WestLand Publishers

Digital Journal of Science (DJS)

Case Report

Sphenopalatine Block Applications in Cluster Headache Treatment

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Received Date: **10 December, 2024**; **Published Date:** **30 December, 2024**

Keywords:

Cluster Headache; Sphenopalatine Ganglion; Radiofrequency Ablation; Pain Management; Autonomic Symptoms.

Abbreviations:

CH: Cluster headache; fMRI: functional Magnetic Resonance Imaging; PET: Positron Emission Tomography; RFA: radiofrequency ablation; SPG: sphenopalatine ganglion; SUNCT: Short-lasting Unilateral Neuralgiform headache attacks with Conjunctival injection and Tearing.

Citation:

Rani HR, Samodra YL (2024) Sphenopalatine Block Applications in Cluster Headache Treatment. Digital J Sci 1(1): 108.

Abstract

Cluster headaches are characterized by severe, short-lasting unilateral pain, lasting 15-180 minutes, accompanied by distinctive autonomic symptoms such as tearing and nasal congestion. This case report discusses a 57-year-old male with a five-year history of these headaches, which escalated in frequency recently, leading to a diagnosis of cluster headache despite various unsuccessful treatments. The patient's condition was managed with verapamil for prophylaxis and oxygen for acute attacks, but significant relief was only achieved through a transnasal Sphenopalatine Ganglion (SPG) block with lidocaine. Consequently, Radiofrequency Ablation (RFA) of the SPG was performed due to its known role in headache pathophysiology, offering a promising alternative for patients resistant to conventional therapy. The procedure was conducted with precision under fluoroscopic guidance, resulting in immediate symptom relief. This case highlights the potential of SPG interventions in the management of chronic, intractable cluster headaches and underscores the need for further research into the long-term efficacy and safety of such techniques.

Introduction

Cluster headaches are distinct among cephalalgias due to their intense, one-sided pain that is both brief and frequent, lasting from 15 to 180 minutes and happening anywhere from once every other day to eight times in a single day [1]. These headaches follow a remarkably consistent schedule, often striking at the same time daily or during sleep, instilling a fear of night-time in those affected. The pain is notoriously severe, paired with a suite of autonomic symptoms on the headache side, such as tearing eyes, eyelid swelling, and nasal congestion. This unique presentation makes cluster headaches crucial for prompt and precise diagnosis, highlighting the need to identify these symptoms to distinguish this condition from other headache disorders [2]. Despite its clear diagnostic criteria, cluster headache remains an enigma in terms of effective management. Traditional treatments often fall short, leaving a significant portion of patients in ongoing distress [3]. The prevalence is relatively low, affecting about 0.1% of the adult population, with a pronounced gender bias towards men. Onset usually strikes in the

early twenties, with a peak in the forties [4]. Factors like family history, smoking, previous head injuries, and irregular sleep patterns due to shift work are linked to its development. This condition of limited therapeutic success sets the stage for exploring alternative treatments highlighting the need for innovative approaches beyond the conventional [5,6]. The Sphenopalatine Ganglion (SPG), first implicated in headache pathogenesis by Sluder in 1908, has evolved from a target for simple nerve blocks to a potential site for more advanced interventions [7]. Historically, physicians have employed SPG blocks for a spectrum of pain conditions, but in modern practice, it's predominantly used for managing head and facial pain. The SPG's role in pain modulation makes it an intriguing target for neurostimulation and ablation techniques [8,9]. This case report delves into the journey of a patient with cluster headache who, after navigating through some ineffective treatments, found relief through radiofrequency ablation of the SPG.

Case Presentation

A 57-year-old male, 75 kg of weight and 168 cm of height, presented with a five-year history of severe, intermittent headaches. The pain was described as burning, unilateral (left side), accompanied by ipsilateral lacrimation, nasal congestion, and a sensation so intense that the patient expressed a desire to "hit his head against the wall." The attacks typically last between one to two hours, occurring multiple times daily with periods of remission lasting from days to weeks. Triggers include brushing teeth or chewing. Over the past three months, the frequency of these attacks increased to two to four episodes per day, each lasting about 90 minutes. The patient has a medical history of controlled hypertension (systolic blood pressure typically around 150 mmHg) and hypercholesterolemia, managed by an internal medicine specialist. He visited numerous specialists without significant relief, including a neurologist who recommended a head and neck CT scan, which was normal. Dental consultations resulted in the extraction of left upper molars, yet no dental cause was identified. The patient has a past smoking history but ceased since the onset of headaches. No previous trauma, diabetes mellitus, or stroke history was reported. Upon clinical examination, the patient exhibited distinct neurological signs; notably, there was a region of diminished sensation on the left side of his forehead along with miosis and ptosis of the left eye. Despite these specific findings related to his headache, all other general physical and organ function tests, including musculoskeletal, liver, kidney, and coagulation assessments, returned within normal limits, indicating that the headache was not associated with a broader systemic dysfunction. The diagnosis of Cluster Headache was made, predicated on the patient's description of the pain as unilateral, the characteristic pattern of attacks, and the presence of ipsilateral autonomic symptoms. However, the differential diagnosis included Paroxysmal Hemicrania due to the similarity in the nature of attacks. This condition was considered less probable due to the patient's response to treatments typically effective for cluster headaches. Orbital myositis was also considered but dismissed following normal findings on imaging studies and clinical assessment.

In terms of patient education, the individual was advised on several lifestyle modifications aimed at reducing the frequency and severity of headache episodes. This involved avoiding known triggers such as alcohol, petrol fumes, and certain foods like cheese, citrus fruits, chocolate, processed meats, MSG, nuts, seeds, and peanut butter. For management, the patient had been continuing his prophylactic therapy with Verapamil, as prescribed by a previous neurologist. For acute attacks, two main abortive treatments were employed: firstly, nasal oxygen therapy at 3 liters per minute, which helps in quickly alleviating the headache; secondly, a transnasal Sphenopalatine Ganglion (SPG) block using 4% lidocaine was performed. This latter intervention provided the patient with immediate relief from his symptoms. The preparation for SPG ablation involved several steps to ensure safety and efficacy. After thorough patient education, informed consent was secured. Pre-procedure evaluations were conducted, including blood tests to rule out any underlying infections or coagulopathy, and a cardiac assessment to ensure the patient could tolerate the procedure. The area for needle insertion was carefully marked just anterior to the right mandible and below the zygomatic arch. The patient was positioned lying down with his head secured to prevent movement, an IV line was established for potential sedation or emergency medication, and the facial area was meticulously sterilized. The ablation procedure itself

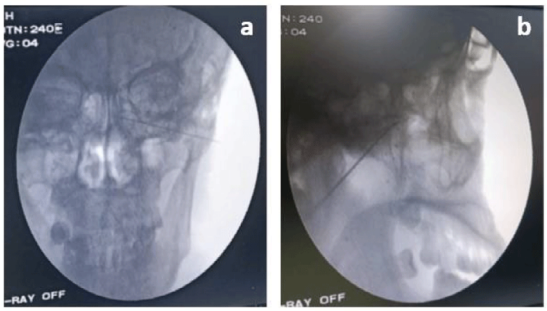

Figure 1: Final needle position for sphenopalatine ganglion ablation.
a) AP view showing the needle lateral to the nasal wall at the level of the middle turbinate.
(b) Lateral view confirming the needle's entry into the pterygopalatine fossa.

utilized specialized equipment, including a radiofrequency ablation system, fluoroscopy for image guidance, a specific RF needle, nonionic contrast for needle placement confirmation, local anesthetics, and sedation drugs like Midazolam, Fentanyl, and Propofol, alongside emergency CPR equipment. During the procedure, the needle was carefully advanced under fluoroscopic guidance into the pterygopalatine fossa (Figure 1). First, sensory stimulation was used to confirm the correct placement of the needle, followed by a contrast injection to ensure no vascular or intranasal entry. Local anesthesia was then administered, and two radiofrequency lesions were created at 80°C for 60 seconds each. Post-ablation, a mixture of bupivacaine and triamcinolone was injected for additional relief and to mitigate potential inflammation.

Discussion

Cluster headache (CH) is a severe primary headache disorder characterized by recurrent episodes of unilateral periorbital pain lasting 15 to 180 minutes, but typically around 30 minutes. These episodes are often accompanied by ipsilateral autonomic symptoms such as lacrimation, nasal congestion, ptosis, miosis, eyelid swelling, and eye redness [10,11]. The headaches typically occur in clusters, striking daily for weeks or months, often at night, which may result in sleep avoidance. The condition may present as episodic, with periods of remission, or as chronic, with little or no remission. CH predominantly affects young adult males, with an estimated prevalence of 0.5 to 1.0 per 1,000, and displays circannual and circadian patterns [12,13]. Common triggers include alcohol, strong odors, and naps, with attacks frequently occurring at predictable times. Additional triggers include hypoxia, potentially linked to sleep apnea, and vasodilators such as nitroglycerin during cluster episodes [14,15]. The pathophysiology of CH involves activation of parasympathetic outflow through the facial nerve, primarily via the SPG, leading to trigeminovascular activation and neuroendocrine disturbances. The hypothalamus's involvement explains the cyclic nature of CH, and genetic factors, including the hypocretin receptor gene, are implicated in about 10% of cases with a familial pattern [15,16]. Imaging studies, including Positron Emission Tomography (PET) and Functional Magnetic Resonance Imaging (fMRI), have shown hypothalamic gray matter changes, underscoring the role of the trigeminal parasympathetic reflex in arterial dilation and increased sensitivity to vasodilators, alongside signs of autonomic dysfunction like abnormal heart rate variability and increased nocturnal lipolysis [17,18]. The SPG, or Meckel's ganglion, is located within the pterygopalatine fossa, an inverted pyramid-shaped structure behind the maxillary sinus. The boundaries of this fossa include the vertical plate of the palatine bone medially, the maxillary sinus posteriorly, the pterygoid plates vertically, and the pterygomaxillary fissure laterally [19]. Functionally, it's central among the head's parasympathetic ganglia, controlling nasal blood flow to regulate the temperature of inhaled air. The SPG receives a mix of neural inputs—parasympathetic, sympathetic, and sensory—making it a key node for pain modulation [20]. The 2018 International Headache Society guidelines define cluster headache as a condition involving at least five episodes of severe, unilateral pain around the eye, above the eye, or in the temple, lasting 15 to 180 minutes untreated, and accompanied by symptoms like red or watery eyes, nasal congestion, eyelid swelling, facial sweating, pupil constriction, or restlessness. These attacks occur with a frequency of one every other day to eight per day during active periods and must not be explained by another medical condition [14,21]. The differential diagnosis includes paroxysmal hemicrania, responsive to indomethacin, and orbital myositis, among others like migraines and Short-lasting Unilateral Neuralgiform headache attacks with Conjunctival injection and Tearing (SUNCT) syndrome [3,12].

Management involves dual approaches: acute treatment for immediate relief and prophylaxis to mitigate future attacks. Verapamil is a cornerstone for prevention, starting at 240 mg daily and titrated as needed. For acute attacks, oxygen therapy and sumatriptan are commonly used [22]. Given the SPG's role in CH, it's a target for alternative therapies, including SPG blocks via various methods [19]. Our patient experienced temporary relief with a transnasal SPG block, leading to Radiofrequency Ablation (RFA) for more sustained relief. Percutaneous RFA providing a relatively quick and cost-effective treatment option with a low incidence of complications. RFA works by heating the target tissue to interrupt pain pathways [23]. There are two main modalities: traditional RFA, which uses continuous heat, and pulsed RFA (PRFA), which applies heat in pulses, potentially offering a less invasive approach with fewer thermal side effects, though it might require more sessions to maintain efficacy [24,25]. Precision in needle placement is crucial, often achieved with the aid of real-time fluoroscopy and electrical stimulation to ensure accurate targeting of the SPG [26]. Recent studies, including long-term follow-ups, indicate varied but generally positive outcomes, with a significant proportion of chronic CH patients experiencing substantial pain relief. However, there's no clear superiority of one RFA method over the other in terms of outcomes, but PRFA might be favored due to its safety profile [23,27]. This case underscores the complexity of CH management, advocating for a combination of pharmacological and interventional

techniques. The SPG's role in CH pathology makes it an attractive target for both diagnosis and treatment. RFA of the SPG marks a significant therapeutic advancement, offering solutions where traditional treatments falter. Future research should aim to refine these techniques, explore genetic influences, and personalize treatment strategies to match the unique patterns of each patient's CH.

Acknowledgements

The authors express their gratitude to the Benang Merah Research Center for their assistance with English proofreading.

Conflict of Interest

The authors declare no conflicts of interest related to this article.

Funding

None

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