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**Research Article**

# The Responses of the Greater Occipital Nerve Blockade by Local Anesthetics in Headache Patients

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## Summary

**Background:** Peripheral nerve blockade has been using in primer headache treatment for a long time. Our aim in this study was to examine the efficiency of greater occipital nerve (GON) blockade in patients with primary headache especially medical overuse headache.
**Materials and Methods:** Sixty-nine headache patients who were treated with greater occipital nerve blockade have been examined retrospectively. Thirty-seven of the patients had migraine, 17 of them had medication overuse headache, 7 of them had autonomic cephalagia, 4 of them had trigeminal neuralgia and 3 of them had cervicogenic headache.
**Results:** It has been observed that the intensity, period and frequency of the pain were significantly reduced after the first blockade and ranged stable in repetitive blockades. For the migraine patients; attack frequency was decreased at 50% rate in the first blockade. Attack period was decreased at 91.6% rate at first, then at repetitive blockades effect proceeded as 95.83% and 72.22% respectively. Similar results were reached in other headache groups as well.
**Discussion:** Patients can have significant symptomatic reliefs with first GON blockade. Repetitive blockades can be used in order to provide continuance in the effect or to provide pain relief until the effect of other preventive treatments will start.

**Key words:** Migraine, Nerve blockade, Greater occipital nerve blockade, headache, GON

# Başağrısı Hastalarında Büyük Oksipital Sinirin Lokal Anestezikler ile Blokajının Yanıtları

## Özet

**Giriş:** Periferal sinir blokajları primer başağrıları tedavisinde uzun süredir kullanılmaktadır. Bu çalışmada biz, primer başağrısı olan hastalarda, özellikle büyük oksipital sinir blokajının etkinliğini araştırdık.
**Materyal ve Metodlar:** Daha once büyük oksipital sinir blokajı yapılan 67 hasta çalışmaya dahil edildi. Hastaların 37 tanesinde migren, 17 hastada aşırı analjezik kullanımı başağrısı, 7 hastada otonom başağrısı, 4 hastada trigeminal nevralji ve 3 hastada da servikojenik başağrısı mevcuttu.
**Sonuçlar:** İlk blokaj ve tekrarlayan blokajlardan sonra ağrı şiddeti, periyodu ve sıklığında azalma tespit edildi. Migren hastaları için, ilk blokajdan sonra atak sıklığı %50 oranında

azalmıştı. Atak periyodu da ilk tedavide %91.6, sonra takip eden blokajlarda sırası ile %95.83 ve %72.22 oranlarında azaldı. Benzer sonuçlar diğer başağrısı gruplarında da izlendi.
**Sonuçlar:** Hastaların ilk blokajdan sonra anlamlı oranda semptomatik rahatlama gösterdikleri izlendi. Tekrarlayan blokajlarla etkinin devam ettiği izlendi ve bu durum önleyici tedavide de tekrarlayan blokajların kullanılabileceği düşüncesini beraberinde getirdi.

**Anahtar Kelimeler:** Migren, Sinirblokajı, Büyükoksipitalsinirblokajı, Başağrısı, GON

## INTRODUCTION

The history of performing greater occipital nerve blockade in primary headaches has started with scientists such as James Lance and Peter Goadsbyin 1985's[15]. Peripheral nerve blockade and trigger point injection have been using in primer headache treatment for a long time. This protocol helps providing relief for most of the patients in headache and accompanying symptoms within a short time. Peripheral nerve blockades are performed most frequently to greater occipital nerve and branches thereof[5].

Preferably local anesthetics are used. They take effect by blocking the nerve conduction with Na channel inhibition and through unmyelinated c fibers and thinly myelinated A fibers[7]. Most frequently used anesthetics are lidocaine and bupivacaine. On chemical basis, both are under the amide group which is less allergenic than esters[3].

Beside the mechanism of action of greater occipital nerve blockade, it is still being subject to discussion if performing of this method is effective or not in primary headaches[4].

In this study, we aimed to examine the efficiency and adverse effects of GON blockade in patients who were receiving treatment for primary headache.

## MATERIAL AND METHODS

Headache patients who were followed-up in Ankara Training and Research Hospital, Department of Neurology between January 2009 & May 2011 and were treated with greater occipital nerve blockade have been retrospectively examined. Sixy-nine patients whose data are completely reachable were included to the study. Effects and adverse effects of GON blockades which have been performed in the headache treatments of the patients diagnosed with several classes were evaluated. Classification of the headache diagnosis of the patients as of the date that they were included to the study was made according to the diagnosis criteria of IHS published in 2004.

Medical treatments that the patients received before GON blockade and information about whether they had received a prophylactic treatment during the blockade or not were recorded. Intensity of the headaches of the patients was evaluated according to the progression notes taken during the period after the blockade and was evaluated under five groups as: no pain, mild pain, moderate pain, intense pain, severe pain.

GON blockades of all the patients were performed in Pain Center of the Anesthetics and Reanimation Clinic of our hospital. Blockade was performed by combining bupivacaine which is a local anesthetic under amide class. Greater occipital nerve blockade was performed by introducing from 2 cm lateral and 2 cm inferior to the external occipital protuberance. Occipital artery was first palpated and needle was inserted vertically as far as periost and then aspired by withdrawing. So that injection risk to the occipital artery was prevented. Blockade was performed by injecting 0,5% 2cc bupivacaine to great occipital nerve.

Patients whose monthly painful days, frequency, period and intensity of the attacks were not informed are excluded from study. Likewise, frequency, period

and intensity were recorded after the blockade and treatment responses and number of the days without pain was evaluated. If GON was performed again, the repetition ranges were recorded as well. While evaluating the frequency and period of the pain, it shouldn't be ignored that in trigeminal neuralgia and autonomic cephalgia cases, because of features of the pains in this type, the frequency and period of the pain couldn't be informed objectively by the patients. By considering this fact, trigeminal neuralgia and autonomic cephalgia diagnosis groups were excluded and a new statistics were produced for the frequency (month) and period (min.) of the pain.

It is recorded if there was any adverse effect after the blockade or not and if any, the frequency and period of it was recorded as well. If the doctor hadn't quit the treatment yet the compliance to the treatment was evaluated. Total blockade number and adverse effects borne by these blockades and painlessness responses after the blockades were recorded.

All data are expressed in number and %. As normal compliance couldn't be determined (Kolmogorov - Smirnov test) averages are shown with median (min-max). Chi square test was used in the comparisons between groups. P value was taken as 0.05 for statistical relevance.

## RESULTS

A total of 69 patients were included to our study. 88.4% (n=61) of the patients were woman and 11.6 % (n=8) of them were man. The youngest of the patients within the study was 18 years old, oldest was 89 and median was 42 (min: 18, max:89).

11.6% (n=8) of our patients were being followed-up for migraine with aura, 42% (n=29) of them for migraine without aura, 1.4% (n=1) for chronic tension type headache, 2.9% (n=2) for chronic cluster, 1.4% (n=1) for episodic paroxysmal hemicrania, 5.8% (n=4) for trigeminal neuralgia, 1.4% (n=1) for medication overuse headache underlying tension type headache, 2.9% (n=2) for medication overuse headache underlying migraine with aura, 20.32% (n=14) for medication overuse headache underlying migraine without aura and 4.3% (n=3) for cervicogenic headache (Figure I). Median of the beginning period of the pains of patients was 60 months (min:2, max: 396).

According to this distribution, rate of the patients who are being followed-up for migraine was 53.6% (n=37), for medication overuse headache was 24.6% (n=17), for autonomic cephalgia was 10.1% (n=7), for chronic tension type headache 1.4% (n=1), for trigeminal neuralgia was 5.8% (n=4) and for cervicogenic headache was 4.3% (n=3).

Physical and neurologic examinations of all the patients were normal. 40.6% of the patients had computed tomography scans of the head, 79.7% had cranial MR and 23.2% had cervical MR.

10.1% of the patients did not receive medical treatment for headache in their history. 85.5% of which were receiving attack treatment along with preventive treatment, 4.3% were receiving only preventive treatment. 78.3% of the patients were receiving preventive treatment while they were receiving greater occipital nerve (GON) blockade treatment.

Median age was 41 years in 37 migraine patients. Twenty six of them were female and median headache starting time was 60 months. During this long period, 31 patients had used some medicine for prophylaxis mainly including combination drugs such as topiramate (TPM) and serotonin noradrenaline reuptake inhibitors (SNRI) but all were failed. Twenty six patients who started blockade treatment were not receiving any prophylactic medicine.

After performing repetitive GON blockades combined with bupivacaine to 37 migraine patients; attack frequency was decreased at 50% rate in first blockade,

62.5% rate in second blockade, 87.5% rate in third blockade and attack intensity was decreased at 66.6% rate and then again at 66.6% rate and 0% rate respectively comparing with the pretreatment stage and attack period was decreased at 91.6% rate at first but then at repetitive blockades effect proceeded as 95.83% and 72.22% respectively(Figure II).

Median age was 39 years in 17 MOH patients. Twelve of them were female and median headache starting time was 108 months. During this long period, 16 patients had used some medicine prophylaxis such as amitriptyline, TPM,valproate, SNRI and combination drugs. Fourteen patients who started blockade treatment were not receiving any prophylactic medicine.

After performing repetitive GON blockades combined with bupivacaine to 17 medication overuse headache patients; attack frequency was decreased at 50% rate in first blockade, 43.75% rate in second blockade, 43.75% rate in third blockade and attack intensity was decreased at 33.3% rate and then again at 33.3% rate and 50% rate respectively comparing with the pretreatment stage and attack period was decreased at 70.83% rate at first but then at repetitive blockades effect proceeded as 62.5% and 72.91% respectively (Figure III).

After performing repetitive GON blockades combined with bupivacaine to 7 autonomic cephalgia patients; attack frequency was decreased at 95.55% rate in first blockade, 92.22% rate in second blockade, 86.66% rate in third blockade and attack intensity was decreased at 75% rate and then again at 75% rate and 50% rate respectively comparing with the pretreatment stage and attack period was decreased at 73.33% rate at first but then at repetitive blockades effect proceeded as 93.33% and 66.66% respectively.

After performing repetitive GON blockades combined with bupivacaine to 4 trigeminal neuralgia patients; attack frequency was decreased at 82.6% rate in first blockade, 53.84% rate in second blockade and attack intensity was decreased at 12.5% rate and 0% rate comparing with the pretreatment stage and attack period was decreased at 25% rate at first but then at repetitive blockades effect proceeded as 0%.

After performing repetitive GON blockades combined with bupivacaine to 3 cervicogenic headache patients; there was no decrease at the attack frequency in first blockade but attack intensity was decreased at 66.6% rate comparing with the pretreatment stage and attack period was decreased at 88.8% rate.

Also in the examination of the adverse effects of the GON blockade, severity in pain or mild adverse effects such as local sensitivity and pain were observed. However it was observed that these adverse effects were reduced during repetitive blockades. Total of 212 GON blockades combined with bupivacaine were performed to 69 patients. When adverse effects were questioned, responses for 210 blockades could be received. In 81.42% (n=171) of the blockades, no adverse effect was examined in the majority of the responsive patients. When observed adverse effects are sorted; most frequent ones were local sensitivity and pain with 9.4% (n=20) rate. Then respectively; 9% (n=19) severity of the pain, 1.42% (n=3) local edema, 0.95% (n=2) hypotension and each at 0.47 (n=1) rate dizziness, syncope, local hematoma, local sensitivity and edema association were observed.

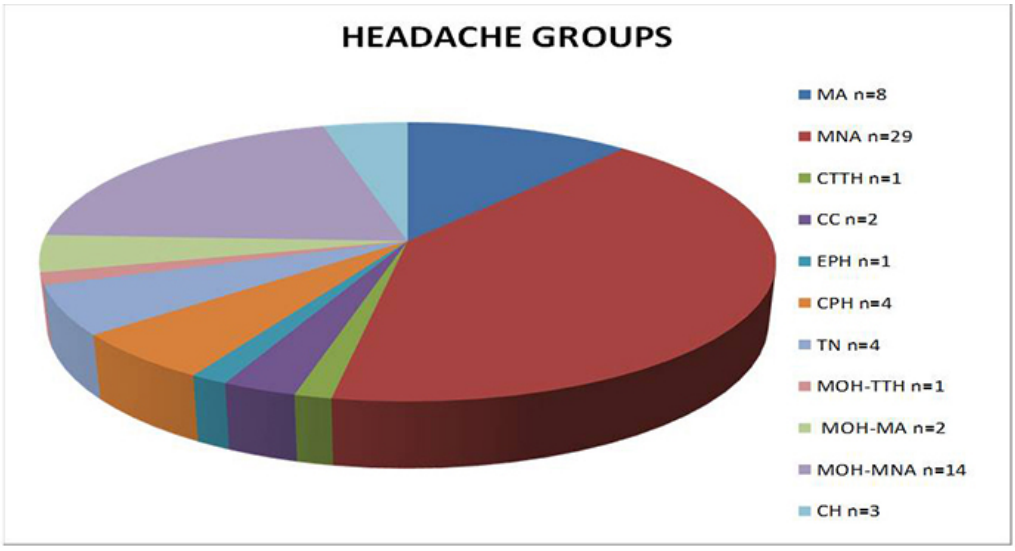


***Figure 1:*** *Distribution graphic of the diagnosis of the patients according to the classification of International Headache Society. HEADACHE GROUPS: MA: Migraine with aura, MNA: Migraine without aura, CCTH: Chronic tension type headache, CC: Chronic cluster, EPH: Episodic paroxysmal hemicranica, CPH: Chronic paroxysmal hemicranica, TN: Trigeminal neuralgia, MOH-TTH: Medication overuse headache underlying tension type headache, MOH-MA: Medication overuse headache underlying migraine with aura, MOH-MNA: Medication overuse headache underlying migraine without aura, CH: Cervicogenic headache*

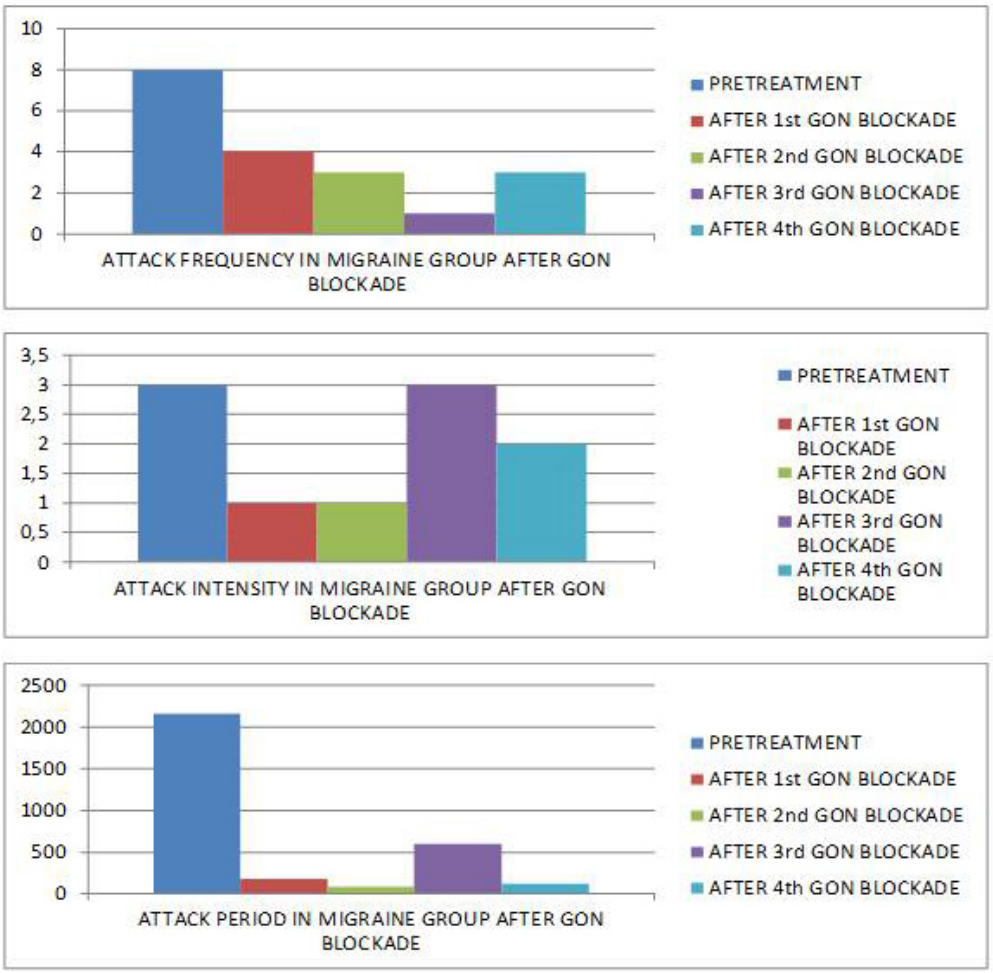


***Figure 2:*** *Table of the changes in the frequency, intensity and period of the attacks in the migraine patients at pretreatment stage and after repetitive GON blockades.*

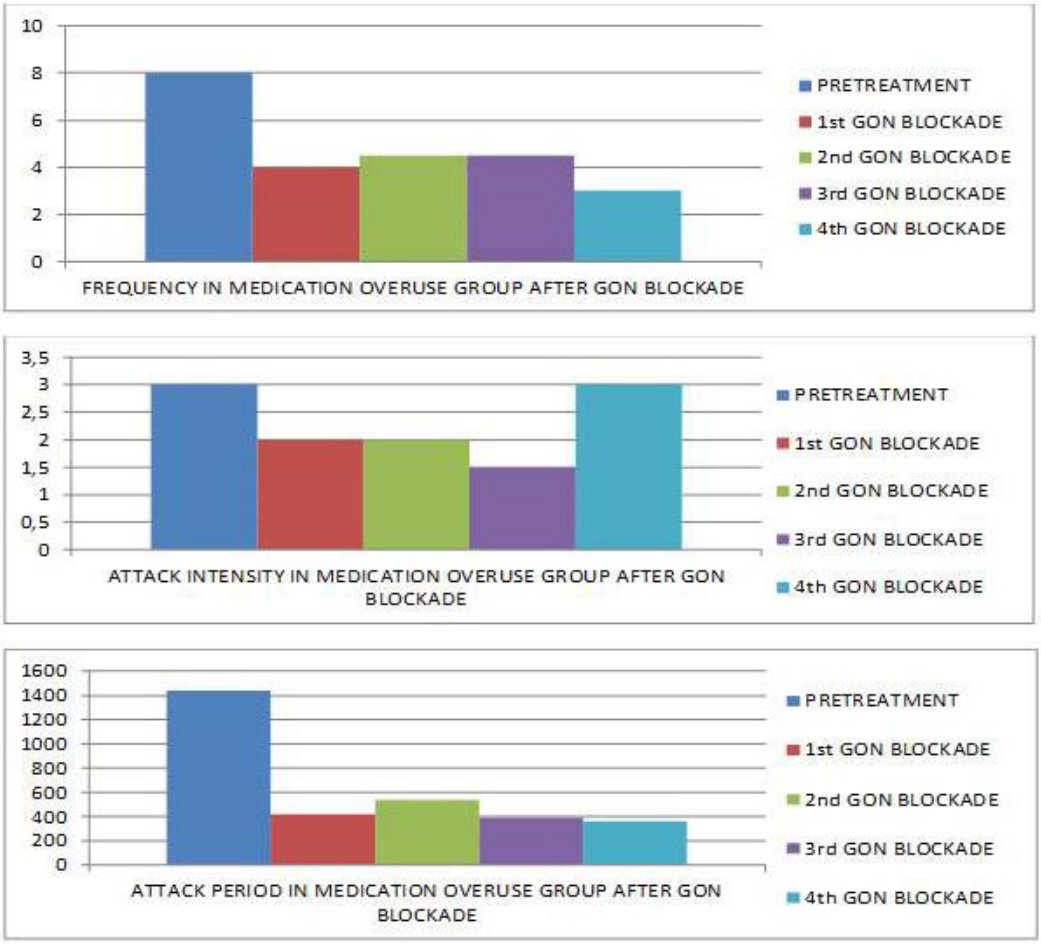


***Figure 3:*** *Table of the changes in the frequency, intensity and period of the attacks in the medication overuse headache patients at pretreatment stage and after repetitive GON blockades*

## DISCUSSION

Peripheral nerve blockades are most frequently performed to greater occipital nerve and branches thereof. Preferably local anesthetics are used[3] Although the number of the precise double blind study is low, many clinicians emphasize on the positive results of the peripheral nerve blockades[1,3,6,9,11,13,16].Because of the anatomic connection and functional relation of trigeminal nerve and occipital nerve, a connection was established with GON blockade even in the pains outside the GON dermatome; for example trigeminal dermatome region[8,14].

Gawel and Rothbart have evaluated the effect of GON blockade combined with lidocaine and methylprednisolone compound injection on 97 refractory migraine patients retrospectively and they informed that 54% of the migraine patients were significantly responding to the treatment and response continued approximately 6 months[13]. In the study of Bovim and Sand where they researched diagnostic value and effects of GON and supraorbital nerve blockades on cervicogenic, tension type and migraine headaches; 14 patients were received blockade combined with one time applied lidocaine and epinephrine compound. After GON blockade, decrease in pains at a rate of 6% in migraine, 14% in tension type headache and 55% in cervicogenic patients starts after five minutes from the blockade in most of the patients[9]. Ashkenazi and Young inform that after 20 minutes from

the administering the trigger point injection and GON blockade to 19 migraine patients, pains and cutaneous allodynia of 90% of them were improved[6].

In our study, after performing repetitive GON blockades combined with bupivacaine to the migraine patients; it was observed that pain intensity has decreased at a rate of 66.6%, period at 91.6% and frequency at 50% rates in first blockade comparing with the pretreatment stage and number of the median exact painless days were 2.5 (min:0, max:300). After the second blockade, it was observed that pain intensity has decreased at a rate of 66.6%, period at 95.83% and frequency at 62.5% rates comparing with the pretreatment stage and number of the median exact painless days were 7 (min:0, max:365). After the third blockade, it was observed that pain intensity has decreased at a rate of 0%, period at 72.22% and frequency at 87.5% rates comparing with the pretreatment stage and number of the median exact painless days were 12.5 (min:0, max:90).

Tobin and Flitman have analyzed the effects of GON blockade combined with bupivacaine and methylprednisolone in medication overuse headache. In total 108 injection were analyzed and 78% of the injections were resulted in headache relief,with a mean decrease in head pain of % 83 and a mean response duration of 6.6 weeks. Response rate changes according to the existence of medication overuse; if there is medication overuse rate changes to 56% and if there is no, rate changes to 84%. Medication overuse modulatory effect over the efficiency of GON blockade is different for various headache types[17].

In our study, after performing the first GON blockade combined with 0.5% 2cc bupivacaine to 17 medication overuse headache patients; it was observed that pain frequency has decreased at a rate of 50%, period at 70.83% and intensity at 33.3% rates comparing with the pretreatment stage and number of the exact painless days were 3 (min:0, max:20). After the second blockade, it was observed that pain frequency has decreased at a rate of 43.75%, period at 62.5% and intensity at 33.3% rates and number of the exact painless days were 5 (min:0, max:20). After the third blockade, it was observed that pain frequency has decreased at a rate of 43.75%, period at 72.91% and intensity at 50% rates and number of the exact painless days were 7 (min:0, max:90). It was observed that these effects continued on the patients who joined to the treatment after repetitive blockades as well.

In conclusion; GON blockade has been found beneficial in medication overuse headache as well and decrease in the period, frequency and intensity of the pain has been observed. Attention must be paid to the fact that the benefit of the patient from treatment is at the same rate in the first blockade and repetitive blockades. Which means that repetitive blockades are applicable not for the response to be increased but for the efficiency to be continued if necessary. Repetitive blockades can be helpful for headaches of the patients during transition treatment for symptomatic support treatment.

Peres et al informed that from 14 patients with cluster headache 64% of them have responded at well and moderate rates[16]. However, in spite of these findings, Busch et al observed mild recovery only in 9% of the 15 chronic cluster patients after GON blockade combined with prilocaine[10]. Afridi et al performed GON blockade combined with lidocaine and methylprednisolone compound injection retrospectively 22 times in total to 19 cluster headache patients. They observed full recovery in pain for average of 12 days in 10 (%53) patients and partial recovery in pain for average of 21 days in 3 (%16) patients[1]. In our study there were 7 autonomic cephalgia patients. As patient number was low at sub-groups; 2 patients with chronic cluster diagnosis, 1 patient with episodic paroxysmal hemicranias

diagnosis and 4 patients with chronic paroxysmal hemicranias have been evaluated under autonomic cephalgia joint title.

After performing the first GON blockade to patients; it was observed that pain frequency has decreased up to 95.55%, period up to 73.33% and intensity up to 33.3% comparing with the pretreatment stage and exact painless period up to 7 (min:0, max:30) days were proceeded. After the second blockade, it was observed that pain frequency has decreased up to 92.22%, period up to 93.33% and intensity up to 75% and exact painless period up to 3.5 (min:0, max:30) days were proceeded. After the third blockade, it was observed that pain frequency has decreased up to 86.66%, period up to 66.66% and intensity up to 50% and exact painless period up to 7 (min:0, max:30)days were proceeded. In autonomic cephalgia patients, while the decrease in frequency, period and intensity of the pain was significant after the first blockade, this fast decrease couldn't be seen in the repetitive second and third blockades. Although there was a mild increase, it couldn't reach pretreatment values and entered a steady plateau phase. But in every blockade, a raise in the number of painless days were observed.

In the GON blockade performed with lidocaine and depo-medrone to the patients with trigeminal neuralgia during a case report, partial recovery in the pain has been provided[19]. In our study, there were 4 trigeminal neuralgia patients and after performing the first GON blockade, it was observed that pain frequency of the patients has decreased up to 82.6%, intensity up to 12.5% and period up to 25% comparing with the pretreatment stage. After the second GON blockade, it was observed that pain frequency of the patients has decreased up to 53.84%, intensity up to 0% and period up to 0%. As it can see; although the decrease was significant in attack frequency at the first blockade, the decrease in attack intensity and period was not that significant and no benefit were gained on attack intensity and period in the second blockade. It is need to be indicated here that; we believe the evaluation of painful period and attack frequency in trigeminal neuralgia patients are not that objective because as the pain is triggered by too many environmental factors, patients might not define this properly.

Anthony performed blockade to 180 patients with cervicogenic headache by injecting depo-methylprednisolone to smaller and greater occipital nerve. 94% of the patients were stayed painless between 10 and 77 days; at an average of 23.5 days[2]. Vincent et al have determined significant decreases up to 1 week in headaches of 41 cervicogenic headache patients after GON blockade combined with bupivacaine comparing with pre-blockade week[18].

In our study, after performing the first GON blockade to 3 cervicogenic headache patients; it was observed that pain frequency has decreased at a rate of 0%, period at 88.8% and intensity at 66.66% rates comparing with the pretreatment stage and exact painless days up to 1.5 (min:1, max:2) were proceeded. While reducing the attack intensity and period in patients with cervicogenic headache diagnosis, GON blockade didn't affect the frequency. As the number of the patients who were treated with second blockade was low, no evaluation could be done.

When GON blockades examined in terms of adverse effects; total of 315 occipital nerve blockades were performed to 89 patients with occipital neuralgia and adverse effects were compared by performing blockades to the patients with 1%, 2% or 5% lidocaine and 20mg Depo-medrol. 69 patients were treated with blockade combined with 1%, 18 patients with 2% and 29 patients with 5% lidocaine compound. Adverse effects were observed in 8 patients (9%) and 5 of this were developed in 5% and 3 of it in %1

lidocaine compound. Most of the patients with adverse effect were woman (n=7, %87) and they were treated with bilateral blockade (%75). Injections administered with combining 1% lidocaine compounds were safe. In the performance of the blockades combined with 5% lidocaine compound to patients at age 70 and over, attention shall be paid.

Adverse effects such as hematoma and local pain may be observed around injection area. Alopecia and cutaneous atrophy have been less frequently observed around the GON region after corticosteroid injection. In a publication wheremethylprednisolone and triamcinolone were compared; cutaneous complications were observed only in one patient after the patient was treated with 806 GON blockades performed for several headache syndromes combined with 80mg methyl prednisolone and 2ml 2% lidocaine compound. However on the contrary, in another center where 100 GON blockades combined with triamcinolone and lidocaine were performed, cutaneous complications such as local alopecia and cutaneous atrophy or hyperpigmentation were observed more frequently in 4 cases.

In a series with 242 cases subject to local anesthetics, especially after prilocaine, benzocaine, lidocaine and tetracaine usage methemoglobinemia cases were informed. Again attention must be paid to the allergic reactions (type I and type IV sensitivity) connected with local anesthetics[12]. After usage of intravascular injection or overdosed local anesthetics by mistake, systemic toxicity findings might be observed. In cardiovascular system and central nerve system, symptoms may be observed starting from mild (for ex: dizziness, metallic taste, periorbital numbness, tinnitus and blurred vision) to serious (for ex: muscular fasciculation, convulsions, coma, cardiovascular or respiratory depression and arrest)[3].

In our study, total 212 GON blockade combined with bupivacaine were performed to 69 patients who had headaches connected with several etiologies. In 20.2% (n=43) of all the blockades there remained no attacks. In the 210 blockades of which adverse effects were examined; there was no adverse effect connected with blockade in 81.42% (n=171) of them. When observed adverse effects are listed; it has seen that the most frequent ones were local sensitivity and pain with rate of 9.4% (n=20) and severity of the pain with the rate of 9% (n=19). CONCLUSION Our aim was to examine the efficiency of the GON blockade in primary headache and medication overuse headache patients. GON blockade is an efficient method which can be used in treatment. In our study, effects and side effects of repetitive GON blockades performed to patients diagnosed with several headaches were evaluated. Also in the examination of the adverse effects of the GON blockade, severity in pain or mild adverse effects such as local sensitivity and pain were observed. However it was observed that these adverse effects were reduced during repetitive blockades.

As it has been observed that with the GON blockades performed in headache treatment the Intensity, period and frequency of the pain were significantly reduced after first blockade and ranged stable in repetitive blockades; this gives rise to thought that the pain could be connected with the modulation in upper centers. By performing GON blockade in headache treatment; patients can have significant symptomatic reliefs with first GON blockade. And repetitive blockades can be used in order to provide continuance in the effect or to provide pain relief until the effect of other preventive treatments will start. In order to support the idea that it can be used supportive to the preventive treatment or alone; more comprehensive, randomized, double-blind and placebo-controlled studies are needed.

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