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Effect of Integrated Neuromuscular Inhibition Technique versus Ischaemic Compression and Trigger Point Pressure Release on Upper Trapezius and Non-Specific Neck Pain

Dr. Krishna Shinde[1], Dr. Manasi Karpe[2]
(Assistant Professor, Department of Physiotherapy, MVP'S Dr Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik, India)[1]
(Department of Physiotherapy, MVP'S Dr Vasantrao Pawar Medical College, Hospital and Research Centre, Nashik ,India)[2]
Corresponding Author: Dr. Krishna Shinde

Abstract:*Neck pain is a common disorder prevailing among individuals of different population with about 70% of the population experiencing an episode of neck pain at sometime during their lives.[1,2] The myofascial pain syndrome is a disorder related to myofascial trigger points.[2] It is defined as a hyperirritable locus in skeletal muscle and that is associated with a hypersensitive palpable nodule in a taut band of muscle.[2] Currently, a large variety of both manual and non-manual interventions exist for the deactivation of trigger points.[3] Our study aims to compare the effect of integrated neuromuscular inhibition technique versus ischaemic compression and trigger point pressure release on upper trapezius trigger points and non-specific neck pain.This study was conducted in subjects with upper trapezius trigger points and non-specific neck pain who presented to the physiotherapy OPD in department of physiotherapy between August 2018 to February 2019. A total of 20 patients were included in the study. The upper trapezius trigger points were significantly reduced after treatment of two weeks.*

Hence forth the above study showed that both integrated neuromuscular inhibition technique and ischaemic compression and trigger point pressure release were equally effective in subjects with upper trapezius trigger points and non-specific neck pain.

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I. Introduction

Neck pain is a common disorder prevailing among individuals of different population with about 70% of the population experiencing an episode of neck pain at sometime during their lives.[1,2] In the United States in the year 2010, the Global Burden of Diseases was analyzed. Neck pain is ranked 4th major epidemic responsible for an individual's year lived with disability and ranked 11th as disability adjusted life years of an individual.[2] One reason for development of pain in neck region is due to development of trigger points due to involvement of trapezius muscle. Clinically, a trigger point is defined as a hyperirritable focus in a muscle or fascia that is tender on palpation and on compression results in referred pain or tenderness in a characteristic "zone".[1] Common causes for activation of trigger points include lack of exercise, prolonged poor posture, emotional distress, arm rests that are too high, sitting without a firm back support (sitting slumped), forward head posture, any position in which shoulders are held up for periods of time may perpetuate trigger points in this muscle.[1] The areas of stressed soft tissue receive less oxygen, glucose, and nutrient delivery, and subsequently accumulate high levels of metabolic waste products. The end result of this cascade of events in the creation of altered tissue status, pain, and the development of trigger points.[3] Trigger points have been associated with hyperalgesia and Limited range of motion and therefore clinically important to identify as these possesses the potential to restrict functional activities. Signs that may include the presence of a taut band in skeletal muscle, the presence of a tender spot within the taut band, a palpable or visible local twitch response upon palpation, and/or needle inspection of the trigger point, the presence of a typical referred pain pattern and restricted ROM of the affected tissues.[3]

II. Materials And Methods

The prospective comparative study was carried out on subjects in MVP'S Dr Vasantrao Pawar Medical College, Hospital and Research Centre, Physiotherapy OPD from August 2018 to February 2019. A total 20 subjects(both males and females) of aged 18-55years were included in this study.

Study Design: Comparative study

Study Location: MVP'S Dr Pawar Medical College, Hospital and Research Centre, Physiotherapy OPD Nashik
Study Duration:6 months
Sample Size: 20
Group A: 10 Group B: 10

Inclusion Criteria:
- 18-55 years of age[4]
- Pain on palpation[1]
- Jump sign characterized by patients vocalization or withdrawal[1]
- Limitation of neck movements (lateral flexion and rotation)[1]
- Pain of atleast 3 on visual analouge scale[1]

Exclusion Criteria:
- Recent history of trauma to spine or neck shoulder region[1]
- History of surgery to spine and shoulder [1]
- Congenital and acquired spinal deformities[1]
- Serious pathology(eg: malignancy, infection, inflammatory disorder)[3]
- Cervical spinal cord comprmise (eg: diffuse sensory abnormality, diffuse weakness, hyperreflexia, or the presence of clonus)[3]

Procedure Methodology

Under convenient sampling method,subjects were taken from MVP'S Dr Pawar Medical College, Hospital and Research Centre, Physiotherapy OPD Nashik. The subjects were screened as per the inclusion and exclusion criteria and were put in group A (INTEGRATED NEUROMUSCULAR INHIBITION TECHNIQUE) and group B(ISCHAEMIC COMPRESSION AND TRIGGER POINT PRESSURE RELEASE). Procedure and purpose of study was explained to participants in understandable language. All subjects were divided by convenient sampling method in group A and group B.

Group A Subjects received six sessions given in two weeks treatment of integrated neuromuscular inhibition. Initially a warm up phase of free exercises of neck were encouraged for 5 times each.Then in supine lying , stretch was applied with the thenar of the hand down towards muscle insertion and the other hand andbody to bend the head and cervical spine to the opposite side hold for 10 sec and relax, perform 3 times for one session. Subsequently, cervical isometrics in sitting position by giving resistance on the forehead (cervical flexion, extension, rotation, and lateral flexion) for 10 sec with 15 sec breaks between holds with 10-15 repetitions in a progressive manner.

Group B Subjects received six sessions given in two weeks treatment of ischaemic compression and trigger point pressure release. **Ischaemic compression:** It consisted of sustained deep pressure with the thumb on the upper trapezius trigger points for 30secs-1min.Pressure was released when there was decreased tension in the trigger point or when the trigger point was no longer tender or 1 min had elapsed, whichever occured first. **Trigger point pressure release:** A non-painful slowly increasing pressure with the thumb was applied over the trigger point until a tissue resistance barrier is felt. This level of pressure was maintained until release of the tissue barrier is felt, at which time pressure is increased until a new barrier is reached. This process was repeated until there is no trigger point tension/ tenderness or 90 sec has elapsed , whichever occurred first.

Statistical Analysis

Data was analysed using Primer version 7 in this study. Baseline characteristics of the two treatment groups namely integrated neuromuscular inhibition technique versus ischaemic compression and trigger point pressure release were compared to evaluate the success of randomization. The within group (Intra group) comparisons of the change in the Visual Analouge Scale (VAS) ,Range of Motion, and neck disability index(NDI) score PRE and POST was assessed by paired t test. The between group (Inter group) comparisons of the change in the Visual Analouge Scale (VAS) ,Range of Motion, and neck disability index(NDI) score PRE and POST was assessed by unpaired t test. The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result

- After 2 weeks of treatment, it was found that as p value for Group A regarding pre and post treatment pain, cervical lateral flexion and rotation ROM and NDI score was <0.0001, Group A proved extremely statistically significant in reducing pain and NDI score and improving ROM in patients with upper trapezius trigger points and non-specific neck pain.

- As p value for Group B regarding pre and post treatment pain, cervical lateral flexion and rotation ROM and NDI score was <0.0001, Group B proved extremely statistically significant in reducing pain and NDI score and improving ROM in patients with upper trapezius trigger points and non-specific neck pain.
- As the p value for the comparison between Group A and Group B for pain is 0.055, it not statistically significant. As the p value for the comparison between Group A and Group B for right lateral flexion is 0.355, it is not statistically significant. As the p value for the comparison between Group A and Group B for left lateral flexion is 0.470, it is not statistically significant. As the p value for the comparison between Group A and Group B for right cervical rotation is 0.295, it is not statistically significant. As the p value for the comparison between Group A and Group B for left cervical rotation is 0.275, it is not statistically significant. As the p value for the comparison between Group A and Group B for NDI score is 0.635, it is not statistically significant.
- Hence, both the groups are equally effective in reducing pain and NDI score and improving lateral flexion and cervical rotation in patients with upper trapezius trigger points and non-specific neck pain.

- **Gender distribution:**
  Total no. of males-3
  Total no. of females-17

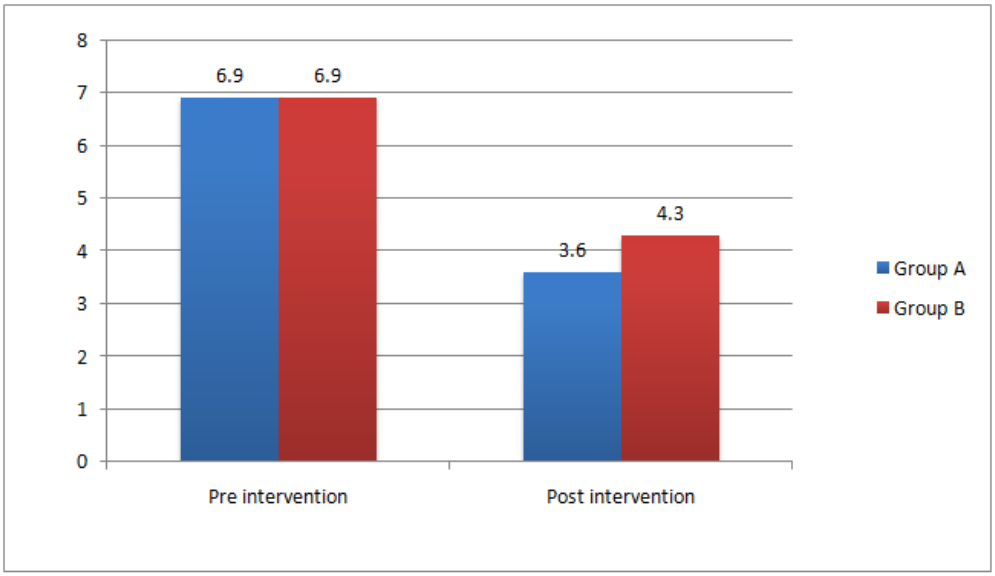
Table shows distribution of various age groups in the study of 20 subjects.:

AGE GROUP	NO. OF PATIENTS
20-30	14
31-40	4
41-50	2

- **Table No. 01 Comparison of VAS score pre & post- interventional within Group A and Group B**

VAS	Group A	Group B
Pre-interventional Score	6.9	6.9
Post-interventional Score	3.6	4.3
t value	15.461	15.922
p value	0.000	0.000
Results	Extremely significant	Extremely significant

- **Graph 01.Comparison of VAS score pre & post-interventional within Group A and Group**



- **Table No. 2 Comparison of Right lateral flexion pre & post-intervention within Group A and Group B**

Right Lateral flexion	Group A	Group B
Pre-interventional Score	33.3	38.1
Post- interventional Score	39.8	41
t value	-8.854	-6.018
p value	0.000	0.000
Results	Extremely significant	Extremely significant

- **Graph 02: Comparison of Right lateral flexion pre & post-interventional within Group A and Group B**

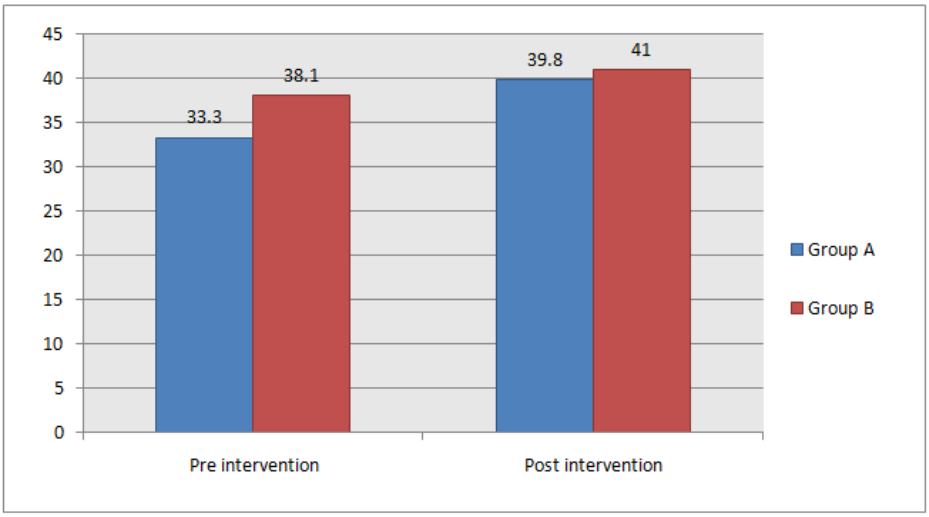


Table No. 3 Comparison of Left lateral flexion score pre & post-interventional within Group A and Group B

Left lateral flexion	Group A	Group B
Pre-interventional Score	33.3	36
Post interventional Score	39.8	38.8
t value	-8.854	-6.000
p value	0.000	0.000
Results	Extremely significant	Extremely significant

- **Graph 03 Comparison of Left lateral flexion score pre & post-interventional within Group A and Group B**

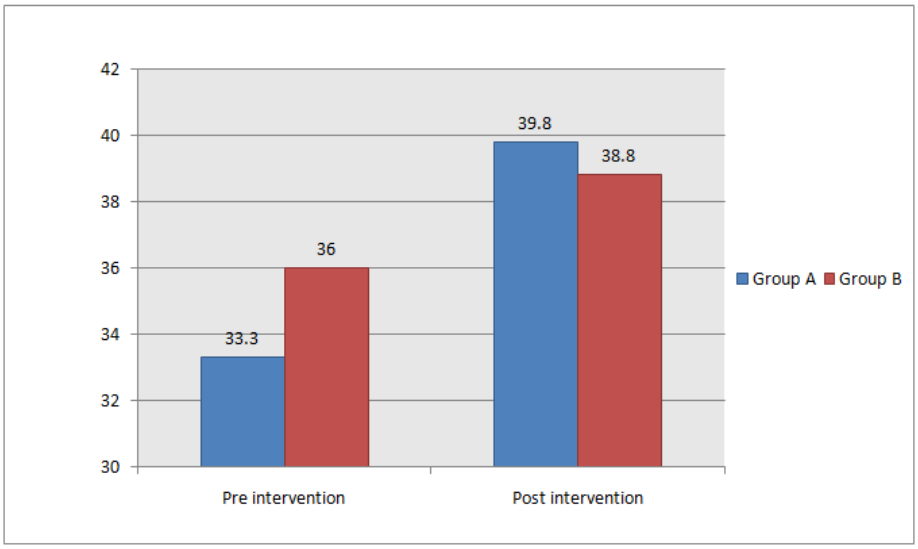


Table No. 04 Comparison of Right cervical rotation score pre &post-interventional within Group A and Group B

Right cervical rotation	Group A	Group B
Pre-interventional Score	65.5	68.1
Post-interventional Score	73.6	71.6
t value	-11.732	-6.220
p value	0.000	0.000
Results	Extremely significant	Extremely significant

- **Graph: 04 Comparison of Right cervical rotation pre & post-interventional within Group A and Group B**

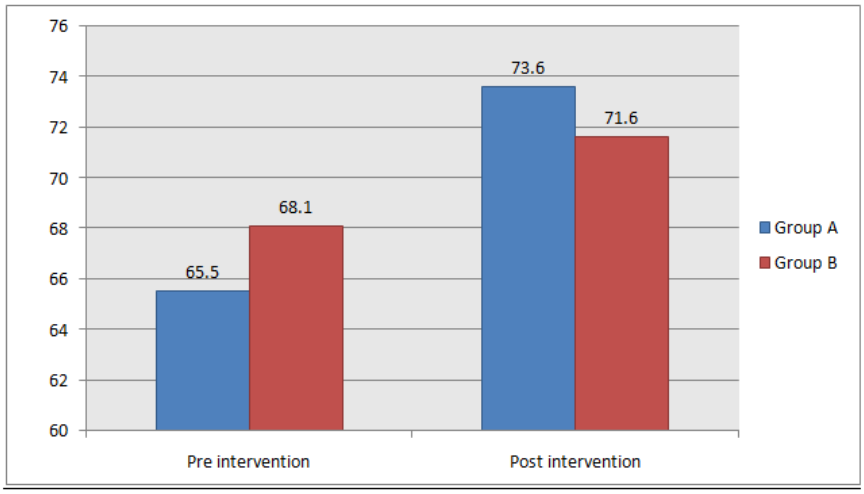


Table No. 5 Comparison of Left cervical rotation score pre & post-interventional within Group A and Group B

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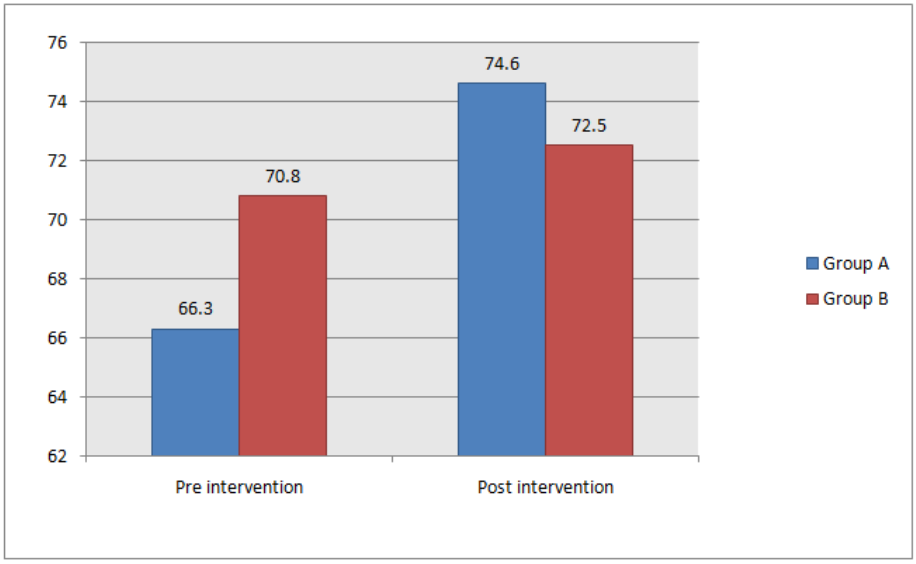
LT cervical rotation	Group A	Group B
Pre-interventional Score	66.3	70.8
Post-interventional Score	74.6	72.5
t value	-7.644	-3.157
p value	0.000	0.000
Results	Extremely significant	Extremely significant

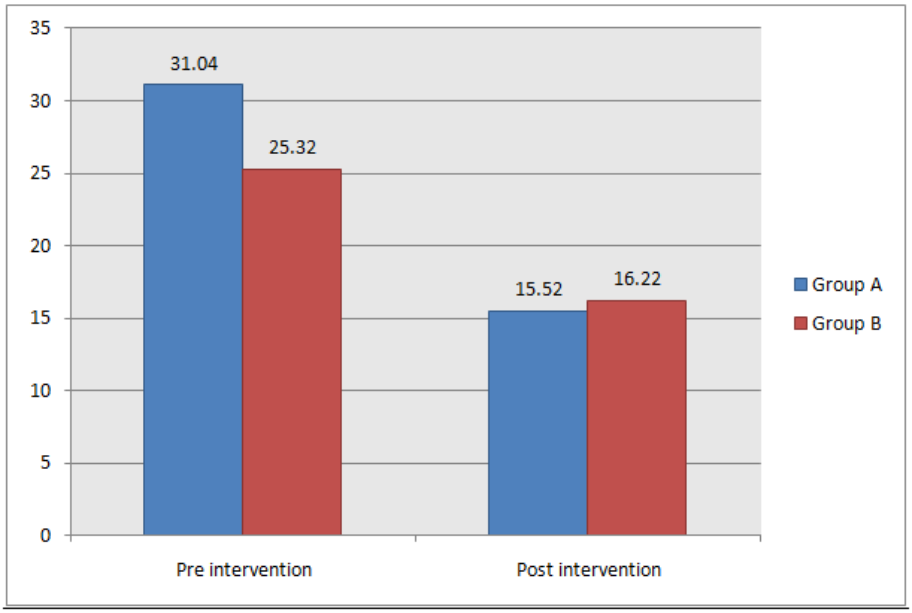
- **Graph: 5 Comparison of Left cervical rotation pre & post-interventional within Group A and Group B**



- **Table No. 6 Comparison of NDI score pre & post-interventional within Group A and Group B**

NDI score	Group A	Group B
Pre-interventional Score	31.04	25.32
Post-interventional Score	15.52	16.22
t value	17.940	6.022
p value	0.000	0.000
Results	Extremely significant	Extremely significant

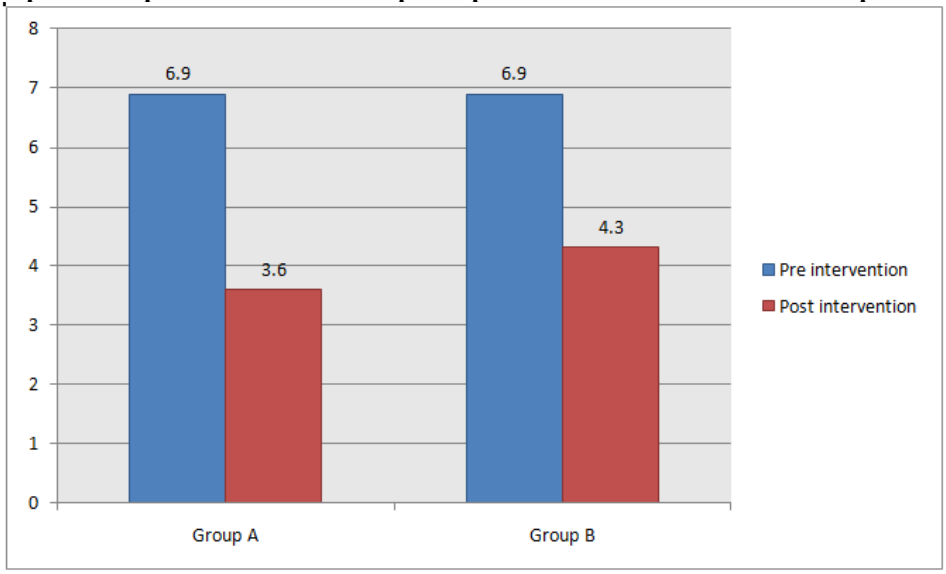
- **Graph: 06 Comparison of NDI score pre & post-interventional within Group A and GroupB**



- **Table No. 7 Comparison of VAS pre & post-interventional Between Group A and Group B**

VAS	Pre-interventional Score	Post- interventional Score
Group A	6.9	3.6
Group B	6.9	4.3
t value	0.000	-2.049
p value	1.000	0.055
Results	Not significant	Not significant

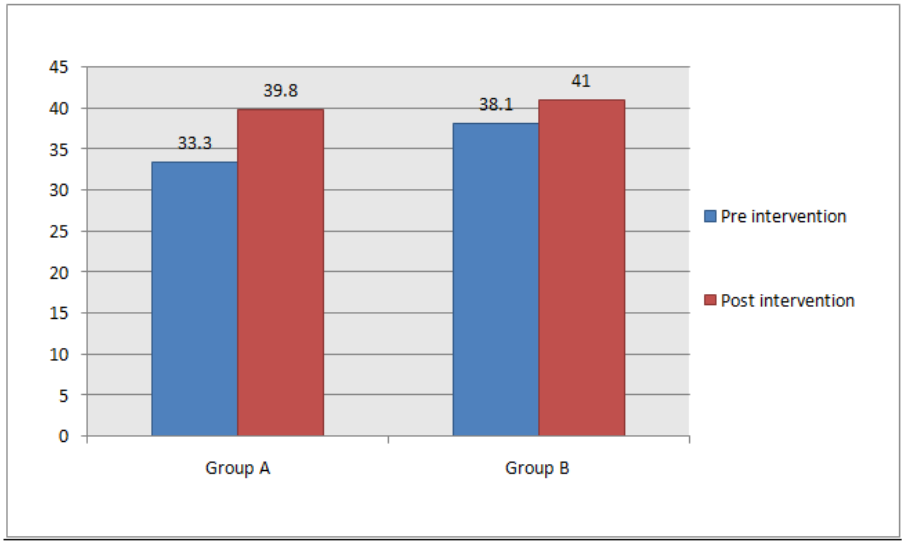
- **Graph. 7 Comparison of VAS score pre & post-interventional Between Group A and Group B**



- **Table No. 8 Comparison of Right lateral flexion pre & post-interventional between Group a and Group B**

Right lateral flexion	Pre-interventional Score	Post- interventional Score
Group A	33.3	39.8
Group B	38.1	41
t value	-4.041	-0.950
p value	0.000	0.355
Results	significant	Not significant

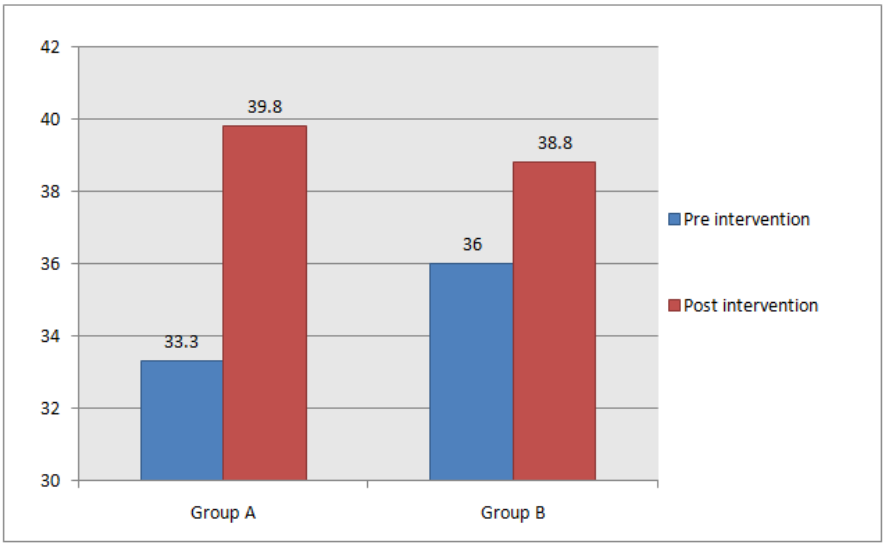
- **Graph. 8 Comparison of Right lateral flexion pre & post-interventional between Group a and Group B**



- **Table No. 9 Comparison of Left lateral flexion pre & post-interventional between Group a and Group B**

LT lateral flexion	Pre-interventional Score	Post- interventional Score
Group A	33.3	39.8
Group B	36	38.8
t value	-1.964	0.738
p value	0.065	0.470
Results	Not significant	Not significant

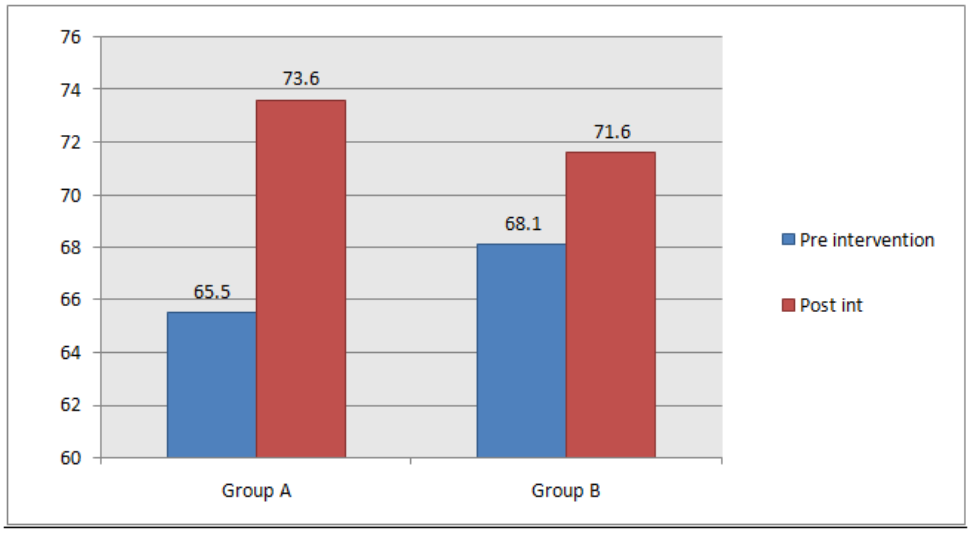
- **Graph. 09 Comparison of Left lateral flexion pre & post-interventional between Group a and Group B**



- **Table No. 10 Comparison of Right cervical rotation pre & post-interventional between Group a and Group B**

Right cervical rotation	Pre-interventional Score	Post- interventional Score
Group A	65.5	73.6
Group B	68.1	71.6
t value	-1.363	1.080
p value	0.190	0.295
Results	Not significant	Not significant

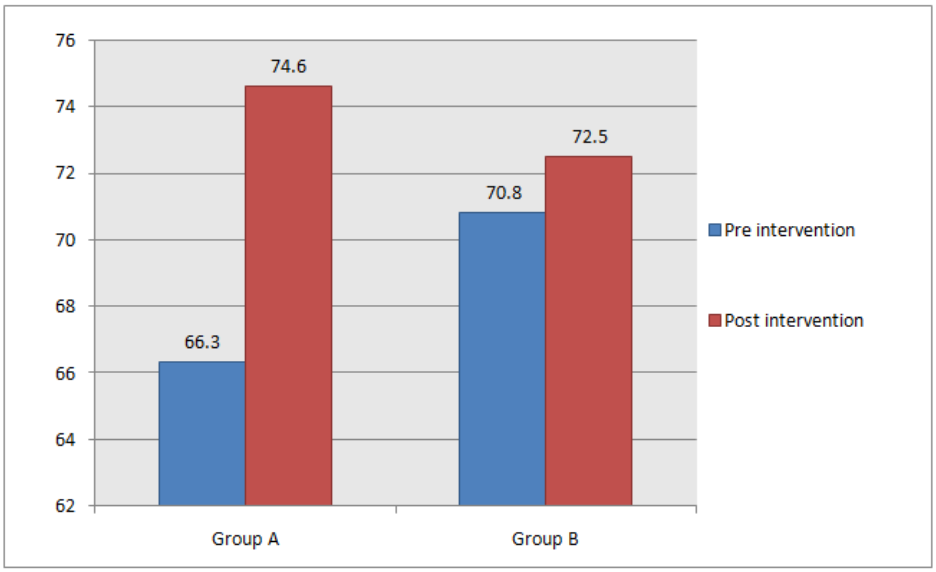
- **Graph. 10 Comparison of Right cervical rotation pre & post-interventional between Group a and Group B**



- **Table No. 11 Comparison of Left cervical rotation pre & post-interventional between Group a and Group B**

Left cervical rotation	Pre-interventional Score	Post- interventional Score
Group A	66.3	74.6
Group B	70.8	72.5
t value	-2.388	1.126
p value	0.028	0.275
Results	Not significant	Not significant

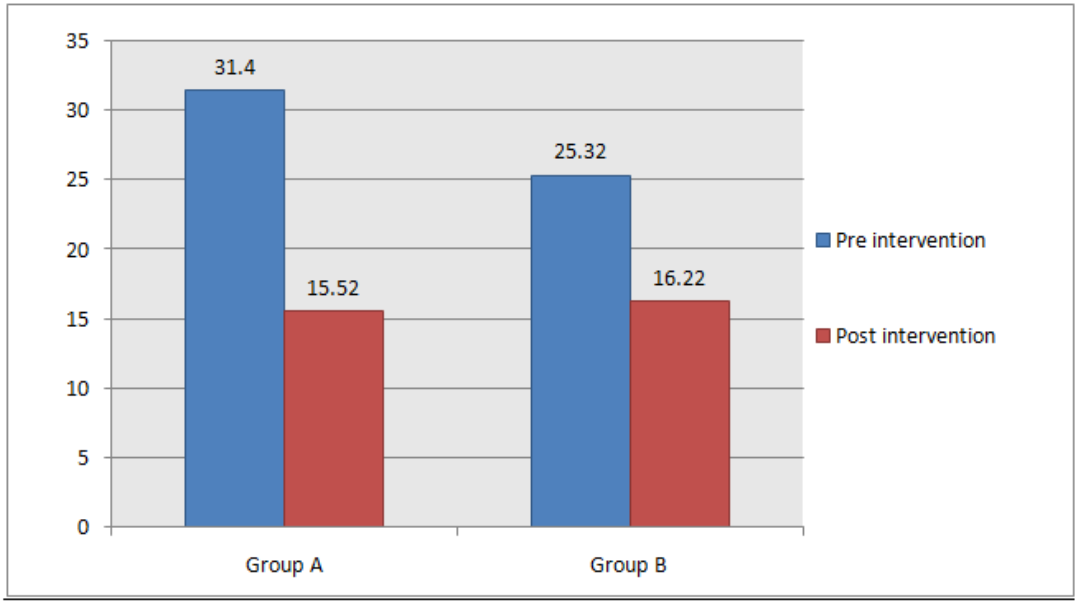
- **Graph. 11 Comparison of Left cervical rotation pre & post-interventional between Group a and Group B**



- **Table No. 12 Comparison of NDI score pre & post-interventional between Group a and Group B**

NDI score	Pre-interventional Score	Post- interventional Score
Group A	31.4	15.52
Group B	25.32	16.22
t value	2.649	-0.483
p value	0.016	0.635
Results	Not significant	Not significant

- **Graph. 12 Comparison of NDI score pre & post-interventional between Group a and Group B**



IV. Discussion

- The upper trapezius muscle plays an important role in the stability and mobility of the neck region. The formation of trigger points in the upper trapezius gives rise to specific pain pattern in the neck.
- Aim of study was to compare the effects of INIT and IC and TrpPR on upper trapezius trigger point in patients with non-specific neck pain. A comparative study of 20 subjects was carried out. Outcome measures were assessed using VAS for pain, cervical lateral flexion, cervical rotation and NDI for measuring disability.
- Subjects were divided into 2 groups; group A received INIT technique and group B received IC and TrpPR. Outcome measures were assessed on day one pre-treatment and after 2 weeks post-treatment. Data obtained was analysed using PRIMER version 7 and showed statistically significant reduction in pain and NDI score and improvement in cervical lateral flexion and cervical rotation. However, when comparison was done, INIT proved to be more effective than IC and TrpPR in reducing VAS and NDI scores and improving cervical lateral flexion and cervical rotation.
- As the p value is <0.0001 in group A , the result is extremely statistically significant ie: INIT is effective in reducing pain and NDI score and improving cervical lateral flexion and cervical rotation. There was significant reduction in pain by mean change of VAS 3.3 units (6.9-3.6).
- A study done by **Fryer, 2011** stated that , ”shortening of soft tissues are due to a pathological disorders which can cause pain and reduced movement in neck. Stretching of these structures will rapidly improve ROM and reduces the pain due to spasms and fibrosis[5].
- **Mahajan R** proved the possible mechanism for reduction in pain due to MET can be attributed to the hypalgesic effects which can be explained by the inhibitory golgi tendon reflex activated during the isometric contraction that leads to reflex relaxation of the muscle. Activation of muscle and joint mechanoreceptors leads to sympatho-excitation evoked by somatic efferents and localized activation of the prequeductal grey matter that plays a role in descending modulation of pain. The reason for mechanism of pain reduction is isometric exercise regimes might be due to increase in endorphins that occurs usually after training and better neuromuscular control. The strong muscle contraction happen during isometric exercises which activate muscle stretch receptors. These afferent from these receptors cause endogenous opioids to be released and also causes the release of beta endorphins from the pituitary gland, these secretions may cause decrease in pain[6].

- Right Cervical lateral flexion was improved by mean change of degrees 6.5 (33.3-39.8) , Left cervical lateral flexion was improved by mean change of degrees 6.5 (33.3-39.8) while Right cervical rotation was improved by mean change of 8.1 degrees (65.5-73.) and Left cervical rotation was improved by mean change of 8.3 degrees (66.3-74.6).
- **Mahajan R** stated that effects of MET for increase in ROM can be explained on the basis of physiological mechanisms behind the changes in muscle extensibility , reflex relaxation, viscoelastic changes. Combination of contraction and stretches might be more effective for producing viscoelastic change than passive stretching. MET works on decreasing the spasm or tightness of muscle by 1st resetting the muscle spindle and inhibiting the muscle by activating the golgi tendon organ. This phenomenon is called post-isometric relaxation in which there is a period of relative hypotonicity during which a stretch of the involved muscle is more easily achieved than before contraction[6].
- **Fryer ,2011** movements owned by INIT includes MET, isometric contraction of muscles with the motion control which is gente on muscles and reduces muscle spasm and joint restriction and disability[5]. **Portero** proves that the beneficial effect of strength training program (isometric contraction with resistance) increases neck muscle size and strength during lateral flexion and decreases the fatigability of superficial muscles of the neck.
- A study by **Lewit and Simons 1984** observed that post isometric relaxation helps in decreasing the increased tension by restoring the full length of muscle. NDI score was reduced by mean change 15.52 units (31.04-15.52). As more marked reduced in VAS and improvement in cervical lateral flexion and cervical rotation there was improvement in personal care, lifting capacity, reading, concentration, working ability, driving skills, recreation activities NDI score is reduced.
- As the p value <0.0001 in group B, the result is extremely statistically significant ie: IC and TrpPR is effective in reducing VAS and NDI scores and improving cervical lateral flexion and cervical rotation. There was significant reduction in pain as mean change of VAS was 2.6 units (6.9-4.3). **Hou etal.** said that pain and muscle spasm relief from direct pressure may result from the reactive hyperaemia produced in the area, or from the spinal reflex mechanism[7]. There was significant improvement in Right cervical lateral flexion as mean change was 2.9 degrees (38.1-41), Left cervical lateral flexion was improved by mean change of degrees 2.6 (36-38.8) while Right cervical rotation was improved by mean change of 3.5 degrees (68.1-71.6) and Left cervical rotation was improved by mean change of 1.7 degrees (70.8-72.5).
- Study done by **Simons(2002)** under the title understanding effective treatment of myofascial trigger points has proposed that tigger point pressure release may equalize the length of sarcomeres in the involved Trp's and consequently decrease the palpable knot, pain and improves ROM[8]. NDI score was reduced by mean change of 9.1 units (25.32-16.22) as pain is relieved after releasing trigger point; concentration, recreation activities, working capacity of individual improved hence NDI score is lowered.
- According to this study, INIT as well as IC and TrpPR are effective in reducing pain, NDI score and improving cervical lateral flexion and cervical rotation. But comparing mean difference values of VAS, NDI scores and cervical lateral flexion and rotation in unpaired t-test INIT is more effective than IC and TrpPR in reducing pain, NDI score and improving cervical lateral flexion and rotation.

V. Conclusion

Study concluded that integrated neuromuscular inhibition technique and ischaemic compression and trigger point pressure release are equally effective in reducing pain and neck disability index and improving range of motion.

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