

Brief Communications

Multiple Cranial Nerve Blocks as an Alternative Preventative Therapy for Chronic Migraine

Linford Fernandes, MBChB ; Nashaba Khan, MBBS; Jessica Dobson, BSc; Marc Randall, MD, FRCP ; Luis Idrovo, D.Med, FRCP 

Objective.—The objective of this prospective cohort study is to evaluate the efficacy of multiple cranial nerve blocks (MCNBs) as a preventative therapy for chronic migraine.

Background.—MCNBs, namely greater occipital nerve (GON) blocks, are frequently used for the acute and transitional treatment of migraine. There is little evidence on the efficacy of repeated MCNBs as a preventative treatment for chronic migraine.

Design.—This single-center, prospective cohort study collected demographic and outcome data on chronic migraine patients who had MCNBs in the headache service between June 2017 and March 2019. Outcome measures included reduction in headache days, Headache Impact Test 6 (HIT6) scores and patient-reported effectiveness of the blocks.

Results.—Outcomes for 64 patients with a diagnosis of chronic migraine or chronic migraine with aura (MWA) were collected. Average age at first block procedure was 41 years (range 21–72) with a female predominance of 54/64 patients (84%). About 37/64 patients (58%) had repetitive occipital nerve blocks only, and 27/64 patients (42%) had occipital and trigeminal nerve blocks. Mean ($\pm$ SD) reduction in headache days post-MCNBs was 5.4 ($\pm$ 5.0) days and mean ($\pm$ SD) reduction in HIT6 scores was 5.3 ($\pm$ 10.3). About 42/64 patients (66%) responded to the MCNBs with at least a 30% reduction in headache days. Mean ($\pm$ SD) duration of effect was 5.7 ($\pm$ 5.4) weeks. About 13/64 of the patients transformed to low-frequency episodic migraine on follow-up. About 22/64 patients (34%) showed no reduction in headache days or HIT6 scores. About 9/112 (8%) instances of minor post block complications were documented with a total of 501 injections.

Conclusion.—This study demonstrates that repetitive MCNBs could provide effective prevention in patients with chronic migraine.

Key words: multiple cranial nerve blocks, chronic migraine, corticosteroids

Abbreviations: GON greater occipital nerve, HIT6 Headache Impact Test 6, MCNBs multiple cranial nerve blocks, MOH medication overuse headache

(*Headache* 2020;60:981–987)

INTRODUCTION

Greater occipital nerve (GON) blocks have been used in the treatment of migraine for several years with many headache practitioners using them in their

headache services.^{1,2} There have been a few open label series, and more recently randomized control trials on the use of GON blocks in migraine, both with and without steroids.^{3–7} The use of corticosteroids in GON

From the Department of Neurology, Leeds Teaching Hospitals NHS Trust, Leeds, UK (L. Fernandes, N. Khan, J. Dobson, M. Randall, and L. Idrovo); Headache Service, Leeds Teaching Hospitals NHS Trust, Leeds, UK (M. Randall and L. Idrovo).

Address all correspondence to L. Idrovo, Department of Adult Neurology, Leeds Teaching Hospitals NHS Trust, Leeds LS1 3EX, UK, email: luis.idrovo@nhs.net

Accepted for publication March 3, 2020.

blocks is controversial but some experts argue in favor of it, as it may confer a prolonged antinociceptive effect.^{3-4,8} Unlike GON blocks, multiple cranial nerve blocks (MCNBs) include injecting superficial branches of the trigeminal nerve as well. Consensus recommendations have recognized the paucity of clinical evidence for the use of MCNBs in migraine.⁹ Previous randomized trials have found some promising results on the efficacy of nerve blocks in chronic migraine, and more recent real-world data has shown that MCNBs are useful in the transitional treatment of chronic migraine.⁸ We conducted a prospective cohort study with the aim of identifying the efficacy and safety of repetitive MCNBs in patients with chronic migraine who had not previously had nerve blocks for headache. We hypothesized that repetitive MCNBs would provide a clinically meaningful benefit to chronic migraine patients.

METHODS

This is a prospective, non-randomized, cohort study carried out in the headache service in the Leeds Teaching Hospitals Trust, in the United Kingdom. This was a pragmatic study with no funding provided specifically for the study. This study has received ethical approval from the hospital's research and governance department. All patients provided written informed consent prior to the nerve block procedures. Inclusion criteria were patients with a primary headache diagnosis of chronic migraine with or without aura (MWA or MWoA) (ICHD classification 3-beta), who had not previously had nerve block treatment for headache.¹⁰ They were referred to the peripheral nerve block clinic at Leeds Teaching Hospitals Trust if they preferred an injectable treatment option for migraine prevention and had prominent tenderness of the occipital (greater and/or lesser) and/or trigeminal (supraorbital, supratrochlear, and auriculotemporal) nerves on examination. Patients were also offered treatment if they gave a history of sensitization or allodynia in the distribution of these nerves. Prospective patients were not required to be on stable preventive agents leading into the nerve blocks. Exclusion criteria were a headache diagnosis other than chronic migraine and those with previous experience of nerve block treatments. MCNBs were administered by a trained attending

neurologist in the day unit at the hospital. Side effects, including bleeding from the injection site, localized hair loss from steroid injections, and transient dizziness from the injection, were explained to all patients before each procedure. Patient data were prospectively collected during clinic encounters between June 2017 and March 2019. Patients were followed up for up to 20 months based on the number of MCNBs they received. Patients underwent repetitive bilateral occipital nerve blocks or bilateral occipital and trigeminal nerve blocks based on the response to the treatment, location of maximal tenderness and/or area of sensitization. Successful delivery of the nerve block procedure was judged at 5 minutes by testing for at least a partial numbness along the dermatomal distribution of the nerve injected. The constituents of the individual nerve blocks, volumes injected and their anatomical locations are outlined in Table 1. Patients continued on their migraine preventatives and acute medications during the course of the MCNBs, and were allowed to change preventative medication during the course of study follow-up. Primary outcome measurements were the proportion of patients with at least a 30% reduction in their headache days at 4 weeks post block as well as the mean reduction of headache days after 4 weeks following the blocks, gathered from patients' headache diaries. The 30% reduction in headache days is currently used by the National Institute for Health and Care Excellence (NICE) to judge the efficacy of onabotulinumtoxinA treatment in chronic migraine.¹¹ Secondary outcome measures included reduction of Headache Impact Test 6 (HIT6) scores by 12 weeks, and these questionnaires were administered between 10 and 12 weeks after the last nerve block.¹² Additional patient-reported outcomes of their headache improvement were gathered by a telephone survey approximately 12 weeks after the first block, by clinicians who did not administer the nerve blocks in the study. Demographical data and complication rates of MCNBs were also collected concurrently. As this was a cohort study, with no matching controls, there was no sample size predetermined and patients who had received MCNBs and had complete data sets for the measures of interest in the study time frame, were used for analysis. This is the primary analysis of the data in this study and the primary outcome measurement was determined a priori, with secondary outcomes measured post hoc.

Conflict of Interest: None

Funding: None

Table 1.—Nerve Block Constituents and Anatomical Landmarks for Each Injection Site

Nerve	Anatomical Location for Injection	Constituents per Injection (Volume Injected, mL)
Greater occipital	At the point on the medial third of the line drawn between the occipital protuberance and mastoid process	Methylprednisolone 40 mg/mL (2 mL) Lidocaine 2% (1 mL) Bupivacaine 0.5% (1 mL) Total injection volume = 4 mL
Lesser occipital	At the point on the lateral third of the line drawn between the occipital protuberance and mastoid process	Lidocaine 2% (1 mL) Bupivacaine 0.5% (1 mL) Total injection volume = 2 mL
Auriculotemporal	At the point immediately anterior to the tragus	Lidocaine 2% (0.5 mL) Bupivacaine 0.5% (0.5 mL) Total injection volume = 1 mL
Supraorbital	At the point 0.5 cm above the supraorbital notch	
Supratrochlear	At the superomedial aspect of the supraorbital ridge	

Statistical Analysis.—Prospective data were collected and stored on a secure Microsoft Excel database during the study and analysis was done using IBM SPSS Statistics version 20 (IBM Corp. Int.). Results are presented as mean ($\pm$ standard deviation, SD) for quantitative variables and summarized by frequency (percentage) for categorical variables. Mean ($\pm$ SD) values are used for measures that have met the assumptions of normality as tested with Q-Q plots. Mean values of continuous outcome measures before and after treatment were compared using paired *t* tests. Chi-square test was used to compare categorical variables, while Fisher's exact test was used to compare categorical variables when the expected count within a cell was less than 5. Statistical significance was set at the 95% level ($P < .05$) using 2-tailed testing. Patients with missing data sets and those lost to follow-up were not included in the study analysis.

RESULTS

Demographics.—Out of 124 headache patients who had MCNBs in the headache service within the study time period, patients without chronic migraine headache diagnoses were excluded, including those with episodic migraine,⁹ cluster headache,¹⁰ occipital neuralgia,¹³ paroxysmal hemicranias,⁶ cervicogenic headache,⁶ and other cranial neuralgias.⁸ Outcomes for 64 patients with a diagnosis of chronic migraine who underwent at least 1 MCNB procedure were collected. Mean age at the first nerve block procedure was 41 (± 12.4) years, with an age range of 21–72 years. There was a female proportion of 54/64 (84%)

patients. About 20/64 (31%) patients had a diagnosis of chronic MWA. About 10/64 (16%) patients had a concomitant diagnosis of MOH. About 6/64 (9%) patients had accompanying occipital neuralgia. Patients had previously tried an average of 2 (range 0–5) migraine preventative medications including 1 patient who had previous onabotulinumtoxinA treatment.

Baseline and Treatment Outcomes.—Mean baseline headache days per month were 17.3 (± 3.3) days. Mean baseline HIT6 score was 67.1 (± 5.8). About 37/64 (58%) patients had only repetitive occipital nerve blocks (greater and lesser), and 27/64 (42%) patients had a combination of occipital and trigeminal nerve blocks. About 33/64 (52%) patients had a minimum of 2 nerve block procedures. During the course of the study, a number of patients had the MCNBs only once ($n = 31/64$), twice ($n = 22/64$), thrice ($n = 7/64$), and quad ($n = 4/64$) times. The mean duration between repeated MCNBs was 19.9 (± 9.2) weeks.

Baseline and outcome measures are summarized in Table 2. About 42/64 (66%) patients responded to the MCNBs with at least a 30% reduction in headache days post block when measured at 4 weeks. The mean reduction in headache days post block was 5.4 (± 5.0 , $P < .001$) days. About 32/64 patients provided HIT6 scores at the 3-month time point and so these cases were used for analysis of HIT6 scores. The mean reduction in the HIT6 score after the first block procedure was 5.3 (± 10.3 , $P = .07$). Patient-reported mean duration of effect of each block was 5.7 (± 5.4) weeks and there was no clinically significant variation in this

Table 2.—Baseline and Outcome Measures for the Multiple Cranial Nerve Blocks

Outcome Measures	Pre-MCNB ($\pm$ SD)	Post-MCNB ($\pm$ SD)	Mean Difference (95% CI)	P Value
<i>Headache days per month</i>				
All chronic migraine (n = 64)/days	17.3 ($\pm$ 3.3)	12.1 ($\pm$ 5.6)	5.4 (4.12, 6.63)	<.001
Chronic migraine with aura (n = 20)/days	17.5 ($\pm$ 4.0)	10.5 ($\pm$ 4.4)	7.1 (4.89, 9.21)	<.001
Chronic migraine without aura (n = 44)/days	17.5 ($\pm$ 3.0)	12.9 ($\pm$ 5.9)	4.6 (3.07, 6.16)	<.001
MCNB responders only (n = 42)/days	17.4 ($\pm$ 3.4)	9.2 ($\pm$ 4.1)	8.2 (6.97, 9.41)	<.001
GON blocks only (n = 37)/days	17.7 ($\pm$ 3.8)	12.7 ($\pm$ 5.6)	5.0 (3.25, 6.45)	<.001
GON + trigeminal nerve blocks (n = 27)/days	17.3 ($\pm$ 2.5)	11.3 ($\pm$ 5.5)	6.0 (4.00, 7.93)	<.001
HIT6 score (n = 32)	67.1 ($\pm$ 5.8)	61.8 ($\pm$ 8.7)	5.28 (1.58, 8.99)	.007

CI = confidence interval; GON = greater occipital nerve; MCNB = multiple cranial nerve block; SD = standard deviation.

response after multiple blocks. There was no statistically significant difference in the reduction of headache days in patients who had occipital nerve blocks only and those who had occipital and trigeminal nerve blocks ($P = .429$). Patient who had chronic MWA were statistically significantly more likely to have responded to the nerve block ($P = .009$). There was no statistically significant difference in response rates based on the presence of medication overuse headache (MOH) ($P = .144$) or painful cranial neuropathy ($P = .170$). About 13/64 (20%) responders with chronic migraine had transformed to low-frequency episodic migraine on follow-up approximately 3 months later with a mean of 7.2 ($\pm$ 3.6) headache days per month. About 8/13 (62%) of these patients received a combination of occipital and trigeminal nerve blocks. About 22/64 patients (34%) showed no reduction in headache days or HIT6 scores post block.

About 27/64 patients were referred for onabotulinumtoxinA treatment due to suboptimal response to the MCNBs, of which 12 patients had a good response as per the national criteria.¹¹

There were 9/112 (8%) instances of MCNB complications (4 episodes of transient dizziness, 4 episodes of injection site pain, and 1 episode of localized hair thinning) documented with a total of 501 injections during the course of the study.

DISCUSSION

This is the first series of its size to collect prospective real-world data focusing on the efficacy of

repetitive MCNBs in chronic migraine patients. We also present demographical data and treatment outcomes with follow-up data of up to 20 months demonstrating the safety of repetitive nerve blocks in this population. Despite the widespread use of GON blocks, MCNBs are used less often and there is variation in the protocols for individual nerve blocks. In particular, the inclusion of steroids in GON injections has produced conflicting outcomes when triamcinolone has been used.^{13,14} The determination of any benefit could be dose related and in our study, we used 40 mg/mL dose of methylprednisolone per GON block, in parallel to higher doses of corticosteroids (betamethasone) used in the randomized trial for cluster headache.¹⁵ In keeping with consensus recommendations, we decided on at least 3 month intervals between repeated steroid MCNBs.⁹ Pain relief from anesthetic only MCNBs blocks has been shown to last for weeks, underlining the role of the greater occipital and trigeminal nerves in neuromodulation of the caudal trigeminal nucleus and upper cervical segments involved in cranial nociception.^{3,16} This involvement of the trigeminal afferents in the modulation of chronic migraine, led us to target the SO, ST, and AT nerves as well as the GON and LON. In our study, the use of lidocaine, allowed for almost immediate assessment of the effect of the nerve block, by testing for numbness in the dermatomal distribution of the nerve injected. The longer 4-hour half-life of bupivacaine would allow for a more prolonged sensation of analgesia, while awaiting 2-3 days for the steroids to take their anticipated effect.

The clinically and statistically significant mean reduction of 5.4 headache days of our cohort after 4 weeks post-MCNB is promising, and we found that the response rate was statistically significantly higher in chronic MWA (90%) as opposed to chronic MWA (54%, $P = .009$) which was unanticipated. To our knowledge, this is the first time there has been a suggestion of different responses to MCNBs between chronic MWA and MWA. This adds to evidence from a previous study that demonstrated the improvement in auras associated with migraine when treated with GON blocks, suggesting some interplay between modulation of the trigeminocervical complex and the resolution of aura.¹⁷ This is a post hoc analysis and suffers from multiplicity concerns but does provide a signal for future adequately powered studies to explore further. Like previous studies, we found no statistically significant difference in the response rate between chronic migraine patients with MOH (90%) and those without (61%, $P = .144$), although with only 10/64 patients with MOH in our sample, this study is not powered to detect a statistically meaningful difference.⁴ About 32/64 patients did not complete their HIT6 scores within the time period and were excluded from the HIT6 analysis, but the 32/64 patients with completed HIT6 scores, showed a statistically significant reduction of 5.3 ($P = .007$) points after the first block. About 13/64 (20%) responders with chronic migraine transformed to low-frequency episodic migraine after at least one of the MCNBs and did not relapse throughout the course of the study. It is difficult to quantify the significance of this change in migraine phenotype as it has not been shown in other studies looking at chronic migraine as they have not differentiated between chronic and frequent episodic migraine.

As this was a cohort study with prolonged follow-up, we allowed patients to continue taking their acute analgesics for headache relief as well as any preventative medications, but there was no statistically significant predominance of any migraine preventative, with up to 11 different preventative medications being tried in our study population prior to the MCNBs. Chronic migraine patients have relatively poor compliance with oral migraine preventatives with compliance rates as low as 26% at 6 months based on a large database study.¹⁸ Periodic injection therapies like MCNBs and onabotulinumtoxinA treatment, provide an alternate approach

to patients with poor compliance to oral medication. We defined our chronic migraine study population using the standard diagnostic criteria at the time, the ICHD classification 3-beta and used standard outcome measures like the headache diaries and HIT6 scores to improve the external validity of our study.

One of the limitations in this study is that the time period between repeated MCNBs was not determined a priori, apart from setting a minimum interval of 3 months. Patients were given repeated MCNBs if they reported a response to the first MCNB procedure and continued with repeated MCNBs thereafter. Additionally, patients were also allowed to change preventative medication during the observation period, which is another limitation but this confounder was accounted for in the analysis. Patients were also given the opportunity to relay their perception of the efficacy of the MCNBs and whether they had a reduction in the frequency and severity of their chronic migraine. They also reported how long they felt the MCNBs were effective. The mean duration of response was 5.7 (± 5.4) weeks in those who felt the MCNBs were effective and this is longer than reported in the randomized controlled trials, although the lack of a control group is a limitation.^{6,7,13,19} It is therefore difficult to comment on how much of the improvement in the patients who responded were due to a placebo effect and it might have contributed to the mean duration of response. There is no consensus currently on the appropriate placebo to use in MCNBs, partly due to the perception of numbness in the dermatomal distribution of the nerve being blocked when anesthetics are used. This creates difficulties in blinding patients to placebo and anesthetic blocks.²⁰ As our patients had a clinically significant migraine burden, and the lack of consensus on the time period that MCNBs should be effective for, we thought it important to include a telephone survey of the patients' views on the duration of effect. Although, there were no missing data sets among the study population for the primary outcomes of headache days or telephone survey, 32/64 patients did not return the HIT6 scores within the time frame and so were excluded for the analysis of HIT6 outcomes. One reason might have been that these patients performed worse on HIT6 scores, but an attempt to mitigate this was made by adding the telephone survey on duration of effectiveness as an additional measure to capture all the study patients.

Data were also collected on the nonresponders and 27/64 patients were referred for onabotulinumtoxinA treatment due to their dissatisfaction with the efficacy of the MCNBs. About 12/27 (44%) of these patients had at least a 30% improvement in their chronic migraine frequency following onabotulinumtoxinA treatment, which suggests that patients who do not respond to MCNBs, may not respond to onabotulinumtoxinA treatment, despite the different mechanism of action.²¹

Any side effects or complications were documented throughout the course of the study. There were 112 individual nerve block encounters during the study with a total of 501 separate injections. Minor complications were reported on 9/112(8%) separate occasions and included transient dizziness,⁴ localized pain at the injection site,⁴ and localized hair thinning.¹ These complication rates are in keeping with other cohort studies which illustrate that repetitive MCNBs have a low complication rate.^{4,22,23}

CONCLUSION

This prospective cohort study provides evidence that repetitive MCNBs with corticosteroids are safe and could be an effective alternate strategy in providing short-term headache prevention in patients with chronic migraine. The transformation into episodic migraine in a third of our responders is promising and may suggest that repetitive occipital and trigeminal nerve blocks could have a better role in the management of chronic migraine. This study requires further investigation with well-designed, adequately powered, randomized controlled trials comparing the long-term efficacy, safety, and perhaps cost-effectiveness of MCNBs in a large cohort of patients.

STATEMENT OF AUTHORSHIP

Category 1

(a) Conception and Design

Luis Idrovo, Marc Randall, Linford Fernandes

(b) Acquisition of Data

Linford Fernandes, Nashaba Khan, Jessica Dobson, Luis Idrovo

(c) Analysis and Interpretation of Data

Linford Fernandes, Luis Idrovo

Category 2

(a) Drafting the Manuscript

Linford Fernandes, Nashaba Khan, Jessica Dobson, Marc Randall, Luis Idrovo

(b) Revising It for Intellectual Content

Linford Fernandes, Luis Idrovo

Category 3

(a) Final Approval of the Completed Manuscript

Linford Fernandes, Nashaba Khan, Jessica Dobson, Marc Randall, Luis Idrovo

REFERENCES

1. Blumenfeld A, Ashkenazi A, Grosberg B, et al. Patterns of use of peripheral nerve blocks and trigger point injections among headache practitioners in the USA: Results of the American Headache Society Interventional Procedure Survey (AHS-IPS). *Headache*. 2010;50:937-942.
2. Ashkenazi A, Blumenfeld A, Napchan U, et al. Peripheral nerve blocks and trigger point injections in headache management – A systematic review and suggestions for future research. *Headache*. 2010;50:943-952.
3. 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.
4. Weibelt S, Andress-Rothrock D, King W, Rothrock J. Suboccipital nerve blocks for suppression of chronic migraine: Safety, efficacy, and predictors of outcome. *Headache*. 2010;50:1041-1044.
5. Inan L, Inan N, Karadas O, et al. Greater occipital nerve blockade for the treatment of chronic migraine: A randomized, multicenter, double-blind, and placebo-controlled study. *Acta Neurol Scand*. 2015;132:270-277.
6. Dilli E, Halker R, Vargas B, et al. Occipital nerve block for the short-term preventive treatment of migraine: A randomized, double-blinded, placebo-controlled study. *Cephalalgia*. 2015;35:959-968.
7. Cuadrado ML, Aledo-Serrano Á, Navarro P, et al. Short-term effects of greater occipital nerve blocks in chronic migraine: A double-blind, randomised, placebo-controlled clinical trial. *Cephalalgia*. 2017;37:864-872.

8. Miller S, Lagrata S, Matharu M. Multiple cranial nerve blocks for the transitional treatment of chronic headaches. *Cephalalgia*. 2019;39:1488-1499.
9. Blumenfeld A, Ashkenazi A, Napchan U, et al. Expert consensus recommendations for the performance of peripheral nerve blocks for headaches – A narrative review. *Headache*. 2013;53:437-446.
10. Headache Classification Committee of the International Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia*. 2013;33:629-808.
11. NICE. Overview. Botulinum toxin type A for the prevention of headaches in adults with chronic migraine. Guidance. Available from: www.nice.org.uk/guidance/ta260/chapter/1-Guidance
12. Kosinski M, Bayliss MS, Bjorner JB, et al. A six-item short-form survey for measuring headache impact: The HIT-6. *Qual Life Res*. 2003;12:963-974.
13. Ashkenazi A, Matro R, Shaw JW, Abbas MA, Silberstein SD. Greater occipital nerve block using local anaesthetics alone or with triamcinolone for transformed migraine: A randomised comparative study. *J Neurol Neurosurg Psychiatry*. 2008;79:415-417.
14. Kashipazha D, Nakhostin-Mortazavi A, Mohammadianinejad SE, Bahadoram M, Zandifar S, Tarahomi S. Preventive effect of greater occipital nerve block on severity and frequency of migraine headache. *Glob J Health Sci*. 2014;6:209-213.
15. Ambrosini A, Vandenheede M, Rossi P, et al. Suboccipital injection with a mixture of rapid- and long-acting steroids in cluster headache: A double-blind placebo-controlled study. *Pain*. 2005;118:92-96.
16. Bartsch T, Goadsby PJ. Stimulation of the greater occipital nerve induces increased central excitability of dural afferent input. *Brain*. 2002;125:1496-1509.
17. Cuadrado ML, Aledo-Serrano Á, López-Ruiz P, et al. Greater occipital nerve block for the acute treatment of prolonged or persistent migraine aura. *Cephalalgia*. 2017;37:812-828.
18. Hepp Z, Dodick DW, Varon SF, Gillard P, Hansen RN, Devine EB. Adherence to oral migraine-preventive medications among patients with chronic migraine. *Cephalalgia*. 2015;35:478-488.
19. Inan LE, Inan N, Karadaş Ö, et al. Greater occipital nerve blockade for the treatment of chronic migraine: A randomized, multicenter, double-blind, and placebo-controlled study. *Acta Neurol Scand*. 2015;132:270-277.
20. Robbins MS. Peripheral nerve blocks, steroid injections and their niche in headache medicine. *Cephalalgia*. 2015;35:850-852.
21. Ramachandran R, Yaksh TL. Therapeutic use of botulinum toxin in migraine: Mechanisms of action. *Br J Pharmacol*. 2014;171:4177-4192.
22. Sahai-Srivastava S, Subhani D. Adverse effect profile of Lidocaine injections for occipital nerve block in occipital neuralgia. *J Headache Pain*. 2010;11:519-523.
23. Hascalovici JR, Robbins MS. Peripheral nerve blocks for the treatment of headache in older adults: A retrospective study. *Headache*. 2017;57:80-86.