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The effects of repetitive greater occipital nerve blocks on cervicogenic headache

Tekrarlayıcı büyük oksipital sinir bloklarının servikojenik baş ağrısında etkileri

Devrimsel Harika Ertem[1], İlhan Yılmaz[2]

[1]University of Health Sciences, Şişli Hamidiye Etfal Research and Training Hospital, Department of Algology, Istanbul, Turkey.

[2]University of Health Sciences, Şişli Hamidiye Etfal Research and Training Hospital, Department of Neurosurgery, Istanbul, Turkey.

Abstract

Objective: The clinical features of cervicogenic headache (CH) are characterized by unilateral, dull headache; precipitated by neck movements or external pressure over the great occipital nerve (GON). No conservative therapies have been proved to be effective for management of CH. The purpose of this study was to assess the effects of interventional pain management, including repetitive anesthetic block using lidocaine and methylprednisolone injections to GON for local pain and associated headache.

Materials and Methods: This retrospective cohort study was undertaken between January 2016 and December 2017. Twenty-one patients with CH were evaluated in our headache clinic during the study period. The diagnosis of CH was made according to International Classification of Headache Disorders 3rd edition beta version. The sociodemographic and clinical characteristics were recorded for all patients who underwent at least 3 GON blocks and attended at least 4 follow-up appointment. Change in the Numeric Pain Rating Scale (NPRS) was used to assess the response to GON blocks. SPSS 23.0 was used as the statistical analysis program.

Results: The mean age of patients was 61.51±13.88, 42.85 % were female. The duration of headache was 30.81±21.95 years. Eighty-five percent of patients had unilateral headache. Ten patients had myofascial spasm (trigger points) located in neck, occipitalis, and temporalis muscles. Sixty-six percent of patients reported headache following head trauma. From 3-months post treatment a significant decrease in NPRS (p=0.000) was identified. The number of headaches was reduced significantly at three months (p=0.000) No serious complication was noted. The coexistence of myofascial spasms, history of trauma and additional headache did not have any significant effect on improvement of NRS scores (p>0.05).

Conclusion: The results of this study demonstrated that repetitive greater occipital blocks may be an effective option for management of CH and contribute significant reductions in pain severity scores at 3 months following injection.

Keywords: Headache, cervicogenic headache, chronic pain, greater occipital nerve, nerve block

Öz

Amaç: Servikojenik baş ağrısının klinik özellikleri tek taraflı, dolgun baş ağrısıyla karakterizedir; boyun hareketleri veya büyük oksipital sinir üzerine basınç ile provoke edilir. Servikojenik baş ağrısının tedavisinde etkili bir konservatif yöntem tanımlanmamıştır. Bu çalışmanın amacı, servikojenik baş ağrısında büyük oksipital sinire tekrarlayıcı lidokain ve metilprednizolon enjeksiyonlarının girişimsel ağrı tedavisinde etkilerini değerlendirmektir.

Gereç ve Yöntem: Bu retrospektif kohort çalışması Ocak 2016 ile Aralık 2017 tarihleri arasında yapıldı. Çalışma dönemi boyunca baş ağrısı polikliniğimizden takip edilen yirmi bir hasta değerlendirildi. Servikojenik baş ağrısı tanısı, Uluslararası Baş Ağrısı Bozuklukları 3. Baskı beta versiyonuna göre yapıldı. En az 3 büyük oksipital sinir blok geçiren ve en az 4 takip randevusuna katılan tüm hastalar için sosyodemografik ve klinik özellikler kaydedildi. Büyük oksipital sinir bloklarına cevabı değerlendirmek için Sayısal Ağrı Derecelendirme Ölçeğinde (NPRS) değişim kullanıldı. İstatistiksel analiz programı olarak SPSS 23.0 kullanıldı.

Bulgular: Hastaların yaş ortalaması 61.51 ± 13.88,% 42.85'i kadındı. Baş ağrısı süresi 30.81 ± 21.95 yıldı. Hastaların yüzde seksen beşi tek taraflı baş ağrısına sahipti. On hastada boyun, oksipital ve temporalis kaslarında miyofasiyal spazm (tetik noktalar) vardı. Hastaların % 61'i kafa travması sonrası baş ağrısını bildirmişti. Tedaviden 3 ay sonra NPRS'de anlamlı bir azalma (p = 0.000) tespit edildi. Baş ağrısı sayısı üç ayda belirgin olarak azaldı (p = 0.000) Ciddi bir komplikasyon görülmedi. Miyofasiyal spazmlar, travma öyküsü ve ek baş ağrısının birlikteliği, NPRS skorlarının düzelmesinde önemli bir etkiye sahip olmadı (p> 0.05).

Sonuç: Bu çalışmanın sonuçları, tekrarlayan büyük oksipital sinir blokların, servikojenik baş ağrısı tedavisinde etkili bir seçenek olabileceğini ve enjeksiyondan sonraki 3 ay içinde ağrı şiddeti skorlarında anlamlı azalmaya neden olduğunu göstermektedir.

Anahtar Kelimeler: Baş ağrısı, servikojenik baş ağrısı, kronik ağrı, büyük oksipital sinir, sinir bloğu

Address for Correspondence/Yazışma Adresi: Devrimsel Harika Ertem MD, University of Health Sciences, Şişli Hamidiye Etfal Research and Training Hospital, Department of Algology, Istanbul, Turkey
Phone: +90 530 142 88 76 E-mail: hkaozhan@gmail.com

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Introduction

Cervicogenic headache (CH) implies a chronic hemicranial pain caused by a disorder of the cervical spine and its anatomical structures innervated by C1, C2, and C3 cervical spinal nerves (1). According to The International Classification of Headache Disorders, 3rd edition (beta version), the diagnostic criteria of CH are as follows; evidence of a disorder or lesion within the cervical spine or soft tissues of the neck, pain developed in temporal relation to the onset of the cervical disorder and improvement after treatment of the cervical disorder, reduced cervical range of motion, worsening by provoking, and pain relief following diagnostic blocks (2).

CH is generally associated with head or neck injury, but may also occur without trauma.

Symptoms of CH are typically dull and radiating occipital or neck pain, local tenderness by pressure over suboccipital area, painful rotation of cervical spine, and restricted active and passive neck range of motion, and pain provocation by passive rotation of neck (3). Although clinical features of CH have not been validated for the diagnosis, diagnostic blocks targetting the greater and lesser occipital nerves from dorsal ramus of C2 and C3 can be both diagnostic and therapeutic (4). None of oral medication has been shown to be effective for the treatment of CH. Physical treatment modalities such as muscle stretching and manual cervical traction have been studied for headache of cervical origin, but much of the published literature consists of case reports or case series (5). Nerve blocks targeting the greater and lesser occipital nerves from dorsal ramus of C2 and C3 are diagnostic and therapeutic for CH. When conservative treatment failed, interventional pain management methods, including injection of local anesthetics and corticosteroid at the location of great occipital nerve (GON), intraarticular/ medial branch corticosteroid injection (C2-3, C3-4 zygapophysial joints, medial branches of the C3 and C4 dorsal rami), radiofrequency ablation, occipital nerve stimulation, epidural steroid injections, and surgical treatment, are another options for the treatment of CH (5,6).

Early studies including diffrent types of study designs have reported an improved control of CH pain after GON blocks (6,7,8).To date, however, there are no similarly well-known GON injection protocols for the treatment of CH. The aim of this study was to assess the efficacy and log-lasting response of repetitive GON injections using corticosteoid and local anesthetics in the treatment of CH.

Materials and Methods

Participants

This retrospective cross-sectional study was approved by the ethics committee of xxx Training and Research Hospital and was performed in accordance with the Declaration of Helsinki. Twenty-two patients having undergone at least 3 GON blocks and attended at least 3 follow-up appointment for the treatment of CH who admitted to our headache clinic during a 6-month period from June 2017 to December 2017 were evaluated. Patients with secondary headaches, psychiatric disorders, organic disease of the brain or spinal cord, cancer, and coagulopathy were ruled out. All patients were diagnosed with CH according to International Classification of Headache Disorders 3rd edition beta version criteria (2). Diagnosis of CH was made on the basis of headache history, physical motion examination, pressure points, and imaging studies of cervical structures to exclude other medical conditions.

The patients' demographic characteristics (age, sex), onset of headache, additional primary headaches, pain due to active myofascial trigger points, headache days per month, history of trauma, neurological examinations, and post-injection complications were recorded. Change of pain severity in the Numerical Rating Scale (NRS) was used to assess the response to GON blocks.

Injection procedure

GON onto the scalp located at the upper part of the neck was found to be approximately 10-15 mm medial to the midpoint of the line of the occipital tubercle and the mastoid tip on the headache side. A mixture of local anaesthetic 3-4 ml of 2% lidocaine and 1 ml of methylprednisolone acetate was injected at the site.

Statistical analysis

SPSS 23.0 was used as the statistical analysis program. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used for the demographic and clinical characteristics. Anova with repeated measures test was used to compare follow-up NRS scores. Categorical data were compared using the chi-square test or Fisher's exact test. A p value of <0.05 was considered to be statistically significant.

Results

Of 21 patients (age 61.51±13.88; range: 32-84; 12 male), details of demographic and headache characteristics of the study group is given in Table 1. All patients reported that they had tried oral medical treatments, such as paracetamol, non steroid anti inflamatuary drugs, and/or topical analgesic creams before

Table 1. Demographic and clinical characteristics of patients

Characteristics of Patients	Number of Patients (n)
Gender (F/M)	9/12
Age	61.51±13.88 (range 32-84 years)
Duration (month)	30.81±21.95 (range 6-72months)
Number of headache days monthly	21.10±5.07 days
Localization Right Left Bilateral	 n=11 (52.4 %) n=7 (33.3 %) n=3 (14.3 %)
Myofascial spasm	n=10 (47.6 %)
History of trauma	n=14 (66.7 %)
Additional Headache Migraine Tension-type	n=7 (33.3 %) n=2 n=5
Initial NPRS scores	6.71±0.64

admission. Onset of headache was 30.81±21.95 months and number of mean headache days in a month was 21.10±5.07 days. Eighteen patients (85.7%) had unilateral headache and 52.4% of patients suffered from on the right side CH. Headache was most frequently located in neck, occipital, temporal, and frontal areas. Ten patients (47.6 %) had myofascial spasm (trigger points) located in trapezius, levator scapulae, splenius capitiis, semispinalis, and temporalis muscles. 66.7 % of patients reported headache following head trauma. Seven patients (33.3%) had additioal primary headaches. Five patients had tension-type headache and 2 patients had episodic migraine.

Mean NRS scores before injection was 6.71±0.64 and after first injection, mean NRS scores was 1.48±0.93 with a significant decline (p=0.000). The mean NRS scores were recorded as follows for first month (second injection) and second month (third injection): 3.52±1.21, 2.38±1.40, respectively. Eight patients reported that they did not have pain so they did not get their forth injection. Mean NRS scores of third month (forth injection) of other 13 patients was 1.71±1.59. For analysing mid term effect of injections on NRS scores, Anova with repeated measures test was used (Table 2). This difference was noted to be statistically significant (p=0.000). The mean number of headache days declined to 3.40 ± 1.20 in third month (p=0.000).

Two-way Anova with repeated measures applied for analysing the effects of clinical characteristics, such as myofacial spasms, history of trauma, and additional primary headaches (migraine or tension type headache). The coexistence of myofascial spasms (p=0.191), history of trauma (p=0.810) and additional headache (p=0.280) did not have any significant effect on improvement of NRS scores.

Most post-injection complications were minor and transient. Complications were as follows: increased pain during injection day, temporary numbness, pain at injection site. Infection, hematoma, paralysis, and nerve root injury were not reported.

Discussion

This study aimed to demonstrate the outcomes pertaining to the management of CH after performing repetitive GON injections using corticosteroid and local anesthetics in three months period. After treatment, decline of the initial NRS scores and mean number of headache days were noted to be statistically significant.

Table 2. Changes in mean NRS scores during follow-up periods

	Mean NRS scores	Mean NRS difference from previous period	P value
First month (before second injection)	3.52±1.21	-3.19 (-47.5 %)	0.000
Second month (before third injection)	2.38±1.40	-1.14 (-32.4 %)	0.001
Third month (before fourth injection)	1.71±1.59	-0.67 (-28.2 %)	0.027

Furthermore, coexistence of trigger points of myofascial spasms, history of trauma, and additional primary headaches (migraine or tension type headache) did not show an association with the severity of pain during the procedures.

While the exact pathophysiology of CH is not clear, headache related to cervical spine structures are potential sources of neck and occipital pain. The mechanism of CH has been explained by the convergence between cervical and trigeminal afferents in the dorsal horn of the C1-3 cervical segments of the spinal cord. The third occipital nerve innervates the C2-C3 cervical facet joints and this is the most common source of CH. The C2-C3 cervical intervertebral disc, the atlantooccipital joint, and the C3-C4 facet joint also can cause CH (9,10). These joints and occipital nerve are the most vulnerable to trauma from whiplash of the neck. According to The ICHD-3 beta, headaches caused by head and neck trauma are classified separately. For this reason, trauma is not necessarily the cause of CH. Only 66.7 % of our sample had reported a history of trauma, and we found that the decline of pain severity scores did not differ from patients who did not have trauma during the treatment.

The differential diagnosis for CH includes a wide variety of medical disorders, such as the following: Posterior fossa or spinal tumors, developmental anomalies of the craniocervical junction (Arnold Chiari type I malformation), osteomyelitis of the cervical vertebrae, rheumatoid arthritis, ankylosing spondylitis, traumatic subluxation of the upper cervical vertebrae, cervical herniated intervertebral disc, cervical spondylosis or arthropathy, spinal nerve compression, and vertebral artery dissection (4). The ICHD-3 beta states that demonstration of clinical signs of pain in the neck and abolition of headache following diagnostic blockade of a cervical structure or its nerve are evidences that the neck pain can be attributed to CH. Patients included in this study were diagnosed according to The ICHD-3 beta. All of our patients had a drammatical pain relief after first injection to GON.

Provocation of headache by pressure on neck muscles and radiation of pain are some of the main characteristics of CH. Because the cervicotrigeminal connections may refer to pain impulses from the neck to the frontotemporal region, CH can present with different clinical features and complaints (11). Cervical myofascial trigger points have been reported as a cause CH, but there are no controlled studies yet (5). 47.6 % of our sample had myofascial trigger points. Eventhough the decline of pain severity scores did not differ significantly from patients who did not suffer from cervical myofascial pain during the treatment, patients with trigger points reported that injections targetting these trigger points had helped on their head movements and reduced side-locked pain. Physical examination of patients with CH should include an assessment of trigger points. We recommend routine trigger points examination and injections for the successful pain management of CH.

The treatment of patients with CH requires a generalised approach with pharmacologic, physical, and interventional pain management, including anesthetic block, zygapophysial joint/medial branch corticosteroid injection, radiofrequency ablation (RFA), and surgical treatment (12). Benefits of physical treatments, cervical epidural steroid injections, and botulinum toxin for the treatment of CH have been reported previously (13,14,15). Prior studies relating to treatment of CH have shown that local

steroid injection for CH are effective (6,7,8,16). Despite the fact that injection of steroid on GON is a valid and less destructive interventional treatment option, definitive evidence is lacking. There are limited number of randomized controlled trials exploring the dose-response relationship and efficacy of blocking GON with local anesthetics and steroid injection for the treatment of CH. Naja et al performed a randomized, double-blind, placebo-controlled trial to compare the effectiveness of nerve stimulator-guided occipital nerve block in the treatment of CH using anesthetic mixture of lidocaine 2% and bupivacaine 0.5% or normal saline as placebo on clinical improvement for two weeks (6). They reported that the decrease of pain severity and associated symptoms such as analgesic consumption, duration of headache and its frequency, nausea, vomiting, photophobia, phonophobia, and limitations in functional activities were statistically significant in the treatment group, but not in the placebo group. Patients were followed for two weeks after the injection, so long-term effects of the injection have not been observed. Inan et al suggested that repeated GON blocks provided efficacy similar to repeated C2/C3 blocks (7). We started with occipital nerve block to test for this condition. If the block responded positively, the patient was treated with repeated GON blocks with lidocaine and methylprednisolone once per month for three months. After 3-months post-injections, nearly 40 % of patients were free of pain. Our findings support the results of Inan et al.

Similarities of signs and symptoms of the primary headache disorders such as tension-type headache, migraine, or hemicrania continua may mimic the clinical features of CH. Distinguishing CH from other types of headaches can be difficut. Moreover, some patients may present with different types of primary headaches. Anthony examined the prevelance of CH among patients with primary headache, and effects of local corticosteroids into the region of the GON and lesser occipital nerve (13). Among 796 patients with primary headache, 16.1% were found to be suffering from CH and 20.1% migraine plus cervicogenic headache. Patients received 4 ml 1% lidocaine and 160 mg methylprednisolone. The investigator concluded that injections of depot methylprednisolone into the region of the GON and LON for both CH and migraine plus CH groups produced a complete relief of pain for a period ranging from 10 to 77 days. Our work differs from this study in terms of some features. First, in his study, the definitions of headaches were defined according to those of IHS Classification 1988. Secondly, we performed repeated injections monthly aiming to blocking the cervicotrigeminal circuit. In our sample, 33.3% of patients had additional primary headaches such as migraine and tension-type headache. Performing GON blocks was not associated with improved outcome in patients with additional headache. Our findings require confirmation in a larger sample study.

In our sample, most post-injection complications were minor and transient. However, due to blind injections, there is a risk of serios complications such as infection, hematoma, paralysis, and nerve root injury. For this reason, we highly recommend these procedures shoul be performed by experienced physicians.

Lack of control group is a major limitation in this study. The use of a placebo control in any neural intervention is a difficult task, which adds ethical issues and difficulty with recruitment. In addition to these, because of the subjective nature of NRS scores, pain experienced by patients during the treatment period might not be reflected objectively. Although small sample size of patients with a relatively short follow-up duration limits significance of our results, we conclude that GON blocks with a mixture of lidocaine and methylprednisolone for the treatment of CH is a safe, simple, and effective technique without severe adverse effects. CH is a complex medical condition that can be challenging for physicians. Because of the heterogeneity of interventional techniques for the treatment of CH, repeated GON injections may be considered as a useful treatment option for patients with CH who have failed conservative treatments.

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