Journal of Spine
ISSN: 2165-7939

Choudhari et al., J Spine 2012, 1:3
DOI: 10.4172/2165-7939.1000115

Research Article Open Access

Comparison of Upper, Middle, and Lower Trapezius Strength in Individuals with Unilateral Neck Pain

Rucha Choudhari, Deepak Anap*, Keerthi Rao and Chandra Iyer

College of Physiotherapy, Pravara Institute of Medical Sciences University, Loni, Ahmednagar, Maharashtra, India

Abstract

Introduction: Patients with neck pain often have subjective complaints of muscle stiffness, tension, or tightness in addition to their pain. It has been stated that in neck pain there is tightness of Upper Trapezius leading to weakness of Middle and Lower Trapezius, so this study compares the strength of Upper, Middle and Lower Trapezius muscle on the side of pain and the contralateral side.

Method: The strength of Upper, Middle, and Lower Trapezius were assessed and compared on the side ipsilateral and contralateral to the pain in individuals with unilateral neck pain using Stabilizer Pressure bio feedback unit.

Results: It has been shown that there is no significant difference in the strength of Upper Trapezius while there is a significant difference in the strength of Middle, And Lower Trapezius muscle on the side of pain and opposite side.

Conclusion: The study supports that assessment and strengthening of Upper, Middle, and Lower Trapezius is necessary in individuals with unilateral neck pain.

Keywords: Upper, Middle, Lower Trapezius strength; Unilateral neck pain

Introduction

Neck pain (or cervicalgia) is a common problem, with two-thirds of the population having neck pain at some point in their lives [1]. Most patients who present with neck pain have "non-specific (simple) neck pain", where symptoms have a postural or mechanical basis. Aetiological factors are poorly understood [2] and are usually multifactorial, including poor posture, anxiety, depression, neck strain, and sporting or occupational activities [3].

The common causes of neck pain are soft tissue injuries such as ligament sprain, muscle strain, degenerative disc diseases, whiplash injury, tumours, arthritis, etc.

Patients with neck pain often have subjective complaints of muscle stiffness, tension, or tightness in addition to their pain [1,2]. Various authors have proposed that Middle and Lower Trapezius muscle weakness may occur due to prolonged tightness or over activity of the Upper Trapezius muscle, resulting in postural adaptations and pain [3,4].

The majority of research on Scapulothoracic muscle dysfunction has examined individuals with shoulder pathologies such as shoulder impingement, rotator cuff insufficiency, and shoulder instability [5-7]. Such research has focused on Scapulothoracic muscle imbalances, which disrupt normal scapular positioning, resulting in impaired biomechanics and, ultimately pain [5-7]. It has been suggested that muscle imbalances in the scapulothoracic region occur when the Upper Trapezius becomes tight and Middle and Lower Trapezius become weak [3,5,6]. Janda [8] described muscle imbalances as impaired relationships between muscles prone to tightness that lose extensibility, and those prone to inhibition and weakness.

Also some textbook authors [8,9] have stated that individuals with neck pain clinically exhibit limited strength or endurance of Lower Trapezius muscle. Characteristics of Scapulothoracic muscle imbalances are found not only in patients with shoulder pathologies but also in individuals with neck pain and cervicogenic headaches [9,10]. Jull et al. [11] determined that Upper Trapezius tightness was more prevalent in individuals with cervicogenic headaches than in asymptomatic individuals. There is some evidence available to indicate that unilateral neck pain may have a particular effect on muscle ipsilaterally. Larsson et al. (1998) demonstrated a significant reduction in Trapezius blood flow along with reduced electromyographic amplitude and power frequency in patients with chronic cervico-brachial pain. Numerous authors have found limitations in cervical flexor, cervical extensor, and cervical rotator muscle strength in individuals with neck pain and cervicogenic headaches, as compared to asymptomatic individuals [12-14].

Lower Trapezius strength is decreased in individuals with unilateral neck pain, this is supported by Petersen and Wyatt [15] so, with further scope, this study tries to assess the strength of Upper and Middle Trapezius along with Lower Trapezius. The study also compares strength of Upper, Middle and Lower Trapezius on the side of pain with the contralateral side.

Neck pain disability index used in this study is a scale which is used to determine association of disability with neck pain. It was developed in 1989 by Vernon [16]. It is a standard instrument for measuring self rated disability due to neck pain and is used by the clinicians and researchers. It consists of 10 items each of them is scored from 0-5. Thus the maximum score is 50. Score 0-4=no disability, 5-14=mild, 15-24=moderate, 25-34=severe, above 34-complete disability.

The neck disability index has statistically significant validity (Pearson's r = 0.89, P < or equal to 0.05) [17].

The stabilizer pressure biofeedback unit used in this study to assess the strength gives valuable information to ensure quality and precision in exercise performance and muscle testing. It allows the clinician and patient to determine if the patient is able to isolate and maintain

***Corresponding author:** Deepak Anap, College of Physiotherapy, Pravara Institute of Medical Sciences University, Loni, Ahmednagar, Maharashtra, 413736 India, E-mail: deepak.anap@hotmail.com

Received February 01, 2012; **Accepted** March 03, 2012; **Published** April 10, 2012

Citation: Choudhari R, Anap D, Rao K, Iyer C (2012) Comparison of Upper, Middle, and Lower Trapezius Strength in Individuals with Unilateral Neck Pain. J Spine 1:115. doi:10.4172/2165-7939.1000115

contractions of the cervical or lumbopelvic core stabilization muscles. The inter tester reliability of Stabilizer Pressure Biofeedback is 0.788 and test-retest reliability is 0.766 [18].

Method

Twenty five participants (N=25) which included 13 females and 12 males between the age group of 20 to 50 years (mean 37.56) were recruited through systematic random sampling. A convenience sample of 13 female and 12 male participants (N=25) between ages 20 and 50 years (mean 37.56) was taken. The criteria for inclusion in this study were unilateral neck pain which is 3 or more months in duration. Exclusion criteria were pain radiating to whole Upper extremity, history of recent cervical spine surgery, accident or trauma. Each participant received a verbal explanation of test procedure and participants signed a written consent form. The study was approved by the university ethical committee of Pravara Institute of Medical Sciences, Deemed University, Loni.

Procedure

Each participant was given an intake questionnaire to report side of symptoms, symptom duration, and hand dominance. Participants also completed neck disability index which has been found to be reliable, valid, and sensitive in objectively measuring neck pain and associated disability [17].

Strength of Upper, Middle, and Lower Trapezius muscle was assessed using Stabilizer Pressure Biofeedback unit, by measuring the amount of force required by the examiner to overcome the participants' maximum muscular efforts in sequential manner. Strength of Upper, Middle and Lower Trapezius was assessed in standard positions as described by Kendall et al. [17]. Participants were given instructions about the test procedure, and then positioned in prone, with the Upper extremity diagonally overhead, in the line of fibres of Lower Trapezius to assess the Lower Trapezius strength, and the Upper extremity in 90 degree abducted position for Middle Trapezius and for Upper Trapezius the participants are positioned in sitting with the Upper extremity relaxed.

A towel roll was placed under the head to maintain the cervical spine in neutral position. To avoid the compensations during the test, manual fixation was provided by placing the hand just inferior to opposite scapula. The participants were then instructed to maintain this position while the examiner provided resistance. Then the cuff of pressure biofeedback was kept on the dorsal aspect of distal forearm and force was applied by the examiner in downward direction, towards the floor, until the participant's maximum effort was overcome. This procedure was done to assess strengths of Middle and Lower Trapezius and for Upper Trapezius participants were in sitting position with the cuff applied at the top of the shoulder and the examiner applied the force in downward direction towards the floor until the participant's maximum muscular effort was overcome. The maximum force reading was recorded. And two trials were taken with 30 sec interval in between.

Statistical analysis

Mean and standard deviations were calculated for both the groups.

Comparison of mean between the two groups (e.g. affected and unaffected side) was made using unpaired student t test.

Results

Twenty five participants were enrolled and tested. On comparison of strength between Upper, Middle and Lower Trapezius muscle in both groups using unpaired t test, p value ($p < 0.05$) was found to be significant for Middle and Lower Trapezius as shown in Table 1.

68% of individuals showed affection of strength on the dominant side of pain as shown in Table 2.

Table 3 shows the extent of disability in individuals having unilateral neck pain with 16 individuals having mild disability.

No significant difference was found in Upper Trapezius strength while significant difference was found in Middle strength and Lower Trapezius strength on the side ipsilateral to pain and contralateral to pain. The result also reveals that there is more involvement of dominant side and most of the individuals have mild amount of disability.

Discussion

This study demonstrates the comparison between Upper, Middle and Lower Trapezius strength in individuals with neck pain. In neck pain there is over activity of Upper Trapezius muscle so; it becomes tight, resulting in scapulothoracic muscle imbalance causing weakness of Middle and Lower Trapezius muscle. The standard positions as described by Kendall et al. [17] are used in this study. The Upper extremity is positioned in the direction of the fibres of Upper, Middle, and Lower Trapezius muscle. Kinney et al. [19] found significantly greater Middle and Lower Trapezius activation for Middle and Lower Trapezius manual muscle test when the Upper extremity was placed at 90º and 125º of glenohumeral joint abduction respectively.

The results revealed that there is no significant difference in strength of Upper Trapezius muscle but there is a significant difference in strength of Middle and Lower Trapezius muscle between sides ipsilateral and contralateral to pain in individuals with unilateral neck pain. Dominant versus non dominant muscle strength was Lower ($P < 0.05$) for the affected group versus non affected group [20]. The data analysis indicates that most of the individuals have mild amount of disability associated with neck pain.

A stabilizer Pressure Biofeedback unit is used to assess the strength of Trapezius muscle because it gives the quantitative information about muscular efforts exerted by the patient and reduces manual errors.

Although there is currently no other studies investigating Trapezius strength in individuals with neck pain, there has been research on hip muscle strength for those with unilateral patellofemoral pain [19]. Cichanowski et al. [21] found hip abductor and hip external rotator strength in collegiate female athletes to be significantly reduced on the side of patellofemoral pain as compared to contralateral side. These results are consistent with the current study's findings that musculature biomechanically linked to the area of pain can potentially be weaker on the symptomatic side.

	Affected Side Strength (mm of Hg)	Affected Side Strength (mm of Hg)	"P" Value
Upper Trapezius	30.32	31.72	0.3734
Middle Trapezius	17.12	19.48	0.0432
Lower Trapezius	13.2	16	0.0027

Table 1: Strength comparison between affected and unaffected side.

	Dominant Side	Non Dominant Side
No. of Individuals	17(68%)	8(32%)

Table 2: Distribution between Dominant and Non Dominant side.

	0-4	5-14	15-24	25-34	>34
No. of Individuals	1	16	8	0	0

Table 3: Neck Disability Score.

The findings of this study are also consistent with impairments described in the physical therapy neck pain clinical practice guidelines, which are linked to World Health Organizations international Classification of Functioning, Disability, and Health (ICF) and associated International Statistical Classification of Diseases and Related Health Problems (ICD-10) [16]. These guidelines state that patients with compromised coordination, strength, and endurance of neck and Upper quadrant muscles, including Trapezius, fit into the ICF impairment-based category of neck pain with movement coordination impairments and the associated ICD-10 category of sprain and strain of the cervical spine [16].

Conclusion

The results of this study demonstrated that individuals with unilateral neck pain exhibit significantly less Lower Trapezius strength than Middle Trapezius than Upper Trapezius on the side of neck pain compared to the contralateral side with more involvement of dominant side and have mild amount of disability.

References

1. Binder AI (2007) Cervical spondylosis and neck pain. BMJ 334: 527-531.
2. Binder AI. Neck pain syndromes. Clinical Evidence.
3. Binder AI (2004) Cervical pain syndromes. Oxford textbook of rheumatology. (3rd ed.) Oxford Medical Publications, USA.
4. Starring DT, Gossman MR, Nicholson GG Jr, Lemons J (1988) Comparison of cyclic and sustained passive stretching using a mechanical device to increase resting length of hamstring muscles. Phys Ther 68: 314-320.
5. Vasseljen O Jr, Johansen BM, Westgaard RH (1995) The effect of pain reduction on perceived tension and EMG-recorded trapezius muscle activity in workers with shoulder and neck pain. Scand J Rehabil Med 27: 243-252.
6. Kelley MJ (1995) Anatomic and Biomechanical Rationale for Rehabilitation of the Athlete's Shoulder. J Sport Rehabil 4: 122-154.
7. Pink MM, Tibone JE (2000) The painful shoulder in the swimming athlete. Orthop Clin North Am 31: 247-261.
8. Janda VL (1994) Muscles and motor control in cervicogenic disorders: assessment and management. Physical Therapy of the Cervical and Thoracic Spine. (2nd Ed) Churchill Livingstone, Philadelphia, USA.
9. Cools AM, Dewitte V, Lanszweert F, Notebaert D, Roets A, et al. (2007) Rehabilitation of scapular muscle balance: which exercises to prescribe? Am J Sports Med 35: 1744-1751.
10. Cools AM, Witvrouw EE, Declercq GA, Vanderstraeten GG, Cambier DC (2004) Evaluation of isokinetic force production and associated muscle activity in the scapular rotators during a protraction-retraction movement in overhead athletes with impingement symptoms. Br J Sports Med 38: 64-68.
11. Jull (2002) Headaches of cervical origin. Physical Therapy of the cervical and thoracic spine. Churchchill Livingstone, Philadelphia, USA.
12. Jull G, Barrett C, Magee R, Ho P (1999) Further clinical clarification of the muscle dysfunction in cervical headache. Cephalalgia 19: 179-185.
13. Falla D, Jull G, Rainoldi A, Merletti R (2004) Neck flexor muscle fatigue is side specific in patients with unilateral neck pain. Eur J Pain 8: 71-77.
14. Barton PM, Hayes KC (1996) Neck flexor muscle strength, efficiency, and relaxation times in normal subjects and subjects with unilateral neck pain and headache. Arch Phys Med Rehabil 77: 680-687.
15. Petersen SM, Wyatt SN (2011) Lower trapezius muscle strength in individuals with unilateral neck pain. J Orthop Sports Phys Ther 41: 260-265.
16. Vernon (1989) Neck disability index. The chiropractic Resource Organization.
17. Kendall (2005) Muscles: testing and function with Posture and Pain. (5th ed.) Lippicot Williams and Wilkins, Baltimore, MD, USA.
18. Childs JD, Cleland JA, Elliott JM, Teyhen DS, Wainner RS, et al. (2008) Neck pain: Clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health from the Orthopedic Section of the American Physical Therapy Association. J Orthop Sports Phys Ther 38: A1-A34.
19. Kinney E, Wusthoff J, Zyck A, Hatzel B, Vaughn D, et al. (2008) Activation of the trapezius muscle during varied forms of Kendall exercises. Phys Ther Sport 9: 3-8.
20. Trakis JE, McHugh MP, Caracciolo PA, Busciacco L, Mullaney M, et al. (2008) Muscle strength and range of motion in adolescent pitchers with throwing-related pain: implications for injury prevention. Am J Sports Med 36: 2173-2178.
21. Cichanowski HR, Schmitt JS, Johnson RJ, Niemuth PE (2007) Hip strength in collegiate female athletes with patellofemoral pain. Med Sci Sports Exerc 39: 1227-1232.
22. Cools AM, Declercq GA, Cambier DC, Mahieu NN, Witvrouw EE (2007) Trapezius activity and intramuscular balance during isokinetic exercise in overhead athletes with impingement symptoms. Scand J Med Sci Sports 17: 25-33.
23. Jordan A, Mehlsen J, Ostergaard K (1997) A comparison of physical characteristics between patients seeking treatment for neck pain and age-matched healthy people. J Manipulative Physiol Ther 20: 468-475.
24. Ylinen J, Salo P, Nykänen M, Kautiainen H, Häkkinen A (2004) Decreased isometric neck strength in women with chronic neck pain and the repeatability of neck strength measurements. Arch Phys Med Rehabil 85: 1303-1308.
25. Bohannon RW (1988) Make tests and break tests of elbow flexor muscle strength. Phys Ther 68: 193-194.
26. Vernon H, Mior S (1991) The Neck Disability Index: a study of reliability and validity. J Manipulative Physiol Ther 14: 409-415.
27. Helsinki (2007) Reliability of Stabilizer pressure Biofeedback Unit. J Bone Joint Surg Br 91B: 283.