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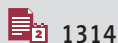
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Tinnitus Triggered by a Cerebellopontine  
Arachnoid Cyst in an Adolescent

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Study Design A  
Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
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Southwestern Medical Center, Dallas, TX, USA**Corresponding Author:** Seckin O. Ulualp, e-mail: [seckin.ulualp@utsouthwestern.edu](mailto:seckin.ulualp@utsouthwestern.edu)  
**Financial support:** None declared  
**Conflict of interest:** None declared**Patient:** Female, 14-year-old  
**Final Diagnosis:** Arachnoid cyst • tinnitus  
**Symptoms:** Tinnitus  
**Medication:** —  
**Clinical Procedure:** Audiogram • MRI  
**Specialty:** Otolaryngology**Objective:** Rare coexistence of disease or pathology**Background:** Tinnitus can be a symptom of a wide range of disorders. The identification and treatment of the underlying condition is essential for management of tinnitus in children. Tinnitus can occur with medical conditions other than sensorineural hearing loss. Cerebellopontine arachnoid cysts are rare and can cause tinnitus and hearing loss in adults. Tinnitus caused by an arachnoid cyst has not been reported in an adolescent. We report clinical and radiological features of a teenager with bothersome tinnitus caused by an arachnoid cyst.**Case Report:** A 14-year-old girl with unilateral tinnitus for 10 months presented to the Pediatric Otolaryngology Clinic. The loudness and duration of tinnitus had progressed gradually. Turning the head to the right induced right otalgia and tinnitus. The patient denied hearing loss, vertigo, exposure to loud noise, feeling of fullness in ear, otorrhea, facial weakness, numbness, dysphagia, changes in smell or taste, and problems with the jaw or temporomandibular joint. The focused neurological examination and head and neck examination were within normal limits. The patient had normal hearing on audiometry. T1-weighted, T2-spin-echo, T2-FLAIR, and diffusion-weighted magnetic resonance imaging sequences were obtained, revealing a right cerebellopontine angle arachnoid cyst. After arachnoid cyst marsupialization, the patient's tinnitus and otalgia resolved.**Conclusions:** This case highlights the importance of suspecting identifiable nonauditory system disorders as causes of tinnitus in children. Thorough analysis of clinical findings and timely use of imaging is critical to prevent delay in diagnosis and treatment of children with bothersome tinnitus caused by rare medical conditions.**Keywords:** Adolescent • Arachnoid Cysts • TinnitusFull-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/938294>

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## Background

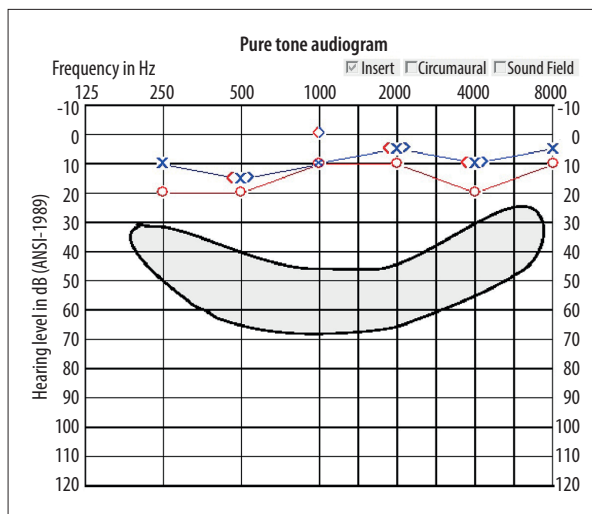
Tinnitus is the perception of sound without an external source [1]. The sound perceived is typically described as buzzing, ringing, clicking, pulsating, and other noises [1,2]. While subjective tinnitus is perceived only by the patient, objective tinnitus can be perceived by others. Subjective tinnitus is more common than objective tinnitus. The prevalence of tinnitus in children ranges from 6% to 46% [3]. Children rarely spontaneously report tinnitus, and persistent and bothersome tinnitus has been found to occur in 0.6% to 3.1% of children [3,4]. The prevalence of tinnitus is higher in children with any type of hearing loss [5]. Tinnitus can cause behavioral changes, poor concentration, and difficulty sleeping. Early detection and treatment of tinnitus is essential to diminish the distress it causes.

Tinnitus can be a symptom of a wide range of disorders, such as cerumen impaction of the external auditory canal, Eustachian tube dysfunction, otosclerosis, Ménière's disease, vestibular schwannoma, vascular anomalies, myoclonus, and intracranial hypertension. Tinnitus is classified as idiopathic in the absence of an underlying cause. Identification and treatment of the underlying condition is essential for the management of tinnitus in children.

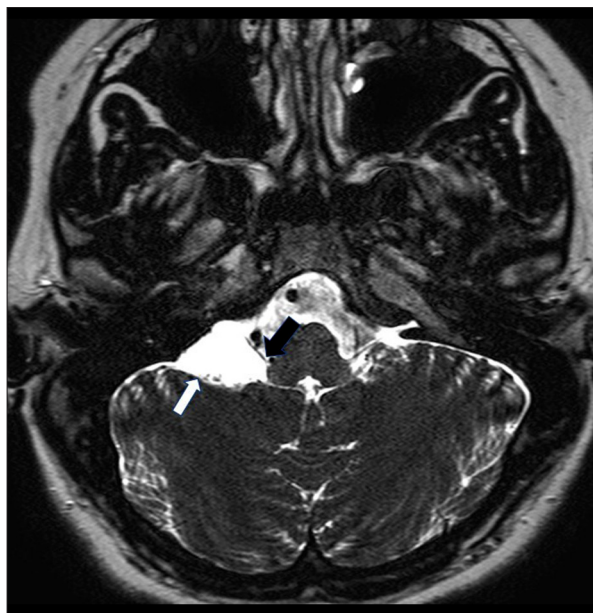
Intracranial arachnoid cysts are cerebrospinal fluid-filled cysts, which occur in adults and children [6]. Intracranial arachnoid cysts are mostly asymptomatic; however, patients can develop symptoms specific to the location [6,7]. The most common location of intracranial arachnoid cysts is the middle cranial fossa [8,9]. Cerebellopontine arachnoid cysts are rare and can cause tinnitus and hearing loss in adults [8-11]. To the best of our knowledge, isolated tinnitus caused by an arachnoid cyst has not been reported in an adolescent. We report the clinical and radiological features of a teenager with isolated tinnitus caused by an arachnoid cyst.

## Case Report

A 14-year-old girl with no medical or surgical history presented to the Pediatric Otolaryngology Clinic because she had been hearing an intermittent soft buzzing sound in her right ear for 10 months. The tinnitus would only last a few minutes initially. The adolescent eventually presented to otolaryngology clinic because the loudness and duration of the tinnitus gradually became more severe, with loud and frequent episodes of tinnitus affecting her concentration at school. The patient developed right otalgia during episodes of tinnitus. Turning the head to the right induced right otalgia and tinnitus. The tinnitus did not interfere with sleep. The patient denied hearing loss, vertigo, exposure to loud noise, feeling of fullness in the ear, otorrhea, facial weakness, numbness, dysphagia,



**Figure 1.** The pure-tone audiogram revealed hearing threshold levels ranging from 10 dB to 20 dB in the right ear and 5 dB to 15 dB in the left ear.



**Figure 2.** Magnetic resonance imaging demonstrating the right arachnoid cyst's (white arrow) association with 7<sup>th</sup> and 8<sup>th</sup> cranial nerves (black arrow)

changes in smell or taste, and problems with the jaw or temporomandibular joint.

On physical examination, the auricles were of a normal shape, size, and location, without scars, lesions, or masses and no mastoid swelling, tenderness, or erythema. The ear canals were free of cerumen, otorrhea, debris, and foreign bodies, and the tympanic membranes were of normal color with good mobility. There was no audible tinnitus when the patient reported having tinnitus induced by turning the head to the right. The

head and neck examination and focused neurological examination were within normal limits. The patient had normal hearing on audiometry (Figure 1). Magnetic resonance imaging (MRI) of the temporal bones and internal auditory canals was obtained owing to the history of unilateral tinnitus. T1-weighted, T2-spin-echo, T2-FLAIR, and diffusion-weighted MRI sequences were obtained. This revealed a right cerebellopontine angle arachnoid cyst with superior displacement of the cisternal segments of the right 7<sup>th</sup> and 8<sup>th</sup> cranial nerves and anterior displacement of the cisternal segments of the right 9<sup>th</sup>, 10<sup>th</sup>, and 11<sup>th</sup> cranial nerves (Figure 2). The patient was referred to the Neurosurgery Department. After she underwent arachnoid cyst marsupialization, the tinnitus and otalgia resolved.

## Discussion

Tinnitus can occur with medical conditions other than sensorineural hearing loss (ie, secondary tinnitus), or without an identifiable cause (ie, primary tinnitus). Tinnitus is described as “bothersome tinnitus” in distressed patients, patients seeking active therapy, and patients with degraded quality of life and/or functional health status. We describe the clinical presentation and management of a 14-year-old girl with bothersome tinnitus due to a cerebellopontine angle arachnoid cyst. The present case illustrates the critical role of thorough analysis of clinical assessment findings and timely use of imaging in the management of children with tinnitus caused by rare medical conditions.

Tinnitus is reported in 34% of children when specifically questioned; however, bothersome tinnitus occurs in up to 3.1% of children [3,4,12]. Tinnitus in children is commonly ignored; hence, children seek medical care more than 12 months after the first appearance of symptoms [13]. Bilateral tinnitus is more common than unilateral tinnitus [13]. Most children experience intermittent and soft tinnitus [14]. Tinnitus can degrade patient quality of life owing to social isolation, depression, sleep disorders, and poor concentration [13]. Similar to patients in previous studies, the adolescent in this study experienced soft and intermittent tinnitus in the right ear. As the tinnitus progressed, our patient developed more frequent and loud episodes. The time between the first appearance of tinnitus and presentation to the Pediatric Otolaryngology Clinic was 10 months. As a consequence of the worsening nature of the tinnitus, our patient experienced poor concentration. Timely recognition of tinnitus and initiation of diagnostic tests are critical to prevent adverse consequences of unrecognized tinnitus.

Tinnitus can be caused by auditory and nonauditory system disorders. In children with bothersome tinnitus, triggers for tinnitus include hearing loss, jaw misalignment/malocclusion, noise trauma, tension of the neck, and middle ear aeration [13]. Nonauditory system tinnitus can occur after cerebellopontine

angle tumor removal and can be gaze-modulated [15]. The loudness of the tinnitus varies by ocular movements. Atrophy of the flocculus on the surgical side has been suggested to modulate tinnitus [15,16]. Functional MRI revealed that tinnitus is associated with activities of the Heschl’s gyrus, angular gyrus, cerebellar, and limbic system [17]. Arachnoid cysts are a benign malformation of the arachnoid layer of the meninges. Surgery is recommended when the arachnoid cyst is associated with hydrocephalus, seizure, increased intracranial pressure, or focal neurologic deficits [18,19]. In the present study, displacement and compression of the vestibulocochlear nerve by a cerebrospinal fluid-filled right arachnoid cyst triggered tinnitus. Tinnitus and otalgia were completely resolved upon treatment of the arachnoid cyst, confirming its role in the tinnitus experienced by our patient.

The most effective diagnostic and treatment strategies for children with tinnitus have not been established. Clinical practice guidelines for adults with bothersome and persistent tinnitus assist clinicians in managing primary tinnitus [1]. Guidelines recommend obtaining a targeted history and examination at the initial evaluation of tinnitus. Audiologic examination is obtained in the presence of tinnitus, regardless of laterality, duration, or perceived hearing status. Imaging studies of the head and neck are recommended in the presence of unilateral tinnitus, pulsatile tinnitus, focal neurological abnormalities, or asymmetric hearing loss. Imaging studies used for evaluation of the head and neck in patients with tinnitus include computerized tomography angiography of the brain or temporal bone, or MRI angiography of the brain or internal auditory canals. In the present study, a symptom-directed history, physical examination, and hearing test were used to determine the need for imaging. MRI is recommended in the presence of unilateral tinnitus present for more than 6 months. The management of tinnitus in our patient was in accordance with clinical practice guidelines recommended for adults with tinnitus. Further studies are needed to establish clinical practice guidelines to manage cases of tinnitus in children.

## Conclusions

This case highlights the importance of suspecting identifiable nonauditory system disorders as the cause of tinnitus in children. Thorough analysis of clinical findings and timely use of imaging are critical to prevent delay in diagnosis and treatment of children with bothersome tinnitus caused by rare medical conditions.

## Department and Institution Where Work Was Done

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## Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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