, mountain bikers, and video game players.[4]

Treatment options for DQ vary, including conservative and non-conservative approaches. Conservative occupational therapy (OT) treatments for DQ include physical agent modalities such as ultrasound, and iontophoresis.[6-8] Other commonly used OT conservative treatments include activity modification, manual therapy, hot/cold packs, therapeutic exercise,

non-steroidal anti-inflammatory medications (NSAIDs), and immobilization of the thumb with a thumb-spica orthosis.[1,2,8,9] These OT interventions are typically guided by the Biomechanical and Rehabilitative Frames of Reference, which aim to restore range of motion, strength, and endurance in order to improve function in meaningful occupations. Corticosteroid injection is a highly common and effective medical treatment for DQ. The surgical approach includes release of the first dorsal compartment, and may be recommended when symptoms fail to respond to conservative treatment.[10] Variations in the wrist and hand can predispose individuals to DQ, and may also make treatments less effective.[11] From current literature, it remains unclear what OT treatment or combination of treatments produces the most effective outcomes for treating DQ.

Occupational therapists provide individuals with de Quervain's tenosynovitis with several different therapeutic interventions.[1] A thumb spica orthosis is utilized to improve DQ symptoms by immobilizing the wrist and thumb. There is currently a lack of consensus among OT's regarding an exact protocol for use of an orthosis for wrist and thumb immobilization.[12] Therapeutic ultrasound and iontophoresis are common physical agent modalities utilized by OT's in order to decrease symptoms of pain in the wrist and thumb. However, little evidence exists supporting the use of either modality for the treatment of DQ specifically.[6-8,13] Eccentric exercise is commonly implemented during treatment, and may reduce pain and increase strength in the APL and EPB tendons.[4] Manual therapy is also used, most commonly in the form of transverse friction massage in order increase circulation to facilitate pain reduction and promote tendon healing.[9] This method may be intolerable to some client's with DQ due to the applied firm pressure at the point of tenderness.[7] Activity modification is also commonly used

as treatment in order to help prevent forceful and repetitive movements that can exacerbate pain caused by DQ. This approach may involve workplace modifications or lifestyle changes to reduce the amount of aggravating activity, and thus reduce pain levels.[7]

The purpose of this retrospective research study was to determine the effectiveness of conservative OT treatments used at a national rehabilitation organization, for individuals diagnosed with DQ. This study provides evidence to support the use of specific OT interventions in the treatment of DQ.

METHODS

Study Design and Participants

A retrospective chart review of 1160 de-identified patient electronic medical records was reviewed by the researchers. Data was provided by a national rehabilitation organization and reviewed from January 1, 2003 to December 31, 2013.

Inclusion Criteria

For each individualized patient record to be included and analyzed in this study, the following criteria had to be met: Treatment must have been provided by an occupational therapist, patient was at least 18 years of age at discharge, and the specified body region treated by an OT must have been classified as hand/fingers, or wrist. Additionally, for records to be included, the referring diagnosis or treating diagnosis (determined by the treating therapist) had to contain the term(s): deQuervain's, deQuervain's tenosynovitis, and/or deQuervain's tendonitis.

Exclusion Criteria

Patient records were excluded if treatment was given by a physical therapist, patient was not at least 18 years of age at discharge, if there was error on the data set (record missing pertinent information), the patient had confounding diagnoses, and if the patient had been treated for other hand/wrist case that may or may not have been specifically classified as DQ within the national rehabilitation organization between 2003 and 2013. Additionally, records were excluded if the patient was being treated post-surgically, outcome measures were not assessed at final treatment session, and if the patient did not receive treatment following evaluation.

Out of a total of 1,160 de-identified electronic medical records, 741 were excluded due to either no indication of de Quervain's tenosynovitis in the treating and referring diagnosis, or the patient had one or multiple confounding diagnoses. 182 records were excluded because the patient was treated by a physical therapist; 29 were excluded because the patient was being treated post-surgically; 6 were excluded because the patient was under the age of 18 at initial treatment; and 7 were excluded due to an error on the dataset. 9 records were excluded because the patient had been treated for other hand/wrist case that may or may not have been specifically classified as DQ within the national rehabilitation organization between 2003 and 2013. Furthermore, 31 records were excluded due to missing outcome measures at the final treatment session, and 7 were excluded because the patient only received an evaluation. Following exclusion, 148 records remained to be included in the study (Fig. 1).

OUTCOME MEASURES

Pain

The Numeric Pain Rating Scale (NPRS) is a valid, reliable, and psychometrically sound clinical instrument for assessing pain. [15-16] Administration involves an 11-point subjective scale that can be provided orally or visually.[21] Clients are asked to rate their pain from 0 to 10, with 0 being "no pain" and 10 being the "worst pain imaginable."[15] Scores are reported as integers from 0 to 10, with a 2-point difference constituting a clinically significant change.[15,21.] Therefore, the researchers decided to utilize a minimal clinically significant difference of two on pain scores for data analysis.

The current study has two different pain outcome measures. The first is a pain score reported at rest, the second is a pain score reported during activity. The difference of a patient's pain score from the initial OT evaluation in comparison to his or her score at discharge was calculated to identify any change in pain level.

Functional Assessments

The Self Assessed Function- Upper Quarter (SAF-UQ), is a 24-item subjective questionnaire created by the partnering organization for internal use. The measure contains six response categories for each item. Clients rate their perceived ability in each area from 0, "unable to do" to 5 "not difficult at all." The Function Classification Scale (FCS) is an objective tool that is administered by the therapist. The FCS measures function as observed by the therapist, with scores ranging from 1 "unable" to 7 "complete independence." There is no information in the literature regarding psychometric properties of the SAF-UQ or the FCS. It is unclear what values constitute a clinically significant change in the SAF-UQ and FCS assessments. Data from these measures at the initial OT evaluation and at discharge were used to identify change in functional performance.

PROCEDURE

Statistical analysis

De-identified data were explored by researchers, and reviewed by an epidemiologist using Statistical Package for the Social Sciences (SPSS) 20 data software. Descriptive statistics were obtained for the data set. A paired sample t-test was performed to determine statistically significant changes in scores from initial to discharge for all outcome measures (SAF-UQ, FCS, pain at rest, pain with activity). Logistic regression analyses were performed to determine which treatment was statistically significant among patients with a clinically significant improvement of pain at rest as determined by the difference from initial pain at rest score to the discharge pain at rest score. Commonly applied OT treatments were identified in the descriptive analysis as being hot/cold pack, iontophoresis, ultrasound, therapeutic exercise, manual therapy, therapeutic functional activity, and orthotic management/training. Logistic regression analysis was also performed for the pain with activity outcome measure. This statistical analysis was performed for each individual conservative OT treatment.

RESULTS

Demographics

Of the final sample selected of 148 patients, 99 were female (66.9%), and 39 were male (28.3%), with a mean age of 46.94 ± 15.34 years. Diagnosis frequency between the affected right and left hand varied. 49 patients were diagnosed with right DQ (33.1%), 35 patients were diagnosed with left DQ (23.6%), 10 patients were diagnosed with bilateral DQ (6.8%), and 54 patients had an undetermined diagnosis (36.5%). Patients pursued treatment between one and 373 days following the onset of DQ symptoms. The length of treatment between patients

ranged from four to 388 days (mean of 37 ± 35.193 days). Throughout a patient's course of treatment, the number of OTs that worked with each patient ranged from one to five (mean of 2.17 ± 0.965 OTs).

Conservative Occupational Therapy Treatments

The associated symptoms of DQ result in a functional disability of the involved hand, and can ultimately impact performance in all areas of occupation.[13,14] Occupational therapists utilize conservative modalities to help individuals regain function of the wrist, and thumb. When an individual regains function of the wrist and thumb, engagement in their daily occupations can increase.

Treatments used for each patient were identified based on Current Procedural Terminology (CPT) codes used for each OT session. Conservative OT treatments most commonly used by occupational therapists at the partnering national rehabilitation organization were: Therapeutic exercise, iontophoresis, therapeutic ultrasound, manual therapy, hot/cold pack, therapeutic functional activity, and orthotic management/training.

Paired Samples Analysis

The paired samples t-test determined statistically significant changes in scores from initial to discharge for all outcome measures with the exception of the pain at rest score ($p=.167$) (Table 2).

Therapeutic Exercise Treatment

Of the total sample of 148 patients, 124 patients (83.8%) received therapeutic exercise at some point throughout treatment (Table 1). Of the 124 patients that received therapeutic exercise at any point throughout treatment, 39.5% had a clinically significant reduction of pain

at rest score and 76.6% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 81.7% had received therapeutic exercise treatment. Of the 108 patients who had a clinically significant reduction in pain with activity, 88.0% received the therapeutic exercise treatment (Table 4). Therapeutic exercise was a statistically significant effective treatment in reducing pain with activity ($p = 0.038$) (Table 4). However reductions in pain at rest were not statistically significant ($p=0.186$) (Table 5).

Iontophoresis Treatment

Of the total sample of 148 patients, 91 patients (61.5%) received iontophoresis at some point throughout treatment (Table 1). Of the 91 patients who received iontophoresis at any point throughout treatment, 41.8% had a clinically significant reduction of pain rest score and 71.4% had a clinically significant reduction of pain with activity score (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 63.3% received iontophoresis (Table 5). Of the 108 patients who had a clinically significant reduction pain with activity, 60.2% received iontophoresis (Table 4). However, those reductions in both pain at rest ($p = 0.527$) and pain with activity ($p = 0.700$) were not statistically significant (Tables 4 & 5).

Therapeutic Ultrasound Treatment

Of the total sample of 148 patients, 86 patients (58.1%) received ultrasound at some point throughout treatment (Table 1). Of the 86 patients that received ultrasound at any point throughout treatment, 44.2% had a clinically significant reduction of pain at rest score and 80.2% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 63.3% had received ultrasound

treatment. Of the 108 patients who had a clinically significant reduction in pain with activity, 63.9% received the ultrasound treatment (Table 4). However, those reductions in both pain at rest ($p = 0.349$) and pain with activity ($p = 0.081$) were not statistically significant (Tables 4 & 5).

Manual Therapy Treatment

Of the total sample of 148 patients, 65 patients (49.3%) received manual therapy at some point throughout treatment (Table 1). Of the 65 patients that received manual therapy at any point throughout treatment, 36.9% had a clinically significant reduction of pain at rest score and 70.8% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 40.0% received manual therapy treatment (Table 5). Of the 108 patients who had a clinically significant reduction in pain with activity, 42.6% received the manual therapy treatment (Table 4). However, those reductions in both pain at rest ($p = 0.746$) and pain with activity ($p = 0.857$) were not statistically significant (Tables 4 & 5).

Hot/Cold Pack Treatment

Of the total sample of 148 patients, 43 patients (29.1%) received hot/cold pack application at some point throughout treatment (Table 1). Of the 43 patients that received hot/cold pack application at any point throughout treatment, 48.8% had a clinically significant reduction of pain at rest score and 74.4% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 35% had received hot/cold pack treatment (Table 5). Of the 108 patients who had a clinically significant reduction in pain with activity, 29.6% received the hot/cold pack treatment

(Table 4). However, those reductions in both pain at rest (p = 0.085) and pain with activity (p = 0.370) were not statistically significant (Tables 4 & 5).

Therapeutic Functional Activity Treatment

Of the total sample of 148 patients, 43 patients (29.1%) received therapeutic functional activity at some point throughout treatment (Table 1). Of the 43 patients that received therapeutic functional activity at any point throughout treatment, 37.2% had a clinically significant reduction of pain at rest score and 74.4% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 26.7% received therapeutic functional activity treatment (Table 5). Of the 108 patients who had a clinically significant reduction in pain with activity, 29.6% received therapeutic functional activity treatment (Table 4). However, those reductions in both pain at rest (p = 0.146) and pain with activity (p = 0.861) were not statistically significant (Tables 4 & 5).

Orthotic Management/Training Treatment

Of the total sample of 148 patients, 28 patients (18.9%) received orthotic management/training at some point throughout treatment (Table 1). Of the 28 patients that received orthotic management/training at any point throughout treatment, 60.7% had a clinically significant reduction of pain at rest score and 92.9% had a clinically significant reduction of pain with activity (Table 3). Of the 60 patients who had a clinically significant reduction in pain at rest score, 28.3% had received orthotic management/training treatment (Table 5). Of the 108 patients who had a clinically significant reduction in pain with activity, 24.1% received the orthotic management/training treatment (Table 4). However, those

reductions in both pain at rest ($p = 0.167$) and pain with activity ($p = 0.687$) were not statistically significant (Tables 4 & 5).

DISCUSSION

This study explored the effectiveness of six conservative occupational therapy treatments on reducing pain levels at rest and with activity.

Therapeutic exercise treatment was both clinically and statistically significant at reducing pain with activity over the course of OT intervention ($p = 0.038$). This statistically significant finding indicates that therapeutic exercise may be an effective conservative treatment to reduce pain. 83.8% of patients received therapeutic exercise at some point during the course of treatment, which indicates that occupational therapists commonly treat DQ with therapeutic exercise. Of the 124 patients that received therapeutic exercise at any point throughout treatment, 39.5% had a clinically significant reduction of pain at rest, and 76.6% had a clinically significant reduction of pain with activity**.** Active treatment options for DQ include pain-free ROM exercises, strengthening, tendon gliding, and eccentric training exercises.[11] According to the literature, eccentric exercise may facilitate healing and increase strength in the APL and EPB tendons, which results in reduced pain and increased tolerance for eccentric loading during daily activities.[7] The researchers were not provided with detailed treatment data therefore, further research is needed to determine the appropriate amount of exercise, and which specific type of therapeutic exercise is considered the most effective. It also unclear what specific type of exercise was used by the occupational therapists at the partnering national rehabilitation organization.

Iontophoresis treatment was commonly used (61.5%) at some point during occupational therapy treatment. Although the effectiveness of iontophoresis was not statistically significant among patients with a clinically significant improvement in pain at rest or with activity, 71.4% of patients who received iontophoresis had a clinically significant reduction of pain with activity. This large proportion may provide additional limited support of the existing literature for the use of this modality in decreasing tendon pain during activity.[20] However, the medication, medication dosage, and amount of time for delivery via iontophoretic administration was not specifically identified in the data, making generalizations limited regarding the efficacy of this treatment method.

Ultrasound treatment was not a statistically significant effective treatment for reducing either pain at rest or pain with activity among DQ patients with a clinically significant improvement in pain from initial to discharge visit. A large proportion of the patients who received ultrasound treatment had a clinically significant improvement in pain with activity (80.2%). Ultrasound treatment has been demonstrated to be effective for the treatment of pain caused by tendinopathy, but the literature is limited and conflicting.[6,7] More information regarding specifics of ultrasound including whether application was pulsed or continuous, identification of the frequency employed (w/cm^2), and record of the number of times ultrasound was used throughout the course of treatment, would provide further insight regarding this modality.

Sixty-five patients received manual therapy at some point throughout treatment. However, manual therapy was not found to be a statistically significant effective treatment. 36.9% of patients had a clinically significant reduction of pain at rest, and 70.8% of patients had

a clinically significant reduction of pain with activity. According to the literature, occupational therapists utilize manual therapy most commonly in the form of transverse friction massage, in order to increase circulation, reduce pain, and promote tendon healing. [9] Specific manual therapy techniques utilized for treatment were not provided for the researchers in the data set. These findings indicate further research is needed to determine which specific type of manual therapy (mobilization/manipulation, or manual traction) is being used by occupational therapists.

Hot/cold pack treatment was not a statistically significant effective treatment for reducing either pain at rest or pain with activity among DQ patients with a clinically significant improvement in pain from initial to discharge visit. A large proportion of the patients who received hot/cold pack treatment had a clinically significant improvement in pain with activity (74.4%). However, hot packs and cold packs were identified in the same category, despite their different physiological effects.[19] Therefore the current findings are limited regarding hot and cold pack treatment, and consideration of these treatments effectiveness is important for future research.

Forty-three patients received therapeutic functional activity at some point throughout treatment. Therapeutic functional activity treatment was not a statistically significant effective treatment for reducing either pain at rest or pain with activity among DQ patients with a clinically significant improvement in pain from initial to discharge visit. 74.4% of the patients who received therapeutic functional activity treatment had a clinically significant improvement in pain with activity. Occupational therapists will initially treat body structures and functions to reduce pain, and then focus on purposeful activity to improve function and performance in

areas of daily living. Specific therapeutic functional activities used as a treatment were not provided for the researchers in the data set. [22] There is limited evidence on the effectiveness of therapeutic functional activity as a treatment for DQ in existing literature therefore further research is needed.

Twenty-eight patients received orthotic management/training at some point throughout treatment (18.9%). Although the effectiveness of orthotic management/training was not statistically significant among patients with a clinically significant improvement in pain at rest or with activity, 92.9% of patients who received orthotic management/training had a clinically significant reduction of pain with activity. Of the twenty-eight patients that received orthotic management/training, it is unknown whether symptoms were managed by a rigid or flexible orthosis. Additionally, the researchers were not given data input regarding patient wearing schedules, or patient compliance with the orthosis. According to the literature, the most effective orthoses to provide immobilization and support for the wrist and thumb, is the thumb-spica orthosis.[23] Although a thumb-spica orthosis immobilizes and supports the wrist and thumb, existing literature argues it may not be beneficial for an individual to wear during daily functional activities, because more force may be exerted resulting in active resistance against the orthotic during grasping and pinching activities.[7,24] Overall, there is insufficient evidence of rigid or flexible orthoses alone as an effective conservative treatment modality for de Quervain's tenosynovitis. More quality research on orthotic management as an effective treatment modality for de Quervain's tenosynovitis is needed to further understand the use and efficacy.

Strengths and Limitations

This study had a large sample size of 148 patients, which was determined by following a strict adherence to inclusion and exclusion criteria. Record elimination was carefully selected to ensure the most representative sample possible while reducing confounding variables. The data in this study was extracted and analyzed by three researchers, to ensure accurate results. In addition the NPRS outcome measure is a valid and reliable tool with an established value of clinical significance.

The retrospective design of this study is a limitation, and ideally randomized control trials evaluating each treatment could provide more comprehensive insight to the research question. A large number of records were excluded from the study due to failure to meet inclusion criteria (1,012 records), thus decreasing the study size. The data explored utilized outcome measures without established psychometric properties (SAF-UQ, FCS). There was also a lack of specificity regarding all treatment methods, with CPT codes being the only identifier of which treatment was provided for each patient. These CPT codes lack information about each treatment necessary for making specific clinical recommendations. Treatments utilized were analyzed individually without consideration to combinations of treatments for each patient. Finally, the current findings resulting from this study may not be highly generalizable since all data was gathered from one rehabilitation organization.

CONCLUSION

The results of this study indicate that occupational therapy treatment can decrease pain and increase function in patients with DQ. Therapeutic exercise may be an effective treatment method for improving pain during activity for individuals with DQ. However, further research is necessary to identify which point during the course of the disease process that therapeutic

exercise appropriate, and which exercises should be utilized for decreasing pain. In addition, orthotic management/training may be a beneficial treatment method for improving pain during activity for individuals with DQ; however further research identifying which types of orthoses are most effective is necessary.

Randomized controlled trials examining each modality assessed in the current study are necessary to further identify effectiveness. Future research should also consider combinations of treatments, and include the use of functional outcome measures with established psychometric properties and levels of clinical significance.

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Table 1. Frequency of occupational therapy treatments used to treat de Quervain's tenosynovitis

Treatment	Frequency	Percent(%)
Therapeutic Exercise		
Received treatment	124	83.8
Iontophoresis		
Received treatment	91	61.5
Ultrasound		
Received treatment	86	58.1
Manual Therapy		
Received treatment	65	43.9
Hot/Cold Pack		
Received treatment	43	29.1
Therapeutic Functional Activity		
Received treatment	43	29.1
Orthotic Management/Training		
Received treatment	28	18.9

Table 2: Paired samples statistics of total sample showing change on outcome measures of pain and function (VAS,SAF-UQ, & FCS)

Outcome Measure	**Initial Mean ± SD**	**Discharge Mean ± SD**	**p-value**
Self Assessed Function	3.319 ± .8520	3.974 ± .8552	.000
Function Classification Scale	3.591 ± .9076	5.03 ± 1.103	.000
Pain at rest	2.67 ± 2.427	1.14 ± 1.643	.167
Pain with activity	7.00 ± 2.077	3.40 ± 2.534	.037

Table 3: Percentage of patients within each treatment category with clinically significant improvement on VAS outcomes

Treatment	Percent clinically significant improvement on VAS at rest (%)	Percent clinically significant improvement on VAS during activity (%)
Hot/cold pack	48.8	74.4
Iontophoresis	41.8	71.4
Ultrasound	44.2	80.2
Therapeutic exercise	39.5	76.6
Manual therapy	36.9	70.8
Therapeutic functional activity	37.2	74.4
Orthotic training/management	60.7	92.9

Table 4. Logistic Regression Analysis of treatments for patients with a clinically significant improvement on pain with activity as determined by change from initial to discharge on the Visual Analogue Scale

Treatment Received	**%****	**OR**	**95% CI Lower**	**p-value**
Hot/Cold Pack	29.6	1.593	0.576-4.405	0.370
Iontophoresis	60.2	1.204	0.469-3.095	0.700
Ultrasound	63.9	2.236	0.905-5.527	0.081
Therapeutic Exercise	88.0	3.052	1.065-8.725	0.038*
Manual Therapy	42.6	1.084	0.449-2.617	0.857
Therapeutic Functional Activity	29.6	1.095	0.395-3.039	0.861
Orthotic Management/Training	24.1	1.246	0.426-3.664	0.687

*Statistically significant finding based on p<.05

%** Frequency of treatments used for clinically improved cases as determined by VAS with activity scor

Table 5: Logistic Regression Analysis of treatments for patients with a clinically significant improvement on pain at rest as determined by change from initial to discharge on the Visual Analogue Scale

Treatment Received	%**	OR	95% CI	P-value
Hot/Cold Pack	35.0	2.092	.904-4.844	.085
Iontophoresis	63.3	1.306	.571-2.988	.527
Ultrasound	63.3	1.488	.648-3.419	.349
Therapeutic Exercise	81.7	.484	.165-1.418	.186
Manual Therapy	40.0	1.139	.518-2.503	.746
Therapeutic Functional Activity	26.7	.513	.208-1.263	.146
Orthotic Management/Training	28.3	1.888	.767-4.650	.167

*Statistically significant finding based on p<.05
%** Frequency of treatments used for clinically improved cases as determined by VAS at rest score

Figure 1. Exclusion Criteria