International Journal of Cerebrovascular Disease and Stroke
Babici D et al. Int J Cerebrovasc Dis Stroke 6: 164.
www.doi.org/10.29011/2688-8734.000064
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Case Report

Suicidal Ideation in a Severe Case of Non-Pulsatile Tinnitus Caused by a Dural Arteriovenous Fistula

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Citation: Babici D, Mohamed AA, Mattner O, Snelling B (2023) Suicidal Ideation in a Severe Case of Non-Pulsatile Tinnitus Caused by a Dural Arteriovenous Fistula. Int J Cerebrovasc Dis Stroke 6: 164. DOI: https://doi.org/10.29011/2688-8734.100164

Received Date: 15 October, 2023**; Accepted Date:** 19 October, 2023**; Published Date:** 23 October, 2023

Abstract

Pulsatile tinnitus is often the initial presentation of a dural arteriovenous fistual, so a high index of suspicion is needed to avoid misdiagnoses and possible fatal consequences. Although pulsatile tinnitus commonly originates from a vascular malformation and non-pulsatile tinnitus from a neurodegenerative one, pulsatile and non-pulsatile presentations can result from other underlying pathologies. If a vascular pathology causes a non-pulsatile complaint that cannot be heard by the examiner or detected clinically or radiologically, it is bound to be misdiagnosed as central tinnitus.

Herein, we report a rare presentation of a dural arteriovenous fistulas contributing to subjective, non-pulsatile tinnitus. The 50-year-old male patient in this case presented with 2 years of tinnitus, refractory to several treatment approaches that eventually lead to suicidal ideation. Magnetic resonance imaging of the head, magnetic resonance angiography of the head and neck, and computerized tomography scan of the temporal bone did not reveal any acute pathology. Cerebral angiogram revealed a dural arterio-venous malformation in the left sigmoid and transverse sinus. The patient was treated with transarterial Onyx-18 embolization of the dural arterio-venous malformation. His symptoms resolved by 50% following treatment and by 80% at 6-month reevaluation.

Dural arteriovenous fistuals are rare vascular malformations that, if left untreated, have fatal complications. These vascular malformations may not be detected by physical examination or audiometric evaluation alone. In the absence of neurologic deficits and retrograde leptomeningeal or cortical venous drainage, selective angiographic embolization appears to be an efficient and low-risk modality for symptomatic treatment.

Keywords: Therapeutic embolization; Objective tinnitus; Tinnitus of vascular origin; Subjective tinnitus

Introduction

Tinnitus is defined as the perception of sound without an external acoustic source. Tinnitus is a common symptom, affecting up to 15% of the adult population [1]. Objective and subjective tinnitus are two broad categories, with the latter constituting majority of cases. Subjective tinnitus is usually described as a ringing, humming, hissing, or roaring sound of variable occurrence and intensity. Descriptions range from intermittent sounds that are at a noticeable level to continuous sounds that are at an intensity that hinders the daily life of patients. Subjective tinnitus may localize unilaterally or bilaterally and can be described as feeling like it is originating from the brain as opposed to the ears. Objective tinnitus differs in that there is a physically apparent sound that is also heard by the examiner.

Despite unclear physiology, non-pulsatile tinnitus (nPT) is the most common type of tinnitus [2]. Neuroscientifically, phantom sound perception in this class of tinnitus is believed to occur as

a result of central reorganization triggered by deafferentation [3]. This, and other alterations in spontaneous neuronal activity of the auditory system, is the believed etiology of tinnitus [4]. Anatomically, the auditory nervous system is believed to be the main source of abnormality that is responsible for the neural activity induced perception of sound. The ear is also an expected source in many cases [4].

Pulsatile tinnitus (PT) represents a type of tinnitus that commonly originates from a vascular pathology or malformation. PT can be further classified into an arterial or venous type, with arterial types representing majority of cases. Venous types of PT are infrequently diagnosed and occasionally occur because of increased or turbulent blood flow in the dural sinus-jugular vein system. However, two distinct etiologies of venous tinnitus have been described. One type originates from abnormalities in the transverse-sigmoid-jugular system, while the other demonstrates no abnormalities of the transverse-sigmoid-jugular system, but rather alterations of intracerebral cerebrospinal fluid (CSF) dynamics. Causes of the latter type include hydrocephalus secondary to stenosis of the sylvian aqueduct, increased intracranial pressure in the setting of an Arnold-Chiari malformation, or idiopathic intracranial hypertension. The former can have unilateral presentations of venous tinnitus and can present with an increased perception of sound as venous flow alterations are induced when turning the head contralaterally [5]. Reduction and/or cessation of symptoms can be achieved by turning the head to the same side of the anatomical defect or by gentle compression of the internal jugular vein [6]. Venous humming sounds may be clinically identified upon placement of a stethoscope over the noise generating area.

Although PT commonly originates from a vascular malformation and nPT from a neurodegenerative one, pulsatile and non-pulsatile presentations can result from other underlying pathologies [7]. Herein, we specifically present a rare case of nPT caused by a dural arterio-venous fistula (DAVF).

Case Presentation

A 50-year-old male with no significant past medical history was admitted to the hospital due to a 2-year history of tinnitus. The patient visited multiple otorhinolaryngologists in the past and tried steroids, diuretics, and other medications to manage his symptoms. The patient was refractory to all treatment approaches and began developing recurrent episodes of syncope secondary to severe tinnitus. His tinnitus progressed in a recurrent fashion, resulting in suicidal ideation. A few days prior to admission, the patient experienced an episode of intense tinnitus and dizziness followed by loss of conscious. Upon admission, the patient underwent magnetic resonance imaging (MRI) of the head, magnetic resonance angiography (MRA) of the head and neck, and computerized tomography (CT) scan of the temporal bone to assess for acute pathology. Imaging studies did not reveal any pathology to explain his symptoms. The decision was made to proceed with a cerebral angiogram that revealed a dural arterio-venous malformation in the left sigmoid and transverse sinus (Figure 1). The patient underwent transarterial Onyx-18 embolization of the dural arterio-venous malformation (Figure 2) and his symptoms resolved by 50%. The patient was reevaluated at 6-months and demonstrated an 80% resolution of symptoms.

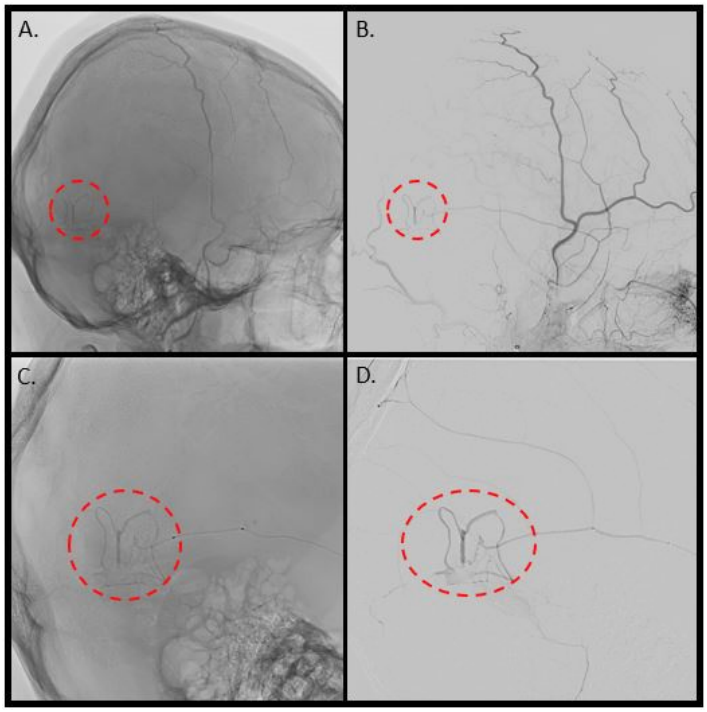

Figure 1: Dural arterio-venous malformation in the left sigmoid and transverse sinus prior to embolization. **A & B:** Left external carotid artery (ECA) Injection. **C & D:** Left middle meningeal arterial (MMA) Injection.

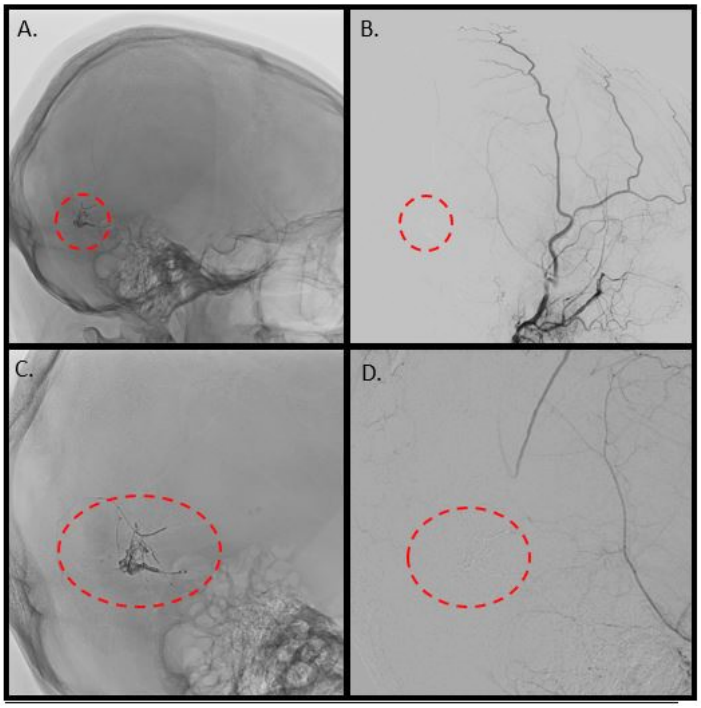

Figure 2: Dural arterio-venous malformation in the left sigmoid and transverse sinus following embolization. **A & B:** Left external carotid artery (ECA) Injection. **C & D:** Left middle meningeal arterial (MMA) Injection.

Discussion

Tinnitus is a perceived sound that is rhythmic and cardiac synchronous. Tinnitus may be subjective, in that it is only perceived by the patient or objective, in that is perceived by both the patient and the examining physician. To ensure an optimal diagnostic approach, it is imperative to understand the nature of both categories of tinnitus as well as their unique differentiating physical findings. Attaining both a thorough clinical history and physical examination are essential in establishing a diagnostic plan. The clinical history and physical examination findings of the presented patient in this case study suggested a tinnitus of vascular origin. While it may be reasonable to proceed directly to angiography with objective pulsatile tinnitus, this is unwarranted in patients with subjective pulsatile tinnitus. Instead, the use of MRI/MRA can be utilized as both a sensitive and noninvasive diagnostic tool that can aid in the detection of potentially life-threatening abnormalities without exposing patients to the morbidity associated with angiography [8,9]. The efficacy of MRI/MRA was demonstrated in the presented case by clearly revealing a DAVF involving the left transverse sinus and the sigmoid sinus. A small nidus is rarely localized, even with the use of MRI/MRA, making normal findings on these imaging studies non-exclusionary of an intracranial DAVF. If clinically suspected, cerebral angiography is required to confirm or exclude DAVFs [9,10].

Therapeutic options for DAVFs include conservative management, transarterial embolization [11], transvenous embolization [12], and surgical resection of the involved sinus [13]. The therapeutic strategy should consider the natural history of the DAVF and thus be based on the pattern of venous drainage [14]. Patients demonstrating retrograde venous drainage into leptomeningeal and/or cortical veins require aggressive management, beyond symptom control, for anatomical correction as this flow patten is a stronger predictor of intracranial hemorrhage and neurologic deficits. Patients with normal antegrade flow, with DAVFs that drain directly into a dural venous sinus, are not typically indicated as these DAVFs are benign with a high likelihood of stability or spontaneous resolution of symptoms [15]. Although the venous drainage of the DAVF in the present case was directly into the sigmoid sinus with antegrade flow, the subjective tinnitus was not tolerated well by the patient. Thus, with consideration that the patient demonstrated no evidence of intracranial hemorrhage or neurologic deficit, elective intervention aimed at palliation of the tinnitus was planned. Selective angiography identified the feeding arteries to the DAVF followed by transarterial Onyx-18 embolization of the nidus of the DAVF. The patient experienced significant resolution of their symptoms immediately following treatment and continuous improvement was demonstrated at 6-month follow up.

Conclusion

DAVFs are rare vascular malformations with fatal complications if left untreated that may not be detected by physical examination or audiometric evaluation alone. The identification of a DAVF with MRI/MRA and treatment with the use of selective angiographic embolization appears to be an efficient and low-risk modality in the diagnosis and treatment of symptomatic DAVF in the absence of neurologic deficits and retrograde leptomeningeal or cortical venous drainage. Prospective randomized studies with objective outcome assessments are needed to confirm the treatment benefits.

Conflict of interest: None.

Ethics Statement: The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Fund: This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Author Contributions: Concept and design: DB, AM, and BS. Analysis and interpretation: DB, AM, OM, and BS. Data collection: DB, AM, OM, and BS. Writing the article: DB, AM, OM, and BS. Critical revision of the article: DB, AM, OM, and BS. Final approval of the article: DB, AM, OM, and BS. Statistical analysis: N/a. Obtained funding: N/a. Overall responsibility: DB, AM, OM, and BS.

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