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Greater Occipital Nerve Blockade in the Treatment of Tension-type Headaches in the Emergency Department

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Abstract

Aim: This study aimed to tension-type headache (TTH) investigate the efficacy of greater occipital nerve (GON) blockade performed with dexketoprofen under ultrasonography in patients presenting to the emergency department.

Materials and Methods: This prospective, randomized, controlled study was conducted with patients who presented to the emergency department with TTH. The treatment was planned as 50 mg of intravenous (IV) dexketoprofen over 5 min for Group 1 and IV dexketoprofen followed by ultrasonography-guided GON blockade with 0.5% bupivacaine for Group 2. The patients' demographic characteristics and pain levels according to the 10-cm Visual Analog Scale were recorded at the time of presentation. The pain scores of the patients were recorded at the 10th, 20th, 30th, 60th, and 120th minutes, and the difference between the 0th and 120th minutes was calculated as the delta value.

Results: Of the 159 patients included in the study. There was a decrease in the pain scores at the 10th minute in both groups with treatment, and the greatest decrease occurred in Group 2 at the 20th minute. The delta visual analog scale score was found to be 4.71 in Group 1 and 7.11 in Group 2, and it was observed that GON blockade therapy together with IV dexketoprofen reduced the severity of pain more rapidly and effectively than IV dexketoprofen alone.

Conclusion: When managing acute pain attacks in patients presenting to the emergency department with TTH, the combined use of IV non-steroidal anti-inflammatory drugs with a GON block increases treatment outcomes, reduces treatment duration, and enhances the efficacy of analgesics compared with their use alone.

Keywords: Tension-type headache, treatment, non-steroidal anti-inflammatory drugs, greater occipital nerve blockade

Introduction

Tension-type headache (TTH) is the most common primary cause of headaches, with a high prevalence and significant socioeconomic impact (1). Despite its prevalence and impact on quality of life, there is a lack of comprehensive knowledge on the underlying causes and viable treatment options for TTH (2,3). The triggering effect of psychological stress in the pathophysiology of TTH continues to be valid as a universally acknowledged mechanism (4,5). While the diagnosis is made according to the current clinical situation and the International Headache Criteria, the primary focus of the evaluation of patients with TTH is the exclusion of secondary fatal causes (6). The headache is bilateral and characterized by mild to severe intensity. It may create a sensation of tightness, resembling a band around the head. There are no accompanying neurological signs.

Treatment is tailored based on whether TTH is acute or chronic. Patients seek emergency treatment when their headache intensifies or they are unable to find a solution. Treatment for acute symptoms might vary from non-pharmacological methods to the use of both single and combined analgesic drugs. While pharmaceutical treatment methods such as non-steroidal anti-inflammatory drugs (NSAIDs), adequate sleep, proper posture, and massage techniques are often preferred methods that can alleviate patients' pain, excessive medication use should be

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prevented. However, despite accompanying comorbidities, peripheral nerve procedures, such as nerve blockade and stimulation, can be favored (7). In particular, greater occipital nerve (GON) blockade is a reliable and well-tolerated method for relieving acute and short-term headaches (8,9).

GON blockade is effective in the transmission of sensory information to the nucleus caudalis and in the sensory innervation of the occipital region skin. It also traverses through the layers of the neck muscles, such as the semispinalis capitis and trapezius. Research has demonstrated that GON blockade, which is applied based on mechanical pain sensitivity in the head and neck muscles, is the most prominent finding in TTH and has a pain-reducing effect (7,10,11). The current study investigated the efficacy of GON blockade performed using dexketoprofen under ultrasonography in patients admitted to the emergency department.

Materials and Methods

Study Design

The study was designed as a prospective, randomized, controlled study and was conducted with patients who presented to the emergency department of a tertiary hospital due to TTH from March 2022 to August 2022 following the approval of the Atatürk University Faculty of Medicine Clinical Research Local Ethics Committee (date: 27.01.2022, decision number: B.30.2.ATA.0.01.00/98). All individuals provided written informed consent for inclusion before participating in the study.

Participants and Randomization

All patients who presented to the emergency department with headache as the main complaint were evaluated in the triage unit. Excluded from the study were patients aged 18 and >65 years, those whose vital signs were unstable according to their age, those with additional diseases that cause chronic comorbidities (especially those with coagulation disorders, those receiving anticoagulant treatments, those who had undergone posterior fossa surgery, etc.), pregnant women, patients with headaches of any organic cause, those who were allergic to the treatment protocols to be applied, those who did not agree to participate in the study, and those who did not meet the diagnostic criteria for TTH according to the International Headache Criteria-3 (6).

The treatment protocols to be applied to the patients who met the study criteria were numbered as Group 1 and Group 2 by a physician other than the physician who would perform the treatment, and they were placed in a sealed envelope. The treatment protocols to be applied to the patients who met the study criteria were numbered as Group 1 and Group 2 by a physician other than the one who would perform the treatment. The protocols were then placed in a sealed envelope. The treatment protocol involved the intravenous (IV) administration of 50 mg of dexketoprofen in 100 mL of 0.9% NaCl over 5 min for Group 1 and the IV administration of 50 mg of dexketoprofen in 100 ml of 0.9% NaCl over 5 min, followed by the bilateral administration of 2 mL of bupivacaine at a concentration of 0.5% under ultrasonography guidance. To eliminate gender differences between the groups, 10 envelopes were prepared and labeled as M1, F1, M2, F2, etc. before being placed in boxes. If the envelopes in the boxes ran out, equivalent quantities were added.

GON Block

Patients who agreed to participate in the study and undergo the procedure were placed in a sitting position under standard monitoring (blood pressure, arterial rhythm, and pulse oximetry). The procedure was performed under ultrasonography, under sterile conditions, and using an 8-16-mHz probe. To determine the localization of the occipital nerve, the occipital artery was sonographically detected one-third medial to the distance between the mastoid process and protuberantia occipitalis externa. Following negative pressure aspiration from the medial side of the occipital artery using a 30-G needle, GON blockade was performed by applying 2 mL of bupivacaine at a concentration of 0.5% to both occipital nerves (Figure 1). The hemodynamic data of the patients were monitored for 30 min after the procedure.

Patient Data and Pain Assessment

Upon admission, the patients were asked to complete a study form prepared to determine their demographic characteristics,

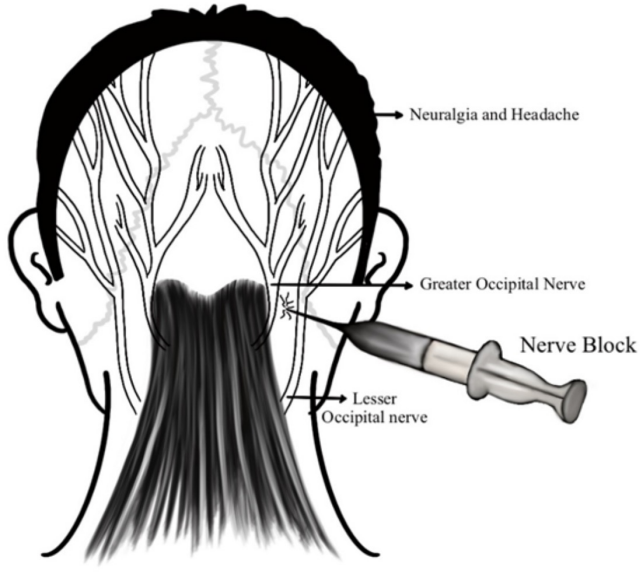

Figure 1. Greater occipital nerve blockade

personal and family history, presentation complaints, pain characteristics, previous use of analgesics, when they used these analgesics, vital signs, physical examination findings, and pain intensity levels according to the visual analog scale (VAS) scored from 0 to 10. The VAS scores of the patients were recorded at the 0th, 10th, 20th, 30th, 60th, and 120th minutes, covering the entire period from their first presentation through 120 min after treatment and/or procedure, regardless of their previous responses. In addition, the delta VAS score was calculated as the difference between the VAS scores evaluated at the 0th and 120th minutes.

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) program (IBM SPSS Statistics for Windows, version 22.0. Armonk, NY: IBM Corp. Data are presented as mean, standard deviation, median, minimum, maximum, percentage, and number. The normality of the distribution of continuous variables was examined using the Shapiro-Wilk test. For comparisons between two independent groups, the independent-samples t-test was used if the normal distribution condition was met, and the Mann-Whitney U test was used otherwise. The comparison of variables between more than two dependent groups was performed using the repeated-measures analysis of variance test in the presence of a normal distribution and the Friedman test otherwise. A p value of 0.05 was considered statistically significant.

Results

Of the 159 patients included in the study, 80 were in Group 1, where IV dexketoprofen was administered, and 79 were in Group 2, where IV dexketoprofen and GON block therapy were administered (Figure 2). There were no statistically significant differences between the two groups in terms of age, gender, or vital signs, with these variables showing a homogeneous distribution (Table 1).

While 47.8% of the patients experienced a headache at least once a month, 6.9% stated that they experienced more than four attacks. At the time of presentation, the patients were asked to describe the type (pressing, throbbing, squeezing, and pulsatile) and location of their headache. The most common type of headache was throbbing (35.2%), followed by squeezing (33.3%). Localization of pain was unilateral in 56% and in the temporal and frontal regions in 29.6%.

Pain characteristics, accompanying symptoms, and family history did not significantly differ between the treatment groups (Table 2).

Table 3 presents the VAS scores of the treatment groups. There was no statistically significant difference between the two groups in terms of the VAS scores evaluated at the time of presentation (0th minute) (p=0.147). However, with treatment, there was a decrease at the 10th minute in both groups, and this was statistically significant (p=0.002). After treatment, the greatest decrease occurred in Group 2 at the 20th minute (Table 3). The delta VAS score was calculated to be 4.71 in Group 1 and 7.11 in Group 2, and it was observed that GON block therapy together with IV dexketoprofen reduced the severity of pain more rapidly and effectively than IV dexketoprofen alone (Figure 3).

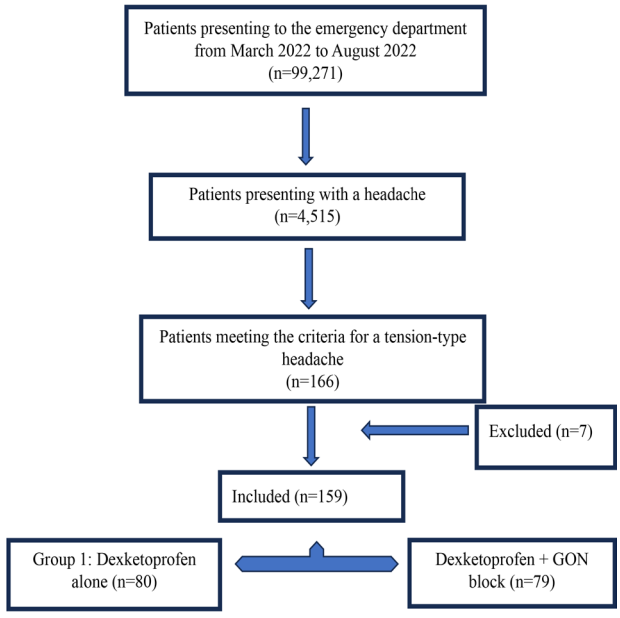

Figure 2. Flowchart of the study
GON: Greater occipital nerve

Table 1. Patients' demographic characteristics and vital signs at the time of presentation

	Group 1 (n=80)	Group 2 (n=79)	p
Gender (female/male)	43/37	40/39	0.694
Age (years)	36.65	37.57	0.654
Systolic blood pressure (mmHg)	120.69	122.47	0.253
Diastolicblood pressure (mmHg)	77.01	77.78	0.523
Pulse (/min)	75.89	76.06	0.897
Respiratory rate (/min)	14.48	14.14	0.250
Body temperature (°C)	36.18	36.14	0.106
Pulse oximetry (%)	96.56	96.89	0.266

Group 1: Dexketoprofen alone, Group 2: Dexketoprofen + greater occipital nerve blockade, min: Minutes

Table 2. Headaches characteristics according to treatment groups			
Headache characteristics	**Group 1 (n=80)**	**Group 2 (n=79)**	**p**
Headache duration before presentation			
Less than 60 minutes	38	33	0.304
More than 60 minutes	42	46	
Localization			
Unilateral	48	41	0.304
Bilateral	32	38	
Associated with exercise	52	46	0.380
Headache at rest	62	58	0.550
Accompanying symptoms			
Nausea	6	6	0.982
Vomiting	2	1	0.567
Photophobia	3	1	0.317
Phonophobia	1	2	0.553
Family history	3	3	0.987
Group 1: Dexketoprofen alone, Group 2: Dexketoprofen + greater occipital nerve blockade			

Table 3. VAS scores of the patients according to treatment groups			
	Mean VAS scores		
Evaluation time	Group 1 (n=80)	Group 2 (n=59)	p value
Minute 0	8.56	8.85	0.147
Minute 10	7.78	6.94	0.002
Minute 20	6.75	4.94	<0.0001
Minute 30	5.64	3.71	<0.0001
Minute 60	4.70	2.62	<0.0001
Minute 120	3.85	1.73	<0.0001
Delta	4.71	7.11	<0.0001
VAS: Visual analog scale			

Discussion

When managing acute pain attacks in patients with TTH, which cause loss of daily activities and work capacity, the use of IV NSAIDs together with a GON block increases the treatment efficacy and shortens the treatment duration compared with their use alone. In addition to increasing patient and physician satisfaction, this treatment is also effective in reducing emergency department crowding, side effects due to medications, and the need for additional medication use.

TTH, a common neurological disorder, affects 26.8% of the general population, with its prevalence reaching its peak in women between 35 and 39 years (12). In particular, the epizootic and chronic subtypes of TTH are more prevalent among women (13). The study found that 52.2% of the participants were female, with a mean age of 37.11 years, and 47.8% had an attack at least once a month. There were also no statistically significant differences between the treatment groups in terms of gender, age, and vital signs of the patients at the time of presentation, indicating a homogeneous distribution, which is consistent with the literature (14,15).

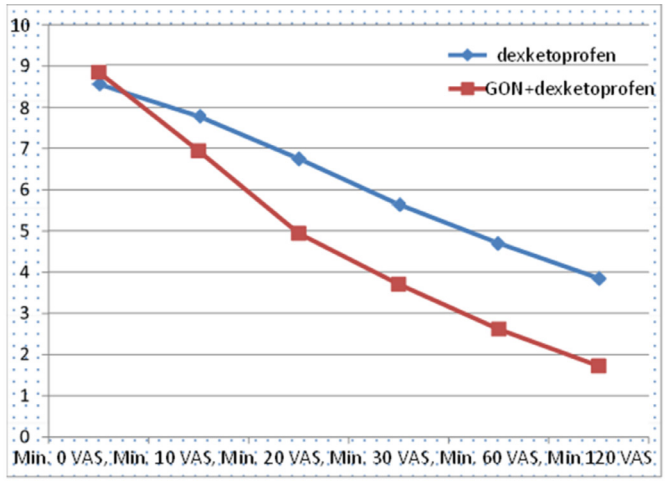

Figure 3. VAS score change graph of the treatment groups
VAS: Visual analog scale, GON: Greater occipital nerve

The diagnosis of primary headaches is based on appropriate clinical evaluation, review of medical history, and assessment of headache onset, duration, and frequency, as well as pain characteristics, accompanying symptoms, aggravating factors, and aggravating factors. Pain that is bilateral, occurs with attacks that are often throbbing or pressing, and lasts between 30 min and 24 h suggests the presence of TTH (13,16). In addition, patients frequently describe the sensation of a rubber band being tightened around the head. Of our patients, 35.2% reported experiencing throbbing pain, 33.3% experienced compressive pain, 56% experienced unilateral pain, and 29.6% experienced pain localized in the temporofrontal region. Pain characteristics were consistent with those reported in the literature, with the exception that some cases were unilateral. Accompanying symptoms are also important to differentiate TTH from migraine. A migraine attack may be accompanied by nausea, vomiting, photophobia, and phonophobia, in addition to an increase in pain (17). However, some case series in the literature have reported a diagnosis of TTH in 53% of patients with nausea (18). In the current study, among the additional symptoms accompanying pain, nausea and vomiting were the most common, occurring in 7.5% of cases. Although 2.5% of the

patients had photophobia, this rate was lower than that of patients with migraine-type headaches.

In TTH, the effect of exercise on pain severity, frequency of headache attacks, headache duration, quality of life, medication use, and psychological symptoms has recently become a controversial issue in the literature (19-21). Various exercise types have been employed for treating these patients, and while it has been reported that aerobic exercises have no effect on reducing the severity of pain, studies have indicated a moderate efficacy of strength exercises in the treatment, albeit with a very low level of evidence (22,23). In the current study, it was determined that the severity of pain increased with exercise in 61.6% of the patients.

TTH is characterized by mild to moderate intensity. Therefore, it responds to lifestyle changes along with pharmacological treatment, such as over-the-counter analgesics (13). In acute pharmacotherapy, it is recommended to use over-the-counter NSAIDs, such as acetaminophen, aspirin, ibuprofen, and naproxen, as well as high-efficacy prescription drugs, including ketoprofen and diclofenac (24). However, because NSAIDs can inhibit the cyclooxygenase pathway, have gastric, hepatic, and renal side effects, and cause increased blood pressure and risk of bleeding, the treatment should be tailored to each individual patient. The majority of studies in the literature focus on migraine headaches, with particular emphasis on the use of acetaminophen and NSAIDs (25-27). The use of NSAIDs is also recommended in the acute treatment of TTH. In a study conducted by Moore et al. (28), the use of 1,000 mg of paracetamol, 400 mg of ibuprofen, and 25 mg of ketoprofen was shown to be more effective than placebo. In addition, in previous studies, dexketoprofen was found to be an effective treatment during acute pain attacks (29,30). However, in our study, we administered a GON block in addition to IV dexketoprofen and observed a more rapid decrease in pain as assessed by VAS.

GON blockade has been previously used for treating various headache types, especially migraine, and a decrease in pain intensity, attack frequency, and analgesic use frequency has been observed (31,32). GON blockade has also been used in TTH and found to be effective in reducing pain severity (7,33). In our study, we found that GON blockade combined with IV dexketoprofen treatment resulted in a decrease in 20th-minute and 120th-minute delta VAS scores compared with the use of IV dexketoprofen alone. The higher decrease indicated by the delta VAS score in cases in which GON blockade was used is an indication of the efficacy of this treatment. The results obtained from the current study align with those reported by studies conducted to date and suggest that GON blockade should be considered a viable therapy option for TTH.

Study Limitations

The most important limitation of our study is that because GON blockade is not included as a sole treatment option in the treatment guidelines, IV dexketoprofen was administered to patients in both treatment groups in line with ethical principles. Therefore, the therapeutic efficacy of GON blockade alone could not be evaluated. The study being conducted in an emergency department and the limited patient follow-up also posed limitations in evaluating the long-term effects of GON blockade. Lastly, the exclusion of individuals with chronic diseases resulted in the study being conducted with data obtained from some patients.

Conclusion

In this study, it was observed that the use of GON blockade together with IV analgesics for treating patients presenting to the emergency department with TTH led to a faster reduction in pain and increased the efficacy of analgesics. It is considered that this combined treatment would also contribute to a decrease in overcrowding by shortening the follow-up period of patients in the emergency department and result in an increase in patient satisfaction.

Ethics

Ethics Committee Approval: The study was approved by the Atatürk University Faculty of Medicine Clinical Research Local Ethics Committee (date: 27.01.2022, decision number: B.30.2.ATA.0.01.00/98).

Informed Consent: Consent form was filled out by all participants.

Authorship Contributions

Surgical and Medical Practices: E.Y.Ç., M.Ç., Concept: E.Y.Ç., Ö.B., Z.Ç., Design: E.Y.Ç., Z.Ç., Data Collection or Processing: E.Y.Ç., M.Ç., Analysis or Interpretation: E.Y.Ç., M.Ç., Literature Search: M.Ç., Ö.B., Writing: E.Y.Ç., Ö.B.

Conflict of Interest: No conflict of interest was declared by the authors.

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