Chettinad Health City Medical Journal
Volume 13, Issue 1 - 2024, Pg. No. 81-86
Peer Reviewed & Open Access Journal

Research Article

Optimising Therapeutic Benefits: Suboccipital Muscle Inhibition Technique for Enhanced Balance and Alleviation of Pain Intensity in Individuals with Chronic Neck Pain

Madan Kusum[1], Bharti Sharma[2], Harsirjan Kaur[3], Charu Chhabra[4]

[1]Student, [2,3]Assistant Professor, Department of Physiotherapy, Gurugram University, Gurugram, Haryana, India.
[4]Assistant Professor, Department of Physiotherapy, Jamia Hamdard University, New Delhi.
DOI: https://doi.org/10.24321/2278.2044.202414

INFO

Corresponding Author:
Harsirjan Kaur, Department of Physiotherapy, Gurugram University, Haryana, India.
E-mail Id:
harsirjan4242@gmail.com
Orcid Id:
https://orcid.org/0000-0002-5631-5568
How to cite this article:
Kusum M, Bharti S, Kaur H, Chhabra C. Optimising Therapeutic Benefits: Suboccipital Muscle Inhibition Technique for Enhanced Balance and Alleviation of Pain Intensity in Individuals with Chronic Neck Pain. Chettinad Health City Med J. 2024;13(1):81-86.

Date of Submission: 2023-07-12
Date of Acceptance: 2023-11-19

ABSTRACT

Background: Chronic neck pain is one of the diseases amongst other reported musculoskeletal diseases prevalent in the population. Suboccipital muscle inhibition is one of the manual techniques used to reduce the myofascial restriction in the muscles of the occiput region, by activation of the autonomic nervous system (parasympathetic system) and raises the amount of endorphins, which lessens the pain sensitivity, and relation of the myodural bridge which connects the rectus capitis posterior minor muscle to dura which affects balance ability.

Aim: The aim of the study was to optimise therapeutic benefits using the suboccipital muscle inhibition technique for enhanced balance and alleviation of pain intensity in individuals with chronic neck pain.

Materials and Method: Based on convenient sampling 30 subjects having neck pain were selected who fulfilled the selection criteria. Pre-test and post-test data were collected. Intervention in the manner of suboccipital inhibition was given to subjects for 8 min. The outcome measures used were balance and pain. The significance level was established at 0.05. Paired t-test was employed to measure the significance of the difference in pre-test and post-test scores of balance and pain. All data were processed using Statistical Package for Social Science 27.

Result: The comparison of the mean difference of pre-test and post-test scores of balance (tandem stance-1.36 and single leg stance -1.80) and pain (-1.67) showed the effectiveness of the technique (p value < 0.001).

Conclusion: The suboccipital muscle inhibition technique was impactful in balance enhancement and reducing pain intensity in individuals with chronic neck pain.

Keywords: Balance, Chronic Neck Pain, Suboccipital Muscle Inhibition Technique

Chettinad Health City Medical Journal (P-ISSN: 2277-8845 & E-ISSN: 2278-2044)

Introduction

Neck pain is one among other reported musculoskeletal conditions in the general population. It significantly affects one's well-being and contentment as well as society at large. In a study that looked at the cross-national prevalence of chronic pain problems, individuals in developing and developed nations reported chronic neck pain at rates of 41.1% and 37.3%, respectively. In the Indian population, chronic pain was found to be prevalent overall at 19.3%. 3.11% of the population in a research conducted at a small urban primary health centre in a city in central India reported having neck pain. The age range of 21–40 years was shown to be the most affected, followed by the age range of 41–60 years.[1]

There are several factors that might contribute to persistent neck pain, such as drug addiction and a lack of awareness of pain, but poor posture is the main culprit. Poor posture is one of the most common causes of neck pain. It is simple to develop bad posture habits without even realising that even seemingly benign activities like reading in bed can eventually result in pain and even severe issues.[2] The suboccipital muscles are a set of four muscles that surround the external occipital prominence of the skull. The rectus capitis posterior major, minor, inferior, and superior, as well as the obliquus capitis include the four muscles.[3] It is well known that the suboccipital muscle has a significant quantity of muscle spindles, which may also affect balance. The rectus capitis posterior minor muscle, which acts as a proprioceptor, has 36 spindles per gram as per research conducted by Kang et al.[4] The rectus capitis posterior major muscle exhibits an average of 30.5 spindles per gram. The splenius capitis muscle, on the other hand, has only 0.8 spindles per gram and 7.6 spindles per gram and the gluteus maximus has only 0.8 spindles per gram. The proprioceptive ability of the muscle decreased with rectus capitis posterior minor atrophy in terms of balance proficiency and standing posture, the group with muscle atrophy experienced a decline in their balance ability.[5] A myofascial bridge connects the ligament nuchae with the dura as well as the suboccipital muscles, particularly the rectus capitis posterior minor muscle.[6] Changes in posture can lead to variations in muscle length, impacting both muscle strength (referred to as force-generating capacity) and endurance (referred to as fatigue-resistant capacity).[7]

According to one study by Uthaikhup et al.,[8] changes in the structure of muscles may be linked to altered postural and balance regulation, altered fibre type, and functional impairment (lower strength and endurance) neck discomfort, somatic irregularities, and compromised standing balance are all linked to anatomical or functional alterations in the suboccipital muscles.[5,8,9] Persistent discomfort and impaired balance can arise due to (1) inadequate suppression of nociceptors at the dorsal horn of the spinal cord, (2) nociceptive inputs triggered by active trigger points, and (3) the substitution of muscle tissue with adipose tissue, potentially reducing the density of muscle spindles and Golgi tendon organs.[7] By reducing the myofascial restriction in the suboccipital region, the suboccipital muscle inhibition technique is one of the manual techniques that try to reduce the tension in the suboccipital muscles. Through activation of the autonomic nervous system (parasympathetic system) and an increase in the release of endorphins, which lessen pain perception, the suboccipital muscle inhibition technique causes muscles to relax.[6] Suboccipital muscle inhibition technique uses a steady pressure on soft tissues to induce relaxation and normalise reflex activity.[10] The suboccipital muscle inhibition technique uses constant pressure to relax muscles and control reflex activity in soft tissues. This technique, similar to "peeling an onion", uses light traction to measure soft tissue tension.[11] With this method, aberrant spinal dura tension is successfully reduced, and the rectus capitis posterior minor's neuromuscular connections are restored. This method promotes a harmonic connection between deep and superficial flexors during cervical movement by reducing stress in upper cervical tissues.[12]

Method

In this experimental study, 30 participants were selected from Gurugram University by convenience sampling method. Participants of age group 20 to 30 years of both genders and having chronic neck pain were included in the study. The participants were excluded if they had undergone any surgical procedure, were recently diagnosed with any vestibular problem, history of trauma and fracture of the cervical and lower limb, serious pathological conditions or neurological deficits that can affect the outcome of the study. The study was accomplished at Gurugram University, Department of Physiotherapy, Faculty of Life Sciences, Gurugram, Haryana. Ethical approval for the study was obtained from the institutional review board of Gurugram University. The study was performed according to the National Ethical Guidelines given by the Indian Council of Medical Research (2017) and the Helsinki Declaration (2013). Written informed consent of the participants who were willing to take part in the project was taken and detailed information about the study was given to them.

The confidence interval was determined at 95% and the level of significance at 0.05. All participants were recruited via classroom and office announcements. Participants were provided with an explanation of the study's objective and methodology, and written consent was obtained. The participants were requested to mark their pain level on the Visual Analogue Scale. Rating were derived from self-reported symptom assessments, involving a solitary hand-mark placed on a 10-cm line. This line symbolises a

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202414

spectrum extending between the extremes of the scale, the left end corresponds to “no pain” (0 cm), while the right end signifies the most intense pain “worst pain” at 10 cm. Distances between the participant’s marks and the initial point (left end) of the line were measured in centimetres and interpreted as indicative of their pain level.[13]

The balance of the participant was assessed through the Four Stage Balance Test. The test comprised four distinct balance tasks, each designed to challenge an individual’s equilibrium. The participant aimed to maintain balance for a duration of 10 seconds with both feet touching, followed by a similar stance with one foot placed slightly ahead of the other. Subsequently, the challenge escalated to standing with one foot positioned ahead of the other in a heel-to-toe arrangement. Lastly, the participant stood on a single leg (Figure 1), endeavouring to sustain the stance for a maximum of 30 seconds while keeping their eyes open. In the event that the participant was unable to sustain the specified duration for any of the tasks, the test was concluded.[14]

Figure 1.Positions for Four Stage Balance Test

The therapist sat at the head of the table and positioned her hands beneath the subject’s head with her fingers making contact with the occipital condyles to execute the suboccipital muscle inhibition technique on them. The next step included utilising the middle and ring fingers of both hands to locate the space between the occipital condyles and the spinal process of the second cervical vertebra. She places her hands at the base of the skull with her fingers extended and connected, her metacarpophalangeal joints stretched at a 90° angle, and delivers constant, painless pressure to the ventral region. To clear the suboccipital zone of obstruction, little cranial traction might be given (Figure 2). Once the tissue achieved a state of relaxation, the therapist gently withdrew contact, allowing the subject’s head to rest comfortably on the table. Throughout the application of the suboccipital muscle inhibition technique, the subject was instructed to keep their eyes closed to prevent eye movements from influencing the tone of the suboccipital muscles.[15] Post-test scores of balance and pain were recorded immediately after the intervention.

Figure 2.Suboccipital Muscle Inhibition Technique

The data was processed using Statistical Package for Social Science version 27 and Microsoft Excel 2019.

Result

The mean and standard deviation of demographic data were calculated and are shown in Table 1. Results were obtained by comparing the pre- and post-intervention scores of VAS and the Four Stage Balance Test using paired sample t test, mean, standard deviation, p value and mean difference values were obtained. The effect size was determined using eta squared. The mean value of pre-VAS and post-VAS, standard deviation, p value, t value and mean difference as shown in Table 2. The effect size of 0.4 signified a moderate effect size.

The significant difference between pre-VAS (5.03) and post-VAS (3.36) scores showed the effectiveness of the technique on pain intensity. Calculated t value (5.22) > critical t value signifies statistically significant variation in mean. The change in pre- and post-intervention values of the balance test can also be seen in Table 2. The effect size was moderate for the balance test with 0.3 and 0.5 for tandem and single leg stance respectively. In balance enhancement, pre- and post-test scores for tandem stance (27.1 and 28.4, respectively) and pre-test (26.3) and post-test scores (28.1) for single leg stance both significantly improved after the intervention. Higher calculated t values (-3.60) for tandem and (-5.76) for single-leg stance were observed.

The average pre-intervention and post-intervention values of outcome variables can be seen in Table 2. The negative mean difference showed the technique was effective on balance in participants having chronic neck pain. A significant interaction between the sub-occipital muscle inhibition technique and reduction in pain intensity along with improvement in balance ability was observed.

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202414

Table 1.Demographic Data

Demographic Variables	Mean ± SD
Age (years)	23.06 ± 1.63
Height (meters)	5.36 ± 0.3
Weight (kilograms)	58.96 ± 10.6

Table 2.Pre-Intervention and Post-Intervention Values of Outcome Variables

Parameters		Mean ± SD	Mean Difference in Pre- and Post-Intervention Values	p	t	Eta Squared (Effect Size)
VAS score	Pre-intervention	5.03 ± 1.03	1.67	0.000*	5.22	0.4
	Post-intervention	3.36 ± 1.6				
Tandem stance (second)	Pre-intervention	27.1 ± 1.3	-1.36	0.001*	-3.6	0.3
	Post-intervention	28.4 ± 1.9				
Single leg stance	Pre-intervention	26.3 ± 1.5	-1.8	0.000*	-5.76	0.5
	Post-intervention	28.1 ± 2.0				

*Significant

Discussion

The objective of the study was to find whether the balance and pain intensity in people with chronic neck pain improved with the suboccipital muscle inhibition technique. Results revealed that both the variables showed improvement in their scores but the improvement was less because of a small sample size. Irrespective of this, a significant difference was noted in the single leg stance of the Four Stage Balance test with respect to the pain intensity on VAS. The current study showed the reduction of pain intensity and improvement of balance with the use of the suboccipital muscle inhibition technique. This was the first study that found the effectiveness of the suboccipital muscle inhibition technique on balance and pain intensity in chronic neck pain. Other studies were also conducted which revealed the effectiveness of the suboccipital muscle inhibition technique on lumbar mechanical pain, hamstring flexibility, and forward head posture conducted alone or in comparison with other techniques or therapy.

In terms of improvement in balance, similar findings were found in the study conducted by Kang in 2021, in which the suboccipital muscle inhibition technique and sham suboccipital muscle inhibition technique were administered for a duration of 4 min and 8 min in the respective groups. Active range of motion, lunge angle, and single leg balance test significantly improved after the suboccipital muscle inhibition technique application. Significant enhancement in balance was found after the application of 8 min of suboccipital muscle inhibition technique in comparison to 4 min referring to the myodural bridge that links the rectus capitis posterior minor to the dura mater.[4]

Hack et al. reported the suboccipital muscle inhibition to alleviate excessive strain in the myodural bridge, which connects the suboccipital muscle known as rectus capitis posterior minor (RCPM) to the posterior atlanto-occipital membrane, thereby restricting pain signals.[16]

Another study conducted by McPartland and Brodeur[17] concluded that the rectus capitis posterior minor muscle originates from the posterior atlantooccipital membrane, where its fibres have a direct impact on the biomechanics of the dura mater. The higher concentration of muscle spindles within this muscle could additionally function as a proprioceptor sensor, playing a vital role in maintaining equilibrium and detecting discomfort. Non-thrusting methods might be more advantageous for addressing the suboccipital area, such as muscle-energy techniques and manipulation of myofascial tissue would be beneficial in the reduction of pain and improving balance.

Another study which supports the finding of the reduction of neck pain was conducted by Tozzi et al.[18] It explored pain sensitivity and the movement of fascial layers through the application of real-time ultrasound (US) imaging in individuals experiencing neck and lower discomfort. The findings emphasised the potential effectiveness of myofascial release in addressing restricted sliding mobility of fascia and enhancing pain perception within a brief timeframe for individuals with nonspecific neck or lower back pain.

In our study, we found that the neck pain reduced after the intervention which was supported by Pérez-Martínez et al.,[19] in which participants with chronic non-specific neck pain take part and concluded that in comparison

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202414

with myofascial release therapy using suboccipital muscle inhibition technique and self-myofascial release utilising the INYBI instrument for treatment is equally efficacious in improving self-reported pain levels and sensitivity to localised pressure pain in chronic non-specific neck pain patients.

Our findings concerning the impact of the suboccipital muscle inhibition technique are corroborated by a comparable investigation by Hasaneen et al.[6] which finds that suboccipital muscle inhibition led to a reduction in pain intensity among individuals with tension headaches, attributed to its inhibitory influence that alleviated spasms in the suboccipital muscles.

In the case of tension-type headaches, the suboccipital inhibition therapy proved effective in diminishing the influence of headaches, improving the functional aspects of headache-related disability, and enhancing craniocervical flexion in a study conducted by Espí-López et al.[20]

Implications for future research are studies can be done on a wider and larger population. Different subjects and age groups can be studied and follow-up can be done after the intervention.

Conclusion

It can be concluded from the results that the suboccipital muscle inhibition technique was effective in terms of reducing neck pain and improving balance. The effects were significant for both balance improvement and reduction of neck pain. The reduction in neck pain and improvement in balance were observed, thus a short duration of the technique may help improve quality of life. We suggest sub occipital muscle inhibition technique to manage neck pain as well as to improve static balance.

Source of Funding: None

Conflict of Interest: None

References

1. Nair SP, Panchabhai CS, Panhale V. Chronic neck pain and respiratory dysfunction: a review paper. Bull Fac Phys Ther. 2022 Dec;27(1):21. [Google Scholar]
2. Kisner C, Colby LA, Borstad J. Therapeutic exercise: foundations and techniques. Fa Davis Company; 2017. [Google Scholar]
3. George T, Tadi P. Anatomy, head and neck, suboccipital muscles [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2023 Jul 5]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK567762/ [PubMed] [Google Scholar]
4. Kang HS, Kwon HW, Kim DG, Park KR, Hahm SC, Park JH. Effects of the suboccipital muscle inhibition technique on the range of motion of the ankle joint and balance according to its application duration: a randomized controlled trial. Healthcare (Basel). 2021;9(6):646. [PubMed] [Google Scholar]
5. McPartland JM, Brodeur RR, Hallgren RC. Chronic neck pain, standing balance, and suboccipital muscle atrophy--a pilot study. J Manipulative Physiol Ther. 1997;20(1):24-9. [PubMed] [Google Scholar]
6. Hasaneen BH, Eweda RS, Hakim Balbaa AE. Effects of the suboccipital muscle inhibition technique on pain intensity, range of motion, and functional disability in patients with chronic mechanical low back pain. Bull Fac Phys Ther. 2018;23:15-21. [Google Scholar]
7. Sung YH. Suboccipital muscles, forward head posture, and cervicogenic dizziness. Medicina (Kaunas). 2022 Dec 5;58(12):1791. [PubMed] [Google Scholar]
8. Uthaikhup S, Assapun J, Kothan S, Watcharasaksilp K, Elliott JM. Structural changes of the cervical muscles in elder women with cervicogenic headache. Musculoskelet Sci Pract. 2017;29:1-6. [PubMed] [Google Scholar]
9. Fernández-de-Las-Peñas C, Cuadrado ML, Arendt-Nielsen L, Ge HY, Pareja JA. Association of cross-sectional area of the rectus capitis posterior minor muscle with active trigger points in chronic tension-type headache: a pilot study. Am J Phys Med Rehabil. 2008;87(3):197-203. [PubMed] [Google Scholar]
10. Prajapati UM, Shukla YU. Effect of suboccipital muscle inhibition technique on hamstring tightness in healthy adults-an interventional study. Int J Sci Healthc Res. 2020;5(4):51-8. [Google Scholar]
11. Cho SH, Kim SH, Park DJ. The comparison of the immediate effects of application of the suboccipital muscle inhibition and self-myofascial release techniques in the suboccipital region on short hamstring. J Phys Ther Sci. 2015;27(1):195-7. [PubMed] [Google Scholar]
12. Kim BB, Lee JH, Jeong HJ, Cynn HS. Effects of suboccipital release with craniocervical flexion exercise on craniocervical alignment and extrinsic cervical muscle activity in subjects with forward head posture. J Electromyogr Kinesiol. 2016;30:31-7. [PubMed] [Google Scholar]
13. Begum MR, Hossain MA. Validity and reliability of visual analogue scale (VAS) for pain measurement. J Med Case Rep Rev. 2019;2(11):394-402. [Google Scholar]
14. Goecke J. Effectiveness of the stepping on program in fall prevention measured by the Four Stage Balance Test (FSBT). 543. Physical Therapy Scholarly Projects; 2017. [Google Scholar]
15. Rizo AM, Pascual-Vaca ÁO, Cabello MA, Blanco CR, Pozo FP, Carrasco AL. Immediate effects of the suboccipital muscle inhibition technique in craniocervical posture and greater occipital nerve mechanosensitivity in subjects with a history of orthodontia use: a randomized

trial. J Manipulative Physiol Ther. 2012;35(6):446-53. [PubMed] [Google Scholar]
16. Hack GD, Koritzer RT, Robinson WL, Hallgren RC, Greenman PE. Anatomic relation between the rectus capitis posterior minor muscle and the dura mater. Spine (Phila Pa 1976). 1995;20(23):2484-6. [PubMed] [Google Scholar]
17. McPartland JM, Brodeur RR. Rectus capitis posterior minor: a small but important suboccipital muscle. J Bodyw Mov Ther. 1999;3(1):30-5. [Google Scholar]
18. Tozzi P, Bongiorno D, Vitturini C. Fascial release effects on patients with non-specific cervical or lumbar pain. J Bodyw Mov Ther. 2011;15(4):405-16. [PubMed] [Google Scholar]
19. Pérez-Martínez C, Gogorza-Arroitaonandia K, Heredia-Rizo AM, Salas-Gonzalez J, Oliva-Pascual-Vaca A. INYBI: a new tool for self-myofascial release of the suboccipital muscles in patients with chronic non-specific neck pain: a randomized controlled trial. Spine (Phila Pa 1976). 2020;45(21):E1367-75. [PubMed] [Google Scholar]
20. Espí-López GV, Gómez-Conesa A, Gómez AA, Martínez JB, Pascual-Vaca ÁO, Blanco CR. Treatment of tension-type headache with articulatory and suboccipital soft tissue therapy: a double-blind, randomized, placebo-controlled clinical trial. J Bodyw Mov Ther. 2014;18(4):576-85. [PubMed] [Google Scholar]

ISSN: 2278-2044
DOI: https://doi.org/10.24321/2278.2044.202414