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CASE REPORT

NTOS symptoms and mobility: A case study on neurogenic thoracic outlet syndrome involving massage therapy

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Summary Neurogenic thoracic outlet syndrome (NTOS) is a neuromuscular condition affecting brachial plexus functionality. NTOS is characterized by paresthesia, pain, muscle fatigue, and restricted mobility in the upper extremity. This study quantified massage therapy's possible contribution to treatment of NTOS. A 24-year-old female with NTOS received eight treatments over 35 days. Treatment included myofascial release, trigger point therapy, cross fiber friction, muscle stripping, and gentle passive stretching. Abduction and lateral rotation at the glenohumeral (GH joint) assessments measured range of motion (ROM). A resisted muscle test evaluated upper extremity strength. The client rated symptoms daily via a visual analog scale (VAS). Findings showed improvement in ROM at the GH joint. VAS ratings revealed a reduction in muscle weakness, pain, numbness, and 'paresthesia'. Results suggest massage may be useful as part of a broad approach to managing NTOS symptoms and improving mobility.

Introduction

Thoracic Outlet Syndrome (TOS) represents a group of conditions characterized by compression of the neurovascular structures that traverse the thoracic inlet, particularly the interscalene triangle, costoclavicular space, or retropectoralis minor space (Miller et al., 2011; Vanti et al., 2007). It is commonly caused by trauma or abnormalities of the cervical rib, transverse process of C7, or scalene musculature (Chiang et al., 2011; Povlsen et al., 2010; Aralsmak et al., 2012). TOS affects 0.1% of the population and of those, 95% suffer from the neurogenic form (Kapickis et al., 2011; Finlayson et al., 2011). Neurogenic thoracic outlet syndrome (NTOS), or true neurologic TOS, occurs when the constriction is purely neurological, not venous or arterial, and disrupts brachial plexus function (Foley et al., 2012; Ozoa and Fish, 2011).

The brachial plexus originates at spinal nerves C5-T1, travels between the anterior and medial scalene muscles, under the clavicle and pectoralis muscle, to the coracoid

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process, along the axilla, and into the fourth and fifth digits (Abdul-Jabar et al., 2009; Colli et al., 2004). Neural disruption with a lower plexus pattern commonly induces a sensation of burning, paresthesia, pain, and weakness (Aralsmak et al., 2012; Wishchuk, 2004) along the medial border of the forearm and hand (Nannapaneni and Marks, 2003; Ferrante, 2012). Range of motion (ROM) is restricted, especially at the glenohumeral (GH) joint (Watson et al., 2009), as abduction intensifies plexus constriction (Nannapaneni and Marks, 2003; Ambrad-Chalela et al., 2004; Brantigan and Roos, 2004; Vanti et al., 2007). Such limited movement provokes muscular imbalance, (Ferrante, 2012; Ambrad-Chalela et al., 2004) fatigue and aching pain in the suprascapular and cervical region (Hamm, 2006; Bosma et al., 2010). Prolonged compression of the plexus may incite axonal demylination and lag the nerve's conduction velocity. This could result in muscle atrophy and loss of motor function (Chi-ngai et al., 2011; Dubuission et al., 2012; Vanti et al., 2007).

Whiplash injury following a motor vehicle accident is the most common cause of single-episode post-traumatic NTOS (Ferrante, 2012; Sanders, 2009). This type of trauma activates chronic spasms, fibrosis and scarring of supportive musculature (Vanti et al., 2007; Brantigan and Roos, 2004), exacerbating symptoms by further narrowing the inlet (Nannapaneni and Marks, 2003).

Current treatment options

Due to the highly variable nature of NTOS the medical field lacks validated diagnostic exams, leading to misdiagnosis and disputes regarding its validity (Hamm, 2006; Ambrad-Chalela et al., 2004; Bosma et al., 2010; Brantigan and Roos, 2004; Sanders et al., 2007). Surgical options include thoracic outlet decompression and yield mixed results (Bosma et al., 2010; Landry et al., 2001; Colli et al., 2004). Suggested non-operative treatments are physical therapy, exercise, chiropractic treatments, osteopathic treatments, strapping/taping (Chi-ngai et al., 2011), heat, analgesics, muscle relaxants, and massage therapy (Lo et al., 2011; Boezaart et al., 2010; Abdul-Jabar et al., 2009). These conservative treatments intend to restore optimal posture and neural mobility by strengthening musculature and releasing myofasical restrictions (Ferrante, 2012; Mackinnon and Novak, 2002). Few calculable outcome studies have been published on the efficacy of such treatments (Povlsen et al., 2010; Chi-ngai et al., 2011).

Massage protocols are established to correct muscle imbalance (Watson et al., 2010) in the cervicoscapular region, yet firm evidence is lacking to support its effectiveness (Mackinnon and Novak, 2002; Lo et al., 2011). Specific techniques that have produced favorable results in small case studies involve trigger point therapy, stretching, stripping, deep tissue techniques, cross fiber friction, ice massage, muscular engagement, standard passive stretching and neuromuscular therapy (Hamm, 2006).

Few if any quantitative studies have been published to determine the extent of massage therapy's influence on symptomatic improvement and ROM in NTOS patients. This case study calculated massage's possible contribution to symptom and ROM progress via patient pain scale ratings, muscular strength analysis, and postural analyses.

Method

Client profile

The patient was a 24-year-old female who suffered from whiplash sustained during a motor vehicle accident at age 16. The patient's symptoms included paresthesia descending from the costoclavicular space to the hand and underneath the fingernails; a burning sensation along the arm; muscle spasms 'wrapping' across the axilla; limited motor function; muscle fatigue and atrophy; back, shoulder, and neck pain; tremors; swelling of the breast; tension headaches; temporomandibular joint syndrome; tightness in the chest and under the scapula; breathing difficulty; and trouble with lateral shoulder rotation. Upper extremity activities involving arm elevation exacerbated symptoms. In addition, the patient reported high levels of pain intensity waking her regularly throughout the night.

An orthopedist diagnosed the patient with NTOS after an electrophysiological (EMG) reading determined brachial plexus damage and magnetic resonance imaging (MRI) confirmed normal venous function. Prescribed medication and botulinum toxin injections were used in conjunction with chiropractic treatment, physical therapy, and pilates. Relief progressed slowly and the patient was temporarily denied medical coverage until treatments could be determined curative or palliative. The patient's only option for relief was treatment through this study. Upon approval from her Orthopedist, the client proceeded with massage treatment.

Assessment

The patient identified the key symptoms and the most problematic movements during the initial interview. The therapist palpated the musculature to confirm the presence of myofasical restrictions in the cervicoscapular and pectoral region. The therapist and patient established treatment objectives to reduce pain levels, improve strength, and increase ROM void of pain. Massage therapy was to be the solitary variable in determining progress, thus the subject refrained from engaging in other therapies. Progress was measured by means of four assessments.

Patient rated visual analog scale (VAS) of symptomatic pain

The most common symptoms were rated on a scale of zero to ten ('0 = symptom absent, 10 = symptom extreme'). The patient identified these key symptoms as pain in back, shoulders, and neck; muscle weakness; numbness; severity of muscle spasms; frequency of muscle spasms; and 'paresthesia'. Ratings were completed once a day for 35 days and twice on treatment days (pre and post-treatment).

Full abduction at the GH joint assessment

The subject abducted and hyperextended both arms while extending arms at the elbow. The therapist identified and photographically recorded maximum ROM without pain twice on treatment days, pre- and post-treatment. The degree of elevation was compared to a baseline of 180° marked at the subject's shoulder height (Fig. 1).