Effectiveness of Integrated Neuromuscular Inhibition Technique and Myofascial Release with Ultrasound therapy on pain, range of motion and functional disability in Dentists with postural neck pain with upper trapezius trigger points.

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Background

Neck pain is a common problem in the community, affecting approximately 70% of people at some point in their life[1]. Every year, 30% of adults will report having neck pain, and 5–10% of those people will become disabled as a result. Although neck discomfort is typically thought of as benign and self-limiting, it uses a significant amount of healthcare resources. Workers who experience musculoskeletal diseases frequently experience work-related impairment, which has significant financial ramifications due to worker's compensation and medical costs[2]. Dental health workers report a greater frequency of work-related injuries than any other health Muscle-related skeletal issues [3]. Early in a dentist's career, chronic musculoskeletal pain develops. More than 70% of dental students report pain by their third year of study. [4] The L4-L5 region is found to have a high prevalence of pain, which is around 62%, whereas the prevalence of Neck pain in dentists is 74.3%5. The L4-L5 region is determined to have the highest prevalence of pain of all the bodily sites that exhibit musculoskeletal symptoms. Numerous factors, such as prolonged static posture, repetitive movements, poor illumination, and hereditary susceptibility, might contribute to the symptoms of neck pain in dentists. Frequently adopting static positions, which typically call for more than 50% of the body's muscles to engage to hold the body still while defying gravity, is what Ratzon claims causes Neck Pain in dentists[6]. It is believed that repeated prolonged static postures initiate a series of events that could lead to pain, injuries, or career-ending problems seen in musculoskeletal disorders[5].

Muscle imbalances brought on by a forward-head posture might also result in rounded shoulders. When reaching for objects, this position puts the user at risk for impingement of the supraspinatus tendon in the shoulder (rotator cuff impingement). Additionally, the blood flow to the supraspinatus muscle and tendon is impeded by a static position of the arms in an elevated

or abducted state of more than 30°. Arm and wrist abduction can also cause upper trapezius trigger points and trapezius myalgia, which is chronic pain[7].

Osteopaths invented the manual technique known as the muscle energy technique, which is today utilized by a variety of manual therapy professions[8]. This method, known as MET focuses on soft tissues first and foremost. It is promoted as being useful for several things, such as stretching shortened muscles, acting as a lymphatic or venous pump to facilitate the drainage of fluid or blood, and extending the range of motion of a restricted joint[9'10].

The non-invasive treatment methods for neck pain include manual therapies, physical therapy, applying ice, electrotherapy, patient education, acupuncture, non-steroidal drugs, and collar[11]. In recent years using manual therapy techniques for the treatment of musculoskeletal problems has increased[12]. Various manual therapy techniques are available for patients' treatment[12'13].

These techniques are divided into two basic groups: a group of techniques that have been designed based on joint and includes manipulation and mobilization techniques, and another group is Myofascial techniques that have been designed to affect soft tissue[12]. Myofascial Release refers to a manual massage technique that is performed for stretching the fascia and releasing bonds between fascia and skin, muscles, and bones, with the aim of relieving pain and increasing the range of motion and body balance[14]. It is said that the effect of this technique can be mechanical, neural facilitation, and psycho-physiological adaptation[15].

The present study aimed at finding out the effectiveness of the Integrated Neuromuscular Inhibition Technique and Myofascial Release with Ultrasound therapy in the reduction of pain, improvement in range of motion, and reduction of functional disability in Dentists with postural neck pain and upper trapezius trigger points.

MATERIAL AND METHODS

This study was conducted for a duration of 6 months on Dentists with postural neck pain working in Pravara Rural Dental College and hospital, Pravara Institute of Medical Sciences, Loni, Taluka – Rahata, District- Ahmednagar, Maharashtra state, India. dentist aged 25-40 years of age presented with postural neck pain. Both genders included Dentists, having work experience of at least 2-10 years. Dentists with upper trapezius trigger points. Were selected. Those having cervical and degenerative pathology. Participants have a recent history of trauma to the spine or neck-shoulder region. Participants with a history of surgery to the spine and shoulder. Participants with congenital and acquired spinal deformities. were excluded from the study. Informed consent was taken from all participants. Participants were subsequently allocated into two groups based on the method of convenient sampling. Pretest, Post-test experimental group designs were used for the study. The subjects were randomly divided into 2 groups of 60 subjects each:

Group A (Integrated Neuromuscular Inhibition Technique)

Group B (Myofascial release with Ultrasound therapy). The intervention was given for a duration of 5 days a week.

Outcome Measures:

- Visual Analogue Scale (VAS): used to measure the intensity of pain before the intervention and after the intervention.
- Range of Motion of Cervical spine: assessed using Universal Goniometer before the intervention and after the intervention.
- Neck Disability Index (NDI): used to measure functional disability.

Group A: Group A was treated with the Integrated Neuromuscular Inhibition Technique (INIT) which includes the positional release technique, ischaemic compression technique, and muscle energy technique.

Positional release technique:

Physiotherapist sitting on a high sitting stool at the head end of the participant. The participant was in the supine position. The therapist's hand supported the neck and palpated the involved fibers and the other positioned the arm for shoulder abduction. The upper trapezius muscle of the participants was exposed. The therapist held the upper trapezius muscle of the participants with one hand and with the other hand therapist took the same side upper limb in abduction. Then the internal and external rotation of the shoulder was performed to find the position of ease. The participant's neck was rotated and side flexed to the same side. And this position was held for 90 seconds. A brief rest period was given for 30 seconds in a normal position and the procedure was repeated 3 times.

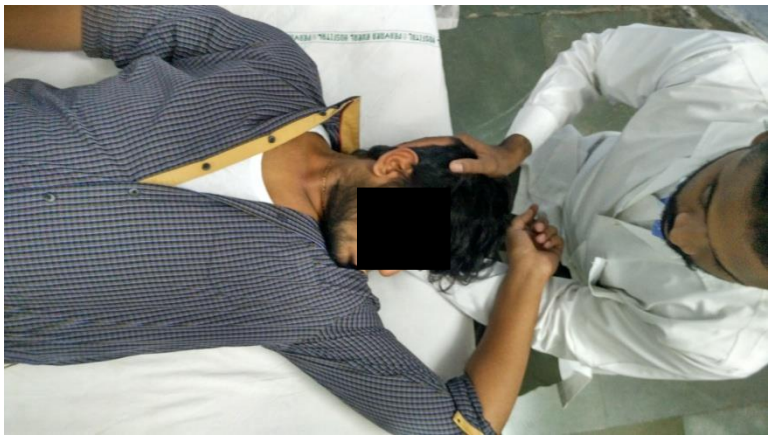

Figure- 1 Application of Positional Release technique

Ischaemic Compression technique:

The physiotherapist stands posterior laterally to the affected side of the participant. The participants were in sitting positions with their backs supported and the forearms were rested

on the pillow. The therapist has one hand on the trigger point and a free hand for palpation. The upper trapezius muscle of the participants was exposed. The non-painful pressure on the trigger point was applied until a barrier of tissue resistance was encountered. The contact was maintained till the release of the tissue barrier and the pressure was increased to reach a new barrier to eliminate trigger point tension. The pressure was applied on the trigger point until the nail blanches. Repeat this procedure 3 times.

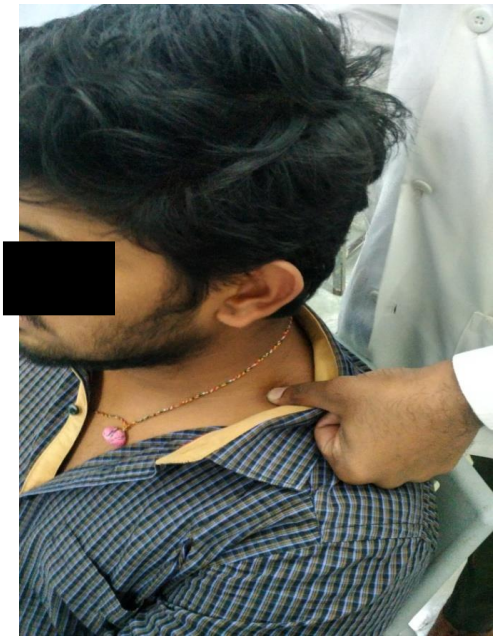

Figure- 2 Application of Ischemic Compression technique

Muscle Energy technique: The therapist sat on a high stool at the head end of the participants. Participants were made to lay supine, arms along the side, necks laterally flexed away from the side being treated. The therapist stabilized the shoulder with one hand and cups the ipsilateral ear/mastoid area, with the other. The participants were in supine, arms along the side, necks laterally flexed away from the side being treated to just short of the restriction barrier, while the therapist stabilized the shoulder with one hand and cupped the ipsilateral ear/mastoid area, with the other. With the flexed neck fully, side bent, and fully rotated to the contralateral side, the posterior fibers of the upper trapezius are involved in contraction. The participant introduced a resisted effort (20% of available strength) to take the stabilized shoulder towards the ear (a shrug movement) and the ear towards the shoulder. The double movement (or effort towards movement) is important to introduce a contraction of the muscle from both ends simultaneously. The degree of effort was mild and no pain was felt. This effort was held for 7-10 seconds. After 7- 10 seconds of contraction and complete relaxation of effort, the therapist gently eased the head and neck into an increased degree of side bending before stretching the shoulder away from the ear while stabilizing the head, to or through the new barrier of resistance as appropriate. This procedure was repeated 3 times.

Figure- 3 Application of Muscle Energy technique

- **Group B:**

Myofascial Release technique: The therapist stood posterolateral on the affected side. The participants were in sitting positions with their backs supported and their forearms were rested on the pillow. The therapist kept the thumbs of both hands on the involved fibers. The upper trapezius muscle of the participants was exposed. The sustained pressure was applied to the restricted tissue barrier. The pressure was applied with both thumbs moving away from each other i.e., one towards the ear and the other towards the shoulder. The pressure was maintained for 90-120 seconds. This causes histological length change and allows the first release to be felt. Then followed into the new barrier. This procedure was repeated 3 times.

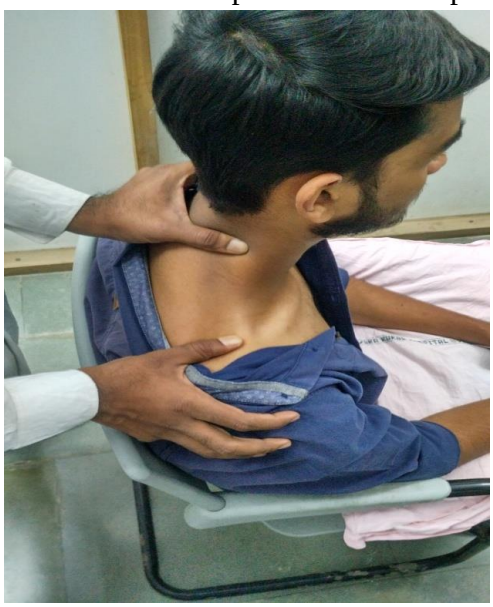

Figure- 4 Application of Myofascial Release technique

Ultrasound therapy: The therapist stood posterolaterally to the affected side. The participants were in a sitting position with their backs supported and their forearms were rested on the pillow. Therapists both hands are free for palpation of trigger points. The upper trapezius muscle of the participants was exposed. The trigger point was first palpated and then it was marked. Ultrasound gel was applied to the transducer head and the transducer head was placed

on the trigger point. The ultrasound machine was set on continuous mode with 1.3 watts/cm2 and the transducer head was moved on the trigger point in a circular pattern for 6 min.

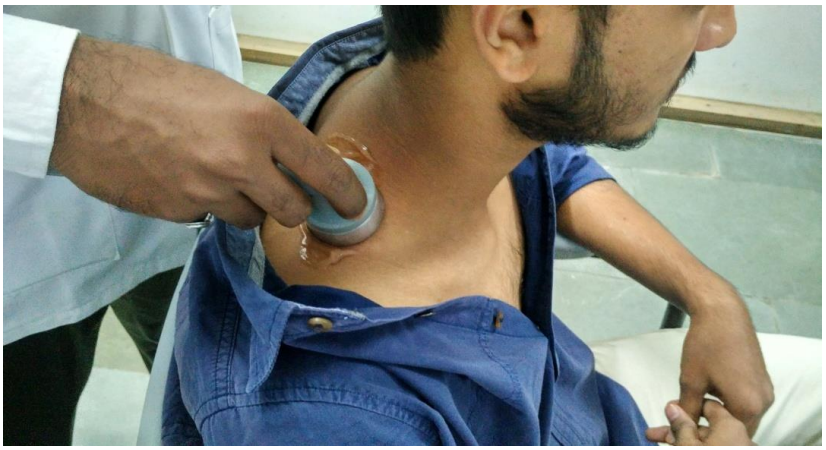

Figure- 5 Ultrasound Application

Results

Pre- and post-treatment data of the participants of both groups were noted. All statistical analysis was done using SPSS 26 software for windows. Descriptive analysis was obtained by using mean & standard deviation. The intergroup comparison between Group A and B of pre-treatment and post-treatment of VAS, Cervical ROM, and NDI was done by paired t-test. The intra-group comparison of pre-treatment and post-treatment of VAS, Cervical ROM, and NDI within Group A and Group B was done by unpaired t-test.

The mean age of participants in group A was 30.13 ± 4.29 years and in the group, B was 29.33 ± 3.64 years. The gender ratio in group A was 18:12 (18 males and 12 females) and in the group, B was 20:10 (20 males and 10 females). The differences in the mean age of both groups were not statistically significant (p = 0.2411, t = 0.7119, df = 29).

Table 1: Within-group comparison in groups A and B participants

	Group A			**Group B**		
Outcomes	**Pre-intervention**	**Post intervention**	**p-value**	**Pre-intervention**	**Post Intervention**	**p-value**
VAS	7.04	2.83	<0.0001	7.25	2.72	< 0.0001
Cervical Flexion	32.16	41.06	< 0.0001	33.2	42.36	< 0.0001
Cervical Extension	31.8	41.4	< 0.0001	34.56	42.8	< 0.0001
Cervical Side flexion to right side	32.1	41.2	<0.0001	34.93	42.73	<0.0001

Cervical Side flexion to left side	31.6	41.33	<0.0001	34.8	42.93	<0.0001
Cervical Rotation to right	38.16	55.63	<0.0001	46.7	56.13	<0.0001
Cervical Rotation to left	39.1	56.06	<0.0001	46.53	56.23	<0.0001
NDI	38.3	32.16	<0.0001	38.79	32.9	0.0001

In above table 1, the mean baseline value for pain in group A (INIT) was 7.04 ± 0.95. After the intervention, the mean value of pain among participants in group A was 2.83 ± 0.46. In group A (INIT) pre-intervention, the mean cervical flexion was 32.16 ± 3.81 degrees, cervical extension was 31.8 ± 2.92 degrees, cervical side flexion to the right side was 32.1 ± 4.07 degrees, cervical side flexion to the left side was 31.6 ± 4.75, cervical rotation to the right was 38.16 ± 5.36 degree and cervical rotation to the left was 39.1 ± 4.75 degrees. Post-intervention, the mean cervical flexion was 41.06 ± 2.69 degrees, the cervical extension was 41.4 ± 2.62 degrees, the cervical side flexion to the right side was 41.2 ± 2.36 degrees, cervical side flexion to the left side was 41.33 ± 3.21, cervical rotation to the right was 55.63 ± 3.63 degree and cervical rotation to the left was 56.06 ± 4.22 degrees the mean difference of pre-intervention of the neck disability index score was 38.3 ± 8.62 and mean difference of post-intervention of the neck disability index score was 32.16 ± 8.27. Independent t-test results revealed that there were significant differences in the VAS (p= <0.0001), Cervical Flexion (p=<0.0001), and NDI (p=<0.0001) in group A. In group B (MFR with Ultrasound), pre-intervention, the mean cervical flexion was 33.2 ± 3.96 degrees, the cervical extension was 34.56 ± 3.97 degrees, cervical side flexion to the right side was 34.93 ± 2.86 degrees, cervical side flexion to the left side was 34.8 ± 3.12, cervical rotation to the right was 46.76 ± 3.82 degree and cervical rotation to the left was 46.53 ± 3.31 degrees. Post-intervention, the mean cervical flexion was 42.36 ± 2.23 degrees, the cervical extension was 42.8 ± 1.90 degrees, the cervical side flexion to the right side was 42.73 ± 1.50 degrees, cervical side flexion to the left side was 42.93 ± 1.91, cervical rotation to the right was 56.13 ± 2.90 degree and cervical rotation to the left was 56.23 ± 2.37 degrees. the mean pre-intervention neck disability index score was 38.73 ± 5.86 and the mean post-intervention neck disability index score was 32.9 ± 5.76. So, within the group, there were significant differences in the VAS (p= <0.0001), Cervical Flexion (p=<0.0001), and NDI (p=<0.0001) in group B.

Table 2: Between groups comparison in group A and B participants

Outcomes	Group A	Group B	p-value
VAS	2.83	2.72	0.3
Cervical Flexion	41.06	42.36	0.04
Cervical Extension	41.4	42.8	0.02

Cervical Side flexion to right side	41.2	42.73	0.004
Cervical Side flexion to left side	41.33	42.93	0.02
Cervical Rotation to right	55.63	56.13	0.5
Cervical Rotation to left	56.06	56.23	0.8
NDI	32.16	32.9	0.0001

Out of the three outcome measures, cervical flexion (p=0.04) extension (p=0.02) rotation to left (p=0.004) and side flexion(p=0.02), and neck disability index (p=0.0001) showed significant differences between groups (P<0.05). The results of There was no significant change found between groups in the VAS (p=0.04)

DISCUSSION

The present study aimed at finding out the effectiveness of the Integrated Neuromuscular Inhibition Technique and Myofascial Release with Ultrasound therapy in the reduction of pain, improvement in range of motion, and reduction of functional disability in Dentists with postural neck pain and upper trapezius trigger points. The results of the present study showed that Integrated Neuromuscular Inhibition Technique (INIT) and Myofascial Release (MFR) with Ultrasound therapy are equally effective in the reduction of pain, improvement of ROM, and reduction in functional disability in Dentists with postural neck pain and upper trapezius trigger points.In the INIT group, the pain reduction may be due to the stimulation of mechanoreceptors which has an influence on the pain gate during the application of trigger point pressure release and increased circulation, after releasing the pressure which ultimately resulted in pain reduction.[62]Protective muscle spasm occurs as a direct result of injury and as a secondary manifestation of inflammation; often as a result of changes in a neuromuscular pattern associated with ‘guarding’, poor posture, favoring an injured area, and bracing and immobilization. Often especially in cases of spasm, the level of spasm is inappropriate for the level of injury. As time goes on, the acute spasm becomes a chronic spasm. This may result in ongoing limited disability, pain, and poor biomechanics well after the injury has healed. Chronic spasm often results in changes in normal fascial, neuromuscular and other connective tissue relationships. This hypertonicity prolongs inflammation, causes ischemia, reduces lymphatic drainage, and increases the concentration of metabolites (waste products) in the tissue[16].

Our findings showed reduced pain intensity following the INIT technique. Our result was in line with the findings of Lamba, D et al [17] and Nagrale et al[18]., 2010. They showed that neck pain can be reduced following six sessions (Lamba, D) and twelve sessions of the INIT technique (Nagrale et al., 2010) in comparison with other treatments.

By placing the distressed tissue into its most ‘ease’, its most ‘comfortable’, and most ‘ pain-free’ condition it evokes a therapeutically significant physiological response i.e. reduction in tension, nociceptive sensitivity, minimizes the stimulation of the affected proprioceptors and circulatory enhancement which helps to resolve musculoskeletal dysfunction. Melzack and Wall (1998) suggested that the reduction in pain is due to mechanoreceptor impulses resulting from applied pressure interfering with pain messages (gate theory). Baldry (1993) stated that analgesic endorphin and encephalin are released in local tissue and the brain. This is in line with the study of Jone (1982) who suggested that a minimum period required to hold a position of ease is 90 seconds in PRT which helps to achieve therapeutic modification by shortening or folding over aberrant tissue by placing the damaged tissue in maximal shortening removes all internal stresses in damaged tissues, totally deactivating the nociceptors. By holding the tissue in this position for 90 seconds, local circulation will improve due to the release from the chronic sympathetic stimulation. Local inflammation will decrease as noxious chemicals are carried away[19].

The analgesic effect of the MET technique was explained by Fryer &Fossum C et al (2009) who hypothesized a neurological explanation for the analgesic effects of MET. A sequence is suggested in which activation of muscle mechanoreceptors and joint mechanoreceptor occurs, during an isometric contraction. This leads to sympathy- excitation evoked by somatic efferent and localized activation of the periaqueductal grey that plays a role in descending modulation of pain. Nociceptive inhibition then occurs at the dorsal horn of the spinal cord, as simultaneous gating of nociceptive impulses takes place in the dorsal horn, due to mechano-receptor stimulation[20].

Fryer G et.al (2009) conducted a study on the effect of muscle energy technique on corticospinal and spinal reflex excitability in asymptomatic participants and found that MET applied to the lumbosacral joint produced a significant decrease in corticospinal and spinal reflex excitability, suggesting overall decreased motor excitability[20].

The ischaemic compression technique can also be explained by the concept of the “barrier release” proposed in which the therapist gradually applies pressure to the MTrP until a definitive increase in resistance is perceived, i.e., the barrier, which is usually perceived as not being painful by the subject. Hence, it can be concluded that ischemic compression techniques might be helpful in reducing pain, increasing pain pressure threshold, and in turn, improving functional status in subjects with myofascial trigger points[21].

Myofascial release (MFR) is an approach that focuses on freeing restrictions of movement that originated in the soft tissues of the body. It is a form of soft tissue therapy that is intended to reduce pain and increase mobility in patients that are suffering from chronic pain conditions. As this technique produces heat and increases blood flow which releases tension from the fibrous band of connective tissue it thus results in softening, elongating, and realigning the fascia and removing restrictions or blockages in the fascia. MFR treatment allows the dysfunctional fascia to return to its position of balance. This safe and gentle treatment results

in the removal of restrictions that prevent free movement and as a result, it helps to restore motion, and relieves and eliminates the soft tissue pain[22].

While ultrasound therapy has been used for the treatment of pain and disability for many years, in two placebo-controlled studies, Srbely and colleagues showed that low doses of ultrasound treatment increased pain pressure threshold and reduced sensitivity on the trigger point by creating short-term antinociceptive effects on trigger points. With ultrasound, the gate control mechanism could be mentioned again due to the excitation of A beta mechanoreceptors. In this, massages produced from mechanoreceptors enter the spinal cord and quick pain impulses at the spinal cord become inhibited and pain would be blocked[23].

As all the interventions were given work majorly on two common mechanisms which are stimulation of mechanoreceptors and post-pressure increase in the blood circulation which relaxes the muscles and eventually helps with reducing pain, improving range of motion, and reducing functional disability. Thus, probably, this could be the reason for both the groups showing equal effectiveness.

Conclusion:

On the basis of the present study, it can be concluded that both INIT and US with MFR on upper trapezius trigger points are effective in increasing the range of motion and reducing pain and functional disability in dentists with postural neck pain.

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