DOI: 10.14744/DAJPNS.2024.00250
Dusunen Adam J Psychiatr Neurol Sci
2024;37:122-129

RESEARCH ARTICLE

Comparison of greater occipital and supraorbital nerve block with amitriptyline use in migraine treatment

Gokce Zeytin Demiral[1], Cem Boluk[2], Haluk Gumus[3], Cansu Koseoglu Toksoy[4], Selin Betas Akin[1], Sueda Ecem Yilmaz[3], Ulku Turk Boru[1]

[1]Afyonkarahisar University of Health Sciences, Faculty of Medicine, Department of Neurology, Afyonkarahisar, Turkiye
[2]Iskenderun Palm Hospital, Department of Clinical Neurophysiology, Iskenderun, Turkiye
[3]Selcuk University of Health Sciences, Faculty of Medicine, Department of Neurology, Konya, Turkiye
[4]Erenkoy Mental and Neurological Diseases Training and Research Hospital, Department of Neurology, Istanbul, Turkiye

ABSTRACT

Objective: Migraine, a condition requiring long-term preventive therapy, especially for individuals with frequent and severe attacks. This study aims to compare the effectiveness of GON and SON (Greater Occipital Nerve and Supraorbital Nerve) blockades with amitriptyline in migraine management.

Method: This retrospective study included 57 patients diagnosed with migraines. The first group consisted of patients who received a daily dose of 25 mg of amitriptyline for six months. The second group consisted of patients who initially received bilateral GON and SON blockades administered weekly for one month, followed by monthly blockade treatments for a total of 5 months. Pain frequency, analgesic consumption, and VAS (Visual Analog Scale) scores recorded in patients' follow-up files were compared between the groups before treatment and at the 1st, 3rd, and 6th months.

Results: Records of 57 patients, comprising 5 males and 52 females, were examined. Among them, 25 received GON and SON blockades, while 32 were treated with amitriptyline. Both groups showed a decrease in pain frequency and fewer painful days over time, with significant differences observed at all time points compared to baseline and between the 1st and 3rd months. Regardless of time factors, a significant difference in pain intensity (VAS) existed between the groups, with lower VAS scores in the GON and SON blockades group. Both groups experienced a statistically significant reduction in VAS scores over time, with notable differences from baseline to subsequent assessments.

Conclusion: This study suggests that GON and SON blockades could be an effective prophylactic treatment for migraines, highlighting its potential as an alternative to amitriptyline therapy.

Keywords: Amitriptyline, headache, migraine, nerve block, treatment

How to cite this article: Zeytin Demiral G, Boluk C, Gumus H, Koseoglu Toksoy C, Betas Akin S, Yilmaz SE, Turk Boru U. Comparison of greater occipital and supraorbital nerve block with amitriptyline use in migraine treatment. Dusunen Adam J Psychiatr Neurol Sci 2024;37:122-129.

Correspondence: Gokce Zeytin Demiral, Afyonkarahisar University of Health Sciences, Faculty of Medicine, Department of Neurology, Afyonkarahisar, Turkiye
E-mail: gokce_zeytin@hotmail.com
Received: November 06, 2023; **Revised:** July 07, 2024; **Accepted:** July 14, 2024

INTRODUCTION

Migraine is a disease that affects many people worldwide (1). Migraine headaches are among the most common primary headaches (2). It affects approximately 16% of the world's adult population, with a higher prevalence in women (3). In Turkiye, migraine prevalence is observed to be 16.4%, similar to global data, with a higher frequency among women (4). Migraine often leads to a loss of function, necessitating long-term drug therapy (5, 6). Preventive treatment is administered in cases involving frequent attacks and a decline in the quality of life (6).

Pharmacological treatment can be categorized into two main types: acute or attack treatment and preventive or prophylactic treatment (7). Acute migraine treatment involves ergotamines, triptans, and other non-specific pain medications (8). There are various options available for prophylaxis, including beta-blockers, calcium channel blockers, tricyclic antidepressants, anticonvulsants (especially topiramate and valproate), botulinum toxin, and CGRP antagonists (7).

Blockades of the greater occipital nerve (GON) and supraorbital nerve (SON) is a commonly employed method to treat migraine headaches, used both acutely and prophylactically (9–13). In the literature, numerous randomized controlled studies investigated the effectiveness of GON and SON blockades (9, 13). Regarding migraine treatment, a single study comparing individuals receiving GON blockade alone to those receiving GON blockade and medical prophylactic treatment was found, and this method was reported to be effective (14).

To the best of our knowledge, there is no study comparing the effectiveness of GON and SON blockades with prophylactic medical treatments for migraine. This study aims to evaluate the efficacy of GON and SON blockades in comparison with amitriptyline, which is an effective migraine treatment among medical treatments.

METHODS

In this study, retrospective data were collected from migraine patients, who underwent GON and SON blockades and those who received amitriptyline treatment. This study was approved by the local ethics committee of Selcuk University. (IRB approval date: 03.01.2023, number: 2023/56) Informed consent was not obtained because the study was retrospective, and the patients' data were retrieved and recorded anonymously. Between April 1, 2021, and January 1, 2022, the records of a total of 113 migraine patients (with or without aura) who presented to the headache outpatient clinics of the Neurology Departments at Afyonkarahisar Health Sciences University and Selcuk University were screened. The diagnosis of migraine was made following the ICHD-3 (International Classification of Headache Disorders, 3rd edition) guidelines (15). Patients, who did not meet the inclusion criteria, and those who were absent from their follow-up visits were excluded from the study. The study was conducted on a total of 57 patient data meeting the criteria, with 25 patients being treated with amitriptyline and 32 patients undergoing GON and SON blockades.

Inclusion criteria include migraine patients aged 18-50 years who experience at least two migraine attacks per month or suffer from severe immobilizing headaches. Exclusion criteria include patients with a history of malignancy, cervical or cranial surgery, bleeding disorders, neuromuscular disorders, major psychiatric disorders such as major depression, use of anticoagulants, other chronic painful conditions, pregnancy or breastfeeding, use of prophylactic medications other than amitriptyline, known hypersensitivity to or contraindications for the use of amitriptyline and lidocaine, and other severe comorbid conditions.

When selecting patients, records of individuals with similar characteristics such as age, gender, average duration of illness, and migraine type, which could affect treatment response, were reviewed and included in the study in both groups. The first group consisted of patients treated with amitriptyline, while the second group comprised patients undergoing GON and SON blockades. Demographic characteristics, chronic disease histories, and average disease durations of the patients were recorded. Existing acute attack treatments (ergotamine, triptans, and NSAIDs) were continued in both treatment methods.

Before starting the treatment, data on pain frequency, number of painful days, pain intensity (Visual Analog Scale), duration of pain, and the number of painkillers taken within a month were obtained from the patient records. A numerical evaluation was conducted on a scale from 0 to 10, where 0 indicated no pain and 10 represented the most severe pain.

Treatment Procedure for the First Group

After using 10 mg of amitriptyline for the first two weeks, 25 mg of amitriptyline was given at bedtime for the next 22 weeks.

Table 1: Comparison of demographic characteristics by medications

	Amitriptyline	GON and SON blockades	Total	Test statistic	p
Age	37.9±7.3 39.0 (21.0–50.0)	41.1±7.1 42.5 (26.0–50.0)	39.7±7.3 40.0 (21.0–50.0)	290.000	0.076[3]
Gender				–	1.000[1]
Female	23 (92.0)	29 (90.6)	52 (91.2)		
Male	2 (8.0)	3 (9.4)	5 (8.8)		
Disease duration	7.4±6.2 6.0 (1.0–30.0)	11.1±8.3 10.0 (1.0–28.0)	9.5±7.6 7.0 (1.0–30.0)	307.000	0.133[3]
Migraine type				–	1.000[1]
Migraine without aura	23 (92.0)	30 (93.8)	53 (93,0)		
Migraine with aura	2 (8.0)	2 (6.3)	4 (7,0)		
Migraine classification				–	0.461[1]
Epizodic migraine	16 (64.0)	22 (68.8)	38 (66.7)		
Chronic migraine	9 (36.0)	10 (31.2)	19 (33.3)		
Family history				2.975	0.085[2]
Absent	21 (84.0)	19 (59.4)	40 (70.2)		
Present	4 (16.0)	13 (40.6)	17 (29.8)		

1: Fisher's Exact test; 2: Yates' correction; 3: Mann-Whitney U test statistic; Mean±standart deviation, median (minimum–maximum), frequency (percentage).

Treatment Procedure for the Second Group

After cleaning the intervention area with an antiseptic solution, 1.5 ml of 2% lidocaine was applied bilaterally along the medial 1/3 of the imaginary line drawn between the protuberant occipitalis externa and the mastoid process after palpating the occipital artery. The needle was withdrawn upon contact with the bone. Aspiration was performed to ensure it was not in the artery, followed by injection.

To block the supraorbital nerve (SON), the corrugator muscle was palpated, and 1.5 ml of 2% lidocaine was administered in the orbit of the pupil at a slight angle to prevent it from entering the foramen. A 26-gauge (G) 13-mm needle was used for the application. Patients were observed under supervision for the next 30 minutes. The blockade procedure was conducted bilaterally to the GON and SON, once a week for the first month (four times), and once a month in the second, third, fourth, fifth, and sixth months, totaling nine sessions. All injections were administered by the same pain specialist.

After treatment, records were reviewed to compare and record pain frequency, number of painful days, VAS scores, duration of pain, and the number of painkillers taken within a month between the two groups at the end of the first, third, and sixth months.

Statistical Analysis

Data were analyzed using IBM SPSS V23 and JAMOVI V2.3.21. Normality of distribution was assessed using the Shapiro-Wilk test. For comparisons of categorical variables between groups, Yates correction and Fisher's Exact test were used. The Mann-Whitney U test was employed for comparing non-normally distributed data between two groups. Shapiro-Wilk test, Fisher's Exact test, and Mann-Whitney U test were performed using the SPSS program. Two-way Robust ANOVA using the Walrus package was conducted for non-normally distributed parameters dependent on drug and time, with Bonferroni tests used for post hoc comparisons. JAMOVI software was used for Robust ANOVA testing. Analysis results for quantitative data were presented as mean±standard deviation and median (minimum–maximum), whereas categorical data were presented as frequency (percentage). The significance level was set at $p<0.05$.

RESULTS

A total of 57 patients, including 5 males and 52 females, participated in the present study. Among them, 25 patients received GON and SON blockades, whereas 32 patients underwent amitriptyline therapy.

There was no statistically significant difference in median ages between the amitriptyline (39.0) and

GON and SON blockades (42.5) groups (p=0.076). Gender distribution showed no significant differences, with 92% females in the amitriptyline group and 90.6% in the GON and SON blockades group (p=1.000).

Median durations of illness, migraine type, migraine classification, and family history did not vary significantly between the two medication groups (p=0.133, 1.000, 0,461, and 0.085, respectively). Table 1 presents a comparison of demographic characteristics by medications.

Regarding the frequency of migraine attacks, there was no statistically significant difference between the two groups, except for the time (p=0.426). However, a significant difference was observed in time (p=0.002), with variations between baseline and other time points and between the 1st and 6th months. There is no statistically significant difference in the median number of attacks (frequency) by the interaction of medication group and time (p=0.358).

The median number of painful days did not significantly differ between medication groups, except for the time (p=0.430). Similar to attack frequency, a significant difference was observed over time (p=0.002), with variations between baseline and other time points and between the 1st and 6th months. There is no statistically significant difference in the median number of painful days according to the interaction of medication group and time (p=0.584).

The median pain intensity (VAS) yielded a statistically significant difference between medication groups, except for the time (p<0.001). The difference persisted over time (p<0.001), with variations between baseline and other time points and between the 1st and 6th months. A difference was observed between the baseline and other time points. There is a statistically significant difference in the median pain intensity (VAS) by the interaction of medication group and time (p<0.001). Differences were observed between baseline and other time points within the amitriptyline group, between the 1st month of amitriptyline and the 3rd and 6th months of GON and SON blockage, and between the 3rd month of amitriptyline and the 6th month of GON and SON blockage.

The median duration of pain did not significantly differ between medication groups, except for the time (p=0.138). However, a significant difference was observed over time (p=0.015), with variations between baseline and other time points. There was no statistically significant difference in the median duration of pain by the interaction of medication group and time (p=0.218).

Table 2: Comparison of parameters by medication and time

	Test statistic	p
Number of attacks (frequency)		
Medication	0.634	0.426
Time	5.099	**0.002**
Medication*Time	3.228	0.358
Number of painful days		
Medication	0.622	0.430
Time	4.929	**0.002**
Medication*Time	1.944	0.584
Pain intensity (VAS)		
Medication	16.050	**<0.001**
Time	9.250	**<0.001**
Medication*Time	19.680	**<0.001**
Pain duration		
Medication	2.200	0.138
Time	3.500	**0.015**
Medication*Time	4.440	0.218
Number of painkillers used		
Medication	1.090	0.296
Time	9.420	**<0.001**
Medication*Time	3.730	0.292

*: Robust ANOVA. p<0.05 statistically significant (bold values).

The median number of painkillers used did not significantly differ between medication groups, except for the time (p=0.296). A significant difference was observed over time (p<0.001), with variations between baseline and other time points. A difference was observed between the baseline and other time points. There is no statistically significant difference in the median number of painkillers used by the interaction of medication group and time (p=0.292). Table 2 illustrates a comparison of parameters based on medication and time, while Table 3 offers a comprehensive overview of descriptive statistics and the outcomes of multiple comparisons concerning parameters across different medications and time periods.

DISCUSSION

The present study confirms that amitriptyline prophylaxis and recurrent GON and SON blockades are highly effective in treating pain frequency and intensity of migraines. The GON and SON blockades group showed lower pain intensity (VAS) scores, with statistically significant decreases observed over time. While the amitriptyline group did not show differences in VAS values between time points, the

Table 3: Descriptive statistics and multiple comparison results for parameters by medication and time

	Amitriptyline		GON and SON blockades		Total	
	Mean±SD	Median (min–max)	Mean±SD	Median (min–max)	Mean±SD	Median (min–max)
Number of attacks (frequency)						
Baseline	9.0±5.0	8.0 (3.0–15.0)	9.0±5.1	8.0 (2.0–15.0)	9.0±5.0	8.0 (2.0–15.0)^{a}
1. month	5.3±4.2	4.0 (0.0–15.0)	5.1±4.3	3.5 (0.0–15.0)	5.2±4.2	4.0 (0.0–15.0)^{b}
3. month	3.9±3.5	3.0 (0.0–11.0)	3.1±3.3	2.5 (0.0–15.0)	3.4±3.4	3.0 (0.0–15.0)^{bc}
6. month	3.8±3.5	3.0 (0.0–11.0)	2.3±3.8	1.0 (0.0–15.0)	2.9±3.7	2.0 (0.0–15.0)^{c}
Total	5.5±4.6	4.0 (0.0–15.0)	4.9±4.9	3.0 (0.0–15.0)	5.1±4.7	3.5 (0.0–15.0)
Number of painful days						
Baseline	10.3±6.7	8.0 (3.0–33.0)	8.7±5.2	8.0 (2.0–15.0)	9.4±5.9	8.0 (2.0–33.0)^{a}
1. month	5.3±4.2	4.0 (0.0–15.0)	5.1±4.3	3.5 (0.0–15.0)	5.2±4.2	4.0 (0.0–15.0)^{b}
3. month	3.9±3.5	3.0 (0.0–11.0)	3.1±3.3	2.5 (0.0–15.0)	3.4±3.4	3.0 (0.0–15.0)^{bc}
6. month	3.8±3.5	3.0 (0.0–11.0)	2.4±3.8	1.0 (0.0–15.0)	3.0±3.7	2.0 (0.0–15.0)^{c}
Total	5.8±5.3	4.0 (0.0–33.0)	4.8±4.8	3.0 (0.0–15.0)	5.3±5.1	3.5 (0.0–33.0)
Pain intensity (VAS)						
Baseline	8.3±1.4	8.0 (5.0–10.0)^{A}	8.3±0.9	8.0 (7.0–10.0)^{A}	8.3±1.1	8.0 (5.0–10.0)^{a}
1. month	7.0±2.3	8.0 (0.0–10.0)^{AB}	5.9±2.0	6.0 (0.0–9.0)^{BC}	6.4±2.2	7.0 (0.0–10.0)^{b}
3. month	6.2±3.2	7.0 (0.0–10.0)^{ABC}	4.6±3.0	5.5 (0.0–9.0)^{CD}	5.3±3.2	6.0 (0.0–10.0)^{b}
6. month	5.9±3.6	7.0 (00–10.0)^{ABCD}	3.2±3.0	3.5 (0.0–9.0)^{D}	4.4±3.5	5.0 (0.0–10.0)^{b}
Total	6.8±2.9	8.0 (0.0–10.0)	5.5±3.0	6.0 (0.0–10.0)	6.1±3.0	7.0 (0.0–10.0)
Pain duration						
Baseline	22.0±22.3	12.0 (3.0–72.0)	22.8±25.1	12.0 (1.0–72.0)	22.5±23.7	12.0 (1.0–72.0)^{a}
1. month	12.4±16.3	6.0 (0.0–72.0)	8.5±13.0	5.0 (0.0–72.0)	10.2±14.5	6.0 (0.0–72.0)^{b}
3. month	10.2±11.8	6.0 (0.0–48.0)	6.7±10.4	3.0 (0.0–48.0)	8.2±11.0	3.0 (0.0–48.0)^{b}
6. month	10.2±11.8	6.0 (0.0–48.0)	4.5±9.5	1.0 (0.0–48.0)	7.0±10.8	2.0 (0.0–48.0)^{b}
Total	13.7±16.6	8.0 (0.0–72.0)	10.6±17.2	4.0 (0.0–72.0)	12.0±17.0	6.0 (0.0–72.0)
Number of painkillers used						
Baseline	9.3±4.4	9.0 (0.0–15.0)	10.1±5.1	10.0 (0.0–15.0)	9.7±4.8	10.0 (0.0–15.0)^{a}
1. month	6.0±5.0	5.0 (0.0–15.0)	4.3±5.0	3.0 (0.0–15.0)	5.1±5.0	3.0 (0.0–15.0)^{b}
3. month	4.6±4.3	3.0 (0.0–15.0)	2.9±3.9	2.0 (0.0–15.0)	3.7±4.1	2.0 (0.0–15.0)^{b}
6. month	4.4±4.4	3.0 (0.0–15.0)	2.5±4.4	1.0 (0.0–15.0)	3.4±4.5	1.0 (0.0–15.0)^{b}
Total	6.1±4.9	5.0 (0.0–15.0)	5.0±5.5	3.0 (0.0–15.0)	5.5±5.3	3.0 (0.0–15.0)

There is no difference between time periods with the same lowercase letters (a, b, c, d). There is no difference between medication and time interaction with the same uppercase letters (A, B, C, D).

GON and SON blockades group exhibited significant differences between baseline and other time points, especially between the 1st and 6th months. Both groups experienced a notable reduction in pain duration and painkiller use over time. Similar to the literature, a significant reduction in pain intensity was observed in the GON and SON blockades (12, 13).

Pain related to migraine and other headaches results from the activation of neurosensors in the dura mater and intracranial blood vessels, such as the trigeminocervical complex, which includes the central projection of the trigeminal nucleus caudalis (16–19). Migraine treatment involves a process that incorporates both pharmacological and non-pharmacological approaches. Preventive treatment is necessary when migraine attacks, have unbearable frequency and are long-lasting, severe, unresponsive to acute medications, or associated with neurological symptoms such as hemiparesis or prolonged aura. Moreover, preventive treatment generally improves the patient's functionality, reduces healthcare costs and resources, and decreases the frequency and severity of migraine attacks (20).

A migraine-preventive drug can have the ability to raise the migraine activation threshold centrally or peripherally. These drugs can reduce migraine generator activation, increase central antinociception, raise thresholds for spreading depression, or stabilize sensitive migraine-prone nervous systems by altering serotonergic or sympathetic tone (21). It was suggested that downregulation of the 5HT2 receptor or regulation of serotonergic neuron discharge might help prevent migraine attacks (11). Amitriptyline downregulates both 5HT2 and B-adrenergic receptors (22).

Local anesthetics block sodium channels reversibly by causing depolarization in nerve fibers that transmit pain signals, especially by blocking sodium channels in nerve fibers, thereby preventing the transmission of pain signals (23). The GON consists of sensory fibers stemming from the C2 level, covering the front and top of the head. Dural afferents and GON afferents establish anatomical connections, and more importantly, these connections are functionally related in terms of mutual excitability changes (19, 24). The SON is a branch of the first part of the trigeminal nerve and provides sensory innervation to the upper eyelid, forehead, and hair during a migraine attack (25). Numerous studies reported that peripheral nerve blockade of the GON (Greater Occipital Nerve) and SON (Supraorbital Nerve) effectively treats acute and chronic migraines (9–14). Until now, there has been no standard for drug dosage application methods or frequency regarding GON and SON blocks. Although the American Headache Society made recommendations for the application of GON blocks, due to the lack of randomized controlled studies, there has been no consensus on the amount to be applied or the frequency of treatment (26). Many studies also showed that repeated blockade is effective (27–29).

Karacan Golen et al. (14) administered GON (Greater Occipital Nerve) blockade with medical prophylaxis to 60 patients with chronic migraines and only GON blockade to 74 patients in two groups, with 6 sessions every 10 days for 3 months. Considering the results reported in their study, it was found that the duration of attacks, the frequency of attacks, the number of analgesic uses, VAS, and MIDAS (Migraine Disability Assessment) scores significantly decreased in the first and third months when compared to the pre-treatment period. In terms of headache parameters, no statistically significant difference was found between the two groups. It was shown that GON blockade is effective even without medical prophylaxis (14).

In the present study, both groups showed a significant decrease in the frequency of pain and the number of painful days over time. The median pain intensity (VAS) score was lower in the GON group. Moreover, there were significant differences in VAS values between baseline and other time points and between the 1st and 6th months in GON and SON blockades due to drug and time interactions. Additionally, significant differences were observed between the baseline VAS value of amitriptyline and the VAS values at the 1st, 3rd, and 6th months, between the 1st month VAS value of amitriptyline and the 3rd and 6th month VAS values of GON and SON, and between the 3rd month VAS value of amitriptyline and the 6th month VAS value of GON and SON. Previous studies also showed that GON and SON blockades improved VAS scores (9, 13).

Tepe and Tertemiz (30) compared the effectiveness of 5 sessions of GON blockade and GON+SON (Supraorbital Nerve-Supraorbital Sinus) blockades every 10 days in two groups of 82 patients who used an excessive amount of medication. They demonstrated that both methods reduced the need for analgesics and the duration of pain. Similarly, in the present study, analgesic use and pain duration significantly decreased in both groups during the 6-month treatment period when compared to the pre-treatment period.

These findings indicate that, in this study comparing the efficacy of prophylactic treatment with amitriptyline and GON and SON blockades, the 6-month follow-up and treatment were more effective in reducing pain intensity. Other pain assessment parameters were found to be similar to amitriptyline. Multicenter and larger-scale studies are needed to better understand the results of this study.

In the literature, very few side effects have been reported for GON and SON blockades. The most commonly reported side effects include sensitivity at the application site, vasovagal syncope, and nausea (12). In our study, these side effects were also observed. Sensitivity at the application site, short-term mild pain in some patients, and occasionally dizziness were reported. However, no serious side effects were observed during or after the application. Consistent with the literature, it was concluded that GON and SON blockades are generally well-tolerated and do not cause serious side effects.

This study has some limitations. Firstly, the retrospective design relies on existing records, which may introduce biases and limit control over variables

and data consistency. Additionally, the relatively small study group may limit the generalizability of the findings and reduce the statistical power to detect differences between groups. The selection of patients based on specific criteria and existing records may lead to selection bias that could affect the results.

CONCLUSION

This study demonstrates that GON and SON blockades provide similar or superior results compared to amitriptyline in migraine treatment. These findings emphasize the consideration of these blockade methods as alternative options to traditional medical treatments. In the future, larger-scale prospective, randomized, and placebo-controlled studies are needed. Such studies can help us obtain more definitive conclusions regarding the long-term effectiveness and reliability of GON and SON blockades.

Contribution Categories		Author Initials
Category 1	Concept/Design	C.B.
	Data acquisition	C.K.T., S.E.Y.
	Data analysis/Interpretation	G.Z.D.
Category 2	Drafting manuscript	S.B.A.
	Critical revision of manuscript	U.T.B., H.G.
Category 3	Final approval and accountability	G.Z.D., C.B., H.G., C.K.T., S.B.A., S.E.Y., U.T.B.
Other	Technical or material support	G.Z.D.
	Supervision	H.G.

Ethical Approval: The Selcuk University Ethics Committee granted approval for this study (date: 03.01.2023, number: 2023/56).

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from all participants.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declare that they have no financial support.

Peer-review: Externally peer-reviewed.

REFERENCES

1. Ashina M, Katsarava Z, Do TP, Buse DC, Pozo-Rosich P, Ozge A, et al. Migraine: Epidemiology and systems of care. Lancet 2021; 397:1485-1495. [CrossRef]
2. World Health Organization. Atlas of headache disorders and resources in the world 2011. https://iris.who.int/bitstream/handle/10665/44571/9789241564212_eng.pdf?sequence=1&isAllowed=y. Accessed Jul 17, 2024.
3. Stovner L, Hagen K, Jensen R, Katsarava Z, Lipton R, Scher A, et al. The global burden of headache: A documentation of headache prevalence and disability worldwide. Cephalalgia 2007; 27:193-210. [CrossRef]
4. Ertas M, Baykan B, Kocasoy Orhan E, Zarifoglu M, Karli N, Saip S, et al. One-year prevalence and the impact of migraine and tension-type headache in Turkey: A nationwide home-based study in adults. J Headache Pain 2012; 13:147-157. [CrossRef]
5. Spierings EL. Mechanism of migraine and action of antimigraine medications. Med Clin North Am 2001; 85:943-958. [CrossRef]
6. Krymchantowski AV. Combining therapies for the treatment of migraine: Is there a role? Expert Rev Neurother 2005; 5:145-147. [CrossRef]
7. Bigal ME, Krymchantowski AV, Rapoport AM. Prophylactic migraine therapy: Emerging treatment options. Curr Pain Headache Rep 2004; 8:178-184. [CrossRef]
8. Digre KB. What's new in the treatment of migraine? J Neuroophthalmol 2019; 39:352-359. [CrossRef]
9. Hokenek NM, Ozer D, Yilmaz E, Baskaya N, Hokenek UD, Ak R, et al. Comparison of greater occipital nerve and supra orbital nerve blocks methods in the treatment of acute migraine attack: A randomized double-blind controlled trial. Clin Neurol Neurosurg 2021; 207:106821. [CrossRef]
10. Korucu O, Dagar S, Corbacioglu SK, Emektar E, Cevik Y. The effectiveness of greater occipital nerve blockade in treating acute migraine-related headaches in emergency departments. Acta Neurol Scand 2018; 138:212-218. [CrossRef]
11. Chowdhury D, Mundra A. Role of greater occipital nerve block for preventive treatment of chronic migraine: A critical review. Cephalalgia Rep 2020; 3:251581632096440. [CrossRef]
12. Inan LE, Inan N, Unal-Artik HA, Atac C, Babaoglu G. Greater occipital nerve block in migraine prophylaxis: Narrative review. Cephalalgia 2019; 39:908-920. [CrossRef]
13. Ozer D, Boluk C, Turk Boru U, Altun D, Tasdemir M, Koseoglu Toksoy C. Greater occipital and supraorbital nerve blockade for the preventive treatment of migraine: A single-blind, randomized, placebo-controlled study. Curr Med Res Opin 2019; 35:909-915. [CrossRef]
14. Karacan Golen M, Yilmaz Okuyan D. Comparison of the effectiveness of greater occipital nerve block in patients receiving and not receiving medical prophylactic treatment in chronic migraine. Turk J Neurol 2022; 28:19-23. [CrossRef]
15. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition. Cephalalgia 2018;38: 1-211. [CrossRef]
16. Ashkenazi A, Young WB. The effects of greater occipital nerve block and trigger point injection on brush allodynia and pain in migraine. Headache 2005; 45:350-354. [CrossRef]
17. Goadsby PJ. Migraine pathophysiology. Headache 2005; 45:S14-24. [CrossRef]
18. Bernstein C, Burstein R. Sensitization of the trigeminovascular pathway: Perspective and implications to migraine pathophysiology. J Clin Neurol 2012; 8:89-99. [CrossRef]

19. Bartsch T, Goadsby PJ. The trigeminocervical complex and migraine: Current concepts and synthesis. Curr Pain Headache Rep 2003; 7:371-376. [CrossRef]

20. Goadsby PJ, Lipton RB, Ferrari MD. Migraine — Current understanding and treatment. N Engl J Med 2002; 346:257-270. [CrossRef]

21. Silberstein S. Preventive treatment of migraine. Cephalalgia 1997; 17:67-72. [CrossRef]

22. Krymchantowski AV, da Cunha Jevoux C, Bigal ME. Topiramate plus nortriptyline in the preventive treatment of migraine: a controlled study for nonresponders. J Headache Pain 2012; 13:53-59. [CrossRef]

23. Tetzlaff JE. The pharmacology of local anesthetics. Anesthesiol Clin North Am 2000; 18:217-233. [CrossRef]

24. Bartsch T. Stimulation of the greater occipital nerve induces increased central excitability of dural afferent input. Brain 2002; 125:1496-1509. [CrossRef]

25. Knize DM. A study of the supraorbital nerve. Plast Reconstr Surg 1995; 96:564-569. [CrossRef]

26. Blumenfeld A, Ashkenazi A, Evans RW. Occipital and trigeminal nerve blocks for migraine. Headache 2015; 55:682-689. [CrossRef]

27. Gul HL, Ozon AO, Karadas O, Koc G, Inan LE. The efficacy of greater occipital nerve blockade in chronic migraine: A placebo-controlled study. Acta Neurol Scand 2017; 136:138-144. [CrossRef]

28. Inan LE, Inan N, Karadas O, Gul HL, Erdemoglu AK, Turkel Y, et al. Greater occipital nerve blockade for the treatment of chronic migraine: a randomized, multicenter, double-blind, and placebo-controlled study. Acta Neurol Scand 2015; 132:270-277. [CrossRef]

29. Ruiz Piñero M, Mulero Carrillo P, Pedraza Hueso MI, de la Cruz Rodríguez C, López Mesonero L, Guerrero Peral AL. Pericranial nerve blockade as a preventive treatment for migraine: Experience in 60 patients. Neurología 2016; 31:445-451. [CrossRef]

30. Tepe N, Tertemiz OF. Comparison of greater occipital nerve and greater occipital nerve + supraorbital nerve block effect in chronic medication overuse headache. Turk J Med Sci 2021; 51:1065-1070. [CrossRef]