

Tinnitus Relief Following Endoscopic Sinus Surgery: A Case Report

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Abstract: Tinnitus, a distressing symptom characterised by the perception of sound in the absence of external stimuli, presents multifactorial origins, with chronic rhinosinusitis (CRS) being among its implicated conditions. The association between sinonasal inflammation and auditory perception underscores the need for comprehensive evaluation and management in refractory tinnitus cases. This case report aims to elucidate the potential efficacy of endoscopic sinus surgery (ESS) in alleviating tinnitus symptoms in patients with CRS refractory to medical management. A 23-year-old female presented with headache, facial pressure, nasal congestion, and bothersome tinnitus persisting for two years. Despite undergoing various medical treatments, her symptoms remained refractory. Imaging revealed opacification of the left sphenoid sinus, implicating sinus pathology in her tinnitus aetiology. ESS was performed to address underlying sinus issues, particularly left-sided sphenoidotomy. Following surgery, the patient reported improved headache, facial pressure, and tinnitus symptoms. Subsequent follow-up assessments demonstrated a complete resolution of tinnitus on the right side and a notable reduction in intensity on the left side. Nasal endoscopy revealed patent sinus ostium, indicating successful surgical intervention. The case underscores the potential of ESS as a therapeutic intervention for CRS-related tinnitus refractory to medical management. While further research is warranted to understand the mechanisms of ESS improvement and optimise surgical techniques, this case highlights the promising role of ESS in addressing underlying sinus pathology and providing relief from tinnitus symptoms.

Keywords: Tinnitus, Rhinosinusitis, Endoscopic, Surgery, Relief

1. Introduction

Tinnitus is a distressing symptom affecting various demographics with multifactorial origins. Its prevalence increases with age, peaking at 14.3% among 60-69-year-olds in the US. Younger populations also experience it, with rates ranging from 4.7% to 74.9%. Chronic rhinosinusitis contributes to tinnitus through eustachian tube obstruction, sinus inflammation, and fluid accumulation [1]. Sinonasal inflammation and auditory perception are linked, with reduced brain connectivity affecting cognitive regulation [2]. This highlights potential neural interactions between the sinonasal and auditory systems. Understanding and managing tinnitus is crucial, but traditional treatments like pharmacological interventions and cognitive-behavioural therapy are limited. Recognising the link between sinus pathology and tinnitus suggests exploring alternative treatment modalities [3]. This case report represents the potential impact of endoscopic sinus surgery as a therapeutic intervention for alleviating tinnitus symptoms in individuals with chronic rhinosinusitis. By addressing underlying sinus pathology, such surgical interventions may offer tangible benefits in ameliorating tinnitus, thus warranting further investigation into its efficacy and underlying mechanisms.

Case Presentation

Clinical Presentation

A 23-year-old female presented to our otolaryngology clinic with a two-year history of persistent symptoms, including headache, facial pressure, nasal congestion, and bothersome tinnitus. The patient described the tinnitus as a constant high-pitched ringing, predominantly affecting her left ear. She emphasised the significant impact of tinnitus on her quality of life, reporting sleep disturbances and difficulties concentrating at work. Despite undergoing multiple therapeutic interventions, such as nasal corticosteroids, saline irrigation, oral antibiotics, and antihistamines for sinusitis and tinnitus management, her symptoms remained refractory to medical treatment.

The patient reported that her symptoms began approximately two years ago, gradually worsening over time. Initially, she experienced intermittent episodes of nasal congestion and mild discomfort in the facial area. However, over the past year, her symptoms intensified, with the onset of persistent headaches and bothersome tinnitus. The tinnitus was described as a high-pitched ringing sound, particularly noticeable in quiet environments and exacerbated by stress and fatigue. The patient reported difficulty falling asleep due to the constant noise in her left ear, which also interfered with her ability to concentrate during the day. She denied any history of trauma to the head or ears, recent upper respiratory tract infections, or significant changes in hearing acuity.

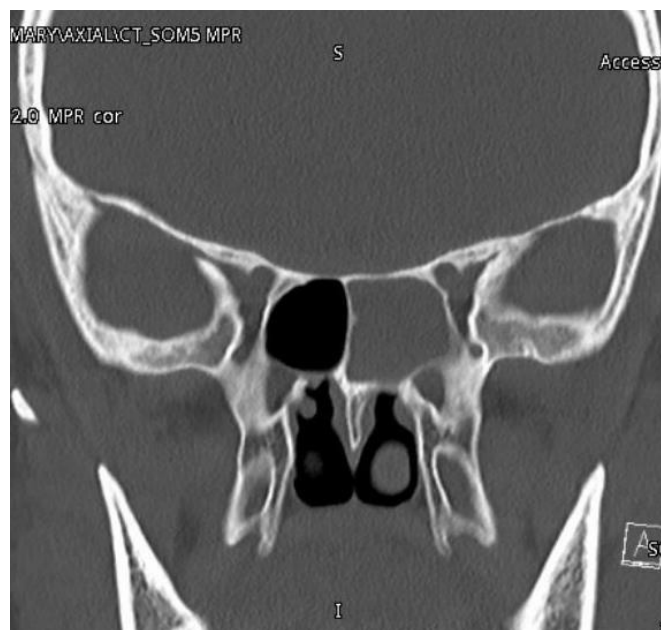
Physical Examination

Upon physical examination, the patient appeared well-nourished and in no acute distress. The head and neck examination revealed no palpable lymphadenopathy or thyroid gland abnormalities. Inspection of the external ears showed normal-appearing auricles without signs of inflammation or discharge. Otoloscopic examination revealed clear ear canals with intact tympanic membranes bilaterally. Tuning fork tests, including the Weber and Rinne tests, demonstrated symmetrical findings consistent with normal bilateral hearing.

A nasal examination revealed bilateral nasal congestion with mucopurulent discharge emanating from the sphenoidal recess. Intranasal endoscopy confirmed the presence of nasal polyps obstructing the nasal passages bilaterally. There was evidence of a deviated nasal septum, with the septal deviation directed towards the left side. The inferior turbinates were mildly enlarged bilaterally, contributing to nasal obstruction. Examination of the oropharynx revealed normal-appearing tonsils without signs of inflammation or exudate.

Imaging Findings

Computed tomography (CT) of the sinuses revealed clear, well-aerated paranasal sinuses, except for opacification observed in the left sphenoid sinus, as depicted in Figure 1. These imaging findings and the absence of vascular causes of tinnitus supported the diagnosis of chronic rhinosinusitis with associated tinnitus.



Treatment Approach

Given the persistence of the patient's symptoms despite medical management, a multidisciplinary approach involving otolaryngology, neurology, and audiology was adopted to develop an individualised treatment plan. The decision was made to pursue endoscopic sinus surgery (ESS) to address the underlying sinonasal pathology and alleviate the patient's symptoms.

Before surgery, the patient was counselled on the goals, risks, and potential benefits of ESS. Informed consent was obtained, preoperative preparations were initiated, including optimising the patient's medical comorbidities, discontinuing anticoagulant medications, and preoperative antibiotic prophylaxis.

The surgical procedure was performed under general anaesthesia with the patient in the supine position. A navigational system was utilised to aid in identifying key anatomical landmarks and facilitate precise surgical dissection. A 0-degree rigid endoscope was introduced into the nasal cavity, and the sinonasal anatomy was thoroughly examined.

The surgical approach involved a combination of maxillary antrostomy, ethmoidectomy, sphenoidotomy, and frontal sinusotomy. Attention was focused on the left sphenoid sinus, where evidence of mucosal thickening and purulent discharge was observed. Meticulous dissection was performed to remove diseased tissue and ensure adequate ventilation and drainage of the sinus cavities.

Intraoperative findings confirmed the presence of chronic inflammation and mucopurulent discharge within the left sphenoid sinus. Careful attention was paid to preserving critical structures such as the optic nerve, carotid artery, and skull base. Hemostasis was achieved using bipolar cautery, and nasal packing was placed to minimise postoperative bleeding and support the nasal mucosa.

Postoperative Outcome

Following surgery, the patient was monitored closely in the post-anaesthesia care unit (PACU) for immediate complications. Vital signs remained stable, and there were no signs of excessive bleeding or respiratory compromise. The pain was managed with intravenous analgesics, and the patient was provided with instructions regarding postoperative care and activity restrictions.

The patient was discharged home on the same day as surgery with a prescription for oral antibiotics and nasal saline irrigations. Regular follow-up appointments were scheduled to monitor the patient's progress and assess for any signs of disease recurrence or postoperative complications.

The patient reported significant improvement in her symptoms at the initial postoperative visit. The frequency and intensity of her headaches had decreased, and she noted a marked reduction in nasal congestion and facial pressure. There was a noticeable improvement in her tinnitus symptoms, with reduced intensity of the ringing sensation in her left ear. Subsequent follow-up assessments at one month and three months post-surgery demonstrated sustained improvement in the patient's symptoms. Nasal endoscopy revealed patent sinus ostia and resolution of mucosal inflammation. The patient reported minimal residual tinnitus, which was well-tolerated and did not significantly impact her quality of life. Audiometric testing showed no evidence of sensorineural hearing loss or significant changes in hearing acuity. Overall, the patient expressed satisfaction with the outcome of the surgical intervention and reported a significant improvement in her overall quality of life. She was able to return to her usual activities without experiencing the debilitating symptoms that had previously plagued her. Long-term follow-up is required to monitor for signs of disease recurrence or late complications.

Discussion

Tinnitus, characterised by the perception of sound in the absence of external stimuli, is a distressing symptom with multifactorial aetiology. While it commonly occurs in older populations, it can also affect younger individuals, highlighting the need for comprehensive evaluation and management across age groups. Chronic rhinosinusitis (CRS) is among the conditions implicated in tinnitus pathogenesis, potentially through mechanisms such as eustachian tube dysfunction, middle ear effusion, and neural interactions between sinonasal and auditory systems.

The association between sinonasal inflammation and auditory perception is supported by neuroimaging studies revealing altered brain connectivity in individuals with CRS. A previous study demonstrated reduced brain connections in key functional hubs that regulate cognition in patients with sinonasal inflammation, suggesting a potential neural link between sinonasal pathology and tinnitus. These findings underscore the importance of

considering sinonasal evaluation in patients presenting with refractory tinnitus, particularly those with concurrent sinonasal symptoms.

Traditional treatments for tinnitus, such as pharmacotherapy and cognitive-behavioural therapy, have limited efficacy, prompting the exploration of alternative therapeutic modalities. Endoscopic sinus surgery (ESS) has emerged as a potential intervention for alleviating tinnitus in patients with CRS refractory to medical management. By addressing underlying sinus pathology, ESS aims to restore normal sinonasal physiology, potentially ameliorating tinnitus symptoms [4].

In the present case, a 23-year-old female with chronic rhinosinusitis and debilitating tinnitus experienced significant improvement following ESS. Despite undergoing various medical treatments, including nasal corticosteroids and antibiotics, her symptoms remained refractory. Imaging revealed opacification of the left sphenoid sinus, implicating sinus pathology in her tinnitus aetiology. ESS was performed to address the underlying sinus issues, with particular attention given to left-sided sphenoidotomy to ensure adequate ventilation and drainage.

After surgery, the patient reported improved headache, facial pressure, and tinnitus symptoms. Subsequent follow-up assessments demonstrated a complete resolution of tinnitus on the right side and a notable reduction in intensity on the left side. Nasal endoscopy revealed patent sinus ostium, indicating successful surgical intervention. These findings suggest that ESS may offer tangible benefits in managing tinnitus in select cases of CRS, warranting further investigation into its efficacy and underlying mechanisms.

The success of ESS in alleviating tinnitus symptoms in this case may be attributed to several factors. First, addressing sinonasal inflammation and restoring normal sinus ventilation and drainage may mitigate the inflammatory mediators and fluid accumulation implicated in tinnitus pathogenesis. Improving eustachian tube function through sinus surgery may alleviate middle ear pressure abnormalities, reducing tinnitus severity. Furthermore, the potential neural interactions between sinonasal and auditory systems highlight the interconnectedness of these anatomical regions, suggesting that resolving sinonasal pathology may indirectly modulate auditory perception [5].

However, it is essential to acknowledge the limitations and considerations associated with ESS as a treatment for tinnitus. While this case demonstrates favourable outcomes, not all patients with CRS-related tinnitus may experience similar benefits from surgery. Patient selection criteria, including the severity and duration of symptoms, comorbidities, and anatomical variations, should be carefully considered when determining the appropriateness of surgical intervention.

Moreover, the optimal surgical technique and extent of sinus surgery for tinnitus management remain subjects of debate. While FESS is a widely utilised approach for CRS treatment, variations in surgical technique and adjunct procedures may influence outcomes. Future studies incorporating standardised surgical protocols and objective outcome measures are needed to elucidate the efficacy of specific surgical interventions for tinnitus relief.

Additionally, the long-term durability of tinnitus improvement following ESS requires further investigation. At the same time, this case demonstrates short-term benefits; sustained relief from tinnitus symptoms beyond the immediate postoperative period warrants longitudinal follow-up and assessment. Factors influencing long-term outcomes, such as disease recurrence, postoperative complications, and patient adherence to medical therapy and lifestyle modifications, should be systematically evaluated.

Furthermore, elucidating the underlying mechanisms of tinnitus improvement following ESS is essential for refining patient selection criteria and optimising treatment strategies. Neuroimaging studies investigating changes in central auditory processing and neural connectivity pre- and post-surgery may provide insights into the neuroplastic changes associated with tinnitus resolution. Additionally, biomarker studies examining inflammatory mediators and cytokine profiles in CRS patients with and without tinnitus could elucidate the pathophysiological mechanisms underlying tinnitus in the context of sinonasal inflammation [6].

This case highlights the potential role of endoscopic sinus surgery in alleviating tinnitus symptoms in patients with chronic rhinosinusitis refractory to medical management. ESS offers a promising therapeutic avenue for select

individuals with CRS-related tinnitus by addressing underlying sinus pathology and restoring normal sinonasal physiology. However, further research is warranted to elucidate the mechanisms of tinnitus improvement following surgery, refine patient selection criteria, and optimise surgical techniques for maximising clinical outcomes.

The strength of this case report is that it explores the effectiveness of endoscopic sinus surgery in treating tinnitus in patients with chronic rhinosinusitis, emphasising the need for comprehensive evaluation and treatment in refractory tinnitus patients.

The limitation of this case report is that its single-patient design and short-term follow-up may not accurately represent long-term relief. Future research with larger sample sizes and longer follow-ups is needed.

Conclusions

The case report highlights the effectiveness of endoscopic sinus surgery (ESS) in alleviating tinnitus symptoms in a patient with chronic rhinosinusitis (CRS). The surgery addresses underlying sinus pathology and restores normal sinonasal physiology, potentially relieving tinnitus. However, further research is needed to understand the mechanisms of ESS improvement, refine patient selection criteria, and optimise surgical techniques. Long-term follow-up studies are also needed to assess the durability of tinnitus relief and evaluate factors influencing postoperative outcomes. The case underscores the potential of ESS as a therapeutic intervention for CRS patients.

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