

## CASE REPORT

# Sigmoid Sinus Resurfacing Technique for Management of Sigmoid Sinus Dehiscence Causing Pulsatile Tinnitus: A Case Report

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### ABSTRACT

A 33-year-old female presented with persistent and troublesome right tinnitus two months after receiving a booster dose of the COVID-19 vaccine. She noticed the tinnitus to be pulsatile, disappearing whenever she lay in bed with the right side of her head on a pillow. She had no hearing loss, history of ear infections, or complaints of neurological dysfunction. Upon examination, gentle pressure applied on the right side of the neck would make the tinnitus cease completely. A computed tomography (CT) scan of the temporal bone suggested sigmoid sinus dehiscence (SSD). Without obliterating the sigmoid sinus, a transmastoid resurfacing of the SSD was done with bone wax and a temporalis fascia graft. This technique has proven effective in relieving tinnitus in our case. The patient was reported to be tinnitus-free following the procedure.

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bothersome tinnitus, which improved after sigmoid sinus resurfacing.

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### INTRODUCTION

Sigmoid sinus dehiscence (SSD) is a clinical condition in which the bone above the sigmoid sinus in the temporal bone is missing or thinned. This condition can lead to various symptoms, such as pulsatile tinnitus, vertigo, and hearing loss. It is typically diagnosed through imaging studies such as CT scans or MRIs; treatment options may include surgical repair or management of the symptoms. Patients with pulsatile tinnitus reported an SSD incidence rate of 23%, with most being female. The incidence of SSD in asymptomatic patients who underwent imaging was also determined to be 1.2% (1). Several techniques have been described to manage the condition. Both endovascular and surgical approaches have been proposed with varying degrees of success. The surgical technique of sigmoid sinus resurfacing has been extensively described and is utilised in 91.4% of SSD patients, while endovascular techniques, such as coiling and stenting, have been used in 7.9% of cases (2), showing promising results in select patients. Additionally, ongoing research and technological advancements continue to expand the options available for managing SSD, offering potential alternatives for those who may not be suitable candidates for traditional surgical or endovascular interventions. Here, we present a case of right sigmoid sinus dehiscence resulting in

A 33-year-old female presented to our otorhinolaryngology (ORL) clinic with persistent right tinnitus for two months. She noticed that the symptom became noticeable two weeks after her first booster dose of the COVID-19 vaccination. There was no immediate or delayed reaction following the vaccination. During the early onset of tinnitus, she also experienced vertigo, which subsided with treatment. She described the tinnitus as pulsating and noticed that the tinnitus disappeared whenever she applied pressure on the right side of the neck. The symptom often disturbs her sleep and troubles her even more during the day at work. She had no hearing loss or any preceding ear disease. There was no accompanying headache, diplopia, or any neurological symptoms. She has a body mass index (BMI) of 32.5 kg/m<sup>2</sup>. The otoscopic examination revealed normal tympanic membrane without any bluish mass, to indicate the presence of a high jugular bulb. The neck examination revealed no prominent vessels, palpable masses, or bruit. A gentle pressure on the area of the right internal jugular vein (IJV) on the neck stopped the tinnitus.

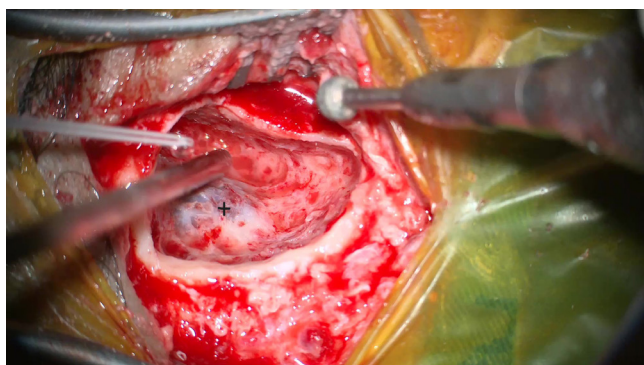
A pure tone audiogram (PTA) showed a right mild hearing loss at lower frequencies. A high-resolution CT (HRCT) scan of the petrous temporal bone showed thinning and irregularity of the normal semicircular contour of the

cortical bone overlying the right sigmoid sinus, which is suggestive of sigmoid sinus dehiscence (Figure 1). Incidentally, a right posterior fossa arachnoid cyst was found adjacent to the right cerebellar hemisphere. We consulted the neurosurgeon based on the incidental finding of the arachnoid cyst. Since the patient had no significant cerebellar signs, we opted for conservative management.

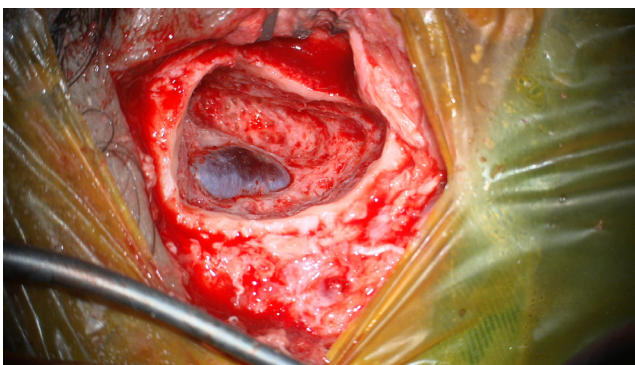
She underwent a cortical mastoidectomy via a postauricular approach. Intraoperatively, a thin bony plate was seen overlying the sigmoid sinus (Figure 2). The bony plate was skeletonised to expose the sigmoid sinus wall (Figure 3). An appropriately sized bone wax, approximately the size of the defect, was then used to push the sigmoid sinus back into the cavity while closing the bony defect (Figure 4). A temporalis fascia graft was then harvested and laid upon the bone wax. Following this, we applied several layers of oxidised cellulose polymer (Surgicel™) on top of the graft. We then used a gelfoam sheet laid on top of the Surgicel™. The periosteal flap was placed back into the mastoid cavity, and the wound closed accordingly.



**Figure 1: High resolution CT (HRCT) scan of the temporal bone showing thinning of the cortical bone overlying the right sigmoid sinus (star) 559x555mm (38 x 38 DPI)**



**Figure 2: Thin bony plate overlying sigmoid sinus just before removal (cross)**



**Figure 3: Exposed sigmoid sinus wall after removal of thin bony plate**



**Figure 4: Exposed sigmoid sinus wall after removal of thin bony plate**

Tinnitus ceased within the immediate postoperative period. No noticeable side effects were seen, other for little discomfort at the surgical incision site. We conducted follow-up examinations on her every three months, and she has been free of tinnitus for the past year following the operation.

## DISCUSSION

Tinnitus is the perception of sound in the absence of any external stimulus. Between the ages of 60 and 69, its prevalence reaches a maximum of 14.3%. Pulsatile tinnitus (PT) is defined as rhythmic and in sync with the pulsation of the vessels within the cranial cavity and has been found to account for about 4% of all tinnitus (3). The aetiology of PT is not fully understood. However, there are two possible explanations for it: either a disruption in the blood flow within the vessels, which causes local turbulence, or changes in the density of the temporal bone, which causes an increase in the sound conduction of regular blood flow in the vessels.

Two sigmoid sinus anomalies have been identified as causes of pulsatile tinnitus. Sigmoid sinus dehiscence caused by the absence or thinning of the bone overlying

the sigmoid sinus or sigmoid sinus diverticulum; an outpouching of the sinus. Similar to the patient in our case study, a study found that those with PT are typically females with a high BMI and a predominance of the right ear (3).

We investigated the case and wondered why the patient presented with PT after receiving her COVID-19 booster shot. Could some vaccine properties induce turbulence flow to her already-thin sigmoid sinus-covering bone? There have been documented instances of tinnitus occurring after receiving the COVID-19 vaccine. This could be extremely beneficial for research purposes, particularly in investigating the potential link between the vaccine and pulsatile tinnitus (4).

A computed tomography (CT) scan of the temporal bone can determine the presence of sigmoid sinus anomalies. It is extremely useful for pre-operative planning because it displays the bony anatomy surrounding the sinus and is relatively inexpensive. As this case demonstrates, it also detects the asymptomatic presence of an arachnoid cyst. Other imaging techniques, such as CT angiograms or magnetic resonance angiograms (MRA), may be useful if the endovascular stenting or coiling treatment option is chosen. These techniques provide detailed information about the blood vessels in the area, allowing for a more precise assessment of the feasibility and potential risks of such procedures. Additionally, they can help identify any other vascular abnormalities that may be present and require further attention during treatment planning.

Various surgical techniques can be used to treat SSD. Several studies described multiple methods of reconstructing or resurfacing the sigmoid sinus wall. Each method requires a routine cortical mastoidectomy to expose the sigmoid sinus region (5). In our case, we described using commercially available bone wax to fill the bony defect. After skeletonising and exposing the sigmoid sinus, a thin layer of bone wax is sized appropriately and pushed into the defect to medialise the exposed sigmoid sinus. The defect is then reinforced with a temporalis fascia graft, and Surgicel™ is laid on top of it. This resurfacing technique effectively addressed the patient's tinnitus and provided long-term relief, as evidenced by the absence of tinnitus one-year post-surgery. Using commercially available bone wax, temporalis fascia graft, and Surgicel™ in combination proved successful in medialising the exposed sigmoid sinus and reinforcing the bony defect.

Currently, neither a universally recommended treatment nor a randomised controlled trial comparing different types of interventions exists for PT caused by sigmoid sinus anomalies. Most treatments, however, advocate surgery as the preferred treatment method due to its potential for long-term relief. Surgical interventions such as the one described have shown promising results in alleviating PT symptoms and improving patients' quality

of life. However, further research is needed to establish standardised treatment guidelines and compare the efficacy of different surgical techniques for PT caused by sigmoid sinus anomalies. Minimally invasive procedures such as endovascular coiling and stenting have also been explored and shown promising results as potential treatment options. However, more studies are needed to determine their long-term effectiveness and potential complications compared to traditional surgical interventions.

## CONCLUSION

Pulsatile tinnitus is a debilitating condition that impairs the patient's quality of life. When caused by sigmoid sinus dehiscence, it can be successfully treated through surgical intervention (2). Most published series show that the SSD surgical reconstruction and resurfacing technique is an effective treatment method. In contrast, the endovascular intervention appeared to be an excellent alternative. Overall, with the appropriate interventions, patients with PT can experience significant improvement in their symptoms and regain their quality of life. However, it is important for healthcare professionals to carefully evaluate each individual case and determine the most suitable intervention approach based on the patient's specific condition and medical history. By considering both surgical and endovascular options, healthcare providers can provide personalised treatment plans that offer the best chance for successful outcomes.

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