ORIGINAL RESEARCH

The Use of Occipital Nerve Blocks & Trigger Point Injections in Headaches with Occipital Tenderness

Samuel Madore, DO,[1] Mitchell K. Ross, MD,[2] & Amber Hayden, DO[3]

[1]Maine-Dartmouth Family Medicine Residency, August, Maine
[2]Central Maine Medical Center, Auburn, Maine
[3]New Hanover Regional Medical Center, Wilmington, North Carolina

Keywords:
Occipital Nerve Block
Trigger Point Injection
Occipital Neuralgia
Migraine
Neurology
Procedural Medicine

Introduction: Occipital nerve blocks and trigger point injections are often used to treat headaches of various etiologies. The extent and duration of benefit from these injections reported in the literature varies widely. In one community neurology clinic, patients who receive these therapies often report reduced pain and improved quality of life lasting two to three months after treatment.

Methods: A retrospective chart review of patients who received occipital nerve blocks in a single neurologists office during the dates of January to July 2014 was performed.

Results: Seventy-one patients were treated in the study. Eighteen were treated with occipital nerve blocks alone while fifty-three received nerve blocks and trigger point injections. Overall, both groups had a median length of benefit of 8 weeks and 91% of patients received benefit. The group who received occipital nerve blocks with trigger points injections had an average increase in benefit of less than one week compared to nerve block only.

Conclusions: The effectiveness and low side effect profile of occipital nerve blocks make it a useful therapy in patients with difficult to control headaches. In this study, the addition of trigger point injections did not lead to a significant increase in length of benefit over occipital nerve blocks alone. The inclusion criteria of occipital tenderness may be responsible for the higher response rate of these nerve blocks compared to prior studies.

INTRODUCTION

Despite the many advances in pharmacotherapy and our understanding of the biologic mechanisms involved, headaches (HA) still remain a difficult condition to treat in many. Patients desire treatments that offer near complete pain relief with minimal side effects, however current medications on the market do not offer that for many patients. When pharmacotherapy and lifestyle changes fail, physicians have turned to needle based therapies. Occipital nerve blocks (ONB) and trigger point injections (TPI) are examples of these therapies and have been shown to provide significant relief to patients suffering from difficult to treat headaches.[1,2]

RELEVANT ANATOMY

The nerves implicated in occipital neuralgia and often the occipital tenderness of migraines are the greater, lesser, and rarely the third occipital nerve. The greater occipital nerves (GON) receive sensory input from a large part of the posterior scalp bilaterally and innervates the semispinalis capitis. This nerve originates from the dorsal rami of C2, travels superiorly towards the occiput while passing through the belly of the semispinalis capitis muscle and becomes subcutaneous after passing through the aponeurosis of the trapezius *(Image 1)*. Multiple anomalies of the nerves course have been noted. A cadaveric study found that in 16.7% of subjects the GON passed through the trapezius muscle and in 6.7% of subjects it pierced the inferior oblique muscle.[3] Clearly, there are multiple areas within the course of the GON and its cited variations that leave it vulnerable to irritation, compression, and entrapment resulting in head pain.

The lesser occipital nerve (LON) originates from C2 -3 and innervates the skin of the posterior auricular and lateral neck regions. It ascends the scalp subcutaneously after wrapping around the posterior border of the sternocleidomastoid muscles. A cadaveric study has demonstrated that the LON actually pierces the sternocleidomastoid, instead of wrapping underneath, in 13% of cadavers.[4] This variation potentially leaves the nerve susceptible to irritation from spasm or overloading of the muscle that can occur in a forward head posture.[5]

The third occipital nerve arises off the C3 and provides sensory innervation of the posterior neck and scalp. It is not commonly treated with nerve blocks for headaches.[4]

CORRESPONDENCE:
Samuel Madore, DO | samadore@mainegeneral.org

RELEVANT RESEARCH

On review of the literature, there is little data demonstrating the long-term effects of ONB on occipital neuralgia. One study of ten people who received ONB containing bupivacaine and steroids for occipital neuralgia showed 40% received complete HA relief for one week or less, 40% for two to four weeks and 20% for ten to sixteen weeks.[6]

Another study involved five hundred patients with idiopathic headaches, of which 48% of these headaches were reportedly due to irritation of the GON. Two groups of patients, those with migraines and those with occipital neuralgia, received lidocaine and methylprednisolone injections into the GON region. Both groups showed similar results; roughly 88% of patients in each group became headache free for a mean of 32 days.[7]

In migraines, ONB has shown varying results as both an abortive and prophylactic treatment. Studies vary in their selection criteria, doses and types of injected solutions, and endpoints. The percentage of migraine sufferers who receive benefit ranges, in most studies, between 45%-85%.[1,8] While there is a wide range in the percentage of patients that receive benefit as well as the length of such benefit, the research shows the ONB is effective in reducing pain in the majority of migraine suffers. One study involved patients with migraines who were having 15 headache days per month that were relatively treatment refractory. These patients received injections containing local anesthetic and methylprednisolone to the greater occipital nerve on the affected side. Of the fifty-four patients, twenty-six (48%) received complete or partial relief lasting a mean of nine and sixty one days, respectively. The authors found that tenderness of the GON was significantly associated with a positive response and that this may be useful in selecting out which patients are more likely to benefit.[9]

ONB can be a diagnostic tool to determine if the patient has occipital neuralgia and is often used to treat migraine and other types of headaches.[1,10] Cervicogenic, cluster, post concussive, hemicrania continua, and migraine headaches have been shown to improve with ONB while tension-type headaches and medication rebound headaches do not have sufficient evidence to support its widespread use.[1,11,12,13] The author often uses ONB to treat patients who suffer from migraine if they have occipital tenderness and standard treatments have failed. Occipital tenderness is a common symptom among many forms of headaches. Migraines and occipital neuralgia can cause patients to have pain in the neck, shoulders, occiput, and retro-orbitally in addition to nausea, vision impairment and dizziness. It has been suggested that irritated occipital nerves could be a trigger for migraines due to the convergence of C2 nerves and the trigeminal system.[14] While there is little data on the prevalence of occipital neuralgia, it is suggested by some researchers that there is considerable overlap between it and the diagnosis of migraine.[14]

In addition to anesthetizing the occipital nerves, injecting and deactivating trigger points (TrP) is a useful technique. TrP are focal, hypertonic areas of skeletal muscle that are tender to palpation and can cause radiation of pain to distant sites or have a twitch when grasped. They have been shown in multiple studies to be increased in numbers or severity in patients with migraines and tension type headaches.[2,15] A study showed that 93% of patients

IMAGE 1:

This dissection shows the lesser and greater occipital nerves passing through myofascial structures.

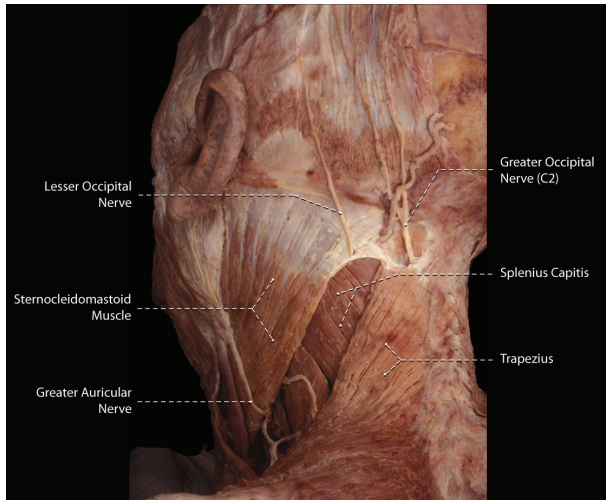

Photo courtesy of Dr. Frank Willard PhD.

with migraines had cervical or cephalic trigger points compared to 29% of headache free controls. Palpation of those points actually caused a migraine in 30% of patients.[16]

Treatment of those points using anesthetic injection has been shown to reduce the frequency and severity of multiple headache types.[9,17] When a Trp is palpated, often times the patient will feel pain or an odd sensation in some of the areas that they feel their headaches. Common Trp in headache syndromes are found in the trapezius, temporalis, sternocleidomastoid, semispinalis cervicis, and splenius cervicis muscles.[9,15]

In a community neurology clinic that often sees patients in consultation for headaches, both treatments are commonly used if the patient still has a significantly reduced quality of life after medication trials. Patients who receive these injections often claim they wish they had been offered the procedure long ago. The purpose of this study was to determine the percentage of patients who received benefit, categorize the length of this benefit, and to evaluate if the addition of trigger point injections led to improved responses.

METHODS

A retrospective chart review studied patients who received occipital nerve blocks and trigger point injections from the date of January 2014 to July 2014 in a single community neurology office. Inclusion criteria for this study included being diagnosed with occipital neuralgia or migraine by the examining neurologist, tenderness of the occipital region on exam, and ONB performed during that visit. Exclusion criteria were incomplete follow up note or lack of follow up within 3 months after the procedure. Outcomes were measured at follow up visits or by phone. Timing of initial follow up varied among patients but was between 8 and 12 weeks after the procedures. If patients had continued benefit on the first follow up, their data was recorded for a total of 6 months post procedure

if seen again in the clinic. On each follow up, patients were asked about any side effects from the procedures and asked to give a percentage value of the reduction in severity and frequency of headaches compared to pre-treatment.

The authors defined benefit as patient reported reduction in frequency or severity of headaches by at least 50%. Fifty-nine of the procedures were performed by a single neurologist and the remaining by two medical students under the direct supervision of this neurologist. Prior to these therapies, patients had already undergone medication trials and lifestyle modifications and were not asked to make any additional changes during the time of the study. Data was analyzed by determining the median and mean length of benefit.

THE PROCEDURES

Patients were placed in a seated position with the clinician standing behind them and landmarks were palpated. The injection of the GON occurs 1/3 the way along a diagonal line from the occipital protuberance towards the mastoid process. The injection site for the lesser occipital nerve block is 2/3 the way towards the mastoid process on the same line. The injected solution is 4ml of 0.5% bupivacaine plus 80mg of methylprednisolone suspension and 0.5-.75 cc of this is injected into each landmark using a 30 gauge needle. All patients received greater occipital nerve blocks bilaterally and received lesser occipital nerve blocks if tender over the corresponding area. No patients received blockade of the third occipital nerve.

The clinician then examined for trigger points in the upper trapezius and cervical musculature bilaterally and injected them with .5-.75 cc of the remaining solution. The number of trigger points injected was not recorded. Detailed information on trigger points and their treatment have been published.[18]

RESULTS

Overall, patients in both groups experienced a median benefit of 8 weeks and 91% of all subjects obtained benefit *(see Table 1)*.

Of the ONB/TPI group, forty-eight of fifty-three patients (90.5%) received benefit with a mean of 9.1 weeks. Of the ONB only group, seventeen of eighteen patients (94%) received benefit with a mean of 8.6 weeks.

Thirteen patients who arrived to the clinic with a headache claimed resolution of it prior to leaving office. From this retrospective chart review it is not known truly how many had headache on arrival.

DISCUSSION

The benefits obtained in this study for patients with migraine headaches or occipital neuralgia appears to be greater than some studies have reported.[1,19] Patients who receive these injections claim to have an overall improvement in quality of life as well as require less abortive medicines and ER visits. Some patients say this is the first time they have had a headache free week in years. One forty-two year old female left the clinic almost headache free after she reported fifty-three straight days of head pain.

TABLE 1:

80% of patients were female with an average age of forty-seven. All patients were Caucasian and lived in central Maine.

Week Benefit	Patients Who Received ONB	Patients Who Received ONB + TPI
0 Weeks	1pt (5.5%)	5 pts (9.4%)
<4 weeks	1 pt (5.5%	8 pts(15%)
4-12 weeks	15 pts (83%	34 pts (64%)
13-24 weeks	1 pt (5.5%)	6 pts (11%)
Median benefit	8 weeks	8 weeks
Mean benefit	8.6 weeks	9.1 weeks
Abbreviations	ONB-occipital nerve block	TPI- trigger point injection

Occipital nerve blocks and trigger point injections deserve a spot in the armamentarium of the clinician to treat headaches. The benefit of the procedures in this study are the ease of administration, low rate of adverse events, low cost and high availability of the materials. Each patient with a headache should be evaluated for occipital tenderness and cervical/upper thoracic trigger points. If occipital tenderness is present, ONB could be offered to patients. Other therapies for occipital neuralgia and migraine include pharmacotherapy, Botox injections, nerve stimulators, and lifestyle modifications. If ONB is used as a diagnostic tool for occipital neuralgia, an alternative diagnosis should be sought for if there is successful anesthetization of the GON, as evidenced by decreased sensation of its sensory distribution, yet the patients' headache is not improved.

If trigger points are found on exam, it is paramount that they be considered in the treatment of the patient. In addition to injection therapy for trigger points, treatment should include educating the patient on stretching and proper posture. Osteopathic manipulation should be considered to address the patient with musculoskeletal complaints and headaches or with trigger points felt to be contributing to their headaches.[20]

Studies have shown that one of the main problems in chronic headaches is central sensitization due to prolonged afferent signals from myofascial tissues.[16,21,22,23] A model of headache pain suggests that trigger points located in muscles innervated by cervical roots 1-3 or by trigeminal nerves are responsible for potentially excessive afferent input into the trigeminal system which may lead to central sensitization.[15,24]

By reducing the sum total of noxious afferent stimuli coming from the myofascial system innervated by cervical nerves, TPI can be used to desensitize or at least help prevent further sensitization of pain receptors and the CNS.

In addition, the ONB functions to reduce noxious afferent input into the central nervous system. An inflamed or injured occipital nerve will bombard the spinal cord and CNS with afferent stimuli,

which can cause occipital neuralgia symptoms. Those same stimuli could also influence sensitization or pain referral patterns of the trigeminocervical complex, often associated with migraines.[25]

The contraindications for the use of ONB are few, but include skull surgery compromising the occiput, Arnold Chiari Malformation, skull deformity and allergies to local anesthetic. The adverse effects of ONB have been minimal in the author's clinical experience. Some patients have reported head soreness that resolves spontaneously 1 hour to 3 days after the procedure. The author no longer uses powdered steroids in the solution after a patient, prior to this study, developed prolonged occipital muscle ache that was thought to be due to precipitated steroid crystals. Adverse events recorded in this study consisted of two patients, both with a prior history of pre-syncope, who developed vasovagal type dizziness that resolved within two minutes after lying supine.

If a patient is experiencing a headache at the time of the injection, the patient may describe a "head-rush" sensation in which they feel a coolness or warmth wash over their skull with some associated lightheadedness, which consistently resolves in a minute or two. As with the use of all local anesthetic injections, there is a risk of arrhythmias with intra-arterial compromise, but with appropriate draw-back technique this risk is minimized. One study noted a case of iatrogenic Cushing syndrome after the administration of 480mg triamcinolone via six bilateral GONB over a period of three months.[26] Currently, the author performs these procedures no more frequently than every three months.

Limitations of this study include the inclusion of two types of headaches, a small number of patients, and the retrospective chart review of patient reported benefit is likely to cause some degree of recall bias.

Future areas of research should attempt to elucidate the best anesthetic solution and if it should contain steroids. To date there is no evidence that including steroids increases the ONB effectiveness.[27] In addition, the inclusion of placebo controls in future studies would help further validate this therapy.

In this study, patients who received less then one week of benefit seemed to have more mixed headache types and were more likely to have been using more abortive medications prior to injection.

A prospective study at the authors' clinic is planned that may better characterize the therapeutic response of these procedures, quantify the reduction in headache medication use, and determine if repeated injections changes the nature of the patients headaches.

CONCLUSIONS

In this retrospective chart review of seventy-one patients who were treated for migraines or occipital neuralgia and found to have occipital tenderness on exam, 91% of patients received benefit with a mean length of 9 weeks using occipital nerve blocks. The median benefit obtained was 8 weeks for both groups. Those who received trigger point injections, in addition to nerve blocks, had an average increased length of benefit of less than one week compared to ONB alone and it is not felt to be significant.

The response rate of 91% is higher than some other studies have reported for migraines and occipital neuralgia.[1,9] It is likely higher in this study due to the inclusion requirement of occipital tenderness.

The patients in this study had all been referred to a neurologist for difficult to treat headaches and many suffered for years before finding any treatment that provided significant benefit without bothersome side effects.

Given how effective occipital nerve blocks appear to be for some headaches with occipital tenderness, further studies are warranted to confirm this retrospective chart review. Both ONB and TPI should be consistently included in the training of physicians who treat headaches. They are easy and safe to perform office procedures that can significantly reduce headache frequency and severity in the majority of patients who experience treatment refractory migraines and occipital neuralgia.

ACKNOWLEDGEMENTS

Frank Willard PhD, of The University of New England College of Osteopathic Medicine, for the use of anatomical dissection of the occipital nerves in Image 1.

CONFLICT OF INTEREST STATEMENT

The Authors declares that there are no conflict of interest.

IRB approval: Approval given by Central Maine Medical Center.

REFERENCES:

1. Tobin J, Flitman S. Occipital nerve blocks: when and what to inject? Headache. 2009; 49(10): 1521-1533
2. Giamberardino MA, Tafuri E, Savini A, et al. Contribution of myofascial trigger points to migraine symptoms. J Pain. 2007; 8(11): 869-878
3. Tubbs RS, Watanabe K, Loukas M, et al. The Intramuscular course of the Greater Occipital Nerve : Novel Findings with Potential Implications for Operative Interventions and Occipital Neuralgia. Surg Neurol Int 2014;5:155
4. Dash KS, Janis JE, & Guyuron B. (2005). The lesser and third occipital nerves and migraine headaches. Plastic and reconstructive surgery, 115(6), 1752-1758
5. Simons DG, Travell JG, Simons LS. Travel and Simons' Myofascial pain and dysfunction: The Trigger Point Manual, ed 2, pg. 262, Baltimore, 1999, Williams and Wilkins.
6. Kuhn WF, Kuhn SC, Gilberstadt H. Occipital neuralgias: clinical recognition of a complicated headache. A case series and literature review. J Orofac Pain 1997; 11:158-165
7. Anthony M. Headache and the greater occipital nerve. Clin Neurol Neurosurg. 1992; 94 (4):297-301
8. Ashkenazi A, Young W. The effects of greater occipital nerve block and trigger point injection on brush allodynia and pain in migraine. Headache. 2005; 45(4);350-354
9. Afridi SK, Shields KG, Bhola R, et al. Greater occipital nerve injections in primary headache syndromes- Prolonged effects from a single injection. Headache 2006; 122:126-129
10. Dougherty C. Occipital Neuralgia. Curr Pain Headache Rep. 2014; 18: 411
11. Scattoni L, Di Stani F, Villani V, et al. Great occipital nerve blockade for cluster headache in the emergency department: case report. J Headache Pain. 2006; 7:98-100
12. Hecht J. Occipital Nerve Blocks in Postconcussive Headaches: a retrospective review and report of ten patients. J Head Trauma Rehabil. 2004; 19: 58-71
13. Leinisch-Dahlke E, Jurgens T, Bogdahn U, et al. Greater occipital nerve block is ineffective in chronic tension type headache. Cephalgia. 2005; 25: 704-708

14. Soma-Srivastava S, Zheng L. Occipital Neuralgia with and without Migraine: Difference in Pain Characteristics and Risk Factors Headache 2011 July ;51:124-128
15. Fernández‐de‐las‐Peñas C , Cuadrado ML, Pareja JA . Myofascial trigger points, neck mobility and forward head posture in unilateral migraine. Cephalalgia. 2006; 26 (9): 1061-1070
16. Calandre EP, Hidalgo J, Garcia-Leiva JM. Trigger point evaluation in migraine patients: an indication of peripheral sensitization linked to migraine predisposition? E J Neurology. 2006 ; 13(3): 244-9
17. Calandre E, Hidalgo J, Garcia-Leiva J, et al. Myofascial trigger points in cluster headache patients: a case series. Head Face Med. 2008;4: 32
18. Alvarez DJ, Rockwell PG. Trigger Points: Diagnosis and Management. Am Fam Physician. 2002;65(4): 653-661
19. Ashkenazi A, Levin M. Greater occipital nerve block or migraine and other headaches: Is it useful? Ashkenazi A, Levin M. Curr Pain Headache Rep. 2007; 11(3): 231-5
20. Keays A, Neher J, Safrenek S. Is osteopathic manipulation effective for headaches? The Journal of Family Practice 2008; 57(3):190-191
21. Fernádez-de-las-Peñas C, Cuadrado ML, Arendth-Nielsen L, et al. Myofascial trigger points and sensitization: an updated pain model for tension-type headache. Cephalgia. 2007 ; 27(5): 383-93
22. Xu YM, Ge HY, Arendt-Nielsen L. Sustained nociceptive mechanical stimulation of latent myofascial trigger point induces central sensitization in healthy subjects. J Pain. 2010:11(12);1348-55
23. Bendtsen L. Central sensitization in tension‐type headache—possible pathophysiological mechanisms. Cephalalgia. 2000; 20(5): 486-508.
24. Olesen J. Clinical and pathophysiological observations in migraine and tension-type headache explained by integration of vascular, supraspinal, and myofascial inputs. J Pain. 1991; 46(2): 125-132
25. Bartsch T, Goadsby P. Stimulation of the greater occipital nerve induces increased central excitability of dural afferent input. Brain. 2002;125:1496-1509
26. Lavin PJ, Workman R. Cushing syndrome induced by serial occipital nerve blocks containing corticosteroids. Headache. 2001; 41(9): 902-904
27. Ashkenazi A , Matro R, Shaw J W, et al. Greater occipital nerve block using local anesthetics alone or with triamcinolone for transformed migraine: a randomized comparative study. J Neurol Neurosurg Psychiatry. 2008; 79(4): 415-417.