Ann Appl Sport Sci, 12(03): e1368, 2024.
http://www.aassjournal.com; e-ISSN: 2322–4479; p-ISSN: 2476–4981. 10.61186/aassjournal.1368

ORIGINAL ARTICLE

The Effects of Intentional Stimulation on Shoulder Muscles and Suboccipital Region for Headache and Shoulder Pain Relief

[1]Na-Young Yoon, [2]Soon-Gi Baek*, [3]Seung-Ho Han*

[1]Anatomy lab., College of Sports Science, Korea National Sport University of Seoul, Seoul, Korea. [2]Department of Beauty Care, Jungwon University, Goesan, Korea. [3]Ewha Medical Academy, Ewha Womans University Medical Center, Seoul, Korea.

Submitted April 18, 2024; Accepted in final form August 11, 2024.

ABSTRACT

Background. To relieve headache and shoulder pain, intentional stimulation of the central nerve passages, such as the sternocleidomastoid muscle, upper trapezius muscle, and suboccipital triangle, has a significant effect. The cause of the pain may be muscle pain or abnormal posture, and the correct area must be targeted. **Objectives.** This study aims to determine the pain reduction effect by relaxing the muscles that serve as passageways for the greater auricular nerve, greater occipital nerve, lesser occipital nerve, and vertebral artery in patients suffering from headaches and shoulder pain. **Methods.** Intentional stimulation of the sternocleidomastoid, upper trapezius, and suboccipital triangle was performed on 30 women in their 50s to 70s suffering from headaches and shoulder pain twice a week for 30 minutes for 12 weeks. Pain intensity before and after implementation was collected through a questionnaire. **Results.** After applying conditioning, the pain of all participants was reduced by more than 50% ($p<0.001$), and the pain level of headache and shoulder pain was measured numerically. As a result of before and after comparison, $p<0.001$ in all variables. A significance value was shown. **Conclusion.** In this study, intentional stimulation of muscles, which are passageways of major nerves, effectively reduced pain. It can also be concluded that pain may be caused by compression or abnormality of the major nerves that pass through the muscle to which voluntary stimulation is applied. Therefore, non-ideal muscle conditions can pressure major nerves, so relaxing the muscles to relieve this can effectively reduce pain.

KEYWORDS: ***Suboccipital Triangle, Sternocleidomastoid Muscle, Occipital Nerve, Compression.***

INTRODUCTION

Headaches can be divided into tension-type headaches and chronic tension-type headaches. Tension-type headaches can occur due to weakness or abnormality in the muscles that support the head, and if tension-type headaches persist for a long time, they can lead to chronic tension-type headaches. The nerves that are targets of tension-type headache and chronic tension-type headache include the occipital nerve, third occipital nerve, and greater auricular nerve, and the condition of the muscles that support the head and neck through which these nerves pass is related to pain. These muscles have much tension, and changes in posture, such as turtlenecks, forward head posture, and rounded shoulders, increase tension in these muscles (1, 2). Muscles affected by postural changes include the suboccipital triangle, sternocleidomastoid, and upper trapezius

*. Corresponding Author:
Soon-Gi Baek, Ph.D.
E-mail: bsg@jwu.ac.kr
Seung-Ho Han, MD., Ph.D.
E-mail: sanford@ewha.ac.kr

(3). Additionally, when these muscles become tense, they can press on the vertebral artery that supplies nutrients to the head, disrupting overall circulation and causing headaches. Therefore, musculoskeletal problems in the head, neck, and shoulder areas may be associated with headaches, and when headaches occur, it is necessary to check the muscles in the neck and shoulder areas (4, 5).

Previous studies on pain points in the upper trapezius, suboccipital, and sternocleidomastoid muscles located in the shoulder have reported that muscle stiffness is related to the occurrence of pain. Muscle pain may spread to surrounding areas, such as the head and shoulders (6, 7). Many pain points are found in the muscles on the dominant side, and if these cause headaches, they can be said to be the cause of migraines. It is predicted that muscle tension may increase depending on the structural changes and direction of the dominant side, which may cause pain by compressing nerve and blood vessel passages (7). Therefore, when pain occurs, the patient's structural defects are identified, musculoskeletal abnormalities are determined, and the suboccipital deltoid and sternocleidomastoid muscles, which are passageways through which nerves involved in headaches pass, should be carefully examined the vertebral artery portion of the suboccipital muscle travels from the transverse process of the second cervical vertebra through the transverse process of the first cervical vertebra to the dura mater (8). During this process, the portion of the vertebral artery behind the suboccipital muscle supplies blood to the cervical spine (9, 10). The suboccipital muscle is innervated by the suboccipital nerve, which arises from the dorsal branch of the first cervical vertebra. Therefore, pressure in the suboccipital muscle is associated with headaches (11).

As a result of studying the relationship between the muscles that support the head and neck and headaches, referred pain was found in major muscles in 20 patients who experienced headaches for more than 8 hours a day on average. Based on these results, it can be said that pain patterns in the muscles at the back of the neck cause headaches (12).

Methods for reducing pain include injections and drug injections that block the controlling nerves, but non-invasive methods include muscle strengthening exercises that can relieve musculoskeletal problems in surrounding areas and compresses to improve circulation. Tension in the muscles around the neck and shoulders of headache patients is related to changes in posture, and pain trigger points on the dominant side are related to the distribution of muscle nerves (13-15). Trigger points mainly appear in areas where nerves passing through muscles are concentrated. Referred pain from muscle trigger points causes headaches and shoulder pain, and temporary pressure to relax the muscles is said to be effective in reducing pain (16). Warm pressure enlarges blood vessels to facilitate blood circulation, and muscle exercise can help relieve pain by activating muscle cells.

Therefore, this study aimed to determine whether intentional stimulation of the neck and shoulder muscles effectively reduces pain in patients with combined headache and shoulder pain.

MATERIALS AND METHODS

Participants. The study participants were 30 older women in their 50s to 70s who regularly suffered from headaches, had round shoulders, and had a forward head posture where the auricles were pushed in front of the shoulder line when viewed from the side. The study was limited to people whose headaches and shoulder pain occurred without any cause other than external pressure or accidents, and those who did not visit a medical institution due to symptoms were recruited.

Protocol. Intentional stimulation of the suboccipital deltoid, sternocleidomastoid, and upper trapezius muscles through which the greater occipital nerve, greater auricular nerve, third occipital nerve, and vertebral artery pass, which are the causes of headaches, was performed for about 30 minutes twice a week for 12 weeks (Figure 1).

Measurement parameters. The degree of headache and shoulder pain was confirmed through questionnaires before and after the end of the study. Participants' pain area, symptom frequency, and symptom maintenance time were investigated through a survey. In this study, participants' pain ratings were expressed numerically and categorized by frequency and duration of occurrence. 0 means no pain, and 10 means pain occurs about 4 times a week and lasts over 3 days. If pain occurs less than once a month and lasts less than 30 minutes, it is classified as grades 1 to 3, and if it occurs less than 3 days a month and lasts less than 4 hours, it is classified as grades 4 to 6. The pain rating is grade 7. Until 9, the frequency of pain was about 4 times

a week, and the duration was less than 3 days (Figure 2).

Statistical analysis. All results in this study were obtained using the SPSS Statistics 23.0 statistical program, and the descriptive statistics for each variable, mean ± standard deviation (Mean±SD), were calculated. The pre-and post-effects of each group were compared and analyzed using a paired t-test. The statistical significance level was set at α=0.05.

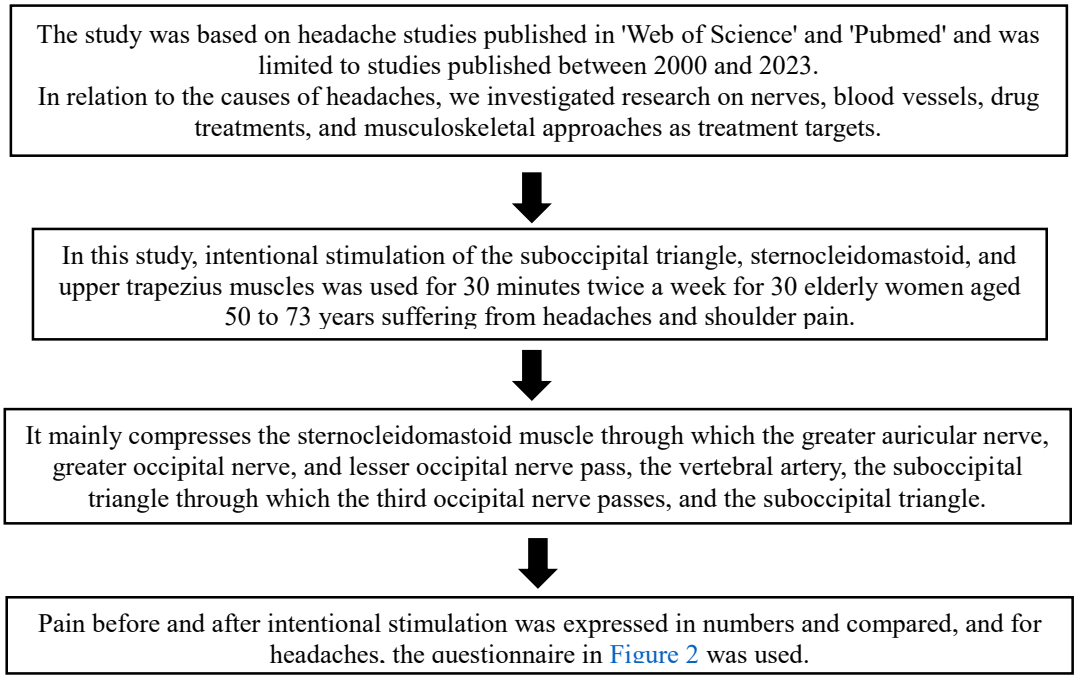

Figure 1. Research process on the effect of intentional stimulation on pain reduction.

RESULTS

There were 30 participants, including 10 women in their 50s, 10 in their 60s, and 10 in their 70s. Their basic information is as follows (Table 1).

Before and after receiving intentional stimulation, participants rated their headache and shoulder pain on a scale of 0 to 10 through a questionnaire. After 12 weeks of intentional stimulation focusing on the posterior deltoid, sternocleidomastoid, and upper trapezius muscles, more than 50% of participants experienced complete relief from headaches and shoulder pain. For some participants, it was slightly more effective for headaches.

Among the 14 people whose most severe headache score was confirmed to be 10, after 12 weeks, 2 people decreased to level 4 to 6, 7 people decreased to level 1 to 3, and a total of 5 people decreased to level 0. They all have in common that after applying the protocol, the pain they originally felt was reduced by more than 50%. When comparing the values before and after pain, the significance probability of the two values was $p<0.000^{***}$, showing that the treatment method applied in this study effectively reduced headaches. Of the 12 people who complained of level 7 to 9 headaches, level 4 decreased to level 4 to 6, level 2 decreased to level 1 to level 3, and the remaining 6 people decreased to level 0. After checking the overall correspondence table of pain levels, a significant value was found at $p<0.000^{***}$. All four participants who experienced pain levels of 4 to 6 had their pain levels reduced to zero. The probability value was $p<0.000^{***}$ when comparing pain for these four patients.

Regarding shoulder pain, among the subjects whose pain was checked as 10, 3 people had their pain reduced to 4~6, 2 people had their pain reduced to 1~3, and 5 people had their pain reduced to 0. Among the subjects whose pain level was previously 7 to 9, 4 decreased to levels 4 to 6, 5 decreased to levels 1 to 3, and 5 decreased to levels 0, showing an average pain reduction of 80%. As a result of comparing shoulder pain values before and after by stage, $p<0.000^{***}$ was found in all statistics (Table 2).

Headache Questionnaire

At what age did have your first headache: _____ What year did your current headache begin: _____

When was your last headache: _____

Are you ever free of pain completely? ☐Yes ☐No

Do you have more than one type of headaches? ☐Yes ☐No

It yes, describe them separately:_____

How many headaches (any type) do you have each month: _____, how long do you last: _____

How would you describe the pain of your most serious headache (circle one or several): _____

throbbing pulsating dull aching pressure-like sharp stabbing electric-like vis-like

Dose the pain like: ☐going from outside-in (compressing, stabbing) ☐ from inside-out (exploding, push out)

When you have a headache (and possibly after), does your scalp and face become sensitive to touch and do you avoid putting on glasses, jewelry or combing your hair? ☐Yes ☐No

Are your headaches brought on by:

your periods / hormonal change exercise stress relaxation after stress change in weather alcohol bright light / glare odors smoke noise lack of sleep too much sleep hunger food additives certain foods

Do your headaches occur on any particular day of the week or time of day? _____

_____

Do you have any warning signs before the start of a headaches? ☐Yes ☐No

Describe: _____

Circle any of the following symptoms you have with your headaches:

neck pain nausea vomiting light sensitivity dizziness noise sensitivity numbness weakness. fever confusion difficulty speaking tearing nasal congestion eyelid drooping. worsening of pain with movement other: _____

Please indicate with X's where you experience pain: _____

Figure 2. Headache questionnaire.

Table 1. Participant's physical characteristics

	Age (years)	Height (cm)	Weight (kg)	BMI (kg/m^2)
50s (n=10)	57.3±1.34	158.8±2.03	57.3±3.06	22.74±1.47
60s (n=10)	66.2±2.13	160.5±2.69	56.4±2.41	21.92±1.39
70s (n=10)	72.9±2.7	160.3±2.45	58.1±2.11	22.75±1.15
Total (n=30)	65.46±6.73	159.86±2.52	57.26±2.65	22.47±1.4

Table 2. Number of people experiencing pain changes due to intentional stimulation

Pain level	Headache			Shoulder pain		
	Pre-test	Post-test	*p-value*	Pre-test	Post-test	*p-value*
10	10.00	2.00±1.82	0.000***	10.00	3.40±1.34	0.000***
7-9	8.00±0.85	1.50±1.67	0.000***	8.35±0.70	1.88±1.53	0.000***
4-6	5.50±0.57	0.00	0.000***	5.62±0.51	0.00	0.000***
1-3	-	-	0.000***	-	-	0.000***
0	-	-	0.000***	-	-	0.000***

*: p<0.05; **: p<0.01; ***: p<0.000

DISCUSSION

Previous studies have shown that referred pain in the upper trapezius, suboccipital triangle, and sternocleidomastoid muscles, which support the head and neck, is the cause of tension headaches and chronic tension headaches, and it has been argued that headache patterns should be analyzed (14-17). Muscle pain points in the suboccipital and sternocleidomastoid muscles are essential for analyzing headache patterns (18, 19). Referred muscle pain is an area where nerves are densely distributed and are caused by changes in pressure and tension due to abnormal posture and decreased joint range of motion (20).

Pain in the muscles located in the neck and shoulders can cause headaches and shoulder pain. In particular, in the case of cervicogenic headaches, the range of motion of the cervical spine is reduced, causing fatigue and tension in the rectus capitis posterior major, minor, and obliquus capitis inferior, which support the head and form the suboccipital triangle (16, 19, 20). Abnormal postures and lifestyle habits that reduce the mobility of the upper cervical spine are said to increase tension in the surrounding muscles that support the neck and head, causing pain (21, 22). Because tense muscles become stiff and difficult to relax through voluntary stretching, intentional stimulation is necessary to improve mobility (17, 23). The vertebral artery and occipital nerve are structures that pass through the suboccipital triangle, and if the triangular space is narrowed due to muscle tension and pressure, blood circulation and nerve transmission may be impaired. These circulatory disorders can also cause various types of pain, so methods are needed to relieve the abnormal pressure and muscle tension caused by abnormal posture (21-23).

The sternocleidomastoid muscle is attached to the clavicle at the mastoid process. The greater auricular, greater occipital, and occipital nerves pass through muscles, and abnormal tension in the sternocleidomastoid muscle causes headaches by pressing on the passing structures (24-26). The suboccipital triangle, which supports the head, is the space through which the vertebral artery and the third occipital nerve pass and is the area that forms the muscular bridge concerning the cerebrospinal fluid (27). Previous studies have shown that inducing cerebrospinal fluid circulation can relieve pain and that headaches can occur when structures passing through the sternocleidomastoid muscle are compressed or cerebrospinal fluid circulation is interrupted. Therefore, it is vital to check and manage the condition of the sternocleidomastoid and posterior deltoid muscles (28, 29).

The participants in this study were experiencing discomfort in their daily lives due to headaches and shoulder pain without any specific cause. As a result of continuous and intentional stimulation of the subject's suboccipital, trapezius, and sternocleidomastoid muscles, headaches were reduced by 6-70% and shoulder pain by 7-80% after application. Comparing the results of this study with previous studies, it is believed that referred pain can cause headaches and shoulder pain and that referred pain can be alleviated by relaxing the area where the pain occurs through intentional pressure.

It is also thought to have positive effects by relaxing the muscles through which the nerves associated with headaches or shoulder pain pass. Headaches and shoulder pain without a specific cause can be reduced by changing your posture and relaxing the muscles around your neck and shoulders.

CONCLUSION

This study was conducted based on previous research showing that when headaches and shoulder pain are caused by referred pain from skeletal muscles, intentional stimulation of the suboccipital triangle, sternocleidomastoid, and upper trapezius muscles can help temporarily relieve pain. Headaches and shoulder pain can occur when joint mobility is reduced and muscle tension increases due to abnormal posture or imbalance. Tight muscles have limited movement, so intentionally applying pressure can relieve tension and reduce pain.

Therefore, when headache or shoulder pain occurs, it is thought that intentionally compressing the deltoid, sternocleidomastoid, and upper trapezius muscles that support the head will help improve blood circulation and reduce muscle-related pain.

APPLICABLE REMARKS

- Since the nerves responsible for pain travel through muscles, when headaches and shoulder pain occur, intentional stimulation of the sternocleidomastoid muscle, occipital triangle, and upper trapezius, through which major nerves pass, helps relieve pain.
- Headaches and shoulder pain should be classified, and the time of occurrence and duration of pain should be considered.
- Cases of liquid treatment, visits to medical institutions, and cases of occurrence without a specific cause should also be considered.
- Intentional stimulation of muscles helps circulation and has no side effects, but care must be taken in finding the stimulation point.

ACKNOWLEDGMENTS

We want to thank the corresponding authors, Dr. Seung-ho Han and Dr. Soon-gi Baek, for their help with the idea and design of this study. We would also like to thank the subjects who participated in this study and agreed to use their data. This research was supported by the Korea Institute of Science and Technology Information (KISTI).

AUTHORS' CONTRIBUTIONS

Study concept and design: Soon-Gi Baek, Seung-Ho Han. Acquisition of data: Na-Young Yoon. Analysis and interpretation of data: Seung-Ho Han. Drafting the manuscript: Soon-Gi Baek. Critical revision of the manuscript for important intellectual content: Na-Young Yoon. Statistical analysis: Na-Young Yoon. Administrative, technical, and material support: Soon-Gi Baek, Seung-Ho Han. Study supervision: Seung-Ho Han.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

FUNDING/SUPPORT

This research was supported by the Korea Institute of Science and Technology Information (KISTI).

FINANCIAL DISCLOSURE

This study has no financial interests related to the material in the manuscript.

ETHICAL CONSIDERATION

Informed consent was obtained from each patient included in the study, and the study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki, as reflected in a priori approval by the institution's human research committee.

ROLE OF THE SPONSOR

The funding organizations are public institutions and had no role in the design and conduct of the study.

ARTIFICIAL INTELLIGENCE (AI) USE

There was NO use of artificial intelligence (AI) for preparation, writing, or editing this manuscript.

REFERENCES

1. Jenkins S, Iwanaga J, Dumont AS, Loukas M, Tubbs RS. What is the suboccipital nerve? Tracking this confusing historical nomenclature. Morphologie. 2021 Feb;105(348):10-14. [doi:10.1016/j.morpho.2020.09.002] [PMid:33172783]

2. Buchgreitz, L., Lyngberg, A. C., Bendtsen, L., & Jensen, R. Increased pain sensitivity is not a risk factor but a consequence of frequent headache: a population-based follow-up study. PAIN®. 2008;137(3):623-630. [doi:10.1016/j.pain.2007.10.023] [PMid:18061350]
3. Lee, M., Lineberry, K., Reed, D., & Guyuron, B. The role of the third occipital nerve in surgical treatment of occipital migraine headaches. Journal of Plastic, Reconstructive & Aesthetic Surgery. 2013;66(10): 1335-1339. [doi:10.1016/j.bjps.2013.05.023] [PMid:23735289]
4. Sillevis, R., & Hogg, R. Anatomy and clinical relevance of sub occipital soft tissue connections with the dura mater in the upper cervical spine. Peer J. 8, 2020; e9716. [doi:10.7717/peerj.9716] [PMid:32864219]
5. Güvençer, M., Akyer, P., Sayhan, S., & Tetik, S. The importance of the greater occipital nerve in the occipital and the suboccipital region for nerve blockade and surgical approaches–An anatomic study on cadavers. Clinical Neurology and Neurosurgery. 2011;113(4):289-294. [doi:10.1016/j.clineuro.2010.11.021] [PMid:21208741]
6. Levy, D., Labastida-Ramirez, A., & Maassen VanDenBrink, A. Current understanding of meningeal and cerebral vascular function underlying migraine headache. Cephalalgia. 2019;39(13):1606-1622. [doi:10.1177/0333102418771350] [PMid:29929378]
7. Moore, M. K. Upper Crossed Syndrome and Its Relationship to Cervicogenic Headache. Journal of Manipulative and Physiological Therapeutics. 2004;27(6):414–420. [doi:10.1016/j.jmpt.2004.05.007] [PMid:15319765]
8. Tubbs, R. S., Loukas, M., Slappey, J. B., Shoja, M. M., Oakes, W. J., & Salter, E. G. Clinical anatomy of the C1 dorsal root, ganglion, and ramus: a review and anatomical study. Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists. 2007;20(6):624-627. [doi:10.1002/ca.20472] [PMid:17330847]
9. Sung, Y. H. Suboccipital muscles, forward head posture, and cervicogenic dizziness. Medicina. 2002;58(12):1791. [doi:10.3390/medicina58121791] [PMid:36556992]
10. La Rocca, G., Altieri, R., Ricciardi, L., Olivi, A., & Della Pepa, G. M. Anatomical study of occipital triangles: the 'inferior'suboccipital triangle, a useful vertebral artery landmark for safe postero-lateral skull base surgery. Acta neurochirurgica. 2017;159: 1887-1891. [doi:10.1007/s00701-017-3300-3] [PMid:28828558]
11. Gutierrez, S., Huynh, T., Iwanaga, J., Dumont, A. S., Bui, C. J., & Tubbs, R. S. A review of the history, anatomy, and development of the C1 spinal nerve. World Neurosurgery. 2020;135: 352-356. [doi:10.1016/j.wneu.2019.12.024] [PMid:31838236]
12. Tubbs, R. S., Mortazavi, M. M., Loukas, M., D'Antoni, A. V., Shoja, M. M., Chern, J. J., & Cohen-Gadol, A. A. Anatomical study of the third occipital nerve and its potential role in occipital headache/neck pain following midline dissections of the craniocervical junction. Journal of Neurosurgery: Spine. 2011;15(1):71-75. [doi:10.3171/2011.3.SPINE10854] [PMid:21495817]
13. Fernández-de-Las-Peñas, C., Ge, H. Y., Arendt-Nielsen, L., Cuadrado, M. L., & Pareja, J. A. Referred pain from trapezius muscle trigger points shares similar characteristics with chronic tension type headache. European Journal of Pain. 2007;11(4):475-482. [doi:10.1016/j.ejpain.2006.07.005] [PMid:16919982]
14. de las Peñas, C. F., Campo, M. S., Carnero, J. F., & Page, J. C. M. Manual therapies in myofascial trigger point treatment: a systematic review. Journal of bodywork and movement therapies. 2005;9(1):27-34. [doi:10.1016/j.jbmt.2003.11.001]
15. Fernández-de-las-Peñas, C., Cuadrado, M., Arendt-Nielsen, L., Simons, D., & Pareja, J. Myofascial Trigger Points and Sensitization: An Updated Pain Model for Tension-Type Headache. Cephalalgia. 2007;27(5):383–393. [doi:10.1111/j.1468-2982.2007.01295.x] [PMid:17359516]
16. Choi, I., & Jeon, S. R. Neuralgias of the head: occipital neuralgia. Journal of Korean Medical Science. 2016;31(4):479. [doi:10.3346/jkms.2016.31.4.479] [PMid:27051229]
17. Bodes-Pardo, G., Pecos-Martín, D., Gallego-Izquierdo, T., Salom-Moreno, J., Fernández-de-Las-Peñas, C., & Ortega-Santiago, R. Manual treatment for cervicogenic headache and active trigger point in the sternocleidomastoid muscle: a pilot randomized clinical trial. Journal of manipulative and physiological therapeutics. 2013;36(7):403-411. [doi:10.1016/j.jmpt.2013.05.022] [PMid:23845200]

18. Bendtsen, L., & Fernández-de-la-Peñas, C. The Role of Muscles in Tension-Type Headache. Current Pain and Headache Reports. 2011;15(6):451–458. [doi:10.1007/s11916-011-0216-0] [PMid:21735049]
19. Farmer, Peter K., et al. An investigation of cervical spinal posture in cervicogenic headache. Physical therapy. 2015;95(2):212-222. [doi:10.2522/ptj.20140073] [PMid:25301967]
20. Alonso-Blanco, C., de-la-Llave-Rincón, A. I., & Fernández-de-las-Peñas, C. Muscle trigger point therapy in tension-type headache. Expert Review of Neurotherapeutics. 2012;12(3):315–322. [doi:10.1586/ern.11.138] [PMid:22364330]
21. Antonia, G. C. Efficacy of manual and manipulative therapy in the perception of pain and cervical motion in patients with tension-type headache: a randomized, controlled clinical trial. Journal of chiropractic medicine. 2014;13(1):4-13. [doi:10.1016/j.jcm.2014.01.004] [PMid:24711779]
22. Roth JK, Roth RS, Weintraub JR, Simons DG. Cervicogenic headache caused by myofascial trigger points in the sternocleidomastoid: a case report. Cephalalgia. 2007;27:375-80. [doi:10.1111/j.1468-2982.2007.01296.x] [PMid:17376116]
23. Gemma V., E.-L., & Antonia, G.-C. Efficacy of Manual and Manipulative Therapy in the Perception of Pain and Cervical Motion in Patients with Tension-Type Headache: A Randomized, Controlled Clinical Trial. Journal of Chiropractic Medicine. 2014;13(1):4–13. [doi:10.1016/j.jcm.2014.01.004] [PMid:24711779]
24. Sollmann, N.; Mathonia, N.; Weidlich, D.; Bonfert, M.; Schroeder, S.A.; Badura, K.A.; Renner, T.; Trepte-Freisleder, F.; Ganter, C.; Krieg, S.M.; et al. Quantitative magnetic resonance imaging of the upper trapezius muscles–assessment of myofascial trigger points in patients with migraine. J. Headache Pain. 2019;20:1–9. [doi:10.1186/s10194-019-0960-9] [PMid:30658563]
25. Goadsby, P. J., Bartsch, T., & Dodick, D. W. Occipital nerve stimulation for headache: mechanisms and efficacy. Headache: The Journal of Head and Face Pain. 2008;48(2):313-318. [doi:10.1111/j.1526-4610.2007.01022.x] [PMid:18234048]
26. Zheng, N., Chung, B. S., Li, Y. L., Liu, T. Y., Zhang, L. X., Ge, Y. Y., ... & Sui, H. J. The myodural bridge complex defined as a new functional structure. Surgical and Radiologic Anatomy. 2020;42:143-153. [doi:10.1007/s00276-019-02340-6] [PMid:31563971]
27. Natsis, K., Baraliakos, X., Appell, H. J., Tsikaras, P., Gigis, I., & Koebke, J. The course of the greater occipital nerve in the suboccipital region: a proposal for setting landmarks for local anesthesia in patients with occipital neuralgia. Clinical Anatomy: The Official Journal of the American Association of Clinical Anatomists and the British Association of Clinical Anatomists. 2006;19(4):332-336. [doi:10.1002/ca.20190] [PMid:16258972]
28. Dash, K. S., Janis, J. E., & Guyuron, B. The lesser and third occipital nerves and migraine headaches. Plastic and reconstructive surgery. 2005;115(6):1752-1758. [doi:10.1097/01.PRS.0000161679.26890.EE] [PMid:15861086]
29. Scali, F., Marsili, E. S., & Pontell, M. E. Anatomical connection between the rectus capitis posterior major and the dura mater. Spine. 2011;36(25):E1612-E1614. [doi:10.1097/BRS.0b013e31821129df] [PMid:21278628]