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Efficacy of the greater occipital nerve block in recurrent migraine type headaches

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ABSTRACT

Aims: We aimed to evaluate six months of results following repeated GON blocks.
Methods: We evaluated the results from GON block performed on 60 patients. Briefly, we applied a standard 2 mL of 0.5% Bupivacaine GON blockage once a week for 4 weeks. We recorded the Visual Analog Scale (VAS) scores, the number of migraine attacks and the Migraine Disability Assessment Questionnaire (MIDAS) scores. The study subjects were not allowed to use medication for prophylaxis, and Ibuprofen (400 mg, 1200 mg at maximum) was prescribed for any migraine attacks.
Results: The initial mean number of attacks per month before starting treatment was 8.33 + 2.31. After treatment, the initial MIDAS mean was found to be 2.82 per month; this declined to 1.47 in 3rd, and was 1.50 in the 6th month. The individual month values were found to be significant, and were listed respectively as, 1st month: 3.95 + 2.52, 2nd month: 3.23 + 1.82, 3rd month: 2.60 + 1.90, 4th month: 2.68 + 2.10, 5th month: 2.58 + 1.90 and 6th month: 2.58 + 1.90. The mean VAS scores were recorded as follows for each month: 6.28 ± 1.24, 3.13 ± 0.97, 2.55 ± 1.19, 2.35 ± 1.26, 2.38 ± 1.20 and 2.48 ± 1.30, respectively. This difference was noted to be statistically significant. No difference regarding the efficacy of the treatment was determined when the results were compared across age groups.
Conclusion: We assume that GON blockage with 2 mL of 0.5% Bupivacaine can be a supportive treatment in migraine treatment, with no serious adverse effects reported.
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1. Introduction

Migraine is a chronic disease which is characterized by recurrent mild or severe headaches, mostly related to a group of signs that originate in the autonomic nervous system. The prominent theory regarding migraine, which is thought to be of neurovascular origin, is that it is triggered by an excitation of the cerebral cortex with abnormal control of the pain-related neurons in the trigeminal nucleus which are located in the brain stem.

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The major occipital nerve contains fibers from the dorsal primary ramus of the C2 segmental nerve and, to a lesser extent, the C3 cervical nerve [1]. Administration of a nerve block into the greater occipital nerve (GON) results in a blocking of the impulses from the site to areas innervated by it. In this way the load of input on the convergent neurons of the 2nd cervical neuron's dorsal horn is diminished and their sensitization is obstructed [2]. It is noted in the literature that the upper cervical nerves and the nucleus of the trigeminal nerve are connected [3]. Also, it has been shown that GON blocks and electrical stimuli to the cervical muscles increase the responses in the second cervical nerve's convergent neurons [4]. There is not yet a complete classification, but differences are evident in the results of GON blocks in patients with a diagnosis of cervicogenic, cluster and migraine headaches [5–7]. The outcomes of trials where blocks have been applied more than once are promising [8,9]. In trials with neurostimulation, the outcomes from recurrent or continuous stimulation verify the augmented efficacy of a GON block being applied more than once [10,11].

In this study, we aimed to evaluate six months of results following repeated GON blocks.

2. Materials and methods

60 patients, who were diagnosed with migraine, according to the International Headache Society (IHS) criteria (IHS, 2004), were included in a 6-month cohort study, after gathering each patient's written consent and the confirmation of the ethical committee [12]. Patients who were pregnant or nursing at the time of the trial, or who had experienced a previous surgical procedure at the site of the injection were excluded. When the patient was in a sitting position, with the head in hyperflexion, 2 mL of 0.5% Bupivacaine injection was applied medially and laterally to the occipital nerve with a 5 cm of 22 gauge needle after palpating the artery in the region which is on the 1/3 part, close to the occipital protuberance and on an imaginary line that is drawn from the occipital protuberance to the mastoid. This was administered following an appropriate site cleansing with poviodine iodochloride. Patients were under observation for 30 min after the injection, and no medical device was used. Any complications in the subjects, for which the block level was evaluated by a pinprick test, were recorded. Blocks were repeated once a week for a month. No medical prophylaxis was given to the patients during the observational period of 6 months. For treatment of acute migraine attacks, Ibuprofen (400 mg, 1200 mg at maximum) was prescribed. During six month period, the number of attacks, the VAS level during the attack (VAS, is a horizontally or vertically drawn line, 10 cm in length, on which at one end ''no pain'' and at the other end ''severe pain'' is written), and a calculation of MIDAS (The Migraine Disability Assessment Questionnaire) scores on 3rd and 6th months were collected. MIDAS has been tested by Lipton et al. regarding its validity, ease of use, confidence, and its significance to health workers [13]. Ertas et al. validated the test (2004), and Gedikoglu et al. updated the test in 2005 [14,15].

3. Analysis of the data

SPSS 21.0 statistics packaged software was utilized for the analysis of the data. In the analysis, descriptive statistical methods (frequency, percentage, mean, standard deviation, respectively), One Way Anova and Repeated Measures Anova were used. In multiple comparisons where there was a difference between groups, Dunnet and Tukey HSD tests were chosen for discrimination purposes. Values with a probability of $p < 0.05$ were accepted as significant, whereas bigger values were identified as non-significant and no differences between the groups were reported.

4. Results

60 patients with a diagnosis of migraine were included, and when the subjects were evaluated in relation to age groups no significance was seen ($p > 0.05$) (Table 1). When the MIDAS scores were compared, there was a significant difference between them: the mean MIDAS score prior to the procedure was found to be 2.82, whereas this value declined to 1.47 in the 3rd month and was 1.50 in the 6th month ($p < 0.05$) (Table 2). In a comparison of VAS scores, the initial mean value for VAS was 6.28; the VAS scores during the following 6 months of observation were lower, and the difference was found to be significant ($p < 0.05$) (Table 3). The initial value for the number of attacks was 8.33, however, when compared to the values in the six months of follow-up, it was found to be lower, which was also significant ($p < 0.05$) (Table 4). In each period of measurement there was no significant difference in a comparison according to the age groups regarding MIDAS, VAS or the number of attacks ($p > 0.05$) (Table 5).

5. Discussion

Invasive procedures aimed at the peripheral nerves are becoming more popular nowadays; but, still, there are no completely accepted protocols for these procedures. Trials

Table 1 – Age groups of the subjects.

Age groups	*n*	%
≤34 years	13	21.67
35–39 years	16	26.67
40–44 years	13	21.67
≥45 years	18	30.00

Table 2 – Comparison of the MIDAS scores.

MIDAS	Mean	SS	*p*	Difference
Prior to procedure[a]	2.82	0.70	0.000 ($F = 178.45$)	a and b, c
3rd month[b]	1.47	0.72		b and a
6th month[c]	1.50	0.68		c and a

Table 3 – Comparison of the VAS scores.

VAS	Mean	SS	*p*	Difference
Prior to procedure[a]	6.28	1.24	0.000	a and b, c, d, e, f, g
1st measurement[b]	3.13	0.97	(F = 166.52)	b and a, c, d, e, f, g
2nd measurement[c]	2.55	1.19		c and a, b
3rd measurement[d]	2.42	1.23		d and a, b
4th measurement[e]	2.35	1.26		e and a, b
5th measurement[f]	2.38	1.20		f and a, b
6th measurement[g]	2.48	1.30		g and a, b

Table 4 – Comparison between number of attacks.

Number of attacks	Mean	SS	*p*	Difference
Prior to procedure[a]	8.33	2.31	0.000	a and b, c, d, e, f, g
1st measurement[b]	3.95	2.52	(F = 82.05)	b and a, d, e, f, g
2nd measurement[c]	3.23	1.82		c and a
3rd measurement[d]	2.60	1.90		d and a, b
4th measurement[e]	2.68	2.10		e and a, b
5th measurement[f]	2.58	1.90		f and a, b
6th measurement[g]	2.58	1.90		g and a, b

attempting to arrive at such a consensus have had conflicting results. Even though these conflicting results confirm the need for more studies in this field, the GON block is widely accepted to be effective in controlling headaches [16,17].

Another point still under discussion is the choice of medication to be used in the procedure. The current approach is to use local anesthetics and local anesthetic-steroid mixtures. Afirdi et al. [18] applied GON block with 3 mL of 2% lidocaine and 80 mg of prednisolone, and results were recorded 1 week prior to and 4 weeks after the procedure. The number of patients with a complete response was 26/101; 36/101 showed a partial response, in which the severity and frequency of the attacks were reduced by 30%; 54 of the 101 patients were included in the diagnosis of migraine. Complete response in these patients lasted for 9 days; in addition, a partial response lasted for 61 days on average. In the latter period of the trial there was no significant correlation between the immediate efficacy of the block after the injection and the longer term probability of success. Regarding complications with GON block, 2 patients had alopecia, one had vasovagal syncope, 3 patients had dizziness, and 3 had atypical pain. In our study, we observed complications in 5 of our subjects: 3 had vasovagal syncope and 2 patients had atypical pain (a headache which spread to the neck).

Ashkenazi et al. applied GON block (2 cc of 2% lidocaine + 5 mg of triamcinolone) and a triggering point injection (0.5 cc of 2% lidocaine) to 15 of 19 patients; the GON block alone was applied to the other 4 patients [19]. The pain scores in all groups were reduced from 6.53 to 3.47, and they reported the GON block to have had a positive outcome in headache management. Additionally, Lauretti et al. used three different volumes of 10 mg dexamethasone + 40 mg of lidocaine, delivered as 5, 10 and 15 mL, and reported that the dose of 5 mL was sufficient to create a sub-compartmental block [20]. In our study, we applied a GON block with 2 mL of Bupivacaine. Even though we practiced a different technique, we documented a decline in the VAS scores, from an initial mean value of 6.28 to a mean value of 2.48 in the 6th month. Moreover, we recorded significantly decreasing values in the MIDAS scores and in the number of attacks in the 6-month period. Our rate of success was similar to that of studies described in the literature [8,9,18,19]. We assume that our high rate of success was related to the administration of nerve blocks more than once, and to

Table 5 – MIDAS, VAS and number of attacks comparison according to the age groups.

	<34 years (*n* = 13) Mean ± SD	35–39 years (*n* = 16) Mean ± SD	40–44 Years (*n* = 13) Mean ± SD	45 and older (*n* = 18) Mean ± SD	*p*
MIDAS					
Prior to procedure	3.00 ± 0.82	2.69 ± 0.79	2.92 ± 0.49	2.72 ± 0.67	NS
3rd month	1.31 ± 0.48	1.56 ± 0.81	1.54 ± 0.88	1.44 ± 0.70	NS
6th month	1.54 ± 0.66	1.50 ± 0.82	1.46 ± 0.66	1.50 ± 0.62	NS
VAS					
Prior to procedure	6.62 ± 1.19	6.38 ± 1.02	5.69 ± 1.11	6.39 ± 1.46	NS
1st measurement	3.15 ± 1.07	3.00 ± 0.89	3.31 ± 1.03	3.11 ± 0.96	NS
2nd measurement	2.92 ± 1.32	2.13 ± 0.89	2.77 ± 1.48	2.50 ± 1.04	NS
3rd measurement	2.46 ± 1.33	2.19 ± 0.98	2.69 ± 1.49	2.39 ± 1.20	NS
4th measurement	2.38 ± 1.50	2.25 ± 0.93	2.77 ± 1.42	2.11 ± 1.23	NS
5th measurement	2.54 ± 1.20	2.13 ± 0.89	2.77 ± 1.48	2.22 ± 1.22	NS
6th measurement	2.54 ± 1.61	2.13 ± 1.20	2.69 ± 1.32	2.61 ± 1.14	NS
Number of attacks					
Prior to procedure	7.77 ± 2.42	9.25 ± 2.67	9.08 ± 1.26	7.39 ± 2.15	0.050
1st measurement	2.92 ± 2.87	3.63 ± 1.75	5.08 ± 2.63	4.17 ± 2.60	NS
2nd measurement	2.38 ± 1.33	3.38 ± 1.45	3.92 ± 1.98	3.22 ± 2.16	NS
3rd measurement	2.46 ± 1.56	2.75 ± 2.65	2.38 ± 0.87	2.72 ± 1.99	NS
4th measurement	2.46 ± 1.39	2.75 ± 2.74	2.69 ± 2.39	2.78 ± 1.80	NS
5th measurement	2.46 ± 1.56	2.75 ± 2.65	2.31 ± 0.85	2.72 ± 1.99	NS
6th measurement	2.46 ± 1.56	2.75 ± 2.65	2.31 ± 0.85	2.72 ± 1.99	NS

NS: non-significant.

the anatomical route of the administration of the local anesthetic through both sides of the occipital nerve, laterally and medially to the nerve, during the GON block. We have realized that in the literature the administration was performed only to the medial side of the nerve with the lateral part being ignored [21].

In recent years, neurostimulators have been used in preference to GON for migraine. The results of those trials are promising, even though they have only been carried out with small numbers of patients. In a study with a group of 25 patients, neurostimulation of the occipital nerve had a success rate of 50% [10]. Additionally, Oh et al. stated that a 90.2% relief in 6 out of 20 patients and a 75–90% relief in another 2 patients by the end of 6 months [11]. Thus, a continuous stimulator, such as in recurrent occipital nerve stimulation, will increase the probability of success.

In conclusion, the GON block is not a successful method for achieving a complete cure in migraine type headaches but that it can be a supportive option in treatment. Because there were no significant differences in the efficacy of the treatment between age groups and there is the potential for a wide-range of application in patient populations diagnosed with migraine.

Conflict of interest

None declared.

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None declared.

Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans; Uniform Requirements for manuscripts submitted to Biomedical journals.

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