Published in final edited form as:

Headache. 2008 July ; 48(7): 1126–1128. doi:10.1111/j.1526-4610.2008.01146.x.

The First 5 Minutes After Greater Occipital Nerve Block

William Young, MD, Brianna Cook, BS, Shahram Malik, MD, James Shaw, PhD, and Michael Oshinsky, PhD

Thomas Jefferson University—Neurology, Philadelphia, PA, USA (W. Young and M. Oshinsky); Thomas Jefferson University—Jefferson Medical College, Philadelphia, PA, USA (B. Cook); East Tennessee State University—Family Physicians of Bristol, Bristol, TN, USA (S. Malik); University of Illinois at Chicago—Pharmacy Administration, Chicago, IL, USA (J. Shaw)

Abstract

We performed greater occipital nerve blocks on 24 migraineurs with unilateral migraine and trigeminal nerve distribution allodynia. Using a visual analog scale for migraine pain, brush allodynia in the trigeminal nerve distribution and photophobia were reduced 64%, 75%, and 67%, respectively, after 5 minutes. Allodynia improved faster than headache. The results of this study suggest that greater occipital nerve blocks initiate an inhibitory process that shuts down several symptom generators.

Keywords

greater occipital nerve block; allodynia; migraine

Almost 80% of migraine patients experience cutaneous allodynia during an attack.¹ Migraine headache becomes difficult to treat as allodynia develops.² Greater occipital nerve (GON) blocks are widely used to treat migraine headache, in the absence of placebo-controlled trials proving efficacy. Both headache pain and trigeminal distribution cutaneous dynamical mechanical brush allodynia (BA) improve significantly 20 minutes after GON block.³ We describe a patient who obtained complete relief of headache and allodynia from V1 to T5 within 8 minutes of a GON block. This was unexpected because established allodynia typically outlasts migraine pain by hours or days.² We undertook to explore the speed of improvement of headache pain and BA, and expand the observation to photophobia.

© 2008 American Headache Society

Address all correspondence to W. Young, Thomas Jefferson University—Neurology, 111 S. 11th St., Suite 8130, Philadelphia, PA 19107, USA.

Human Participant Protection

This project was reviewed by the University of North Carolina's institutional review board, which determined that the project did not constitute human participant research, and the Lifespan Hospital institutional review board, which approved the project.

Conflict of Interest: None

METHODS

Twenty-five outpatients with unilateral episodic migraine or chronic migraine and trigeminal distribution BA, seen at the Jefferson Headache Center from June 2005 to September 2005, were enrolled. Exclusion criteria were a skull defect or history of injury to the area of the GON or prior adverse reaction to GON block, lidocaine, or bupivacaine. Subjects were given a GON block with 1 cc of a 50-50 mix of 2% lidocaine and 0.5% bupivacaine over the occipital ridge. BA was tested by gently stroking a folded 4 × 4 gauze pad 5 times at 2 Hz over the area of maximum allodynia in the ipsilateral trigeminal distribution. Subjects reported headache, BA, and photophobia on a 10-cm virtual analog scale (VAS) every 30 seconds for 5½ minutes starting 30 seconds before injection. Headache pain and photophobia were also reported on a 4-point scale (none to severe) before and 5 minutes after the block. Subjects were tested with a safety pin 7 cm superior to the site of injection to ensure a successful nerve block. If a nerve block was not noted 2 minutes after injection, another injection was given and a new series of measurements were initiated for 5 minutes. Subjects were called after 1 week and queried concerning outcomes. The study was approved by the Thomas Jefferson University Institutional Review Board.

RESULTS

Fourteen subjects had chronic migraine and 11 had episodic migraine. Twenty-one women and 4 men were enrolled. Nineteen were Caucasian and 6 were African American. The mean age was 43.5 ± 12.2 years with a range of 20–63 years.

Prior to GON block the average VAS scores for headache pain, allodynia, and photophobia (present in 19) were 5.83, 5.06, and 6.47, respectively. Five minutes after the block the average percentage improvement in scores was 64%, 75%, and 67%, respectively (Fig.). Prior to treatment 20 subjects had moderate or severe headache, and 16 had moderate to severe photophobia. Improvement on the 4-point scale was similar for episodic and chronic migraine patients. Five minutes after GON block, 60% improved to mild or no headache, and 75% improved to mild or no photophobia. Allodynia improved faster than headache ($P < .001$, Wald test for difference in time trend), with the percentage change from baseline statistically significant at 3 minutes ($P = .003$, Wald test) (Fig.). The estimated hazard of achieving a 50% reduction in baseline VAS score was significantly greater for allodynia than headache ($P = .031$, Wald test of hazard ratio) (Fig.). Improvement in allodynia correlated strongly with headache improvement (Pearson's $r = 0.57$, P [two-tailed] = .003). The mean duration of benefit of the GON block was 4 days, which was the same for patients with episodic and chronic migraine. At 1 week, 23.5% of the subjects who responded to the phone call ($n = 18$) reported ongoing benefits of the GON block.

DISCUSSION

This is the only study to look carefully at the first 5 minutes after GON treatment. GON, supraorbital, and supratrochlear nerve blocks have all been reported as successful treatments for migraine.^{3–6} Those studied did not carefully investigate the speed or the clinical effect of these blocks on photophobia and allodynia. Caputi measured his outcomes at 1 month,

Afridi at 1 week, Ashkenazi at 20 minutes, and Piovesan at 60 days.^{3,4,6,7} The fastest reported response to a commonly available treatment that we are aware of is sumatriptan with a reported 10-minute response rate of 20%, which is considered good (GlaxoSmithKline product information insert).

Our study's principal purpose was to make observations relating to the mechanism of action of GON blocks in treating migraine headache. The finding that pain, allodynia, and photophobia all respond to GON block suggests that a central mechanism rapidly shuts down the generators of each symptom, which are likely to be anatomically separated. This process most likely is initiated by a diffuse inhibitory process. Allodynia may respond more rapidly than headache because the trigeminal nucleus caudalis is more sensitive to this descending inhibition than the trigeminal nerve. Alternatively, convergent inputs to the trigeminal nucleus caudalis from intracranial and extracranial structures may be necessary to sustain the hyperexcitability in the trigeminal nucleus caudalis that gives rise to allodynia, while the transmission of headache pain emanating from intracranial structures may be less dependent on this convergent input. The alternative explanation does not explain the response of photophobia to GON block; thus, we favor the descending inhibition hypothesis.

This inhibitor mechanism might be accessed in other ways. Headache pain, allodynia, photophobia, and phonophobia have been successfully treated in a small case series by injecting a small amount of local anesthetic into cervical paravertebral musculature.⁸ It is unlikely that the improvement in allodynia is dependent on the improvement in headache pain, since allodynia responded more quickly than pain intensity.

As one of the elements of “complete” migraine, Blau noted the lysis occurring at the time of rapid improvement in migraine. This experience may be similar to that of patients receiving a successful GON block and could represent the same mechanics, one naturally occurring and one physician-induced.

This study demonstrates excellent results for pain relief, with 5-minute response rates in a mixed episodic migraine and chronic migraine group similar to those of oral triptans for episodic migraine at 2 hours. The response rate should be interpreted with caution as subjects who had previously responded to GON blocks were not excluded from the trial. Nonetheless, GON block for migraine should be considered an effective management tool for some migraine patients.

Abbreviations

BA	brush allodynia
GON	greater occipital nerve
VAS	visual analog scale

References

1. Burstein R, Yarnitsky D, Goor-Aryeh I, Ransil BJ, Bajwa ZH. An association between migraine and cutaneous allodynia. *Ann Neurol*. 2000; 47:614–624. [PubMed: 10805332]

2. Burstein R, Collins B, Jakubowski M. Defeating migraine pain with triptans: A race against the developing allodynia. *Ann Neurol*. 2004; 55:19–26. [PubMed: 14705108]
3. Ashkenazi A, Young WB. The effects of greater occipital nerve block and trigger point injection on brush allodynia and pain in migraine. *Headache*. 2005; 45:350–354. [PubMed: 15836572]
4. Afridi SK, Shields KG, Bhola R, Goadsby PJ. Greater occipital nerve injection in primary headache syndromes –Prolonged effects from a single injection. *Pain*. 2006; 122:126–129. [PubMed: 16527404]
5. Gale GD, Caputi CA, Firetto V. Therapeutic blockade of the greater occipital and supraorbital nerves in migraine patients. *Headache*. 1998; 38:57. [PubMed: 9505008]
6. Caputi CA, Firetto V. Therapeutic blockade of greater occipital and supraorbital nerves in migraine patients. *Headache*. 1997; 37:174–179. [PubMed: 9100402]
7. Piovesan EJ, Werneck LC, Kowacs PA, Tatsui CE, Lange MC, Vincent M. Anesthetic blockade of the greater occipital nerve in migraine prophylaxis. *Arq Neuropsiquiatr*. 2001; 59:545–551. [PubMed: 11588633]
8. Mellick GA, Mellick LB. Regional head and face pain relief following lower cervical intramuscular anesthetic injection. *Headache*. 2003; 43:1109–1111. [PubMed: 14629248]

Figure.

Percent change in visual analog scale (VAS) score for headache pain, brush allodynia, and photophobia over 300 seconds. The anchors for headache pain were “worst it can be” and severe; for allodynia and photophobia were “worst it can be.” Percent of initial VAS pain, allodynia, and photophobia scores over 5 minutes (a) and survival curves for 50% response on VAS for pain and for allodynia (b). The estimated hazard of achieving a 50% reduction in baseline VAS score was 1.5 times (95% CI = 1.04, 2.19) greater for allodynia than headache.