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Influence of bilateral trapezius muscle pain on jaw opening in young adult females: A Pilot Study.

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ABSTRACT: *Background: Neck pain is the most common cause of absenteeism from work following back pain. There is a higher prevalence of it among women than men. Trapezius muscle pain is majorly found in individuals who are required to keep their head stable for longer periods i.e. desk job workers, drivers, students, etc .This pain sometimes spreads to the temporomandibular system (TMS) and affects its functions. Thus, the aim of the study is to assess one of the functions of the TMS i.e. mouth opening in the study and control group*
Materials and methods: Study included two groups(N=60), study group(n=30) and control group (n=30) with trapezius muscle pain and asymptomatic individuals respectively in the age group of 19-35 years females.They were assessed for temporomandibular joint opening using Vernier calliper; and numerical pain rating scale(NRPS), rheobase for quantifying trapezius muscle pain. Mouth opening in two groups were compared.In the study group, NRPS and rheobase values were correlated with mouth opening.
Results: There was a significant difference in the mouth opening between the study group 37.3 mm (± 0.48) and control group 41.7mm (± 0.4) with p value 0.000514. In the study group, there was negative correlation of numerical pain rating scale values 6.3 (±1.2) with mouth opening 37.3mm (± 0.48) with r= -0.25 and p=0.55; and a weak positive correlation of rheobase 2.37mA (± 0.31) with mouth opening 37.3mm (± 0.48) with r = 0.11 and p=0.17
Conclusion: The current study concluded that, there is a reduction of mouth opening in individuals with trapezius muscle pain than in asymptomatic individuals. There is also a weak positive correlation of rheobase with mouth opening and a negative correlation of NRPS with mouth opening.
KEYWORDS: *Trapezius muscle pain, mouth opening , rheobase , vernier calliper, numerical pain rating scale.*

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I. INTRODUCTION

Temporomandibular disorders (TMD) are defined as a collective term for a number of problems involving masticatory musculature ,the temporomandibular joint(TMJ) and associated structures[1].This dysfunction impairs chewing, swallowing, and speaking. The main signs are joint grating, reduced range of motion, and mandibular deviation during TMJ function.[1].The jaw is an essential part of the human motor system with a close relationship with the head and neck system .[1] Patients with TMD experience pain around the tmj and in the jaw muscles, and they also report associated pain in the shoulder or neck area.[2] Myofascial trigger points (TrPs)in the shoulder and neck muscles have been found to be possible sources of referred facial pain.[2] Subjects having greater disability in the jaw are more likely to have greater disability of the neck and vice versa.[3] Researchers have found that subjects with TMD presented with an increased resting electromyographic activity of the sternocleidomastoid and upper trapezius muscles when compared with control subjects .[3] The causative factors could be attributed to the convergence of trigemminal and cervical input on second order neurons ,in addition to central excitatory effects resulting from nociceptive input are suggested as possible explanations for referred pain.[2] The masticatory muscles contract in response to the contraction of cervical spine muscles. A synergistic relationship between the cervical spine and the muscles of mastication is observed with jaw and neck muscles during normal activities involving chew, talk, and yawn.[2]

In an optimal seated posture the upper trapezius is the principal muscle to carry the load and its static load level is 2% to 3% maximum voluntary contractions. The continuous load and overuse of the muscle masked it's vulnerable to pain, spasm and inflammation (trapezitis).

Muscle pain is common. It arises from specialised nerve endings(nociceptors) whose excitation leads to hyperexcitability of spinal accessory neurons. Muscle pain leads to referred pain.[4] Referred pain is the pain that is felt not(only) at the site of origin, but at some other site some distance away.[4] The studies by Travell and Rinzler are well known for diagramming referred pain patterns from cervical trigger points to the orofacial

region.[5] It is known that there are anatomic, biomechanical and physiologic interactions among the muscles involved in the craniomandibular system (the masseter and anterior temporalis, suprahy-oid and infrahyoid muscles, and the cervical muscles –the upper trapezius, semispinalis capitis, sternocleido-mastoid, splenius capitis, semispinalis capitis, and multifidus) in order to maintain the functioning of the craniomandibular system.[6]

The alterations in extracellular electrolyte concentrations in musculoskeletal pain conditions leads to membrane depolarisation leading to increase in axonal excitability. This can be measured by motor rheobase. This formed the basis of our hypothesis of using one of the S-D curve (SDC) parameters as an objective measure of assessing pain. Hence as an adjunct to numerical pain rating scale(nrps)[7], motor rheobase was used to assess pain since motor rheobase in trapezius spasm group was also found to be lower as compared to asymptomatic group.[8]

II. MATERIALS AND METHODS

Departmental Review was taken for the study. The study was conducted in the research laboratory of K.J Somaiya College of Physiotherapy. The study and the control group consisted of 19-35 years adult females with and without bilateral trapezius muscle pain respectively. The written consent was taken from all the subjects. The rheobase values and numerical pain rating scale values were used for quantifying the trapezius pain. A diagnostic multistimulator was used to assess the rheobase . The vernier caliper was used to check the interincisal distance of active mouth opening by the subject [9].Data collected was analysed for comparison of mouth opening between the two groups. In the study group, the NRPS and rheobase values were correlated with mouth opening separately.

III. RESULTS

The data of 60 adult females(Study group n=30) and (Control group (n=30) in the age group of 19-35 years were collected. The mean and standard deviation of the rheobase 2.37mA ± 0.31, numerical pain rating scale 6.3±1.2 values and mouth opening (study group 37.3mm ± 0.48 and control group 41.7mm ± 0.4) was calculated. The difference in the mouth opening of two groups was significant (Table I).In the study group, there was negative correlation of NRPS with mouth opening and a weak positive correlation of rheobase with mouth opening. (Table II).

Table I : Comparison of mouth opening in the study and control group

Mouth opening in study group (mm)	Mouth opening in control group (mm)	Test used	t-value	p-value
37.3 ± 0.48	41.7 ± 0.40	Unpaired t-test	3.457	**0.00051**

Table II : Correlation of NRPS and rheobase values with mouth opening in the study group

Mouth opening(mm)	NRPS value	Rheobase value	Test used	r value	p value
37.3 ± 0.48	6.3 ± 1.2	-	Pearson's correlation test	0.1136	0.55
	-	2.37 ± 0.31	Pearson's correlation test	-0.2567	0.17

IV. DISCUSSION

The upper fibres of trapezius play an important role in maintaining the stability and posture of the neck. These fibres are highly susceptible to overuse .Trapezius pain which is a common musculoskeletal disorder is a classic stress pain[10]. It is an inflammation in the trapezius muscle with an ensuing pain-spasm cycle which can be difficult to break. This pain may be referred to other area from the primary site of inflammation.[10]

Trapezius muscle pain has become common in office workers who are mostly influenced by prolonged static working positions.[11] This leads to continuous activity of low-threshold motor units, reduced local blood flow, accumulation of Ca2+, and other homeostatic changes in the active muscle fiber[11] . The relative load percentage of maximum voluntary contraction [MVC] on the upper trapezius has been shown to increase with masseter muscle overactivity. In an optimal seated work posture,the upper trapezius has staticload level of 2% to3% maximum voluntary contractions. The alterations in the extra cellular electrolytic concentration leads to membrane repolarization and axonal excitability.[8]This alters the motor rheobase reading hence motor rheobase was used as an objective to quantify trapezius pain. Due to the biochemical and pathological changes in the muscle, there might be alterations in transmission of impulses during muscle contraction.In trapezius muscle pain ,the neurotransmitters that are significantly at higher levels are interstitial protons, calcitonin gene-related peptide, bradykinin, substance P, tumor necrosis factor-alpha, interleukin1-beta, serotonin, and norepinephrine in individuals presenting with myofascial trapezius pain when compared with normal healthy subjects.[1] These changes are seen chiefly due to the noninactivating, voltage-dependent Na+ channels which are active even at resting potential.[8]

The pain in muscle spasm is primarily due to ischemia leading to drop in pH,release of pain-producing substances such as bradykinin , adenosine triphosphate, and H+. Thus, when the trapezius muscle was stimulated, the already existing Na+ ions resulted in earlier contraction as compared to normals leading to lower rheobase values.[8]

Pain or trigger points in the trapezius muscle can cause referred pain in the orofacial and shoulder region .Convergence of trigeminal and cervical input on second-order neurons, in addition to central excitatory effects resulting from nociceptive input, have been suggested as possible explanations for this referred pain.[2] It may be possible that spreading symptom to the trigeminal region can be related to the presence of TrPs in the masticatory muscles because TrPs are related to the presence of sensitization mechanism. The trigger points reduce the function of the masseter muscle and cause alteration in mouth opening. The mean maximal mouth opening for females is 44.3±6.7 mm[12].

In the current study it is seen that there is a significant reduction in the mouth opening in females with bilateral trapezius muscle pain.Also for further understanding of clinical significance and social relevance, similar studies should be carried out in a larger population Previously, it was suggested that head posture, which is controlled by the trapezius muscle,correlates with mouth opening. Different head postures can lead to EMG changes in the digastric muscle during mouth opening, and it is widely accepted that mouth opening reflects the coordination between the suprahyoid and lateral pterygoid muscles[2].Furthermore, Eriksson et al have suggested that functional jaw movements are the result of the activation of jaw as well as neck muscles, leading to simultaneous movements in the temporomandibular, atlanto-occipital, and cervical spine joint.However, in considering the relation between pain and mouth opening, it should be mentioned that pain itself may affect the masticatory muscle activity by central effects. Afferent nociceptive input from the head or neck muscles may excite efferent (motor) neurons, resulting in co-contraction of masticatory muscles, which also may explain the observed reduction of mouth opening.[2] The subjects with trapezius muscle pain had slight functional deficit in the temporomandibular system which was not statistically significant. This is attributed to the presence of latent myofascial trigger points in the masseter muscle.[13]This could be the cause of reduced mouth opening. Thus, the mean NRPS (6.3)of trapezius pain shows clinical correlation but not statistical significance.

V. CONCLUSION

The present study concluded that there is an affection of TMJ in subjects with trapezius muscle pain.Assesment of TMJ becomes essential to complete the evaluation of cervical region.

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