Sphenopalatine Block for Migraine Headaches in Children

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Abstract

Migraine headaches can significantly impact both the physical and psychological well-being of children and adolescents, and have been shown to have a considerable prevalence within this population. It is therefore reasonable to further explore treatment modalities that can alleviate or resolve migraine symptoms. Sphenopalatine ganglion block represents one of these modalities and has demonstrated promising and successful outcomes when treating migraines in the pediatric population.

Keywords: head and neck, face, headaches, interventional radiology

Case Summary

A teenage girl presented with a history of chronic migraine headaches that interfere with her daily activities.

Imaging Findings

A sphenopalatine ganglion (SPG) block was performed under intermittent lateral fluoroscopic guidance with the patient in a supine position and neck extended. The nasal mucosa was locally anesthetized bilaterally using 4% lidocaine spray, followed by 2% viscous lidocaine 5 minutes later. The SphenoCath (Figure 1) was positioned over the middle turbinate and contrast was injected to confirm satisfactory catheter tip position. Then, 2 ccs of 4% lidocaine was slowly injected, and the patient was asked not to swallow to retain local anesthetic in the pterygopalatine fossa (Figure 2).

Figure 1. SphenoCath (Dolor Technologies, Clarefield, Utah).

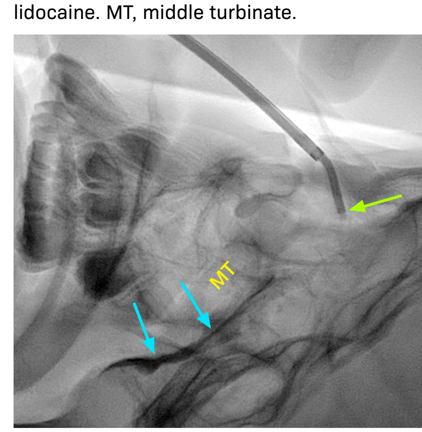
Diagnosis

Migraine Headache.

Discussion

The SPG is the largest of the 4 parasympathetic ganglia of the head and neck. Other common names synonymous for SPG include pterygopalatine ganglion, Meckel ganglion, or nasal ganglion. The SPG resides in the pterygopalatine fossa that is located at or above the level of the posterior to the lateral insertion of the middle nasal turbinate and maxillary sinus. The SPG is approximately 1.0-1.5 mm deep to the posterior nasal mucosa. The SPG receives 3 main inputs: sensory, parasympathetic, and

Figure 2. (A) Coned lateral fluoroscopic spot image demonstrating that the catheter tip (green arrow) is in a satisfactory position above the middle turbinate. Contrast outlining the nasopharynx (teal arrows) with confirming satisfactory position prior to injection of 2% lidocaine. MT, middle turbinate.



sympathetic.[1] The sensory input originates from the maxillary nerve, which gives off 2 ganglionic branches to the SPG, largely without synapsing, and leading into the greater and lesser palatine nerves that are responsible for sensation in the palate, uvula, tonsils, soft palate, and oral mucosa.[1,2] The sympathetic input arises from the superior cervical ganglion, through the deep petrosal nerve, which, in turn, joins the greater petrosal nerve to form the Vidian nerve. The sympathetic fibers do not synapse in the SPG. The

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Disclosures: The authors have no conflicts of interest to disclose. None of the authors received outside funding for the production of this original manuscript and no part of this article has been previously published elsewhere.

https://doi.org/10.37549/JPCR-26-0111
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last input is the parasympathetic fibers that originate in the superior salivatory nucleus of the brainstem and eventually lead into the greater petrosal nerve and then the Vidian nerve.[1,2] These parasympathetic fibers do synapse in the SPG and give rise to post-ganglionic parasympathetic fibers that innervate the lacrimal gland, nasal mucosa, and meningeal vessels.[2,3] Parasympathetic innervation of the meningeal vessels can lead to vasodilation and neurogenic inflammation, leading to activation of trigeminal nociceptors, which, in turn, can cause headache pain.[3] Therefore, using a block to inhibit the SPG may attenuate this mechanism of meningeal vasodilation and neurogenic inflammation, providing a basis for headache relief. Given this anatomical framework, it is reasonable to hypothesize that targeting the SPG can have an influence on chronic headache pain. Accordingly, several studies have investigated whether modulation of the SPG can alleviate or resolve headache symptoms.[4]

The literature shows improvement of symptoms of migraines using SPG-targeted treatment modalities. Targeting the SPG results in pain reduction for cluster headaches (CH) and migraines in adults, either via anesthetic block (Ansarinia et al) or electrical stimulation (Tepper et al).[5,6] Tepper et al reported stimulation of the SPG resulted in 61% of CH completely resolving within minutes, and 77% of the patients with CH experienced a >50% reduction in headache intensity.[5] Ansarinia et al reported 10 patients with migraines who had the SPG blocks and 2 patients were pain-free following 3 minutes of stimulation, and 3 of the patients had pain reduction.[6] It is shown that targeting the SPG can both affect CHs and migraines. While these findings are compelling in the adult population, evidence in pediatric populations is less available.

When compared with adults, SPG treatment modalities for migraines in the pediatric population are sparse. Migraines in the pediatric population can have a significant toll on the well-being of the patient. In a meta-analysis, it was shown that the prevalence of migraine in children and adolescents was 11%, showing a significant portion of this population being affected, warranting further research into treatment modalities.[7] SPG block is a relatively safe and minimally invasive procedure that can be used to treat migraine headaches. A retrospective study found that out of a total of 489 SPG blocks that were performed on patients (ages 6-26 years) who had migraine or status migrainosus, 100% of them achieved pain reduction with a mean preprocedural pain score of 5.7 and a post-procedure pain score of 2.4 assessed using the visual analog scale.[8] Lastly, in a prospective study of 17 adolescents (mean age of 14 years, 82% female) who completed the SPG block series for chronic headaches, 59% reported meaningful improvement , with 53% of the population maintaining this improvement 3 months after.[9]

SPG block in pediatric patients can be initiated using a phased local anesthesia approach using aerosolized 4% lidocaine spray and 2% lidocaine gel at different time intervals and using different methods of delivery (eg, cotton swab).[8] This approach was successful in mitigating the specific anxiety and nervousness of children and adolescents, to allow for insertion of the SphenoCath (Dolor Technologies, Clarefield, Utah) into the nares. The SphenoCath is advanced utilizing intermittent fluoroscopic guidance and brought to the anterosuperior nasal cavity where the curved inner catheter is deployed superior to the middle nasal turbinate. 1 mL of isovue-300 is injected to confirm the transit of fluid towards the pterygopalatine fossa, and once confirmed, 2 mL of 4% lidocaine is slowly injected.[8] Following removal of the catheter, the patient is maintained supine with neck extension for 10 minutes to allow for proper absorption and full contact of the administered lidocaine through the nasal mucosa.[8]

In Kouri et al, a non-image-guided approach was used. 0.3 mL of 0.5% bupivacaine was administered in each naris while the patient was in an upright seated position using a Tx360 nasal applicator device (Tian Medical, Libertyville, Illinois). The tip of the catheter is intended to be positioned posterior to the inferior nasal turbinate, although, without imaging confirmation, the catheter tip location is uncertain. The Tx360 device sprays anteriorly, superiorly, and laterally in order to fully cover the SPG.[9] It is important to specifically note that the 2 studies use different anatomical landmarks: the image-guided approach positions the catheter tip adjacent to the expected location of the SPG with the patient in supine position, while the other delivers anesthetic while the patient is seated upright with uncertain catheter position and a wide spray zone is created to locally anesthetize the SPG.[8,9] These differences are a reflection of the variation in delivery method and guidance used. Although typically well-tolerated, SPG block can result in some minor adverse effects.

Adverse effects resulting from SPG block are typically local and transient. Reported side effects include nasal or palatal numbness, ipsilateral tearing, and an unpleasant taste. Epistaxis, bleeding, and infection have also been described, particularly with injection-based approaches.[4] Overall, SPG block appears to be a safe and well-tolerated procedure for migraine treatment in pediatric patients.

Conclusion

Migraine headaches can significantly impact both the physical and psychological well-being of children and adolescents and has been shown to have a considerable prevalence within this population. It is therefore reasonable to further explore treatment modalities that can alleviate or resolve migraine symptoms. SPG block represents one of these modalities and has demonstrated promising and successful

https://doi.org/10.37549/JPCR-26-0111

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https://doi.org/10.37549/JPCR-26-0111