

**Effectiveness of suboccipital release and instrument- Assisted soft tissue mobilization in subjects with non-specific neck pain - A comparative study**

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**Conflicts of Interest:** Nil

**Abstract**

**Background and Objective:** Non-Specific Neck Pain is the Classic Stress Pain and it is the most common musculoskeletal disorder. The Suboccipital muscle is designated as postural muscle and it is highly susceptible to overuse. Tightness in the muscles can decrease the Range of Motion (ROM) of the Neck. The decrease in motion can negatively affect the mobility of the Cervical Joints. Physiotherapy techniques like Suboccipital Release and Instrument -Assisted Soft Tissue Mobilization (IASTM) have been proposed as an adjunct to Conventional therapy to treat suboccipital muscle.

**Methods:** Prospective study design. 70 subjects with mean age of 20 to 45 years having a Clinical Diagnosis of Non-specific Neck Pain were randomly allocated in to two groups. In Group I (n=35) received with Suboccipital Release Technique whereas in Group II (n=35) received IASTM. Participants were given intervention thrice a week for 4 weeks. The outcome measures in term of Pressure Algometer for Pain, Universal Goniometer for Cervical ROM and Neck Disability Index for Function.

**Results:** Statistical analysis of the data revealed that within the group comparison, showed significant improvement in all parameters. Whereas, in between

the group's comparison IASTM showed better improvement compared to Suboccipital Release.

**Conclusion:** After 4 weeks of intervention both Suboccipital Release and IASTM intervention showed significant improvement on reducing Pain, improving Cervical ROM and Function. However, IASTM group were found to be more effective when compared to suboccipital Release.

**Keywords:** Non-Specific Neck Pain, Pressure Pain threshold, Cervical ROM, Suboccipital Release, IASTM.

### **Introduction**

Neck pain is an unpleasant sensation in the neck that can manifest as fatigue, tension, or pain. Radiation to the shoulders, upper limbs or head<sup>1</sup>.

Non-Specific Neck Pain is defined as pain in the posterior and lateral aspect of the neck between the superior cervical line and the spinous process of the first thoracic vertebra without signs or symptoms of major structural pathology and no or minor to major interference with activity of daily life as well as with the absence of neurological signs and specific pathologies<sup>2</sup>.

Neck pain affects about 5% of the global population as of 2010. Mostly seen age groups of 45 years of age. Point prevalence of neck pain is 4.9% (females: 5.8%; males:4.0%)<sup>3</sup>. Annual prevalence ranging between 30% to 50%<sup>4</sup>, with a mean rate of 37.2%<sup>5</sup>. Life time prevalence to be between 22% to 70%<sup>6</sup>. Prevalence is generally higher in women than in men, higher in urban areas compared with rural areas<sup>7</sup>.

The suboccipital muscles commonly become tense and tender due to factors such as eye strain, wearing new glasses, ergonomics on the computer are poor, teeth grinding, bending over<sup>8,9</sup>. Non-Specific Neck Pain is

most often caused by continuous forward head carrying posture leading to suboccipital muscle tightness, reduced cervical mobility and cervical curvature disappeared<sup>10,11</sup>.

There are some of the causes of neck pain, tightness of muscles of both neck and upper back, pinching sensation of the nerves originating from the cervical vertebrae, Joint disruption and some other numerous spinal problems<sup>12</sup>. Most common cause is that soft tissues become strained or sprained from overuse or over extension<sup>13</sup>. Neck pain can be subdivided into upper cervical segment pain in which the pain is usually referred to the head and lower cervical segment pain in which the pain is referred to scapular region, shoulders, and upper limb. Pain develops in the neck and spreads up to the shoulder or to the base of the skull<sup>14</sup>.

Clinical symptoms are associated with neck pain or pain and stiffness in the neck head ache, dizziness, decreased range of cervical movement increased the fatigability, decreased pressure pain threshold of cervical muscles, radiating pain to shoulder and the upper limbs<sup>15</sup>. Non-Specific Neck Pain is diagnosed by an orthopaedician. Conservative treatment are use to help manage Non-Specific Neck Pain are numerous and include usual medical care<sup>16</sup>. Although there is limited evidence for these treatments, conventional treatment options include the prescription of non-steroidal anti-inflammatory drugs, intramuscular injections of lidocaine. Physical therapy includes manipulation, mobilization, low-level laser therapy, dynamic and isometric exercises have also been proved to be moderately effective<sup>17,18</sup>.

Instrument-Assisted Soft Tissue Mobilization is a remedial system that depends on the delicate tissue preparation method of reasoning presented by JAMES CYRIAX, theories that deep tissue friction tissue massage improves the tissue movement prevent the

scar tissue formation and prevent local inflammatory response. The fascia is an important and often overlooked tissue that often contributes to musculoskeletal pain. The cervical spine has different levels of fascia. Somewhere in between suboccipital muscles and upper cervical dura, which attaches to the cranial fossa and C2 vertebrae? Adhesion of these fascial joints restricts normal muscle movement between the fascial planes. IASTM uses ergonomic instruments to detect and eliminate fascial restrictions. Promote the rapid positioning and effective treatment of chronic soft tissue fibrosis areas inflammation, or degeneration<sup>19</sup>.

Suboccipital Release is also known as cranial base release. Muscles of the neck and upper back often contain many trigger points for over activity. Occipital relief is another technique that helps treat trigger points. It has also been called as ‘inhibitive cervical manual traction’. A mild manual traction is applied to the posterior cervical musculature and ligaments. Direct pressure on the tendon-muscle junction the cervical muscles at the base of the skull, which facilitates relaxation of muscles<sup>20</sup>.

#### Materials and methods

**Study Design:** Prospective study design.

**Ethical Clearance and Informed Consent:** The study protocol was approved by the Ethical Committee of GSL Medical College( Annexure-1) the Investigator explained the purpose of the study and given the subject information sheet. . The participants were requested to provide their consent to participation in the study (Annexure-II). All the participants signed the informed consent and the rights of the included participants have been secured.

**Study Population:** Subjects clinically diagnosed as Non-Specific Neck Pain.

**Study Setting:** The study was conducted at Department of Physiotherapy, GSL Medical College and General Hospital, Rajamahendravaram, Andhra Pradesh, India.

**Study Duration:** The study was conducted during the period between July 2020 to June 2021.

**Sampling Method:** Systematic random sampling

**Intervention Duration:** 4 weeks of training programme, which includes Suboccipital Release of suboccipital muscles and Instrument-Assisted Soft Tissue Mobilization of Suboccipital muscles.

**Sample Size:** A Total number of 100 subjects with Non-Specific Neck Pain were screened. In that 70 subjects were recruited who are willing to participate in the study, Recruited participants were explained the purpose and relevance of the study. Those willing to volunteer were included in the study after obtaining informed consent. All the eligible participants were consecutively randomised in to either Suboccipital Release or Instrument-Assisted Soft Tissue Mobilization of suboccipital muscles with 35 in each group.

#### Materials Used

- Universal Goniometer
- IASTM
- Pressure Algometer

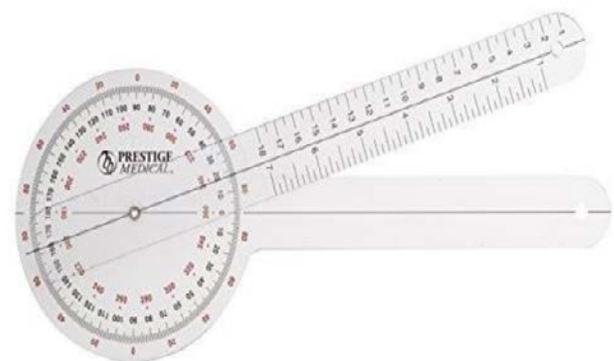


Fig. 1: Universal Goniometer



Fig. 2: IASTM



Fig. 3: Pressure Algometer

### Outcome Measures

**1. Pressure Algometer** has been used for evaluation of sensitivity of the pain and the assessment of pressure perception. This measure has proven to be commonly useful in evaluating tenderness symptom, trigger points, fibrositis. The algometer tested had high reliability and validity values. This support previous research by FISCHER demonstrating acceptable under examined reliability of pressure rate application considering these results may be safe to claim that with practice the use of this algometer is reliable and valid<sup>21</sup>.

**2. Universal Goniometer:** Range of motion is the extent of movement of a joint, measured in degrees of a circle. In this study range of motion can be measured through universal goniometer. A universal goniometer is an

instrument that either measures an angle or allows an object to be rotated to a precise angular position<sup>22</sup>.

**3. Neck Disability Index (NDI):** is a 10-item questionnaire that measures a patient's self-reported neck pain related disability. A higher NDI score means the greater a patient's perceived disability due to neck pain. The "minimally clinically important change" by patients has been found to be 5 or 10%. 0 points or 0% means: no activity limitations, 50 points or 100% means complete activity limitation<sup>23</sup>.

### Universal Goniometer (UG) for Cervical ROM<sup>24</sup>:

The Universal Goniometer (UG) is a reliable, valid, responsive, and frequently used for Cervical Range of motion outcome measure. The full-circle Goniometer or Universal Goniometer is a versatile device for recording measurements of Peripheral joint ROM in subjects. The UG is a 360° Protractor Goniometer by aligning this within the axis of a Joint, the degree of motion can be measured in a single Plane. It contains of mainly three parts.

- 1: Axis
- 2: Stable arm
- 3: Movable arm

### Alignment of Universal Goniometer (UG)

#### Procedure for Measuring Cervical Flexion and Extension:

The examiner positions the UG axis at the centre of the subject's external auditory meatus. The stable arm is vertical, and the movable arm is aligned parallel to the imaginary line between the external auditory meatus and the base of the nares. The recorder writes down both start and end points of the cervical active range of motion (AROM) from the reverse side of the UG Protractor scale.

#### Procedure for Measuring the Cervical Right and Left Side Flexion:

The examiner positions the UG axis

over the center of the subject's sternal notch. The UG stable arm is aligned parallel to an imaginary line between the subject's acromion processes; the movable arm is aligned with the center of the subject nose. The recorder writes down both start and end points of the cervical (AROM) from the reverse side of the UG protractor scale.

**Procedure for Measuring Cervical Right and Left**

**Side Rotation:** The examiner positions the UG axis over the center of the subject's head. The stable arm of UG is aligned with an imaginary line between the subject's acromion processes; the movable arm is aligned with the tip of the subject's nose. The recorder writes down both start and end points of the cervical AROM from the reverse side of the UG protractor scale.

**NDI for Functional Disability**<sup>25</sup>: The Neck Disability Index is a 10-item questionnaire that measures patients' self-reported neck pain related disability. The patients were given a detailed explanation about the Neck Disability Index. Questionnaire consists of 10 sections that recommended to enable the patient to understand how much the Pain has affected their ability to everyday activities. Patient must choose only one that most applies. Each of the 10 sections scored separately and then added up. The score was done by using ONLINE Scoring Calculator. The Functional status was assessed by means of Vernon Neck Disability Index (NDI). Total scores range between 0 and 50 Points. (Annexure IV)

0-4	No Disability
5-15	Mild
15-24	Moderate
25-34	Severe
Over 35	Complete Disability

**Inclusion Criteria**

1. Non-Specific Neck Pain diagnosed by an Orthopedician.
2. Pain in the suboccipital region.
3. Both male and female subjects with age between 20 and 45years.
4. Duration of Pain <1month.
5. Subjects willing to participate in the study.

**Exclusion Criteria**

1. Previous and recent traumatic injury to the neck.
2. Any recent surgical interventions.
3. Systemic illness or neurological illness.
4. Recent corticosteroid injection.

**Procedure**

A brief history was taken as per inclusion criteria and exclusion criteria. The study protocol explained and a written informed consent was obtained from all the patients. All subjects were screened based on the inclusion and exclusion criteria prior to their enrolment into the study. Baseline values for all the outcome measures in all the patients were noted prior to the beginning of the study. Subjects were randomly selected for collection of data. Prior assessment demographic data was noted. The subjects were divided into 2 groups, Group-I received Suboccipital Release and Group-II received IASTM, both groups received conventional exercises thrice a week for 4 weeks.

**Group I: Suboccipital Release**

In group I, the subjects were instructed to be in supine on the table with the therapist seated at the head of the table. The finger pads should be placed over the suboccipital muscles bilaterally, just inferior to the superior nuchal line down at approximately the level of C2. Traction is then applied with the fingers in an anterior, lateral and cephalad direction. Therapist then

uses two handed combinations moved with greater ease. The technique was administered once for 3minutes for one session. This procedure was repeated thrice a week for 4 weeks. All the subjects in this group performed the neck stabilization exercises, 3 days a week for 4 weeks duration<sup>20</sup>.

### **Group II: Instrument-assisted soft tissue mobilization**

In group II, the subjects were seated in a comfortable position. The subject's forehead rested on his/her forearm on a table Infront of him/her. A lubricant (Vaseline) was applied to the skin around the neck area prior to treatment and IASTM was cleaned with an alcohol pad. First, the IASTM blade was used to find the exact areas of restriction in the suboccipital muscles. Apply slow strokes along the suboccipital muscles without causing any pain or discomfort, from the origin to its insertion approximately 3min and repeat 3times. This procedure was repeated thrice a week for four weeks. Subjects were instructed to put an ice pack on the area if they felt any burning sensations after the session. All the subjects in this group performed the neck stabilization exercises, 3 days a week for 4 weeks duration<sup>26,27</sup>.

### **Conventional Exercises**

**Neck Stabilization Exercises Group:** The Neck Stabilization Exercise training is designed to restore cervical muscle function and pain. All the subjects in this group performed the following exercises,3 days a week for 4 weeks duration<sup>28</sup>.

**Chin Tuck:** In standing position, subject pulls back the chin (as if trying to make a double chin) while keeping the eyes level. This was done for 15 repetitions.

**Cervical Extension:** In standing position, subject grasps the base of the neck, with both hands while extending

the neck as far as possible. This was done for 15 repetitions<sup>29</sup>

**Shoulder Shrugs:** In standing position, subject shrugs the shoulders, bringing them up towards the ears and dropping them back. This is done for 15 repetitions

**Shoulder rolls:** In standing position, subject rolls the shoulders forward and backward in a circle respectively. Then the participant relaxes and repeats the sequence for 15 times.

**Scapular retraction:** In standing position, subject brings the shoulder blades together in the back; participant then relaxes and repeats the procedure for 15 times.

### **Results**

The aim of the study was to find the effectiveness of Suboccipital Release and Instrument-Assisted Soft Tissue Mobilization in subjects with Non-Specific Neck Pain. The consort flow chart of the study showed the study organization in terms of Subjects Screening, Random allocation and analysis following the Intervention.

A total 100 subjects were screened for eligibility, amongst 70 subjects were included in the study trail. All the 70 subjects who met inclusion criteria have undergone baseline assessment and included subjects were randomized into two groups consisting of 35 in each group.

In this study, 32 participants completed training in Group-I and 33 subjects completed training in Group-II with dropouts of 3 and 2 in respective groups.

**Comparison of Mean Scores of PPT between the Groups**

Groups	Pressure Pain Threshold	Mean	Sd	P Value	Inference
Group I	Pre	0.78	0.17	0.23	In Significant
Group II		0.73	0.11		
Group I	Post	1.42	0.19	0.000*	Highly Significant
Group II		1.62	0.26		

**Comparison of Mean Scores of Cervical Flexion ROM from Pre- and Post- Test in between the Groups**

Groups	C. Flexion	Mean	Sd	P Value	Inference
Group I	Pre	58.71	10.13	0.92	In Significant
Group II		58.45	11.23		
Group I	Post	60.84	14.56	0.01	Significant
Group II		70.21	14.93		

**Comparison of Mean Scores of Cervical Extension ROM from Pre and Post-test in Between the Groups**

Groups	C. Extension	Mean	Sd	P Value	Inference
Group I	Pre	50.875	7.29	0.14	In Significant
Group II		48.45	5.65		
Group I	Post	55.25	8.31	0.01	Significant
Group II		60.27	8.51		

**Comparison of Mean Scores of Neck Disability Index from Pre- and Post- Test in Between the Groups**

Groups	Neck Disability Index	Mean	Sd	P Value	Inference
Group I	Pre	33.93	8.93	0.44	In Significant
Group II		35.66	9.01		
Group I	Post	17.87	6.35	0.00*	Highly Significant
Group II		13.30	5.23		

**Discussion**

The aim of the study was to evaluate the Effectiveness of Suboccipital Release (Group-I) and Instrument-Assisted Soft Tissue Mobilization (Group- II) on Pain, Cervical Range of Motion and Function in subjects with Non-Specific Neck Pain. In this study subjects were assessed for pressure pain threshold, Cervical Range of

Motion and Function using Pressure Algometer, Universal Goniometer and Neck Disability Index respectively.

In this study (Group-I) suboccipital Release showed statistically significant difference within the groups from pre-test to post-test values on reducing Pain, Improving Cervical Range of Motion (ROM) and Function in subjects with Non-Specific Neck Pain.

In this study (Group-II) Instrument-Assisted Soft Tissue Mobilization showed statistically significant difference within the groups from pre-test to post-test values on reducing Pain, Improving Cervical Range of Motion (ROM) and Function in subjects with Non-Specific Neck pain.

The Sub occipital Release helps to soften the fascia and muscle tissue in the suboccipital area. This helps to open the area between the vertebrae tip C1 (Atlas) and C2 (axial) vertebrae. The neck and the bottom of the head or occiput. The Suboccipital Release may be considered in the Treat tension headache, neck pain, shoulder pain and upper back pain. In addition, this technology can be used for people who have begun to develop higher levels of crossover syndrome. A term used to describe the twisted posture of a person with lowered shoulders. The head and neck protrude forward, a common posture in modern society, which may be related to our lifestyle, smartphones and desktop work. This posture is the result of chronic shortening of the suboccipital muscles and can lead to headaches, as well as head and neck pain. The suboccipital release can be used to stretch and soften these muscles to relieve pain and improve posture.

Our study supported by Ylinen J et al, that Suboccipital Release along with exercises were more Effectively

improve the tenderness threshold and range of motion in patients with Non-Specific Neck Pain .

In IASTM may have an impact on physiological changes by providing an increase in blood flow, Decreased tissue viscosity, myofascial release, damage and improvement of pain receptors. Flexibility of the underlying tissue. IASTM is considered an effective treatment method. Interventions to relieve pain and improve function in less than three months.

Our study was supported by Matthew Lambert et al., that Instrument-Assisted Soft Tissue Mobilization was more effective in reducing Pain, improving Cervical Range of Motion and Function <sup>30</sup>.

This study shows that suboccipital muscle spasm can cause Neck Pain, with restriction in Cervical Range of Motion and increase disability according to Neck Disability Index. Individually both Suboccipital Release and Instrument-Assisted Soft Tissue Mobilization were found to be effective in different conditions. In this study, the soft tissue loosening technique used instruments found to be more effective than suboccipital Release, the reason may be due to Instrument-Assisted Soft Tissue Mobilization is a method of treatment that involves the mechanism of Automatic adjustment of muscle spindles. The shortened position of the muscle is a nonthreatening position for a muscle in spasm and reduced pain and sequence of muscle and joint mechanoreceptors activation evoked firing of local somatic efferent. This in turn led to sympathy excitation and activation of the periaqueductal Gray matter, which resulted in the activation of Pain modulation downwards. In addition, stimulating mechanoreceptors and simultaneously. The door to noxious impulses occurs in the dorsal horn of the spinal cord. IASTM improves the elasticity of soft tissues while eliminating

the limitations of soft tissues (Heinecke et al., 2014) And when heat is released at degrees due to tool friction, the viscosity of the tissue will decrease, making it soft (Markovich, 2015). Physiologically, a decrease in tissue viscosity will improve ROM (Ostojic et al., 2014). At the same time, it can also explain IASTM's major changes to ROM. Assumptions about the nervous system .Muscles under mechanical pressure fascia, intravesical mechanoreceptors become stimulated. This change changes proprioception Information is sent to the central nervous system, which changes the tension of motor units associated with tissues (Schleip, 2003) .Although IASTM, is believed to improve ROM through mechanisms Described in this hypothesis, appearing independently or as a combination, scientific evidence. There is still a lack of support for such claims. Therefore, this study is consistent with previous studies indicate the strength training leads to decrease in pain. Pain relief leads to improvement in function as can be seen by the improvement in the score of Neck disability index <sup>31</sup>.

Hence, we conclude that the therapeutic Instrument-Assisted Soft Tissue Mobilization was found to be more effective than suboccipital Release, and it could be opted as a treatment of choice for reduction of suboccipital muscles Pain, enhancing the Cervical Range of Motion and reduction of Neck Disability when compared with suboccipital Release.

### **Conclusion**

The present study concluded that four weeks of interventions of Suboccipital Release and Instrument-Assisted Soft Tissue Mobilization were shown statistically significant difference in reducing Pressure Pain Threshold and improving cervical Range of Motion and Function. However more percentage of

improvement was found in subjects received Instrument-Assisted Soft Tissue Mobilization when compared to Suboccipital Release.

From the findings of the current study, it can be recommended that the Instrument-Assisted Soft Tissue Mobilization may be opted as a treatment of choice for reduction of suboccipital muscles pain, enhancing the cervical Range of Motion and reduction of Neck Disability.

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