

# The Effect of Greater Occipital Nerve Block on Chronic Migraine

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## ABSTRACT

**Background:** Greater occipital nerve block has been shown to be an effective treatment in patients with cluster or tension type headache but there are very few studies investigating its effect in patients with chronic migraine. This study was to determine the effectiveness of greater occipital nerve block on headache in patients with chronic migraine. We designed an interventional before-after study for patients suffered from chronic migraine.

**Methods:** Patients were participated in this study according to inclusion and exclusion criteria. Frequency, severity and duration of headaches were recorded by patients 2 weeks before injection and then during 6 weeks after injection. We compared data recorded before injection to data from each two-week after injections to determine the effectiveness of greater occipital nerve block in improvement of headaches in patients with chronic migraine.

**Results:** Fourteen patients (mean age=34.21±2.75) were included in the study. Number of attacks was significantly decreased during 6 weeks follow up ( $p<0.05$ ). Mean headache severity was significantly decreased during first and second two-week follow up by 3.04 and 2.39 points, respectively. Duration of headaches was not significantly reduced during follow up.

**Conclusion:** In conclusion, Greater occipital nerve block can improve the status of headache in patients with chronic migraine by decreasing the severity and frequency of headaches. However, it may not be effective in shortening the duration of headaches.

**Keywords:** Headache; Chronic Migraine; Greater Occipital Nerve; Nerve Block; Treatment

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## INTRODUCTION

Migraine is one of the most common neurovascular diseases affecting up 15% of adults worldwide <sup>1</sup>. It is characterized by episodes of headaches correlated with sensory and autonomic nervous system dysfunction <sup>1-4</sup>. The debilitation made by migraine has put this disease as one of top 20 causes of years-lived with disability reported by WHO <sup>5</sup>.

Chronic migraine (CM), the most common cause of chronic daily headache <sup>6,7</sup>, defined as migraine/tension type headache occurs 15 or more days per month

and lasts longer than 4 hours a day for more than 3 months according to the criteria published as "Revised International Headache Society Criteria for Chronic Migraine" in 2006 <sup>3,8</sup>. CM is one of the most common reasons making patients refer to headache clinics <sup>9</sup>. The majority of patients suffer from CM are female and the prevalence rate has been reported between 1% to 5% of the global population <sup>10,11</sup>. These women have higher migraine disability assessment (MIDAS) scores and they are usually anxious, depressed, overusing pain killers and suffering from other forms of chronic pains and

cerebrovascular disorders<sup>12-17</sup>.

Despite the fact that some oral medications have been shown to be useful for decreasing headache frequency<sup>18</sup>, they are not desirable and efficient and these drugs cause serious side effects such as cognitive impairment, sedation and metabolic complications<sup>19</sup>. Thus, other approaches should be considered<sup>20</sup>. Among the peripheral nerve blocking used for headaches<sup>21,22</sup>, greater occipital nerve block (GONB) has been shown to be useful in various types of headaches<sup>23-27</sup>. However, limited studies on the effects of GONB on chronic migraine have been performed.

We designed an interventional before-after pilot study with systematic-style follow-up to investigate the effect of GONB on improvement of headaches in patients with CM.

## MATERIALS AND METHODS

Patients were included based on revised IHS criteria for chronic migraine published in 2006<sup>8</sup> (Table 1). Patients who met one or more following conditions were excluded from the study: history of head trauma or injury in pathway of greater occipital nerve or invasive procedure in occipital area, allergy to corticosteroid, age more than 65 or less than 18, other types of headaches e.g. Cluster, any other neurologic disorders e.g. MS, pregnancy or lactating, dermatological diseases affecting skin sensation in GON area. Patients who had history of GONB were also excluded.

Sixteen patients out of 30 with CM were entered the study according to the inclusion and exclusion criteria. All the details about research project such as duration of treatment, follow-up style, technique of GONB and complications were explained for patients by chief neurologist and informed consent was signed by patients who accepted to participate in this study. This before-after interventional study was approved by Medical Research Ethics Committee, Tehran University of Medical Sciences

(TUMS).

Two patients gave up the project in the middle. Thus, 14 patients were followed up from June 2010 to February 2012. All the patients were allowed to use headache treatment drugs under neurologist observation during the project.

Headache status evaluation questionnaire named “Before GONB” notebook containing basic information of patient such as name, date of birth, career, education, marital status, etc and daily headache description including onset, duration (minutes), severity (from 1 to 10) and number was given to each patients at first and asked them to fill the questionnaire for 2 weeks and then come to clinic for visit and GONB application. The patients were daily reminded by researchers with two mobile messages (SMS), one at 8:00 am and one at 8:00 pm, containing date, patient’s name and a reminder of filling “Before GONB” notebook. A reminder success was checked with delivery reports.

In patients with unilateral headache, GONB was performed at the same side and in patients with bilateral headaches, it was done at the side with higher severity or if equal, according to the patients favor.

For each patient a 10ml syringe filled with 6ml solution containing 3ml bupivacaine 0.5% and 3ml of distilled water (bupivacaine 0.25%) was used. Patient sat down on a chair with desired neck flexion required by pain expert. Using 25 gauge needle, the syringe was entered to medial third of the distance between occipital protuberance and mastoid process in the cephalad direction with 30 degree angle and when contact to periosteum 3ml of bupivacaine 0.25% injected fan-shapely (180 degree). After the injection, the area was gently stroked for 2 minutes by a folded gauze pad 10 times to make the solution equally distributed and preventing hematoma. Then each patient was observed for 15 minutes checking vital signs every 5 minutes to prevent acute complications such as fainting. All the patients were injected by one

**Table 1.** Revised IHS criteria for chronic migraine

I. Headache on $\geq 15$ days per month for at least 3 months
II. Occurring in a patient who has had at least five attacks fulfilling criteria for Migraine without aura
III. On $\geq 8$ days per month for at least 3 months headache has fulfilled III.1 and/or III.2 below; that is, has fulfilled criteria for pain and associated symptoms of migraine without aura: <ol style="list-style-type: none"> <li>i. Has at least two of 1–4:               <ol style="list-style-type: none"> <li>1. unilateral location</li> <li>2. pulsating quality</li> <li>3. moderate or severe pain intensity</li> <li>4. aggravation by or causing avoidance of routine physical activity (e.g. walking or climbing stairs) and at least one of a or b:                   <ol style="list-style-type: none"> <li>a) nausea and/or vomiting</li> <li>b) photophobia and phonophobia</li> </ol> </li> </ol> </li> <li>ii. Treated and relieved by triptan(s) or ergot before the expected development of III.1 above</li> </ol>
IV. No medication-overuse and not attributed to another causative disorder

pain expert.

In the present study, we used a systematic follow up style not allowing missing any small data on headaches features. The patients were followed for 6 weeks after injection. “After GONB” notebook contains table with headaches onset, duration (minutes), severity (from 1 to 10) and numbers of attacks. The patients were daily reminded similar to the way before injection.

At the end of each week, patients were visited and the notebooks were checked and any complications or improvement were recorded.

**Statistical Analysis**

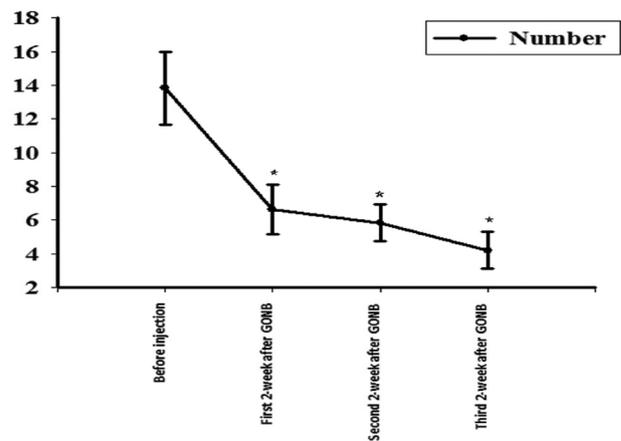
Statistical analysis was performed using office Excel 2016, SPSS software for windows ver. 22 (SPSS Inc., Chicago, IL, USA). Data recorded every two weeks during 6 weeks follow up were compared with those recorded before injection using Wilcoxon Signed Rank Test. P values less than 0.05 were regarded as significant.

**RESULTS**

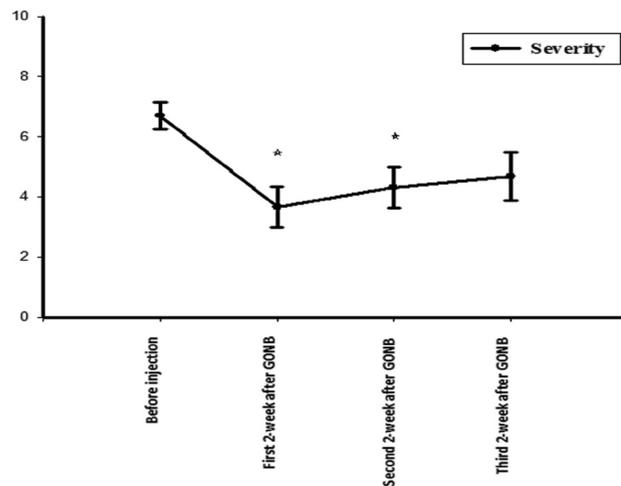
Fourteen patients who met the inclusion and exclusion criteria were participated (4 men and 10 women) in this study. Basic characteristics of patients are shown in table 2.

Number and severity of headaches were significantly decreased during 6 weeks follow up (Figure 1 and Figure 2, P<0.05). Comparing to data recorded before injection, during first two-week follow up, mean number of headaches was significantly decreased by 7.2 points (13.85± 2.16 to 6.64±1.69, P= 0.002, respectively). During second and last two-week follow up, mean number of headaches was also significantly reduced to 5.85±1.09 and 4.21±1.1, respectively. (P= 0.004 and 0.005, respectively).

Headache severity was significantly decreased during first and second two-week follow up by 3.04 and 2.39 points comparing to what was recorded before injection, respectively (6.7± 0.46 to 3.66± 0.68 and to 4.31±



**Figure 1.** Effects of GONB on number of headaches in chronic migraine. The Values are Mean ±SEM. The total number of headaches was significantly reduced by GONB at 2-week follow ups (P<0.05). \* is representative of P<0.05.



**Figure 2.** Effects of GONB on Severity of headaches in chronic migraine. The Values are Mean ±SEM. The severity of headaches was significantly reduced by GONB at 2-week follow ups (P<0.05). \* is representative of P<0.05.

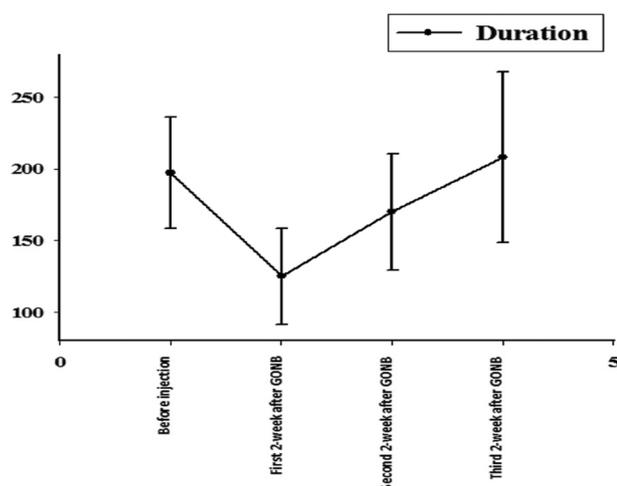
0.67, P= 0.009 and 0.022, respectively). The severity of headaches was not significantly decreased during last two weeks.

Duration of headaches was not reduced during first two-week follow up. However, the duration was increased during next two-week follow ups but not significantly (Figure 3).

Regarding the after-injection follow up weeks, severity and number of headaches were decreased from first two-week to second and from second to last one. However, the differences were not significantly meaningful. Duration of headaches was not significantly changed during follow up period.

**Table 2.** Basic Characteristics of Patients

Age (Year)-mean (SEM)	34.21- (2.75)
Median	31.5
Range	31
Gender, % (n)	
Female	71.5 (10)
Male	28.5 (4)
Headache Duration (years)	2.71
Median	2.5
Range	1-5



**Figure 3.** Effects of GONB on duration of headaches in chronic migraine.

The Values are Mean  $\pm$  SEM. The duration of headaches was not significantly reduced by GONB at 2-week follow ups ( $P > 0.05$ ).

## DISCUSSION

Our results showed that GONB can be effective in decreasing frequency and severity of headache attacks whereas its effect on duration of headaches was not meaningful.

In this study we have tried to follow patients systematically to the best of possible by reminding them writing their headache features twice a day. In analysis, the most important distinguishing factor was the time interval set for outcome measurement (2 weeks). It was more common to report the effects of GONB on headache 5 or 20 minutes after injection<sup>28,29</sup> supporting its great effectiveness. However, it is not efficient enough for a patient who is suffering from severe and long lasting headaches and got needed for GONB. We also tried to reduce all the limitations affecting the data obtained from patients by systematic daily follow-up and being in contact with patients every Friday by phone. However, there were still some limitations in this project as follows: a. Different experiences of pain in this population. Some patients have experienced surgery or normal vaginal delivery whereas headache was the only serious pain experience for the others. Thus, severity measurement (scale from 0 to 10) was affected these differences. b. Small size of population (14 people); It can be due to the prevalence of CM which is also little (2-4%). c. Lack of control group for comparing the results of this population who experienced GONB with; due to immediate effect of GONB as quite pain relief in comparison with the drug treatment, convincing the patients to be divided into two groups and use drugs was nearly impossible.

Previous studies showed that GONB is effective

in treatment of other types of headaches such as migraine<sup>21,23,25,30</sup> cluster headache and occipital neuralgia<sup>26,31-33</sup> and some other studies were to find its impact on patients with CM. In one study the patients with CM did not have any attacks for  $2.7 \pm 3.8$  days lasting for  $14.3 \pm 5.1$  days after GONB<sup>25</sup>. In another study, which added triamcinolone to local anesthetics when performing GONB for one group, it has been shown that the outcome was not significantly different between two groups of patients<sup>28</sup>. Despite the wide usage of GONB for treatment of headaches, no double-blind placebo controlled study has proved its impact on CM<sup>34</sup>.

## CONCLUSION

Our study suggested that using GONB procedure for improving the headaches status in patients with CM seems to be necessary, especially for the patients who get annoyed by frequency and severity of attacks. However, it is not maybe useful in shortening the duration of headaches needing to be investigated in large controlled studies.

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