

Efficacy of Greater Occipital Nerve Block in Treatment and Prevention of Chronic Migraine

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ABSTRACT

Objective: To assess the efficacy of greater occipital nerve (GON) block in treatment and prevention of chronic migraine.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Anesthesia, Combined Military Hospital, Rawalpindi Pakistan, from May to Oct 2023.

Methodology: A total of 50 patients with chronic migraine fulfilling our inclusion criteria were randomly divided into two groups, i.e. Group-O (received GON block) and Group-C (managed with pharmacological therapy). Patients were followed over a period of 3 months. The grading of pain was done with the help of visual analogue score (VAS) into no pain, mild pain, moderate pain and severe pain. The frequency of different pain grades and patient satisfaction were compared with help of chi-square analysis to compute *p*-value.

Results: Out of 50 patients, 19(38.0%) were male while 31(62.0%) were females and mean age Group-O patients was 40.00±11.37 years and Group-C patients was 37.08±10.07 years. 17(68.0%) patients in Group-O had no pain 30 minutes after the application of greater occipital nerve block compared to 5(20.0%) patients who had no pain after multimodal analgesia while 8(32%) patients in Group-O had mild pain compared to 13(52.0%) patients in Group-C with *p*-value <0.001.

Conclusion: It is safe to conclude that greater occipital nerve block is a better alternative to pharmacological agents in treating and preventing chronic migraine.

Keywords: Chronic Migraine, Greater Occipital Nerve Block, Pharmacological Therapy.

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INTRODUCTION

Migraine is a prevalent neurological condition which stands as one of the principal contributors to global disability and the consequent loss of productive working days.¹ The hallmark symptom of a migraine is severe, throbbing headache which can be debilitating accompanied by auras and associated with certain triggers such as foods, stress, lack of sleep, hormonal, and weather changes.² Chronic migraine (CM) is formally characterized as the occurrence of at least 15 headache days per month for a minimum duration of three months, during which at least eight days of the month align with the diagnostic criteria for migraine, either with or without aura, or exhibit a positive response to treatments designed specifically for migraine.³ The World Health Organization (WHO) has positioned migraine as the 19th leading cause of disability globally, with a higher ranking of 12th among women.⁴ There is also a significant association between chronic migraine and elevated suicidal risk in adolescent patients.⁵ A substantial number of

migraineurs concurrently exhibit medication overuse including analgesics, beta blockers, anticonvulsants, opioids, TCAs and SSRIs which is worrisome as it enhances the tendency of addiction. Moreover, efficacies of these drugs are variable, and they are not essentially effective for chronic migraine.⁶ The newer treatments such as Onabotulinumtoxin-A, Anti-CGRP/R monoclonal antibodies and Topiramate have availability issues and side-effects. Moreover, compliance is almost always an issue in chronic migrainers.⁷

The Greater Occipital Nerve (GON) block exhibits the capability to attain substantial analgesic effects when employed as a primary therapeutic intervention for management of migraine. Furthermore, it can serve as a secondary treatment option when other methodologies have proven ineffective. However, it is important to note that the degree of symptom amelioration often manifests considerable variability among individual patients. Some studies suggest that it is short term prevention of CM, and some suggest that it provides long term prevention if CM and yet some suggest that its effects last up to three months after a single injection.⁸ Therefore, the rationale of our study is to find the

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effectiveness of greater occipital nerve block in treatment and prevention of chronic migraine. We also aim at standardizing the technique of nerve block through our study.

METHODOLOGY

This quasi-experimental study was conducted at anesthesia department of Combined Military Hospital Rawalpindi, Pakistan from May 2023 to October 2023 over a period of six months after taking prior ethical approval from the hospital ethical review board (vide Ser No 463). Sample size was calculated using WHO sample size calculator with 80% power of test, 5% level of significance, anticipated population with pain relief with GOB (P1) to be 55.6%⁹ and anticipated population proportion without GOB (P2) to be 16.7%.⁹ The final sample size came out to be 23. We included 25 patients in each treatment group.

Inclusion Criteria: All patients, irrespective of gender with age 18-65 years who reported to out-patient department or emergency with chronic headache and had ASA-I or II physical status were included in the study. Chronic migraine is defined as the occurrence of ≥ 15 headache days in a month's duration.¹⁰ The patients of chronic migraine were included in the study who had VAS >6 at time of presentation to hospital.

Exclusion Criteria: The patients who were allergic to local anesthetic and who had neuropsychiatric disorders, diabetes, hypertension, ASA-III / IV physical status, epilepsy, methemoglobinemia or BMI >30 were excluded.

All patients were selected through non-probability consecutive sampling technique after taken informed written consent. Patients were randomly assigned to one of the treatment groups using lottery method with 25 patients in each group, i.e. Group-O, who received GON block and Group-C, who were given intravenous analgesics as shown in Figure.

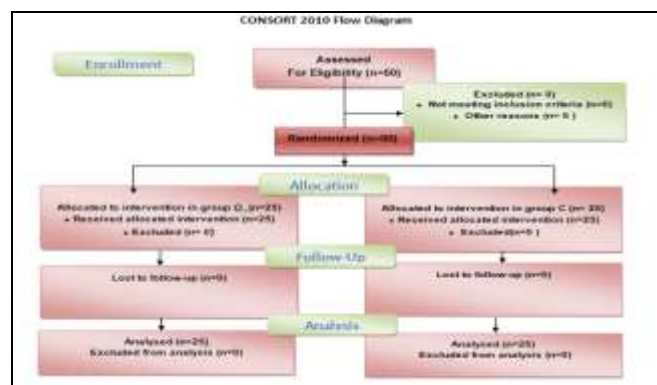


Figure: Phases of the study

All Group-C patients were given intravenous analgesics along with anti-emetics including injection Ondansetron, injection Ketorolac and injection Paracetamol. They were sent home on oral treatment that is Diclofenac potassium 50 mg orally twice a day in case of breakthrough pain.

The Group-O patients were given GON block in pain clinic procedure room. Standard monitoring was attached and a 20G intravenous cannula was passed. All the Group-O patients were given GON-block in sitting position by same anesthetist. The patient's neck was slightly flexed while in sitting position and draped with povidone iodine. The occipital prominence and mastoid process were identified through palpation. Ultrasound was employed to identify occipital nerve as hyper echoic density between planes of obliquus capitis inferior and semispinalis capitis. After confirmation of correct needle tip placement 4ml of mixture of local anesthetic Bupivacaine 0.5% and Methylprednisolone were injected 2cm inferior and lateral to occipital protuberance. Careful aspiration was done before giving injection to avoid arterial injection in a fan like manner of distribution. Gentle pressure was applied over the site of injection for five minutes. The GON block was given bilaterally. These patients were sent home after observation for three hours post-procedure with oral Diclofenac potassium 50mg once a day for any breakthrough pain.

All the patients were followed at 30 min, 3 hours and 3 months after the treatment using VAS to record the treatment effectiveness and patients were asked to report for any breakthrough pain. The presence of breakthrough pain episodes was considered as lack of prevention. The subjective measure of presence or absence or absence of satisfaction was also done at same time intervals for all patients along with VAS. All the data including patients' demographic data and VAS were recorded on pre-designed Performa. Data was analyzed using Social Package of Statistical Science (SPSS version 23). Means and standard deviation were computed for quantitative variables and frequency & percentages were calculated for qualitative variables. Chi-square was employed to compare frequencies. Median and interquartile range (IQR) was calculated for satisfaction and Mann Whitney u test was used. The p -value ≤ 0.05 was considered as significant.

RESULTS

All the study participants cooperated and completed the study protocol and none of the patients

lost to follow. The mean age of the patients in Group-O was 40.00 ± 11.37 years while in Group-C was 37.08 ± 10.07 years showing that migraine is more prevalent in young age groups. 10(40.0%) patients in Group-O were males, and 15(60.0%) patients were females while 9(36.0%) patients in Group-C were males, and 16(64.0%) patients were females as shown in Table-I.

Table-I: Demographic details of Study Groups (n=50)

		Group-O n=25 Mean $\pm$ SD	Group-C n=25 Mean $\pm$ SD
Age (years)		40 $\pm$ 11.38	37.08 $\pm$ 10.071
		Frequency (%)	Frequency (%)
Gender	Male	10(40.0)	9(36.0)
	Female	15(60.0)	16(64.0)
ASA Status	ASA I	15(60.0)	22(88.0)
	ASA II	10(40.0)	3(12.0)

ASA: American Society of Anesthesiologist

Table-II: Comparison of VAS score among groups (n=50)

		Group-O (n=25) Frequency (%)	Group-C (n=25) Frequency (%)	p-value
VAS at 30 minutes	No pain	17(68.0)	5(20.0)	<0.001
	Mild pain	8(32.0)	13(52.0)	
	Moderate pain	0(0)	0(0)	
	Severe pain	0(0)	0(0)	
VAS at 3 Hours	No pain	25(100.0)	19(76.0)	<0.01
	Mild pain	0(0)	6(24.0)	
	Moderate pain	0(0)	0(0)	
	Severe pain	0(0)	0(0)	
VAS at 3 Days	No pain	24(96.0)	16(64.0)	<0.005
	Mild pain	1(4.0)	9(36.0)	
	Moderate pain	0(0)	0(0)	
	Severe pain	0(0)	0(0)	
VAS at 3 Months	No pain	16(64.0)	2(8.0)	<0.001
	Mild pain	4(16.0)	13(52.0)	
	Moderate pain	4(16.0)	4(16.0)	
	Severe pain	1(4.0)	6(24.0)	

VAS: Visual Analogue Scale

Table-III: Comparison of satisfaction levels of both study groups (n=50)

Median patient satisfaction		Group-O (n=25) Median (IQR)	Group-C (n=25) Median (IQR)	p-value
Median satisfaction at 30 minutes		90.80(IQR:10.00)	86.4 (IQR:30.00)	<0.001
Median satisfaction at 3 hours		90.00(IQR:10.00)	90.00(IQR:10.00)	0.192
Median satisfaction at 3 days		90.00 (IQR:10.00)	90.00 (IQR:10.00)	<0.01
Median satisfaction at 3 months		90.00 (IQR:20.00)	70.00 (IQR:72.00)	<0.001
		Frequency (%)	Frequency (%)	
Break through pain	yes	0(0.0)	7(28.0)	<0.005
	no	25(100.0)	18(72.0)	

The primary outcome was frequency of pain quantified by VAS. Seventeen patients (68.0%) patients in Group-O had no pain 30 minutes after the application of GON block compared to 5(20.0%) patients who had no pain after multimodal analgesia. Eight patients (32%) in Group-O had mild and thirteen patients (52.0%) patients in Group-C had mild pain p -value <0.001 after 30 minutes. Similarly, VAS in both

groups at 3 hours, 3 days and 3 months post-treatment is shown in Table-II with a p -value <0.05 indicating a statistically significant difference in treatment outcome with GON block as compared to pharmacological therapy.

The Group-O patients were more satisfied than Group-C patients with Median percentage patient satisfaction of 90.80(IQR:10.00) at 30 minutes post GON block and 86.4 (IQR:30.00) with intravenous multimodal analgesia after thirty minutes. After 3 days of intervention, the median post-operative satisfaction was 90.00(IQR:10.00) in GOB group and it was 90.00(IQR:10.00) after multimodal analgesia with p value of 0.192. Median satisfaction 90.00 (IQR:20.00) after 3 months in Group-O and it was 70.00 (IQR:72.00) in Group-C with p value of <0.001. The frequency of breakthrough pain was noted in 7(28.0%) Group-C patients while none of the Group-O patients reported breakthrough pain with p value of <0.005.

DISCUSSION

Our study showed that bilateral greater occipital nerve block had promising outcome in terms of reduced pain scores and increased patient satisfaction in patients with chronic migraine.

According to study conducted by M Matharu *et al.*, greater occipital nerve blocks (GONB) has been proven to be an effective intervention in approximately three-quarters of cases involving cluster headaches (CH). It offered duration of relief of approximately 3 weeks while presenting minimal complications. They suggested that it can also serve as transitional treatment to prevent headache in patients experiencing episodic or chronic headache like migraine. They performed their research on patients who had both episodic and chronic headache. However, we included only chronic migraine patients in our study, and the results were analogous to findings of Matharu *et al.*¹¹

Stern JJ *et al.*,¹² performed a review of 17 studies and they did not find any significant disparities in clinical outcomes when comparing the use of corticosteroids in nerve blocks to blocks employing only local anesthetic for the management of migraine. Some observational studies collectively indicated that greater occipital nerve blocks were also efficient in treating various conditions, including prolonged aura of migraine, status migrainosus, occipital neuralgia and post-Dural puncture headache.¹² However, in our study we focused on chronic migraine and found a significant impact on both intensity and duration of analgesia in chronic migraines.

According to a case report by Son BC, Chronic disabling headache and facial pain demonstrated improvement following the decompression of the greater occipital nerve. This observation hinted at a potential association between peripheral sensitization and the pathophysiological mechanisms underlying migraine, particularly in cases classified as migraine without aura. The blockade of bilateral greater occipital nerve aborted the chronic headache with in thirty minutes in our study and prevented it for three months. It seems a reliable and promising in terms of both treatment and prophylaxis of headache.¹³

Schwarz *et al.*, performed an observational study on migraine patients to establish the significance of neck pain and the involvement of the trigemino-cervical complex in the pathophysiology of migraine. Their interest in greater occipital nerve block was based on an observation that the application of a nerve block demonstrated varying degrees of effectiveness in the management of primary headaches when compared to other headaches. They observed that percentage decrease in headache was more in patients with chronic headache as they had high baseline frequency. In our study all the patients who were enrolled had moderate to severe headache which reduced to mild or no pain after the nerve block.¹⁴

The existing literature suggests that GON block was both effective and safe and demonstrated utility in the management of various headache disorders, including migraine, cluster headaches, cervicogenic headaches and post-lumbar puncture headaches.¹⁵

Chowdhury D *et al.*, searched the eligible studies in in PubMed and found that greater occipital nerve block stood as a valuable and effective treatment modality across diverse headache disorders due to a multitude of appealing attributes including its prompt onset of action in alleviating pain severity, the ability to sustain its therapeutic effect with a single injection, its straightforward and minimally invasive administration technique, a low incidence of side effects, absence of drug-to-drug interactions and cost effectiveness.¹⁶ Our study also supported the fact that a single injection resulted in pain relief for three months.

We used ultrasound guided technique for GON block. Ryu JH *et al.*, studied the impact of botulinum toxin administered via ultrasound-guided greater occipital nerve (GON) blocks in individuals suffering from chronic headaches centered in the occipital region. They demonstrated that GON block was

effective in alleviating both immediate and long-standing pain among individuals experiencing chronic headaches localized to the occipital area. They did not study patient satisfaction.¹⁷ They followed their patients till six months due which there was elevated dropout rate. We followed our patients for three months and all patients responded to telephonic correspondence.

The greater occipital nerve has been suggested to be effective for several headaches and chronic migraine seems to be one of them. It has successfully been used for detoxification of patients who had drug overuse headache. In a RCT conducted by Arab *et al.* fifty-four patients with medication-overuse headache were included and ninety six percent patients successfully completed detoxification.¹⁸

LIMITATION OF STUDY

Our study was single center, and we focused on chronic migraine patients and did not check its significance in other headaches.

CONCLUSION

It is safe to conclude that greater occipital nerve block is a better alternative to pharmacological agents in treating and preventing chronic migraine.

Conflict of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SZH & RASK: Data acquisition, data analysis, critical review, approval of the final version to be published.

MRI & IN: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

MHS & AK: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Treatment of Chronic Migraine

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