Could a Simple Nerve Block be Considered as a Treatment Option for Occipital Neuralgia with Both Short-Term and Long-Term Effects?

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Objective: The study aims to show both the short- and long-term treatment outcome of occipital nerve block (ONB) patients with occipital neuralgia (ON).

Methods: Patients who visited our hospital between 2013 and 2020 were reviewed retrospectively. Patients were excluded if the medical records were incomplete, if they had received a cervical operation, if they had a traumatic event prior to the symptom onset, or if the follow-up period was less than 3 months. ONB targeted the greater occipital nerve, the lesser occipital nerve or both. Short term follow-up period was defined as 3 months and long term was defined as 12 months. Injection consisted of a mixture of triamcinolone acetonide, lidocaine, and normal saline. Visual analogue scale (VAS) was recorded and compared before and during the follow-up to period to assess treatment outcome.

Results: Clinical charts of 309 candidates were reviewed and 72 patients were excluded, making it 237 patients. VAS scores significantly decreased in both 3-month follow-up (from 7.20 ± 0.94 to 3.48 ± 1.66 , $p < 0.05$) and after 1 year follow-up (from 7.20 ± 0.94 to 2.71 ± 1.07 , $p < 0.05$). Only 8 patients (3.3%) were refractory to ONB and the procedure was found to be relatively safe since only 2 patients (0.8%) showed transient side effects.

Conclusion: There are many treatment options for ON. However, from the results of our study, conservative treatment via ONB may have sufficient effect in controlling symptoms of ON in both short and long term.

Key Words: Headache; Nerve block; Neuralgia

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INTRODUCTION

Occipital neuralgia (ON) is a common neuropathy that is usually described as ascending pain or discomfort of the occipital area of the head. The International Classification of Headache Disorders, third edition (ICHD-3) describes ON as a unilateral or bilateral paroxysmal, shooting or stabbing pain in the posterior part of the scalp, in the distribution(s) of the greater, lesser and/or third occipital nerves (TONs). The pain can also show diminished sensation or dysesthesia which is usually related to tenderness of the involved nerve^{3,8}.

Although the description of the disease appears simple and straightforward, it is still very much poorly understood and the treatment options are controversial. The main cause of ON is thought to be irritation of the occipital nerves either by a muscular, vascular or neurologic problem²⁰. However, patients' symptoms are miscellaneous and are not distinctive, leading to misdiagnosis. Therefore, differential diagnosis with other diseases such as infection, tumor, congenital anomalies, cervicogenic headache or other types of headaches is crucial^{12,19,20}.

Treatment options for ON are very broad and are still under

debate. The most common initial approach to this disease is pain medication, physiotherapy and a simple occipital nerve block (ONB). ONB is a straightforward method that can be carried out bluntly without the assistance of imaging tools due to the lucid anatomical landmarks of occipital nerves. Other methods such as nerve ablation, open surgery, and nerve stimulation are all viable treatment options. However, none of them seems to fully satisfy the patient for pain reduction²⁰.

To the author's knowledge, there is only one study regarding treatment outcome of ONBs for ON using corticosteroids and there aren't any studies that look into long-term outcomes of ONB¹⁰. Some studies have shown that the simple nerve block method has only short-term effects (less than 2 month) making it a treatment option just for a bridging method for a more invasive measure since ON has a chronic aspect^{12,15,19,20}. However, since there is no clear answer to the cure of ON, if symptoms can be controlled for a long and lasting time, the authors believe that more studies need to be carried out regarding non-surgical treatment methods. Therefore, the aim of this study was to find out if ONB could be a viable option for pain control for patients with ON in both the short- and long-term.

MATERIALS AND METHODS

A retrospective analysis of patients, who were admitted to our hospital for ON and received at least one ONB from the year 2013 to 2020, was carried out. The study followed the diagnostic criteria of ICHD-3 for ON. All patients received ONB either unilateral or bilateral greater occipital nerve (GON), lesser occipital nerve (LON), or both. The short-term results were reviewed at 3rd month follow-up and long-term results were studied after 12th month follow-up.

ONB was carried out at the outpatient department of our hospital, by one experienced physician who has had nerve block experience for over 12 years. It was done in a free-handed technique with no assisting imaging tools such as a C-arm, ultrasonography or computed tomography (CT).

The entry point of the injection was focused mainly on the path of the GON and LON. Injection for GON was carried out 2.0 cm below the external occipital protuberance and about 2.5 cm laterally from the midline. As for the LON the procedure was carried out 2.5 cm below the external occipital protuberance and about 5 cm laterally from the midline (Fig. 1).

Injection fluid (total volume, 8 cc) consisted of 4.5 cc normal saline, 3 cc lidocaine 2%, and 0.5 cc triamcinolone acetate (20 mg/cc). If patients had diabetes, the dose of triamcinolone acetate dose was halved. Injection for each site was 2 cc. A 26-gauge spinal needle was used due to its long length which enabled our physician to insert the drug more evenly along the nerve's pathway. The drug of 1 cc was injected first on the initial puncture site. The rest of the fluid was then inoculated in a more distal portion along the nerve's path.

Visual analogue scale (VAS) was recorded to assess treatment outcome. Its scores were documented prior to the procedure, the 2nd week, the 3rd month, the 6th month, and the 12th month after

Fig. 1. The figure depicts the targets for occipital nerve block. Target A is for greater occipital nerve which is 2 cm below and 2.5 cm lateral of external occipital protuberance (EOP). Target B is for lesser occipital nerve which is approximately 2.5 cm lateral from target A.

the procedure. Each score was compared to the initial score before ONB treatment started. If follow-up loss occurred, the VAS score of the last follow-up was recorded and compared with the initial VAS score. Some patients received more than one ONB, nevertheless, the authors compared the VAS with the initial scores. The follow-up periods in these patients were counted from the first nerve block as well, without considering the extra number of ONB.

Patients received a combination of routine medication consisting of GABAergic drugs, non-steroidal anti-inflammatory drugs, and muscle relaxants during the follow-up period. The treatment was regarded as satisfactory when the VAS was reduced at least 50% and the patient confirmed and stopped requesting more medication.

1. Statistical Analysis

The data collected were analyzed with IBM SPSS statistics version 23 (SPSS Inc., Chicago, IL, USA) for windows. Paired *t*-test was used to investigate if the difference in VAS between before ONB and after ONB during the follow-up period was statistically significant. The analytic results were considered significant if the *p*-value was less than 0.05.

RESULTS

A total of 309 cases of ON receiving ONB were reviewed. Of the candidates, 72 patients were excluded from this study due to follow-up loss (26 patients), cervical trauma (16 patients), cervical operation (11 patients), or incomplete medical records (19 patients). Thus, the final number of candidates included in this study was 237. Their mean age was 53 (standard deviation [SD], 13.6) years. There were 113 males and 124 females. The mean follow-up period was 247 (SD, 172.4) days. Co-morbidities including diabetes (9.7%), hypertension (23.2%), smoking (16.0%), alcohol (25.7%) and combined degenerative cervical disease (45.1%) were considered during the analysis of collected data.

The location where the ONB was carried out was GON, LON, or both. Of 237 patients, 65 (27.4%) received ONB at the GON, 37 (15.6%) required ONB at the LON, and 135 (57.0%) received ONB on both GON and LON. A total of 133 (56.1%) patients received ONB unilaterally and 104 (43.9%) received bilateral ONB. The procedure seemed fairly safe since only 2 (0.8%) patients showed transient side effects such as dizziness or nausea.

The initial mean VAS score (7.20 ± 0.94) before ONB was compared with each of the mean scores during follow-up periods after ONB; 2nd week (2.90 ± 1.54), 3rd month (3.48 ± 1.66), 6th month (3.06 ± 1.55), and 1 year (2.71 ± 1.07). Statistical analysis revealed that ONB was effective in decreasing pain scores to a satisfactory level compared to the initial VAS ($p < 0.00001$; Table 1).

DISCUSSION

Neuralgia is defined as discomfort or pain caused by the irritation of one or more peripheral nerves^{3,20}. The concept of neuralgia

along with ON was first introduced by Beruto and Ramos in 1821^{3,6,9,12,20}. ON is also known as Arnold's neuralgia, C2 neuralgia, or occipital neuritis^{3,9,12}. In recent studies, it is standardized as ON and the diagnostic criterion have been introduced by ICHD-3⁸.

Symptoms regarding ON overlap with other types of headaches, making it difficult to diagnose for physicians. Differential diagnosis is very important since each disease entity has a different treatment approach. Physicians usually confuse ON with cervicogenic headache since they have many similar symptoms^{1,2,8} (Table 2). One of the key differences between ON and cervicogenic headaches is that the range of motion of the neck for the latter is limited due to aggravation of pain caused by neck movement. In addition, the pain lasts much longer in ON when it occurs. Although the initial treatment can be the same for both diseases, the outcome may differ completely since cervicogenic headaches are usually due to an anatomic problem of the cervical spine^{1,2,8}.

ON may seem to be straight forward, however, it is very difficult and confusing to treat, since this disease can have numerous different causes (Table 3). Nevertheless, two main nerves involved in ON are GON and LON. GON is more commonly involved (90%) than LON (10%)²⁰. Thus, understanding the anatomy of the involved nerve(s) is important for making a precise diagnosis and performing a targeted treatment plan.

Occipital nerves have three main components: GON, LON, and TON. The origin of the GON is the medial branch of the dorsal ramus of C2. It usually transverses the inferior oblique muscle. It may pierce through the semispinalis capitis muscle or the trapezius aponeurosis. Either way, the main function of the nerve is to provide cutaneous innervation to the posterior scalp. The LON originates from the ventral ramus of C2 and C3. The nerve usually runs parallel to the posterior aspect of sternocleidomastoid muscle and pierces

the deep fascia at the occiput (Fig. 2). The dorsal ramus of C3 is where TON originates. It provides innervation to the lower part of the occipital scalp and the upper cervical region. However, it is rare for the TON to be involved in ON^{3,6,12,13,15,19,20}.

Of a total of 237 patients, most (84.3%, n=200) patients recovered from their pain and discomfort with a single ONB. However, several patients needed more ONB to relieve their pain. The 37 patients (15.6%) needed another ONB within two weeks. Of these 37 patients, 11 received one more nerve block (29.7%) within 6 months of follow-up. Eventually, 8 patients showed refractory results to blocks after one year of follow-up. They had received 4 to 6 nerve blocks.

Results of this study revealed that ONB could be used to control discomfort and pain in most ON patients. However, in some patients this was not the case, even with numerous ONB and medication. This could be due to the following reasons. First, the procedure might have lacked precision since it was carried out in a free-handed technique relying only on anatomic landmarks. Second, ON might have been misdiagnosed due to its overlapping symptoms with other types of headaches and diseases. There have been case reports regarding refractory headaches to medication and nerve blocks being solved after an anterior cervical discectomy and fusion¹⁶. Third, even though the procedure was successful, the irritated or entrapped nerve might have had irreversible injuries. In cases like this a more invasive procedure such as open surgery^{5,9}, nerve stimulation^{3,6,18,20}, nerve ablation^{3,20,21} or pulsed radiofrequency method^{3,4,6,7} could be an option.

ON has been well described for many years. However, there is still no unanimity for its treatment methods. Management of ON patients can differ from patient to patient. Even with an invasive pro-

Table 1. Difference of VAS between initial and after treatment

	VAS average	Paired <i>t</i> -test
Initial VAS	7.20±0.94	
2 weeks after Tx (237 pts)	2.90±1.54	
3 months after Tx (237 pts)	3.48±1.66	p<0.00001
6 months after Tx (114 pts)	3.06±1.55	
1 year after Tx (72 pts)	2.71±1.07	

95% confidence interval.

VAS: visual analogue scale; Tx: treatment; pts: patients.

Table 2. Differential diagnosis of occipital neuralgia

	Occipital neuralgia	Cervicogenic headache
Laterality	Unilateral, bilateral	Unilateral, no side shift
Severity	Moderate to severe	Moderate to severe
Location	Occipital area of head	Posterior neck, occipital head, fronto-parietal head, retro-orbital
Duration	Few sec-min	1 hr-weeks
Frequency	Chronic	Chronic
Associated symptoms	Pain running up neck to occipital area	Similar but milder
Triggering factors	Muscular, vascular, neurogenic	Neck movement, pressure on neck

Fig. 2. Key anatomy of the occipital nerve and its surroundings showing both the muscular structures and the distribution of greater, lesser and third occipital nerves.

Table 3. Possible causes of occipital nerve irritation

Category	Cause of nerve irritation
Vascular	Irritation of the C1/2 nerve roots by an aberrant branch of the PICA
	Dural AVF
	Bleeding from bulbo-cervical cavernomas
	Giant cell arteritis
	Fenestrated vertebral artery pressing on C1/C2 nerve roots
Neurogenic	Aberrant course of the vertebral artery
	Schwannoma in the area of the craniocervical junction
	C2 myelitis
Osteogenic	Multiple sclerosis
	C1/C2 arthrosis atlantodental sclerosis
	Hypermobility C1 posterior arch
	Cervical osteochondroma
	Osteolytic lesion of the cranium
	Exuberant callus formation after C1/C2 fracture

PICA: posterior inferior cerebellar artery; AVF: arteriovenous fistula. [Reprinted from "Neuralgias of the head: Occipital neuralgia", by Choi I, Jeon SR, 2016, J Korean Med Sci, 31, pp.479-88. Copyright 2016 by the Korean Academy of Medical Sciences. Reprinted with permission].

cedure, symptoms might not improve at all. From results acquired in this study, ONB not only seems to have an immediate effect, but also has a relatively lasting and satisfactory outcome in most patients. Also, the procedure itself seems relatively safe. Injection of corticosteroid and lidocaine has been found to be safe as well^{6,10,14,15}.

Recent studies recommend ultrasonography or CT guidance for a more accurate procedure^{11,13,17,21}. However, considering the extra time needed for the preparation of the procedure and extra expense required if such means are used, the efficacy and simplicity of the treatment seem to be neglected. Also, considering the medical environment of an outpatient department in South Korea, a simple ONB is very efficient considering the time and cost. Although our study did not compare treatment results between groups who used imaging modalities and groups who did not use them, results from our study already show statistically significant and satisfactory outcomes. The goal of the nerve block is to reduce inflammatory effects by injecting a reasonable amount of steroid and lidocaine around the compromised nerve. Thus, if physicians know the general anatomic course of the affected nerve, a simple injection will usually suffice. Also, there are no anatomically critical aspects to consider around the occipital nerve, which explains why a simple procedure can have satisfactory results. Nevertheless, future studies should be carried out to prove a difference in the treatment outcomes between patients who received ONB with or without imaging modalities.

The main limitation of our study was that it was carried out retrospectively making it impossible to randomize, control or double-blind patient selection. In addition, evaluation means for treatment outcome could only be carried out with VAS, which is a rather subjective

scale relying solely on the patient's response.

Also, ONB was applied simultaneously with the use of pain controlling medications. Even if patients' symptoms were relieved and sustained, this study has limitations in proving if the pain reduction was due to solely from ONB, medication or from both.

One aspect that our study failed to do was to unify the number of frequencies of ONB. During the follow-up period, numerous patients received ONB more than once if symptoms recurred even after the first injection. The authors believed that the treatment approach of ON is pain management rather than cure, since ON has a high potential to turn chronic. Thus, the number of injections was considered not a major factor in seeing its effects in both the short or long term. Nevertheless, in order for a more accurate result, the unification of the frequencies of ONB is probably necessary.

CONCLUSION

Although there are many reasons for ON, a simple nerve block can be administered with a relatively successful result for pain reduction. Also, since the procedure itself is relatively safe and quite easy to carry out, physicians should not be reluctant to use it as a means for controlling pain in the short and long term.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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