Agri 2023;35(1):16–21
doi: 10.14744/agri.2021.21957

ORIGINAL ARTICLE

Ultrasound-guided interfascial blocks of the trapezius muscle for cervicogenic headache

Servikojenik başarısında ultrason eşliğinde yapılan trapezius kası interfasiyal bloğu

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Summary

Objectives: Disorders in the cervical muscles, such as myofascial trigger points and tightness, are common factors in patients with cervicogenic headache (CEH). We aimed to evaluate the effectiveness of ultrasound-guided interfascial blocks of the trapezius muscle in patients with CEH who showed tenderness in the upper cervical muscle groups.

Methods: A total of 23 patients were evaluated in the prospective observational trial. The injection was performed between the trapezius muscle and levator scapula muscle fascia with a disposable 25-gauge, 10-cm Quincke-tip spinal needle. 10 mL of 0.125% bupivacaine was injected between the muscle fascia. Numeric rating scale (NRS), neck disability index (NDI), pain frequency, and analgesic consumption in the pre-treatment and post-treatment period were evaluated.

Results: The NRS scores at 10 min, 1 week, 2 weeks, and 4 weeks after treatment were significantly better than the pre-treatment NRS score. The NDI scores at 1, 2, and 4 weeks after treatment were significantly better than the pre-treatment NDI score. The pain frequency at 1 and 2 weeks after treatment was significantly lower than that recorded in the pre-treatment period. Statistically significant reductions were observed in analgesic consumption at 1, 2, and 4 weeks after treatment, in comparison with consumption in the pre-treatment period.

Conclusion: We suggest that an ultrasound-guided interfascial block of the trapezius muscle is effective for the treatment of CEH caused by muscle disorders.

Keywords: Cervicogenic headache; interfascial block; trapezius muscle.

Özet

Amaç: Miyofasiyal tetik noktalar ve spazm gibi servikal kas bozuklukları servikojenik baş ağrılı hastalarda yaygın faktörlerdir. Bu çalışmada, üst servikal kas gruplarındaki bozukluklara bağlı servikojenik baş ağrılı hastalarda ultrason eşliğinde trapezius kası interfasiyal blokunun etkinliğini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Çalışmada, 23 hasta prospektif gözlemsel değerlendirildi. 25 gauge, 10 cm Quincke tip spinal iğne ile trapezius kası ile levator skapula kaslarının fasiyaları arasına ultrason eşliğinde ilerlendi. 10 mL %0,125'lik bupivakain enjekte edildi. Numeric Rating Scale (NRS), Neck Disability Index (NDI), ağrı sıklığı ve analjezik tüketimi tedavi öncesi ve tedavi sonrası dönemde değerlendirildi.

Bulgular: NRS skorları tedavi sonrası 10. dakika, birinci, ikinci ve dördüncü haftalarda tedavi öncesi NRS skorlarından anlamlı olarak daha düşüktü. NDI skorları tedavi sonrası birinci, ikinci ve dördüncü haftalarda tedavi öncesi skorlara göre anlamlı olarak daha iyiydi. Ağrı sıklığı birinci ve ikinci haftalarda tedavi öncesine göre anlamlı olarak daha düşüktü. Analjezik tüketiminde birinci, ikinci ve dördüncü haftalarda tedavi öncesi dönemle karşılaştırıldığında istatistiksel olarak anlamlı azalma vardı.

Sonuç: Ultrason eşliğinde yapılan trapezius kası interfasiyal blokunun kas problemlerine bağlı servikojenik baş ağrılı hastaların tedavisinde faydalı olacağını düşünüyoruz.

Anahtar sözcükler: Servikojenik baş ağrısı; interfasiyal blok; trapezius kası.

Introduction

Cervicogenic headache (CEH) is a secondary headache arising from nociceptive structures in the cervical spine or cervical soft tissues, such as facet joints, disk intervertebral, muscles, and ligaments. The structures innervated by the segmental nerves from C1-C3 can serve as sources of CEH. The nucleus trigeminocervical is formed by the pars caudalis of the

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Submitted *(Başvuru)* **23.11.2021** **Accepted** *(Kabul)* **30.12.2021** **Available online** *(Online yayımlanma)* **06.01.2023**

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spinal nucleus nerve trigeminal and the grey matter from the upper three cervical spinal cord segments. The nociceptive afferents of the nervus trigeminus and the first three cervical nerves interact in this region, and this interaction can result in referred pain in the sensory receptive fields of the nervus trigeminus, which is a possible mechanism underlying CEH.[1–3] CEH usually presents as a unilateral headache without a side shift. It is typically referred to as pain from a source in the neck and radiates to one or more regions of the head and/or face. It usually affects the occipital, frontal, and retro-orbital regions and can also occur bilaterally. CEH can be provoked by cervical movements[4,5] and is accompanied by limitations in neck movement and, occasionally, ipsilateral non-radicular shoulder and arm pain.[3,6] The prevalence of CEH in the general population is between 0.4% and 2.5%. However, in patients with headaches, the prevalence is as high as 15–20%.[7]

The International Headache Society published diagnostic criteria (ICHD-3) for CEH[8] and classified it as a secondary headache arising from musculoskeletal disorders of the cervical spine. The ICHD-3 classification criteria for CEH are as follows: (a) any headache fulfilling criterion C; (b) clinical and/or imaging evidence of the neck known to be related to headache; (c) evidence of causation demonstrated by at least two of the following findings: (1) headache development showing a temporal relationship with the onset of a cervical disorder or appearance of a lesion, (2) headache that significantly improved or resolved in parallel with an improvement in or resolution of the cervical disorder or lesion, (3) a reduced cervical range of motion and headache made significantly worse by provocative manoeuvres, and (4) headache abolished following diagnostic blockade of a cervical structure or its nerve supply; and (d) headache not better accounted for by another ICHD-3 diagnosis.

Disorders in the cervical muscles, such as myofascial trigger points (TrPs) and tightness, are common factors in patients with CEH and contribute to pain and disability.[9–11] TrPs are painful, hyperirritable spots localized in the taut band of skeletal muscle. They can cause localized or referred pain and autonomic phenomena such as vasoconstriction, pilomotor response, and hypersecretion.[12,13] The main goal of treatment is inactivation of the TrPs, and injection techniques are the main treatment methods. Interfascial injections have been recently used for TrP-induced pain.[14,15] The structure of the fascia can ease the diffusion of an injected anesthetic during diagnostic and therapeutic blocks, and interfascial injections are becoming more common as a result.[14–16] However, there are no clinical studies in the literature regarding interfascial blocks specifically for CEH.

In the present study, we aimed to evaluate the effectiveness of ultrasound-guided interfascial blocks of the trapezius muscle in patients with CEH who showed tenderness in the upper cervical muscle groups.

Material and Methods

This prospective observational trial was approved by the Research Ethics Committee (KAEK 2020/3/4). All patients provided written informed consent before participation. Patients who met the ICHD-3 classification criteria for CEH and had been experiencing tenderness in the upper cervical muscle groups with palpation and pain for at least 3 months were included in the study. Patients who presented with clinically significant or unstable medical or psychiatric illness, previous surgery on the cervical region, unstable neurological deficits, infection or coagulopathy, history of malignancy, pregnancy, and use of analgesic agents except for paracetamol, and non-steroidal anti-inflammatory drugs; those who took analgesic drugs within the last 48 hours; and those who had received interventional pain treatment within the last 3 months were excluded from the study.

The procedure was performed in the operating room with the patient in the prone position. Standard monitoring (electrocardiography, non-invasive blood pressure, and peripheral oxygen saturation) was utilized, and an IV catheter was put in place. The skin area was aseptically draped with sterile towels and anaesthetized with 2% prilocaine (Priloc; Vem Medical). We used a Logiq P5 ultrasound (Avante Health Solutions, Concord, North Carolina, United States) with a 6–13-MHz linear probe. The probe was placed longitudinally between the acromion and the C7 spinous process. The trapezius and levator scapula muscles and their fasciae were visualized. The injection was performed between the trapezius muscle and levator scapula muscle fascia. A disposable 25-gauge, 10-cm Quincke-tip spinal needle, was inserted in the interfascial plane. The needle was connected through a 25-cm flexible extension

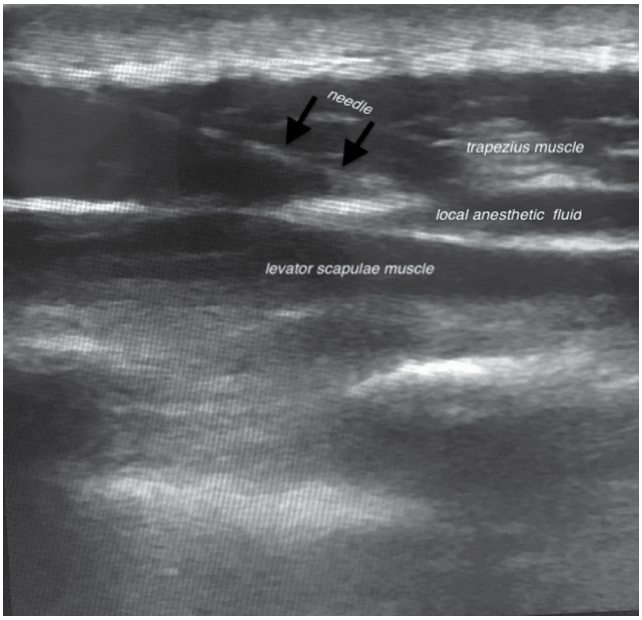

Figure 1. Injection between the trapezius muscle and levator scapula muscle fascia.

tube to a syringe with physiological saline solution (PS) (Serum Fizyolojik; Adeka Medical), and 2–3 mL of PS was injected. The needle was repositioned until anechoic diffusion was observed. When the correct space was confirmed, the syringe was changed, and 10 mL of 0.125% bupivacaine (Buvasin; Vem Medical) was injected between the muscle fascia (Fig. 1). For cases showing bilateral involvement, the procedure was performed bilaterally, and a total of 20 mL of injection was administered, with 10 mL on each side. After treatment, the cannula was removed, and a sterile adhesive plaster was placed over the puncture site. The patients were observed and monitored in the recovery room and discharged after 30 min.

The primary outcome was pain intensity of the patients pre-treatment and at 10 min and 1, 2, and 4 weeks after treatment were evaluated using the Numeric Rating Scale (NRS, a 11-point pain scale, with 0=no pain, and 10=worst pain imaginable). The side with higher pain levels was evaluated in patients who underwent bilateral procedures.

Secondary outcomes were headache frequency, disability as measured using the Neck Disability Index (NDI), and analgesic consumption. NDI was assessed pre-treatment and at 1, 2, and 4 weeks after treatment. Headache frequency was measured as the number of days with headaches in the previous week. Analgesic consumption was measured as the number of times the patient took analgesic drugs in the previous week.

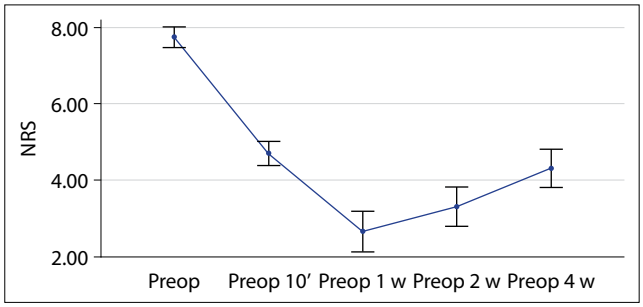

Figure 2. Numeric rating scale scores before and 10 min, 1 week, 2 weeks, and 4 weeks after the procedure.

Table 1. Patient demographics

Age (years)	54.04 (41–78)
Sex (F/M) (n/%)	14/9 (60.9/39.1)
Side (right/left/bilateral) (n/%)	8 (34.8)/11 (47.8)/4 (17.4)
Pain duration (months)	48.13 (3–150)

F: Female; M: Male.

Statistical Analysis

Repeated-measures ANOVA was used for parameters such as NRS and NDI scores, pain frequency, and analgesic consumption to test differences between pre-and post-operative measurements. For the repeated measure ANOVA model, the sample size for the NRS parameter with 5 time-dependent measurements was found as 21, with an effect size of 0.25 and an alpha level of 0.05, with a minimum power of 0.80. Gender was selected as the covariance and the difference between 5 for NRS and 4 time points for other parameters, and the interaction of these two main effects was tested. The sphericity assumption was evaluated using Mauchly's test for sphericity. As a violation of this assumption, Wilk's lambda statistic was used as a multivariate test. General descriptive statistics are summarized as counts and percentages for categorical variables and median-range and mean±standard deviation for continuous variables. $p<0.05$ was considered statistically significant. The changes in the measurements of the parameters over time are presented using line graphs.

Results

A total of 23 patients (14 women and 9 men) aged 41–78 years (mean age, 54.04 years) who underwent ultrasound-guided interfascial blocks of the trapezius muscle for CEH were evaluated in this study. The baseline characteristics of the patients are shown in Table 1.

Table 2. NRS and NDI scores, pain frequency, and analgesic consumption pre-treatment and post-treatment

	NRS	NDI	Pain frequency	Analgesic consumption
Pre-operative	7.74±0.27[a]	25.70±1.03[a]	3.70±0.29[a]	2.61±0.21[a]
10 min	4.70±0.32[b]			
1 week	2.65±0.53[c]	18.3±1.07[b]	1.39±0.27[b]	0.78±0.19[b]
2 weeks	3.30±0.51[bc]	18.61±1.11[b]	1.87±0.29[c]	1.04±0.23[b]
4 weeks	4.30±0.50[bd]	19.65±0.98[b]	2.502±0.32[a]	1.65±0.22[c]
p	p<0.001	p<0.001	p<0.001	p<0.001

For indices such as a, b, c, and d, the means shown with the same letters are the same, while the means with different indices are statistically different from each other; NRS: Numeric Rating Scale; NDI: Neck Disability Index.

The NRS scores at 10 min, 1 week, 2 weeks, and 4 weeks after treatment were significantly better than the pre-treatment NRS score. The NRS score at 10 min after treatment was significantly higher than that at 1 week, while those at 2 and 4 weeks were similar. The NRS scores at 1 and 2 weeks did not differ, but the NRS score at 1 week was significantly lower than that at 4 weeks (Table 2 and Fig. 2).

The NDI scores at 1, 2, and 4 weeks after treatment were significantly better than the pre-treatment NDI score. The post-treatment NDI scores were similar across the evaluated time points (Table 2). The pain frequency at 1 and 2 weeks after treatment was significantly lower than that recorded in the pre-treatment period, while the pre-treatment pain frequency did not differ from that recorded 4 weeks after treatment. Statistically significant reductions were observed in analgesic consumption at 1, 2, and 4 weeks after treatment, in comparison with consumption in the pre-treatment period (Table 2). No complications were reported, except for mild pain at the injection site lasting for a few days in three patients.

Discussion

We found statistically significant reductions in NRS and NDI scores, pain frequency, and analgesic consumption in the post-treatment period with interfascial blocks of the trapezius muscle. On the basis of the previous studies showing that disorders in muscles of the cervical region are one of the causative factors for CEH[9,10,11,17] and the application of various interventional pain treatments for the management of CEH in the literature,[18–21] we thought that an interfascial block of the trapezius muscle may be effective in this type of headache. We have also previously reported the findings for two patients with CEH who experienced pain relief with this block.[22] Furthermore, the greater occipital nerve passes the lateral border of the trapezius muscle and then pierces the fascia of the trapezius muscle with the sternocleidomastoid (SCM) muscle, or it pierces the trapezius muscle itself.[23] On the basis of these considerations, the interfascial block of the trapezius muscle can be expected to be effective for CEH.

Sjaastad et al.[17] have shown that the symptoms of CEH can be induced by firm manual pressure on "certain tender spots in the neck." Zito et al.[10] showed that the incidence of tightness in the upper trapezius, levator scapulae, scalenes, and suboccipital extensors was significantly higher in the CEH group than in the migraine and control groups. Fernandez-de-las-Penas et al.[11] suggested that pain from TrPs in the posterior cervical, head, and shoulder muscles typically refers to the temporal and frontal areas of the head. Oliver et al.[9] investigated whether trigger point sensitivity in the upper trapezius, SCM, temporalis, or posterior cervical muscles is a differentiating factor between cervicogenic and non-CEHs. Their study showed that myofascial TrPs in the upper trapezius muscle are more sensitive in patients with CEH than in those with non-CEH.

In the cervical region, TrPs are usually located in the upper trapezius, SCM, posterior cervical, and temporalis muscles,[13] and the trapezius is one of the most affected muscles.[24] Park et al.[25] found that the tone and stiffness of the suboccipital muscles and upper trapezius muscle were increased in patients with CEH in comparison with healthy individuals. Inactivation of TrPs to restore normal muscle length and function is the cornerstone of pain relief in these patients.

Injection techniques are one of the main treatment methods for painful TrPs and include methods such as local anesthetic injections, dry needling, and interfascial plane blocks.[26] Analgesic blocks of nerve fibers with interfascial injections decrease sensitivity, allow relaxation of the muscles, and provide pain relief to patients with TrPs.[14] The fascia consists of undifferentiated mesenchymal tissue and forms a thin layer between the muscles and adjacent organs. This layering creates interfascial spaces, resulting in the formation of a separate compartment between muscles that allow independent movement of muscles and fibers, and providing circulation support and protection.[27] Using cadavers, Domingo et al.[14] confirmed the diffusion of saline solution in the interfascial space during an ultrasound-guided interfascial block of the trapezius muscle. They also showed a rich innervation network penetrating the fascia in the interfascial space, clarifying the effect of local anesthetics in myogenic pain. In an accompanying clinical study, the authors also found the interfascial block in the trapezius muscle to be as effective as that in abdominal muscles.

Various interventional approaches for CEH, such as local injection, nervus occipitalis major and minor blocks, cervical epidural steroid injection, radiofrequency treatment, and dry needling, have been reported in the literature.[18-21] Ischemic compression may also reduce pain in patients with CEH originating from TrPs in the SCM muscle.[28] Eghtesadi et al.[29] suggested that occipital nerve stimulation may be a safe and effective treatment for refractory CEH. Interventional procedures for CEH in the literature are focused on occipital nerve blocks.[30] In a double-blind and randomized study, 50 patients with CEH were administered occipital nerve blocks and blockade of facial nerves effectively reduced the visual analog scale and total pain index scores by approximately 50% from the baseline values at 2 weeks.[20]

The effect of the cervical region muscles on CEH has been shown previously, but the present study is the first to show the effectiveness of interfascial blocks of the cervical region muscle in CEH. We believe that our positive results may be due to several mechanisms or the synergistic effect of multiple mechanisms, including (a) inhibition of the trigger point, (b) blockade of the accessory nerve and adjacent sensory nerves, and (c) blockade of the greater occipital nerve in the area, where it travels under the trapezius muscle through spread of the injectate to the cephalad, and (d) release of the greater occipital nerve where it pierces the trapezius muscle fascia or itself through relaxation of the trapezius muscle.

The limitation of the present study is that it did not include a control group.

We suggest that an ultrasound-guided interfascial block of the trapezius muscle is effective for the treatment of CEH caused by muscle disorders. Further studies are needed to support our results, and our study will guide further studies on the use of interfascial blocks in CEH.

Ethics Committee Approval: The Samsun Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 28.04.2020, number: KAEK 2020/3/4).

Conflict-of-interest issues regarding the authorship or article: None declared.

Peer-rewiew: Externally peer-reviewed.

References

1. Chaibi A, Russell MB. Manual therapies for cervicogenic headache: A systematic review. J Headache Pain 2012;13:351–9. [CrossRef]
2. Bogduk N, Govind J. Cervicogenic headache: An assessment of the evidence on clinical diagnosis, invasive tests, and treatment. Lancet Neurol 2009;8:959–68. [CrossRef]
3. van Suijlekom H, van Zundert J, Narouze S, van Kleef M, Mekhail N. Cervicogenic headache. In: van Zundert J, Patijn J, Hartrick CT, Lataster A, Huygen FJPM, Mekhail N, et al, editors. Evidence-based interventional pain medicine: According to clinical diagnoses. New Jersey: John Wiley & Sons; 2012. p. 4–44. [CrossRef]
4. Biondi DM. Cervicogenic headache: A review of diagnostic and treatment strategies. J Am Osteopath Assoc 2005;105(Suppl 2):16S–22.
5. Sjaastad O, Fredriksen TA. Cervicogenic headache: Criteria, classification and epidemiology. Clin Exp Rheumatol 2000;18(Suppl 19):S3–6.
6. Fishbain DA, Lewis J, Cole B, Cutler RB, Rosomoff RS, Rosomoff HL. Do the proposed cervicogenic headache diagnostic criteria demonstrate specificity in terms of separating cervicogenic headache from migraine? Curr Pain Headache Rep 2003;7:387–94. [CrossRef]
7. Martelletti P, van Suijlekom H. Cervicogenic headache: Practical approaches to therapy. CNS Drugs 2004;18:793–805.
8. International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition. Cephalalgia 2018;38:1–211. [CrossRef]

9. Olivier B, Pramod A, Maleka D. Trigger point sensitivity is a differentiating factor between cervicogenic and non-cervicogenic headaches: A cross-sectional, descriptive study. Physiother Can 2018;70:323–9. [CrossRef]
10. Zito G, Jull G, Story I. Clinical tests of musculoskeletal dysfunction in the diagnosis of cervicogenic headache. Man Ther 2006;11:118–29. [CrossRef]
11. Fernández-de-Las-Peñas C, Simons D, Cuadrado ML, Pareja J. The role of myofascial trigger points in musculoskeletal pain syndromes of the head and neck. Curr Pain Headache Rep 2007;11:365–72. [CrossRef]
12. Chou LW, Kao MJ, Lin JG. Probable mechanisms of needling therapies for myofascial pain control. Evid Based Complement Alternat Med 2012;2012:705327. [CrossRef]
13. Simons DG. New views of myofascial trigger points: Etiology and diagnosis. Arch Phys Med Rehabil 2008;89:157–9.
14. Domingo T, Blasi J, Casals M, Mayoral V, Ortiz-Sagristá JC, Miguel-Pérez M. Is interfascial block with ultrasound-guided puncture useful in treatment of myofascial pain of the trapezius muscle? Clin J Pain 2011;27:297–303. [CrossRef]
15. Park SM, Cho YW, Ahn SH, Lee DG, Cho HK, Kim SY. Comparison of the effects of ultrasound-guided interfascial pulsed radiofrequency and ultrasound-guided interfascial injection on myofascial pain syndrome of the gastrocnemius. Ann Rehabil Med 2016;40:885–92. [CrossRef]
16. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: A prospective randomized controlled trial. Anesth Analg 2007;104:193–7.
17. Sjaastad O, Fredriksen TA, Pfaffenrath V. Cervicogenic headache: Diagnostic criteria. Headache 1990;30:725–6.
18. Sedighi A, Nakhostin Ansari N, Naghdi S. Comparison of acute effects of superficial and deep dry needling into trigger points of suboccipital and upper trapezius muscles in patients with cervicogenic headache. J Bodyw Mov Ther 2017;21:810–4. [CrossRef]
19. Wang E, Wang D. Treatment of cervicogenic headache with cervical epidural steroid injection. Curr Pain Headache Rep 2014;18:442. [CrossRef]
20. Naja ZM, El-Rajab M, Al-Tannir MA, Ziade FM, Tawfik OM. Occipital nerve blockade for cervicogenic headache: A double-blind randomized controlled clinical trial. Pain Pract 2006;6:89–95. [CrossRef]
21. Ng A, Wang D. Cervical facet injections in the management of cervicogenic headaches. Curr Pain Headache Rep 2015;19:484. [CrossRef]
22. Arici T. Ultrasound-guided interfascial blocks of the trapezius muscle for cervicogenic headache: A report of two cases. Agri 2021;33:278–81. [CrossRef]
23. Won HJ, Ji HJ, Song JK, Kim YD, Won HS. Topographical study of the trapezius muscle, greater occipital nerve, and occipital artery for facilitating blockade of the greater occipital nerve. PLoS One 2018;13:e0202448. [CrossRef]
24. Kamanli A, Kaya A, Ardicoglu O, Ozgocmen S, Zengin FO, Bayik Y. Comparison of lidocaine injection, botulinum toxin injection, and dry needling to trigger points in myofascial pain syndrome. Rheumatol Int 2005;25:604–11. [CrossRef]
25. Park SK, Yang DJ, Kim JH, Heo JW, Uhm YH, Yoon JH. Analysis of mechanical properties of cervical muscles in patients with cervicogenic headache. J Phys Ther Sci 2017;29:332–5.
26. Alvarez DJ, Rockwell PG. Trigger points: Diagnosis and management. Am Fam Physician 2002;65:653–60.
27. Benjamin M. The fascia of the limbs and back--A review. J Anat 2009;214:1–18. [CrossRef]
28. Jafari M, Bahrpeyma F, Togha M. Effect of ischemic compression for cervicogenic headache and elastic behavior of active trigger point in the sternocleidomastoid muscle using ultrasound imaging. J Bodyw Mov Ther 2017;21:933–9.
29. Eghtesadi M, Leroux E, Fournier-Gosselin MP, Lespérance P, Marchand L, Pim H, et al. Neurostimulation for refractory cervicogenic headache: A three-year retrospective study. Neuromodulation 2018;21:302–9. [CrossRef]
30. Ashkenazi A, Blumenfeld A, Napchan U, Narouze S, Grosberg B, Interventional Procedures Special Interest Section of the American, et al. Peripheral nerve blocks and trigger point injections in headache management - A systematic review and suggestions for future research. Headache 2010;50:943–52. [CrossRef]