

# Effect of mechanical neck pain on temporomandibular joint mobility in females aged 18 -30 years

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## Abstract

**Background:** Cervical dysfunction manifests as restrictions anywhere along the kinetic chain of which a temporomandibular joint is an important component. Assessment of existence of a significant relationship between neck pain and temporomandibular joint mobility could be of important practical relevance. **Aim:** Test the hypothesis of functional association between mechanical neck pain and TMJ mobility. **Objectives:** a) To confirm and establish the functional link between cervical muscle dysfunction and TMJ in females with mechanical neck pain. b) To study effect of Mulligan's self fist traction technique on TMJ mobility in patients with mechanical neck pain. **Methodology:** A before and after effect evaluation double blind study with two weeks follow up design was carried out amongst 35 females with mechanical neck pain (experimental group) and 35 asymptomatic females (control group) and assessed for TMJ motion. If TMJ mobility assessment revealed limitation, then those individuals were taught Mulligan's self fist traction technique. They were asked to perform two sessions of five repetitions in a day and each repetition was held for at least 10-15 seconds. Mandibular Depression, Protrusion, and Lateral deviation of the mandible to right and left were considered as outcome measures. Unpaired 't' test was used to compare TMJ mobility between asymptomatic and mechanical neck pain patients. Paired 't' test was used to assess changes in TMJ mobility with the application of Mulligan's self fist traction technique. 82.85 % sample population (29) in experimental group showed restricted TMJ mobility whereas only 31.42% ( 11 ) population in control group revealed TMJ mobility restriction. All movements of TMJ showed statistically significant improvement with application of Mulligan's self fist traction technique for two weeks. **Conclusion:** Results verifies the mutual existence of cervical myofascial dysfunction and Temporomandibular Joint hypomobility. Mulligan's self fist traction technique helped in reversing the sign of hypomobility at TMJ.

**Key Words:** Temporomandibular joint, TMJ, Mulligan's self fist traction technique, vernier caliper, Temporomandibular joint Range of motion.

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## INTRODUCTION

Sharmann has stated that muscular and skeletal balance which protects supporting structures of body against injury or progressive deformity irrespective of the attitude in which these structures are working or resting is very essential.<sup>1</sup> Cervical spine, Muscles and soft tissues of head, neck and temporomandibular joint are components of the kinetic chain i.e. stomatognathic system, a major functional unit of the body.<sup>2</sup> Cervical spine is the most intricate region of the spine, and so are the muscles of this region. These muscles not only have a motion and stabilization functions, but are strongly involved in the regulatory mechanism of posture.<sup>3</sup> Pattern of dysfunction in cervical region typically involves postural muscles

resulting in poor body alignment.<sup>2</sup> This state of mechanical dysfunction can manifest as restrictions anywhere along the kinetic chain of which a temporomandibular joint is an important component. Influence of myofascial imbalance on movement pattern is a prime factor that is commonly overlooked, frequently becoming a prime source of dysfunction. According to Sujata Byahatti (2010), signs of temporomandibular disorders appear in about 60-70 % of general population and yet only about one in four people with signs are actually aware of or report any symptoms. Furthermore, about 5 % of population will have symptoms severe enough for them to seek treatment.<sup>4</sup> Although temporomandibular joint (TMJ) problems can occur in individuals of any age, they are most common in individuals 18 to 30 years of age and are four times more prevalent in women than in men. The female-to-male ratio of patients seeking care has been reported as ranging from 3:1 to as high as 9:1 reported by Steven Scrivani (2008).<sup>5</sup> Many studies have been carried out to analyze relation between different patterns of mandibular movements, corporal position and myofascial coordination in this region. Their interconnection and divergences of opinion raises a question: Do individuals with cervical myofascial dysfunction show alterations in mobility of TMJ. Nowadays, assessment of existence of a significant relationship between neck pain and temporomandibular disorders could be of important practical relevance. This kinetic link is still far from being clarified. Its relevance has been pointed out by different authors (Riccardo Ciancaglini 1999, Friedman M.H 1996) and also by the American Academy of Orofacial Pain, which in its guidelines considers evaluation of range of motion and palpation of cervical muscles to be an important part of the diagnostic protocol for identification of craniomandibular disorders.<sup>7</sup> However, there are no well-designed studies that demonstrate the functional link between cervical spine dysfunction and temporomandibular joint. While abnormal postural stability and myofascial activity related to primary neck dysfunction has been extensively discussed in the medical literature. There is scarcity of information concerning the role possibly played by specific manual therapy techniques like Mulligan's techniques in restoring coordinated functioning of stomatognathic system.

## METHODOLOGY

A before and after effect evaluation double blind study with two weeks follow up design was carried out at V.S.P.M.'s College of Physiotherapy, Nagpur, India. Thirty five females (mean age = 21.7666) with mechanical neck pain of duration 6 or more than 6 months, not undergoing any medical treatment and

asymptomatic temporomandibular joint formed experimental group. Thirty five asymptomatic females (mean age = 22.366) constituted control group. Cervical radiculopathy, H/o VBI, whiplash injury, cervical arthropathy, migraine or tension headache, diagnosed cases of TMJ disorder, H/o trauma to cervical spine or orofacial structure were excluded from the study. Females in experimental and control group were subjected to assessment of soft tissue flexibility around cervical spine especially

1. Posterior cervical muscles
2. Upper trapezius
3. Levator scapulae
4. Strenocleidomastoid

Both experimental and control group participants were assessed for temporomandibular joint range motion with the help of vernier calliper. If the TMJ range of motion assessment revealed limitation, then those subjects were taught Mulligan's self fist traction technique. Although it is for painful mid to end range flexion limitation, here it has been used to assess its effect on the mobility of TMJ. They were asked to perform two sessions of five repetitions in a day and each repetition was held for at least 10-15 seconds. Temporomandibular joint movements i.e. mandibular Depression, Protrusion, and Lateral deviation of the mandible to right and left were considered as outcome measures.

## RESULTS AND DATA ANALYSIS

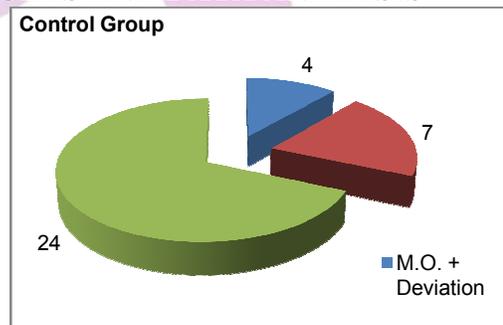


Figure 1: Distribution of Individuals according to Temporomandibular joint disorders (control group)

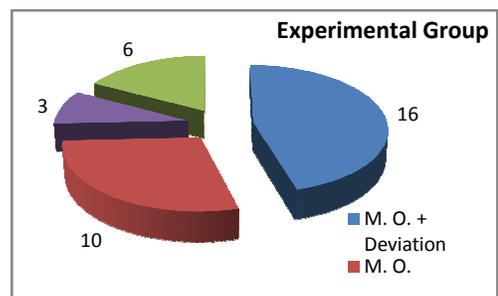
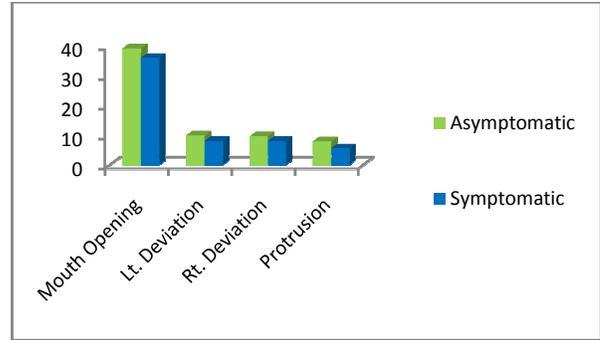


Figure 2: Distribution of Individuals according to Temporomandibular joint disorders (Experimental group)

**Table 1:** Temporomandibular Range of movements in control and experimental group

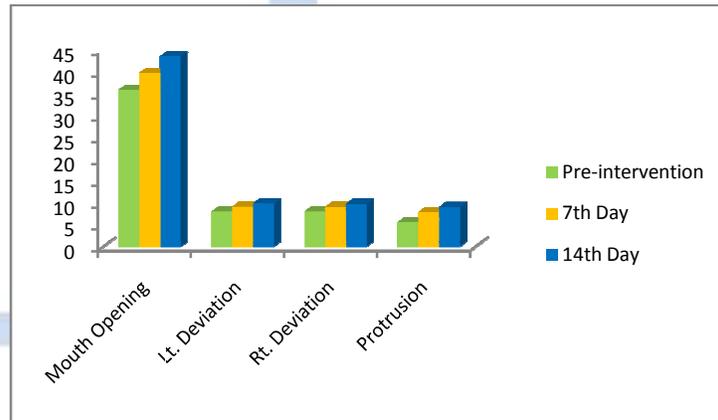
Movements	Control Gr.	Experimental Gr.	t value	P value
Month Opeining	39.43±3.65	35.93±8.1	2.308	0.02
Left Deviation	9.9±1.5	8.03±1.8	4.385	0.001
Right Deviation	9.6±1.3	8.03±1.9	3.69	0.001
Protrusion	7.87±1.3	5.6±1.6	5.98	0.001



**Figure 3:** Temporomandibular Range of movements in control and experimental group

**Table 2:** TMJ movements before and after self fist traction technique

Movement	Pre intervention	7 <sup>th</sup> day	14 <sup>th</sup> day	Pre x post 7 <sup>th</sup> p value	Pre x post 14 <sup>th</sup> p value
Mouth opening	35.93±8.1	39.77±7.6	43.57±7.2	0.0001	0.0001
Left Deviation	8.03±1.8	9.17±1.8	9.87±1.6	0.0001	0.0001
Right Deviation	8.03±1.9	9.13±2.0	9.8±1.7	0.0001	0.0001
Protrusion	5.6±1.6	7.9±2.3	9.7±1.6	0.0001	0.0001



**Figure 4:** Movements before and after Mulligan's self fist traction technique

Data analysis was done using unpaired 't' test to compare TMJ mobility between asymptomatic and mechanical neck pain patients. Paired 't' test was used to assess changes in TMJ mobility with the application of Mulligan's self fist traction technique. 82.85 % sample population in experimental group i.e. 29 females with mechanical neck pain showed restricted TMJ mobility whereas only 31.42% i.e. 11 asymptomatic females in control group revealed TMJ hypomobility. Multidirectional TMJ hypomobility was present in 16 females in experimental group. graph 1,2 All the movements of TMJ in experimental group were statistically significantly restricted. table 1, graph3 29 females with mechanical neck pain revealed TMJ hypomobility. They were taught Mulligan's self fist traction technique and were assessed for the effect of the same on TMJ range of motion on 7<sup>th</sup> and 14<sup>th</sup> day of intervention. All movements of TMJ i.e. mandibular depression (mouth opening), protrusion, and deviations to

right and left showed statistically significant improvement with application of Mulligan's self fist traction technique for two weeks. table 2, graph 4

### DISCUSSION

This study postulates that cervical muscle dysfunction contributes significantly to temporomandibular joint mobility. Activities of masticatory muscles and three dimensional mandibular movements are related to those of cervical muscles as cervical spine is interposed between proximal and distal attachments of some of the muscles controlling the temporomandibular joint<sup>8</sup> Close correlation of temporomandibular disorders with cervical spine disorders has been reported by researches (R La Touche 2009, S.A Olivo 2010). Patients who have neck pain report more signs and symptoms of temporomandibular disorders than those who have no neck pain.<sup>9</sup> Cristiane Pedroni (2005) reported that stomatognathic and cervical systems should be

considered functionally as one where movements of atlanto-occipital joint and cervical vertebrae occur concomitantly with the activation of masticatory muscles and jaw movements. Therefore, myofascial imbalance in this region could lead to the disruption of motor control, compromising the normal mandibular function<sup>10</sup> which remains unnoticed to the patient in the starting. Brodie (1950) demonstrated how tension in one group of muscles may result in tension in another group. The author documented that the rest position of the mandible is determined by muscular equilibrium and that this equilibrium is a function of the maintenance of myofascial co-ordination in cranio-cervical region. Mandible, during normal standing posture, remains balanced with cranium through tensile forces produced by normal function of suprahyoid and infrahyoid muscles. Activity of these muscles is related to those of neck and trunk as well as to the direction of gravitational force acting on the system.<sup>11</sup> Masticatory muscles contract in response to the contraction of cervical spine muscles as these muscles act as agonist and antagonist to one another. Normally, no occlusal contact exists between maxillary and mandibular teeth when muscles of craniomandibular system are relaxed. In the normal resting position of mandible, presence of a freeway space or interocclusal distance of 2 to 4 mm is accepted. Myofascial imbalance in posterior cervical muscles results in shortening and contraction of suboccipital musculature which causes central nervous system input from this region to become nociceptive. This alters neuromuscular influences on the entire masticatory system which influences the resting position of mandible. This muscular inco-ordination in craniocervical region causes supramandibular muscle to pull mandible toward maxilla and cause a more retruded position. The mandibular condyles intrude upward and backward in the glenoid fossa and encroach the resting freeway space, eliminating the rest position and creating tension on the muscles of mastication like masseter and stress on teeth and supporting structures. More retruded position of mandible causes suprahyoid to shorten isometrically, while infrahyoid muscles are stretched. Weakness of anterior cervical neck flexor muscles results in tightening of sternocleidomastoid which is the prime muscular source of proprioceptive input relative to the orientation of the head in space. Effect of this abnormal position may lead to an excessive amount of tension in muscles of mastication especially masseter muscle, upper trapezius muscle and other supporting structures affecting intra-articular pressure within temporomandibular joint. A sustained compression resulting from chronically retruded mandible may produce low grade inflammation from the retrodiscal pad (McKay 1999)<sup>12</sup>. Thus, effect of this

myofascial disharmony in cervical region is the disrupted integrity of stomatognathic system characterised by TMJ hypomobility. According to American National Institute of Dental Research, pain free unassisted mandibular opening of less than 40mm is considered as one of the diagnostic criteria for myofascial dysfunction around temporomandibular joint.<sup>13</sup> In the present study, mandibular depression in females with neck pain was 35.93 mm compared to asymptomatic females in whom the mean mandibular depression was 39.2 mm. The motor parameter of TMJ movements showed a significant improvement in all ranges and approached physiological ranges in treatment based group which can be attributed to Mulligan's self fist traction. The centric position can only be achieved when there is a balance between position and movement patterns of subcranial region, mid and lower cervical spine, hyoid and mandible. Mulligan's self fist traction technique helped in restoring the centric position by stretching tightened muscle groups especially suboccipital posterior cervical, upper trapezius, ; normalizing stress and activities of supramandibular, suprahyoid and infrahyoid muscles ; facilitating patient's ability to maintain head in the position of equilibrium. Mulligan's self fist traction technique helped in re-train the patterns of motor signals in the body, normalizing tone in cervical extensors which are linked with masticatory muscles; consequently normalizing muscle activity around temporomandibular joint, gaining a positive change in the mobility at temporomandibular joint.

#### **Clinical implications**

Close arthrokinematic interaction between the cranio-cervical and temporomandibular regions as showed in this research supports the extremely important need of investigating the complete kinetic chain. Well conducted anamnesis and physical examination is important to achieve more precise diagnosis and select the best possible functional rehabilitation technique. Taking into account results of study it seems obvious that Simple manual therapy techniques like Mulligan's self fist traction technique is not only beneficial for cervical spine but also effective in alleviating annoying problem of TMJ. Interdisciplinary cooperation between dentist and physical therapist is essential to reduce physical, social and psychological impact of chronic conditions of stomatognathic system. Physiotherapists should be an important member of the group of health practitioners who work with patients of these disorders. Hence, the awareness about the role of physical therapist in TMJ disorders should be inculcated amongst physicians and dentists.

## CONCLUSION

Our data verifies the mutual existence of cervical myofascial dysfunction and temporomandibular hypomobility. Mulligan's self fist traction technique helped in reversing the sign of hypomobility at TMJ. Improvement testified to the advisability of Mulligan's self fist traction technique applied.

## LIMITATIONS

- Post intervention change in signs and symptoms of cervical spine was not considered.
- Only female participants were included.

## ABBREVIATION

- TMJ- Temporomandibular joint
- M.O- Mouth opening

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