



EFFICACY OF TRANS NASAL SPHENOPALATINE GANGLION BLOCK IN MIGRAINE

Anesthesiology

Dr Nimisha Verma*

MD Anesthesiology, Associate Professor Department of Anesthesiology, IMS, BHU, Varanasi. *Corresponding Author

Dr Shekhar Anand

MD Anesthesiology Senior Resident, Department of Anesthesiology, IMS, BHU, Varanasi.

Dr Abhishek Pathak

DM Neurology, Associate Professor, Department of Neurology, IMS, BHU, Varanasi.

ABSTRACT

Background: The Sphenopalatine ganglion (SPG), a parasympathetic ganglion in the pterygopalatine fossa, is involved in the activation of trigemino autonomic reflex, a pathway responsible for the symptoms of migraine and other primary headaches. Hypersensitivity of the SPG may be responsible for the escalating pain and repeated attacks in migraine. Blocking the Sphenopalatine ganglion may result in aborting of an acute migraine attack as well as decrease the frequency of subsequent attacks by decreasing hypersensitivity of the SPG. **Method:** An open, prospective interventional study was planned on 42 patients who fulfilled ICHD3 beta criteria of Migraine. A single, bilateral transnasal Sphenopalatine ganglion block was administered to patients with moderate to severe headache, using cotton tip applicator soaked with 4% lidocaine. VAS (Visual Analog Scale) was recorded before the procedure and 15 minutes, 2 hours and 24 hours after the procedure. The frequency of headache before and after a single SPG block was also noted. Statistical Analysis was performed using SPSS software version 23.0. P value of < 0.05 was considered significant. **Results:** 30 patients completed the study. The mean duration of illness in the group was 33.40 ± 15.89 months. The pre procedure VAS was 6.53 ± 1.01 . The mean VAS after fifteen minutes and 2 hours was 2.27 ± 0.69 and 1.37 ± 0.67 respectively. This relief continued till the next day. Mean Frequency of migraine episodes decreased from 10.33 ± 2.84 to 7.90 ± 2.38 after the block ($p < 0.001$). Twenty three patients had recurrence in the second week of intervention and 7 in the third week. **Conclusion:** a single trans nasal Sphenopalatine block is an effective, non invasive way of aborting an acute episode of migraine along with causing a decrease in frequency of further attacks for upto a month.

KEYWORDS

INTRODUCTION:

Migraine is a chronic headache disorder with a complex vascular aetiology. The episodes are debilitating and recurrent requiring abortive as well as prophylactic treatment. Despite a myriad of drugs available to treat migraine, there is a subset of patients who do not get adequate relief or have intractable side effects of medications. It is in these subset of patients, pain relieving interventions play an important role. The pathogenesis of migraine is neurovascular in origin and includes an exaggerated trigemino autonomic reflex which is mediated through the Sphenopalatine (SPG), otic and carotid ganglia¹. The unique position of SPG in the Pterygopalatine fossa, its multiple neural connections to sensory and autonomic systems involved in pain generation and propagation, along with the associated autonomic manifestations seen in many primary headache and facial pain syndromes, makes it a promising target for the treatment of conditions like atypical facial pain, primary headaches and autonomic cephalalgias². Inhibition of parasympathetic outflow from the SPG causes reduced activation of perivascular pain receptors in the cranial and meningeal blood vessels, with resultant reduction in the release of neuro-inflammatory mediators (acetylcholine, nitric oxide, vasoactive intestinal peptide, substance P, and calcitonin gene-related peptide) from sensory fibers supplying the cranial and meningeal vasculature. This, in turn, reduces pain intensity and intracranial hypersensitivity observed in migraine³. Of the three, sphenopalatine ganglion's unique location, allows its access through the nose. Thus we aimed to study the efficacy of Sphenopalatine ganglion block in aborting an acute attack of migraine and also assess its usefulness in preventing further recurrent attacks of migraine headache.

Methodology

Study population: This open uncontrolled prospective study was conducted in the pain division of Department of Anesthesiology and Department of Neurology of our Institute after ethical approval by the Institutes' Review Board. The duration of conduct of the study was from January 2019 to January 2020. All patients in the age group of 20 to 55 years with a history of unilateral headache were screened and were included only after their written informed consent.

Patients of either sex in 20 to 55 years age group who had history of unilateral headache for more than 6 months, that could fit in the ICHD 3 beta criteria of migraine, who were not responding to abortive pain

medications and had a frequency of more than 10 headache episodes per month were included in the study. Patients with a history of medication overuse headache, loss of consciousness, a documented space occupying lesion in the brain or skull base fracture, epilepsy, hypertension, disorders of coagulopathy, polyarteritis nodosa, Takayasu's arteritis were all excluded from the study. The patients who were allergic to lidocaine and patients who had taken any pain medication in the preceding 2 hours were also excluded from the study.

Procedure

A detailed history taking and examination was done in all selected patients and pre procedure complete blood count, liver function and renal function tests were done. The CT head was also done to rule out any intracranial pathology. All patients were instructed to contact us when they had an acute onset of the headache and to come to the hospital without taking any abortive pain medications. On presentation, patients were brought to the post operative ward. Their heart rate, blood pressure and oxygen saturation were monitored. Temperature of the facial skin was measured by attaching a temperature probe to the skin of the face. Patients were made to lie supine in the bed with a thin pillow under the shoulder to extend the neck taking care that the bridge of the nose is below the level of the neck. A cotton tip applicator soaked with 1 ml of 4% lidocaine was inserted in both nostrils till it met with resistance at reaching the posterior lateral nasal space (middle turbinate). The swab was left in place for about 5 minutes and then removed. The position was maintained for another 10 minutes. Patients were asked to swallow any liquid trickling into the throat during the procedure. A rise in facial skin temperature by 1-2 degrees was noted and was considered as a marker of an effective block.

Immediate side effects like throat numbness, nausea and lacrimation were noted. Patient was sent home 2 hours after the block.

Method of measurement of outcome: The parameters assessed were pain and patient satisfaction. Visual Analog Scale (VAS) was explained to the patients on pre procedural visit. It was described as a 10 cm line with marks at 1 cm and the patient was asked to put a mark according to his pain intensity. 0cm being no pain and 10 cm being worst imaginable pain. The VAS was recorded before the procedure, then post procedure at 15 minutes and 2 hours, after which patients were sent home. The pain intensity was assessed telephonically at 24

hours and then again at 1 week and one month after the block to note any decrease in frequency of episodes. Patient satisfaction as percentage was used to assess the satisfaction of the patient with the procedure.

STATISTICAL METHODS:

Taking the power of study to be eighty and the alpha error to be 5% and level of significance to be 95%, a sample size of 40 was estimated. Statistical analysis was performed using SPSS software version 23.0 to apply paired t test for normally distributed data. A P value of <0.05 was considered statistically significant.

RESULTS

A total of 83 patients with unilateral headache were screened for the study, out of which 42 met the study criteria and consented to participate. However, data could be collected for 30 patients only as the rest of the patients were lost to follow up and did not turn up for the block with the study period. Of the 30 patients who received the Sphenopalatine ganglion block, all patients reported immediate relief in acute pain and all were followed up for 1 month. The mean age of the patients suffering from migraine was 30.9 ± 8.53 (20 to 41 years) and the mean duration of illness was 33.40 ± 15.89 months (6 months to 90 months). Our study subjects were both males and females, with females constituting 80 % (24 females and 6 males) of the study population.

The parameters assessed were the heart rate, blood pressure, oxygen saturation (by pulse oximetry) and the pain score (by VAS). The baseline mean VAS of our study population was 6.53 ± 1.01 . This value decreases to 2.26 ± 0.69 , and this change was statistically significant ($p < 0.001$). This further decreased to a mean value of 1.36 ± 0.66 after 2 hours and remained at 1.46 ± 0.63 after 24 hours (Figure 1).

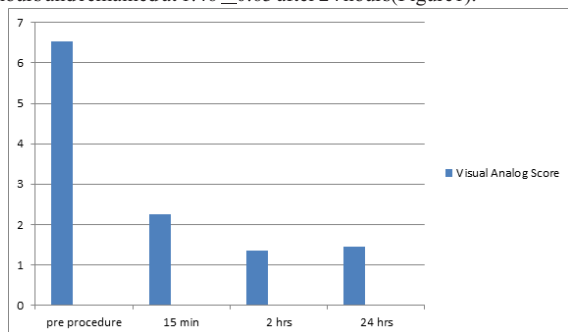


Fig 1 Pain - VAS (Visual Analog Score) before and after the block.

All these are highly significant changes when compared to the baseline. The average no of episodes of headache experienced by our study group before the procedure was 10.33 ± 2.84 , which decreased to 7.90 ± 2.38 in the month following the procedure. This decrease was also statistically significant ($p < 0.001$). The first episode of headache after the SPG block has been shown in Figure 3. No Pain recurred in the first week post block. Twenty three patients had the first episode of headache in the second week and 7 patients in the third week post block.

There was no significant change in blood pressure, heart rate or pulse oximeter reading during or after the procedure (Figure 2).

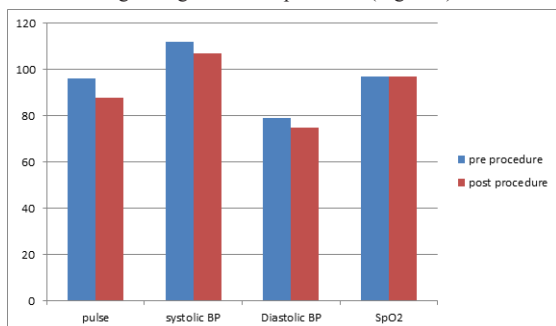


Fig 2: Vitals of migraine patients

All patients complained of numbness in the throat post procedure.

There was no other adverse effect noted during or after the procedure.

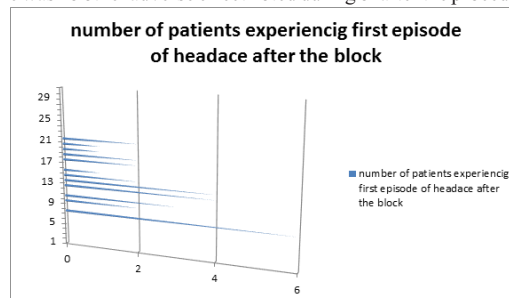


Fig 3: Appearance of headache after the block in the following month in 30 patients

Patient satisfaction was noted as a self reported percentage score. The mean patient satisfaction was noted to be 78.30 ± 8.44 in our study cohort.

DISCUSSION

Recent theories of migraine pathogenesis emphasize that it is a disorder of the dysfunction of brainstem centers regulating the pain perception and vascular tone of cerebral blood vessels. The increase in CGRP during acute attacks of migraine, its presence in the trigeminal nerves is the evidence in favour of neurovascular theory of migraine.¹⁵ The trigemino vascular system has connections with the trigemino autonomic reflex, the afferent of which is via trigeminal nerve and efferent is via greater petrosal part of facial nerve (parasympathetic outflow) through the superior salivatory nucleus (SSN) and into sphenopalatine ganglion (SPG).¹² Blocking the Sphenopalatine ganglion that is connected to the maxillary nerve, the deep petrosal nerve (sympathetic) and the greater petrosal nerve (parasympathetic), may prevent the activation of the trigeminovascular system by blocking the trigemino autonomic reflex. This is the rationale for the use of SPG block in various headaches specially the trigeminal autonomic cephalalgias.¹⁸ This prospective uncontrolled study observed that a single transnasal SPG block using the cotton swab dipped in 4% lidocaine is an effective and safe treatment of acute migraine headaches. Most patients reported a decrease in pain intensity within 5 minutes of application of the block. There was a rapid relief in headache observed at 15 minutes and 2 hours post block and the effect was sustained for more than 24 hours after the procedure. Most patients were satisfied by the procedure and reported a good overall response.

Various studies have shown the effectiveness of SPG block with different drugs^{9, 10, 19} and approaches.^{16, 17} To the best of our knowledge this is the first study on Indian subjects.

All our study subjects had pain relief after the block. Kudrow et al⁵ conducted a similar uncontrolled study in migraine patients but only 50% their patients had pain relief. Their success rate was different from ours because they used 0.3 ml lidocaine and instilled it using a dropper into the nose in the sitting position and so the drug may not have reached the SPG. The effectiveness of the block in our patients was confirmed by the change in the temperature of the facial skin. Schaffer et al⁶ in a randomized, double-blind, placebo controlled trial with intranasal bupivacaine in acute frontal headache patients presenting to the emergency department, found that the group receiving bupivacaine had 50 % reduction in pain at 15 mins which was the same as in the placebo group. This finding is different from ours perhaps because of their use of bupivacaine which has slower onset time as compared to lidocaine and also because they discharged their patients after 15 minutes of administration of block.

There was a decrease in frequency of migraneous headaches after a single injection of Lidocaine into the SPG in our study. A placebo-controlled study with repeated intranasal 0.5% bupivacaine using a specialized device to block the SPG revealed that there was an immediate pain relief as well as a decrease in the frequency of attacks at 6 months.^{9, 10} Literature is sparse regarding how frequently should the SPG block be given to decrease the frequency of attacks. Since most of our patients had no acute headache attacks up to a week after the block, we suggest weekly SPG block, for effectiveness. However this has to be supported by further randomized controlled studies.

There are several limitations in our study. The first one being the lack of a control group and the second the study is underpowered. Subjective pain response might have a significant placebo component, may be a response bias from the patients who consented to participate. We could show the effectiveness of the block by a rise in the facial skin temperature which was an indirect evidence, in the absence of direct demonstration of spread of drug using real time ultrasonography.

Despite the limitations, our study elucidates the use and effectiveness of SPG in acute migraine settings which is quiet common in our country²⁰. It is economical, the onset is rapid, side effects are minimal and it can also lead to decrease in frequency of further attacks. Several pre-designed catheters are available in foreign markets (Sphenocath, Alevio, Tx360³) for trans nasal block, but our age old cotton tip applicator is equally effective if administered with care and caution. The SPG block use will lead to a decrease in the use of frequent pain medications and thus shall also prevent medication overuse headache. The high treatment response rate and satisfaction rates in this study were both encouraging and is clinically meaningful. A recent study evaluating physician knowledge and application of SPG block concluded that it is highly underutilized and lack of formal protocol is the reason for the same.⁷

CONCLUSION

This study concludes that a Single trans nasal Sphenopalatine block using a cotton tip applicator is an effective, non invasive, easy and economical way of aborting an acute episode of migraine with minimal side effects and also decreases the frequency of further attacks upto one month.

REFERENCES

- Möller M, May A. The unique role of the trigeminal autonomic reflex and its modulation in primary headache disorders. *Curr Opin Neurol*. 2019 Jun;32(3):438-442. doi: 10.1097/WCO.0000000000000691. PMID: 30865010.
- Binfalah M, Alghawi E, Shosha E, Alhilily A, Bakhtiet M. Sphenopalatine Ganglion Block for the Treatment of Acute Migraine Headache. *Pain Res Treat*. 2018 May 7;2018:2516953. doi: 10.1155/2018/2516953. PMID: 29862074; PMCID: PMC 5971 252.
- Goadsby PJ, Holland PR, Martins-Oliveira M, Hoffmann J, Schankin C, Akerman S. Pathophysiology of Migraine: A Disorder of Sensory Processing. *Physiol Rev*. 2017;97(2):553-622. doi:10.1152/physrev.00034.2015
- Candido KD, Massey ST, Sauer R, Darabad RR, Knezevic NN. A novel revision to the classical transnasal topical sphenopalatine ganglion block for the treatment of headache and facial pain. *Pain Physician*. 2013 Nov-Dec;16(6):E769-78. PMID: 24284858.
- Kudrow L, Kudrow D B, & Sandweiss J. H. (1995). *Rapid and Sustained Relief of Migraine Attacks With Intranasal Lidocaine: Preliminary Findings*. *Headache: The Journal of Head and Face Pain*, 35(2), 79-82. doi:10.1111/j.1526-4610.1995. hed 3502079.
- Jason T. Schaffer, Benton R. Hunter, Kevin M. Ball, Christopher S. Weaver. Noninvasive Sphenopalatine Ganglion Block for Acute Headache in the Emergency Department: A Randomized Placebo-Controlled Trial. *Annals of Emergency Medicine*, Volume 65, Issue 5, 2015, Pages 505-10, ISSN 0196-0644, <https://doi.org/10.1016/j.annemergmed.2014.12.012>
- Robbins, M.S., Robertson, C.E., Kaplan, E., Ailani, J., Charleston, L., IV, Kuruvilla, D., Blumenfeld, A., Berliner, R., Rosen, N.L., Duarte, R., Vidwan, J., Halker, R.B., Gill, N. and Ashkenazi, A. (2016), The Sphenopalatine Ganglion: Anatomy, Pathophysiology, and Therapeutic Targeting in Headache. *Headache: The Journal of Head and Face Pain*, 56: 240-258. <https://doi.org/10.1111/head.12729>
- Candido KD, Massey ST, Sauer R, Darabad RR, Knezevic NN. A novel revision to the classical transnasal topical sphenopalatine ganglion block for the treatment of headache and facial pain. *Pain Physician*. 2013 Nov-Dec;16(6):E769-78. PMID: 24284858.
- Cady RK, Saper J, Dexter K, Cady RJ, Manley HR. Long-term efficacy of a double-blind, placebo-controlled, randomized study for repetitive sphenopalatine blockade with bupivacaine vs. saline with the Tx360 device for treatment of chronic migraine. *Headache*. 2015 Apr;55(4):529-42. doi: 10.1111/head.12546. Epub 2015 Mar 31. PMID: 25828648; PMCID: PMC6681144.
- Cady R, Saper J, Dexter K, Manley HR. A double-blind, placebo-controlled study of repetitive transnasal sphenopalatine ganglion blockade with tx360® as acute treatment for chronic migraine. *Headache*. 2015 Jan;55(1):101-16. doi: 10.1111/head.12458. Epub 2014 Oct 23. PMID: 25338927; PMCID: PMC4320756.
- Burkett JG, Robbins MS, Robertson CE, Mete M, Saikali NP, Halker Singh RB, Ailani J. Sphenopalatine ganglion block in primary headaches: An American Headache Society member survey. *Neurol Clin Pract*. 2020 Dec;10(6):503-509. doi: 10.1212/CPJ.0000000000000773. PMID: 33520413; PMCID: PMC7837428.
- Alexander CE, Dua A. Sphenopalatine Ganglion Block. [Updated 2021 May 4]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557751/>
- Robbins MS, Robertson CE, Kaplan E, Ailani J, Charleston L, Kuruvilla D, Blumenfeld A, Berliner R, Rosen NL, Duarte R, Vidwan J, Halker RB, Gill N, Ashkenazi A. The Sphenopalatine Ganglion: Anatomy, Pathophysiology, and Therapeutic Targeting in Headache. *Headache*. 2016 Feb;56(2):240-58. [PubMed]
- Ho KWD, Przkora R, Kumar S. Sphenopalatine ganglion: block, radiofrequency ablation and neurostimulation - a systematic review. *J Headache Pain*. 2017 Dec 28;18(1):118. [PMC free article] [PubMed]
- Chen ST, Wu JW. A new era for migraine: The role of calcitonin gene-related peptide in the trigeminovascular system. *Prog Brain Res*. 2020;255:123-142. doi: 10.1016/bs.pbr.2020.05.012. Epub 2020 Jun 16. PMID: 33008504.
- Mehta D, Leary MC, Yacoub HA, El-Hunjul M, Kincaid H, Koss V, Wachter K, Malizia D, Glassman B, Castaldo JE. The Effect of Regional Anesthetic Sphenopalatine Ganglion Block on Self-Reported Pain in Patients With Status Migrainosus. *Headache*. 2019 Jan;59(1):69-76. doi: 10.1111/head.13390. Epub 2018 Jul 25. PMID: 30043973.
- Narouze S, Kapural L, Casanova J, Mekhail N. Sphenopalatine ganglion radiofrequency ablation for the management of chronic cluster headache. *Headache*. 2009 Apr; 49

(4):571-7. doi: 10.1111/j.1526-4610.2008.01226.x. Epub 2008 Sep 9. PMID: 1878 3451.

- Mojica J, Mo B, Ng A. Sphenopalatine Ganglion Block in the Management of Chronic Headaches. *Curr Pain Headache Rep*. 2017 Jun;21(6):27. doi: 10.1007/s11916-017-0626-8. Erratum in: *Curr Pain Headache Rep*. 2017 Nov 20;21(12):53. Mojica, Jeffery [corrected to Mojica, Jeffrey]. PMID: 28432602.
- Bratbak DF, Nordgård S, Stovner LJ, Linde M, Dodick DW, Aschehoug I, Folvik M, Tronvik E. Pilot study of sphenopalatine injection of onabotulinumtoxinA for the treatment of intractable chronic migraine. *Cephalalgia*. 2017 Apr;37(4):356-364. doi: 10.1177/0333102416648328. Epub 2016 May 6. PMID: 27154997; PMCID: PMC539 4468.
- Biman R, Neelanjana P, Avijit H, Das S, Ghosal M K, Misra A K, Banerjee T K, Chaudhuri A, Das S K. Prevalence, burden, and risk factors of migraine: A community-based study from Eastern India. *Neurology India*. Volume:65, Issue Number: 6; 1280-1288