

Endovascular Management of Brain Arteriovenous Malformation (AVM) Presenting with Contralateral Morbid Tinnitus: A Case Report

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Abstract

Brain arteriovenous malformations are type of intracranial high-flow vascular malformation that can present with incidental finding in asymptomatic patients, seizures, headache, ischemic events due to vascular steal from normal brain, hemorrhage. Pulsatile tinnitus is the result of blood flow related sounds transmitted to the inner ear and coincides with heartbeat. AVMs are a rare cause of pulsatile tinnitus

which contributes to less than 1% of published cases in the literature. We report a case of morbid tinnitus due to brain AVM which was resolved completely by endovascular embolization of the lesion.

Keywords: Tinnitus, brain AVM, endovascular embolization

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Introduction:

Arteriovenous malformations (AVM) are high flow lesions” and are commonly (2-5/1000 individuals in the general population) found in the head and neck region. Brain AVMs may present with intracranial hemorrhage, seizures, headaches, and long-term disability; the most common presenting symptoms are hemorrhage and seizures. AVMs are a rare cause of tinnitus. Turbulent blood flow through vessels in the head and neck can be transmitted to the inner ear through surrounding bony and soft-tissue structures, contributing to the perception tinnitus. In up to 30% of cases, no cause is identified. Hofmann et al.¹ showed that they contribute to less than 1% of published cases in the literature.

We experienced a brain AVM patient presented with morbid tinnitus in the contralateral side which was resolved completely by endovascular embolization of the lesion.

Case Report:

A 27-year-old female patient presented with continuous buzzing sound in her left ear. She demonstrated that it resolved partially upon pressing her left neck vessels. She had no history of head injury. Otolaryngologist excluded any ear related cause of tinnitus. She was neurologically intact. Neuroimaging (Fig 1) and cerebral DSA revealed right occipital region arteriovenous

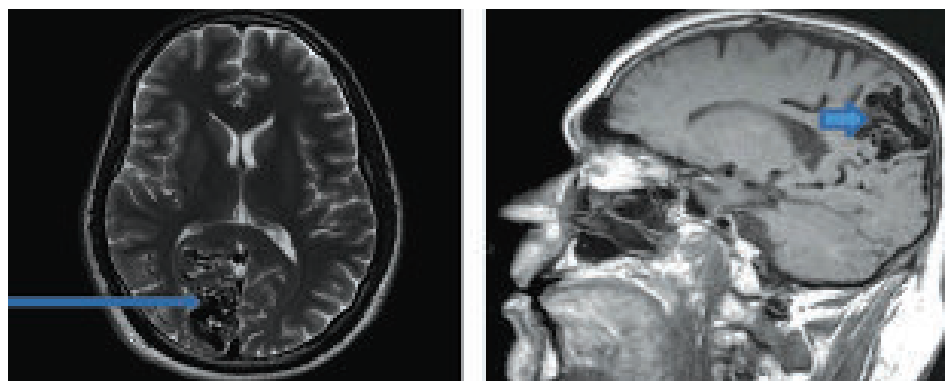


Fig.-1: MRI of Brain reveals signal void (arrow) on T2WI (A) and hyperintense signal (arrow). The nidus (arrowhead in B) is present at the cranial end of the lesion.

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malformation (AVM) with feeding vessel coming from both PCA (Fig 2A). The left dominant P-com was directly feeding the AVM (Fig 2B). Her symptom was caused by hyper dynamic circulation to the AVM via P-com of left internal carotid system.

She was counseled and prepared for occlusion of the offending source with the option of surgical excision of the AVM if needed. Accordingly, she underwent elective endovascular embolization of the AVM with glue (Fig

3A, B, and C). Procedure was uneventful. Post embolization she had developed headache and blurred vision for 48 hours. She was neurologically intact. Ophthalmologist excluded her vision error. CT scan of brain showed satisfactory embolization without any haemorrhage or infarction (Fig 4).

Her tinnitus resolved immediate after the procedure and six-months follow up MRI and MRA of brain revealed radiological obliteration of AVM without any residue or recurrence (Fig-5).

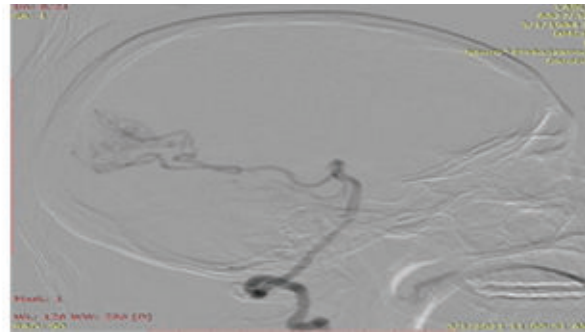
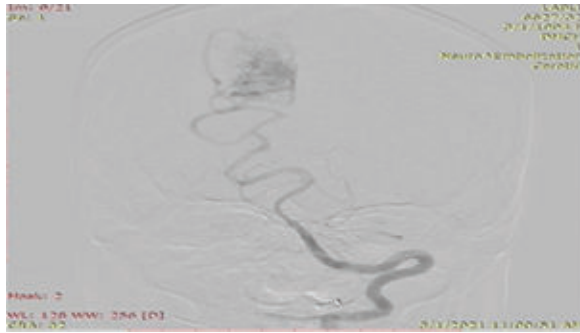


Fig-2:: Cerebral DSA - AVM in the right occipital region fed by both posterior cerebral arteries and draining into superior sagittal sinus.

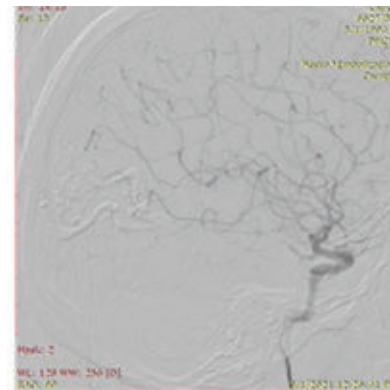


Fig-3: Post embolization Cerebral DSA showing complete occlusion of the AVM

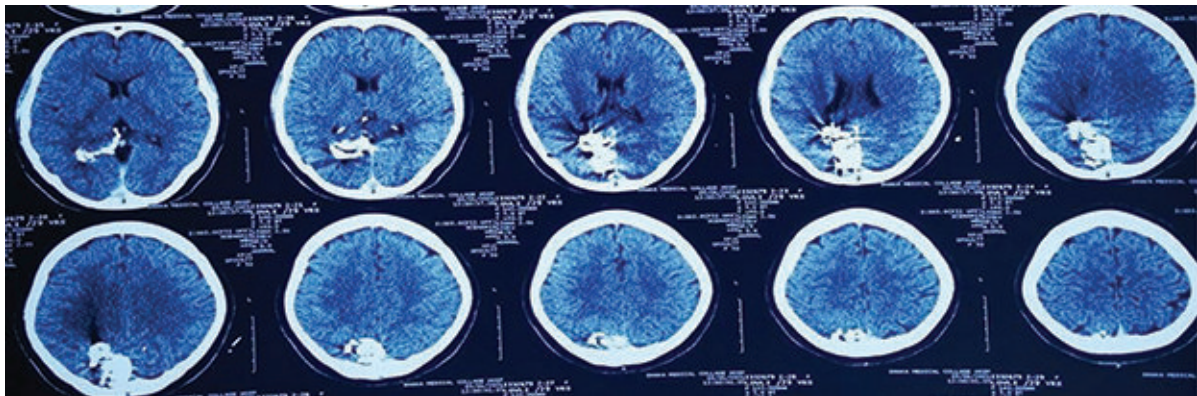


Fig-4: Immediate post embolization CT scan reveals hyperdense area of glue embolized AVM with foreign body artefact

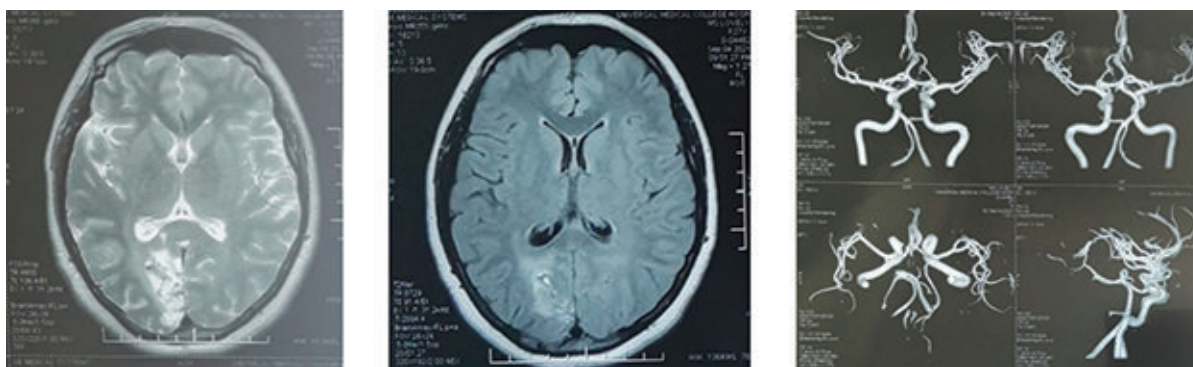


Fig-5: Six-months follow up MRI and MRA of brain reveal radiological obliteration of AVM without any residue or recurrence

Table-I

List of case reports on AVM with tinnitus

Writer	Presentation	Location of AVM	Treatment option
Meng-Chou et al	Pulsatile tinnitus, chronic insomnia	Facial AVM	Therapeutic embolization
Kikuchi et al	Facial palsy, hearingloss, tinnitus	Cerebellar AVM	Surgical excision
Takai et al	Haemorrhage, vertigo, tinnitus	Cerebellar AVM	
Noor Suleima et al	tinnitus	IAC AVM	Watchful waiting
Ayiham Al Arif et al	Pulsatile tinnitus	Multiple venous malformation	Behavioral and suppressive therapy
Woo et al	Pulsatile tinnitus	External ear avm	Hybrid technique of selective embolization followed by surgical excision
Li et al	Tinnitus	Vasculogenic	Transvascular embolization

Discussion:

The patient in this report was presented morbid tinnitus in her left ear without any hearing loss and headache. However, her brain MRI revealed nidus and flow void of dilated draining vein in the right occipital region. Brain DSA revealed the feeding arteries from both the posterior cerebral arteries. The left P-Com was dominant and directly feeding the AVM together with left P1(Fig). Her symptom was caused by hyperdynamic circulation in the region of intracranial ICA where P-com supplying blood to the AVM. When she compressed her left carotid in the neck, her symptom disappeared. Based on this understanding, we decided to embolize the AVM to cut off the offending source.

In the literature good number of AVM cases have been reported who presenting with tinnitus (Table). Meng-Chou Chen has reported a case of facial AVM with pulsatile tinnitus leading to chronic insomnia.² Kikuchi et al.³ reported a cerebellar AVM case presented with

recurrent unilateral facial palsy accompanied by ipsilateral hearing loss and tinnitus. This patient also had a slight sensory disturbance on the left side of the face and the right lower extremity. Takai et al.⁴ reported a case with hemorrhage due to cerebellar AVM. Their case presented with rotatory vertigo and tinnitus. This patient also showed dysarthria later. Noor Suleima et al⁵ described a case of an un-ruptured AVM within the right Internal Auditory Canal (IAC) following a whiplash injury and left ear (contralateral to the lesion) unilateral non-pulsatile tinnitus. Ayiham Al Atif et al⁶ reported multiple venous malformations as a cause of pulsatile tinnitus. The AVM was successfully treated by complete excision after preoperative selective embolization. Li et al.⁷ conducted a review of 82 cases of vasculogenic pulsatile tinnitus treated using a transvascular interventional approach via either the femoral artery or femoral vein between January 2003 and January 2013. Woo et al. [8] encountered an external ear AVM in a 20-

year-old male presenting as pulsatile tinnitus for 7 years.

The remarkable importance of our case is that the patient had morbid contralateral tinnitus from which she recovered after successful embolization of the lesion without any untoward complication.

Managing AVMs is always challenging due to the variety of sizes, anatomic locations, and involvement of surrounding structures. Multidisciplinary therapeutic approaches should be considered in terms of when and how to perform procedures. The prevailing options of AVM can be tailored as per indication ranging from watchful waiting, endovascular intervention, surgery, radiosurgery. These options can be considered either singly or in combinations as hybrid procedures. In our case we treated her by endovascular embolization only.

Balloons, coils, NBCA glue and stents in various combinations can be used for embolization of the underlying vascular abnormalities. In our case we have used ethiodized oil injection (lipiodol) as embolizing agent.

Conclusion:

The tinnitus caused by the AVM is a treatable condition. The treatment needs to be individualized according to the location of AVM, the symptoms, the affectation of the quality of life and the general condition of the patient. Endovascular intervention is relatively simple and minimally invasive to diagnose and treat such case.

Conflict of interest: Nothing to declare

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