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CASE REPORT

A Case of Vascular Pulsatile Tinnitus in the Left Ear Occurred 4 Years after the Operation of Vascular Pulsatile Tinnitus in the Right Ear

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Abstract

Background: Vascular pulsatile tinnitus is a rare tinnitus. Sigmoid sinus related lesion is found one of the important causes of venous pulsatile tinnitus in recent years. This study reports a case of vascular pulsatile tinnitus in the left ear occurred 4 years after the operation of vascular pulsatile tinnitus in the right ear.

Case presentation: A 35-year-old female was admitted to the hospital in December 2018 for "pulsatile tinnitus in the right ear for 2 months". The temporal bone CT examination showed that the mastoid bone wall of the right ear was partially defective. Therefore, the sigmoid sinus bone wall reconstruction was performed in our department to restore the barrier to the sigmoid sinus blood vessels. The patient recovered well after the operation, and there was no further tinnitus. The follow-up until June 2022, the patient had pulsatile tinnitus in the left ear. The temporal bone CT examination showed that the sigmoid sinus diverticulum of the left ear. We speculate that the occurrence of the left sigmoid sinus diverticulum may be related to the change of left sigmoid sinus pressure indirectly after the right ear surgery, especially the change of local blood flow pressure and velocity promotes the change of bone structure, and then the functional tinnitus intensifies.

Conclusion: The formation of the bone wall defect or diverticulum of the sigmoid sinus is caused by multiple factors after birth. Sigmoid sinus is not congenital and invariable. Imaging CT examination shows that the bone wall defect or diverticulum of the sigmoid sinus has an important value in the diagnosis of vascular pulsatile tinnitus.

Keywords

Vascular pulsatile tinnitus, Sigmoid sinus, Imaging temporal bone CT

Background

Pulsatile tinnitus is the abnormal sound generated by the organs, blood vessels and other structures of the head and neck, which is transmitted to the inner ear through the adjacent tissue structures, and makes the patient feel the sound with a certain rhythm. Most of them are generated by vascular factors, which are called vascular pulsatile tinnitus [1,2]. Sigmoid sinus related lesion is found one of the important causes of venous pulsatile tinnitus in recent years. There are mainly three types: Sigmoid sinus diverticulum, sigmoid sinus bone wall defect and transverse sigmoid sinus junction stenosis [3]. Sigmoid sinus bone wall reconstruction is mainly used in the treatment by reconstructing sigmoid sinus bone to restore the normal shape of blood vessel wall and strengthen the shielding ability of blood flow sound. It is suitable for patients with sigmoid sinus diverticulum and/or sigmoid sinus bone wall defect [4].

A patient with vascular pulsatile tinnitus caused by the right sigmoid sinus bone wall defect was treated in our department. The right ear tinnitus was cured by reconstruction of sigmoid sinus bone wall. The patient developed vascular pulsatile tinnitus caused by the left sigmoid sinus diverticulum in the 4th year after operation. The report is as follows.

Case Presentation

The patient Mrs. Wang, female, 35-years-old, was

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admitted to the Department of Otolaryngology Head and neck surgery of Qingdao municipal hospital on December 3, 2018 for "pulsatile tinnitus in the right ear for 2 months". The patient developed pulsatile tinnitus in the right ear 2 months ago after exertion, and tinnitus was persistent and consistent with the beating of the heart. After pressing the right neck with his finger, the tinnitus could disappear temporarily. After the onset of the disease, he had no hearing loss, no ear canal purulence, no dizziness and no treatment, and almost realized that the right tinnitus was aggravated, affecting daily life and sleep. Therefore, he went to the outpatient department of our hospital and was admitted to the hospital as "vascular pulsatile tinnitus of right ear". Since the onset of the disease, the patient has good appetite, poor sleep, normal urine and urine, and no weight loss. He was healthy in the past and denied the history of hypertension, diabetes and cerebrovascular disease. There was no special personal, menstrual, marriage and family history. Specialist physical examination: Bilateral external auditory meatus were unobstructed and tympanic membrane signs were clear. Tuning fork examination (C256): WT: unbiased, RT: binaural (+). The tinnitus can disappear by gently pressing the front edge of the right sternocleidomastoid muscle. The hematological examination results were normal. Auxiliary examination: temporal bone CT showed the right sigmoid sinus bone wall defect, and no obvious abnormality was found in left ear (Figure 1); Intracranial vessel MRA: The intracranial segments of bilateral vertebral artery, basilar artery, internal carotid artery, anterior cerebral artery, middle cerebral artery and posterior cerebral artery were normal in shape, uniform in thickness and signal, and no abnormal vascular mass shadow was found; Jugular vein ultrasound: The lumens of bilateral internal and external jugular veins were clearly displayed, and CDFI showed that the venous blood flow was smooth and well filled; Carotid ultrasound: The lumens of bilateral common carotid artery and internal carotid artery are clearly displayed, and no plaque is found. CDFI showed smooth blood flow and good filling. PW display spectrum is normal. Audiology: Pure tone audiometry: Normal hearing; ABR latency: Left side: V5: 5.36 mv, I-V: 3.83 mv. Right side: V5: 5.36 mv, I-V: 3.66 mv. Acoustic immittance: Bilateral "A" curve. Combined with the patient's history, physical signs and auxiliary examination results, the initial diagnosis was vascular pulsatile tinnitus of right ear. Therefore, the reconstruction of the right sigmoid sinus bone wall was performed. During the operation, part of the mastoid cavity at the rear side was abraded to expose the sigmoid sinus through the ethmoid area approach. The local of sigmoid sinus bone wall defect was seen. The bone around the defect in front of the sigmoid sinus was enlarged and abraded along the defect. The sigmoid sinus was stripped from the inner side of the sigmoid sinus bone wall to expose the sigmoid sinus blood vessels. The fascia was filled from the bone defect to the deep, and then the auricular cartilage was covered and reinforced, and the surface was sealing by bone wax. There was no recurrence of right ear tinnitus after 4 years follow-up.

The patient visited the otolaryngology head and neck surgery clinic of our hospital again on June 30, 2022. The patient complained of pulsatile tinnitus in the left ear 1 week ago, which was persistent and consistent with the beating of the heart. After pressing the left neck with his finger, the tinnitus disappeared temporarily. After the onset of the disease, he had no hearing loss, no ear canal purulence, no earache, no dizziness and headache. The results of temporal bone CT showed that the left sigmoid sinus diverticulum and the right ear mastoid process changed after surgery (Figure 2). Audiology: Pure tone

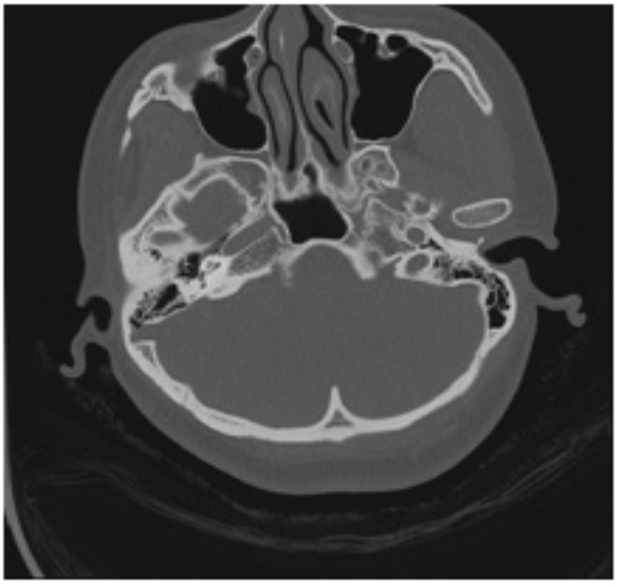

Figure 1: Temporal bone CT: Sigmoid sinus bone wall defect of the right ear, no obvious abnormality in left ear.

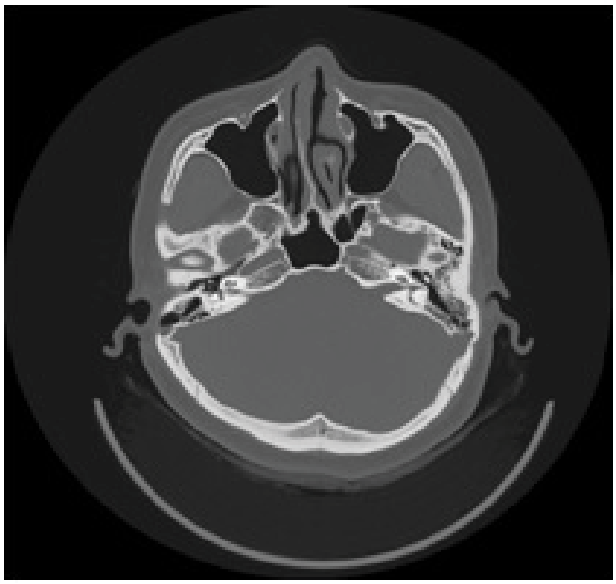

Figure 2: Temporal bone CT shows sigmoid sinus diverticulum of left ear and mastoid process of right ear after operation.

audiometry: Normal hearing; ABR latency: Left side: V5: 5.63 mv, I-V: 3.96 mv. Right side: V5: 5.12 mv, I-V: 3.74 mv. Acoustic immittance: Bilateral "A" curve. Combined with the patient's history, physical signs and auxiliary examination results, the initial diagnosis was vascular pulsatile tinnitus of left ear.

Discussions

Pulsatile tinnitus is a rare type of tinnitus, accounting for about 4% of tinnitus. This kind of tinnitus is mostly caused by the blood vessels or other related structures in the brain and head and neck. It is transmitted to the cochlea through the adjacent bone structures, blood vessels and blood flow to make the patient feel it. Vascular pulsatile tinnitus is more common than non vascular tinnitus, and most of them are from venous vessels [5]. Sigmoid sinus related lesions causing pulsatile tinnitus mainly include: sigmoid sinus bone wall defect, sigmoid sinus diverticulum and stenosis of the junction of transverse sinus and sigmoid sinus. Sigmoid sinus diverticulum with sigmoid sinus bone wall defect is particularly common in clinic [6]. The specific mechanism of pulsatile tinnitus caused by sigmoid sinus related lesions is unknown. At present, it is thought that it may be related to the following two factors: First, the blood flow become turbulent and the blood flow sound become loud due to the changes the vascular wall shape of the venous sinus (such as the sigmoid sinus diverticulum and stenosis of the junction of transverse sinus and sigmoid sinus); Second, the bone wall defect causes the weakening of the shielding effect of the bone wall on the blood flow sound in the sigmoid sinus (such as sigmoid sinus bone wall defect), making the blood flow sound pass through the weak part to the middle ear [7]. High resolution CT of temporal bone (HRCT) and CT angiography are the most valuable imaging examinations in the diagnosis of vascular pulsatile tinnitus. Temporal bone HRCT can clearly show the fine structure of temporal bone, and CT angiography is helpful to judge the relationship between vascular abnormalities and temporal bone structure [8]. As for the vascular pulsatile tinnitus caused by sigmoid sinus related diseases, the reconstruction of sigmoid sinus bone wall is mainly applied to the patients with sigmoid sinus diverticulum and/or sigmoid sinus bone wall defect by reconstructing the sigmoid sinus bone wall to restore the normal shape of blood vessel wall and strengthen the shielding ability of blood flow sound [9].

The patient in this case went to the hospital in December 2018 due to pulsatile tinnitus in the right ear for 2 months. The temporal bone CT examination showed that the mastoid bone wall of the right ear was partially defective. Therefore, the sigmoid sinus bone wall reconstruction was performed in our department to restore the barrier to the sigmoid sinus blood vessels. The patient recovered well after the operation, and there was no further tinnitus. The follow-up until June 2022, the patient had pulsatile tinnitus in the left ear. The temporal bone CT examination showed that the sigmoid sinus diverticulum of the left ear. We reviewed and analyzed the temporal bone CT in 2018 again to find out whether the sigmoid sinus lesions in the left ear before the operation were missed, and confirmed that there was no sigmoid sinus lesion in the left ear again. The sigmoid sinus diverticulum appeared in the left ear 4 years after the operation. This situation is very rare in clinical practice. We review the specific mechanism of pulsatile tinnitus caused by sigmoid sinus related lesions again. According to the changes of image morphology, such as the defect of sigmoid sinus bone wall or the formation of diverticulum, the etiology of vascular tinnitus is analyzed in combination with the clinical analysis. The bone wall defect or blood flow turbulence leads to cochlear eavesdropping, which forms vascular tinnitus. It can be seen from this patient that the right ear operation was successful, but the changes after the operation for 4 years led to clinically imperceptible changes in the bone wall around the contralateral sigmoid sinus, thinning of bone absorption and formation of sigmoid sinus diverticulum. We speculate that the occurrence of left sigmoid sinus diverticulum may be related to the change of left sigmoid sinus pressure indirectly after the right ear surgery, especially the change of local blood flow pressure and velocity promotes the change of bone structure, and then the functional tinnitus intensifies. This also indirectly proves that the formation of the bone wall defect or diverticulum of the sigmoid sinus is caused by multiple factors after birth. Sigmoid sinus is not congenital and invariable. Imaging CT examination shows that the bone wall defect or diverticulum of the sigmoid sinus has an important value in the diagnosis of vascular pulsatile tinnitus. The expert group of this department organized discussions together and consulted a large number of literatures, but no report on similar cases was found. Many questions and different opinions were raised about the clinical characteristics of this patient. It is expected that more scholars will discuss and learn about the reports of similar cases to obtain more clinical data.

Conclusion

The formation of the bone wall defect or diverticulum of the sigmoid sinus is caused by multiple factors after birth. Sigmoid sinus is not congenital and invariable. Imaging CT examination shows that the bone wall defect or diverticulum of the sigmoid sinus has an important value in the diagnosis of vascular pulsatile tinnitus.

Authors' Contributions

All authors wrote, reviewed, and edited the manuscript. Yongtuan Li proposed the idea for this report. The authors read and approved the final manuscript before submission. Yongtuan Li and Hai Zhao were involved in the management of the patient.

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Availability of Data and Materials

Not applicable.

Ethics Approval and Consent to Participate

Ethics approval was obtained from the Institutional Research Ethics Board of Qingdao Municipal Hospital. Consent was obtained from the patient in writing.

Consent for Publication

Consent was obtained from the patient for this case report.

Competing Interests

The authors declare they have no competing interests.

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