

## Case Report

# Dissecting aneurysm of the anterior inferior cerebellar artery in the internal auditory canal presenting with deafness without hemorrhage: A case report and literature review

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## ABSTRACT

**Background:** Anterior inferior cerebellar artery (AICA) aneurysms in the internal auditory canal (IAC) are rare. We have reported a case of dissecting AICA aneurysm in the IAC presenting initially with the eighth nerve palsy followed by the seventh nerve palsy without hemorrhage.

**Case Description:** A 68-year-old woman presented with a sudden onset of vertigo accompanied by deafness and tinnitus on the right side that was preceded by intermittent right retroauricular pain 2 weeks before. Audiogram showed severe sensorineural hearing loss. Computed tomography and magnetic resonance imaging (MRI) indicated absence of prior subarachnoid hemorrhage. Magnetic resonance angiogram (MRA) suggested a tiny aneurysm at the fundus of the IAC accompanied with thinning of the lateral pontine segment of the AICA. Conservative treatment led to moderate improvement of the symptoms. However, the patient developed the right retroauricular pain again, followed by the right facial paralysis 5 months later but still without signs of hemorrhage on MRI. Digital subtraction angiogram showed dissecting aneurysm in the IAC. The patient was managed with oral steroids and direct intervention was avoided due to a risk of ischemia supposed by large area irrigated by the AICA. Follow-up MRA 18 months after the first presentation showed improvement in the narrowing of the AICA proximal to the aneurysm. The patient was functionally independent despite right-sided hearing loss and slight facial paresis.

**Conclusion:** This report warns physicians that a dissecting AICA aneurysm without subarachnoid hemorrhage may cause eighth and seventh nerve palsy.

**Keywords:** Anterior inferior cerebellar artery, Deafness, Dissecting aneurysm, Facial palsy. Internal auditory canal

## INTRODUCTION

Aneurysm of the anterior inferior cerebellar artery (AICA) comprises 1–2% of all intracranial aneurysms.<sup>[2,10]</sup> Commonly, it arises in the proximal part of the artery, especially at the basilar artery (BA)-AICA junction.<sup>[4,10,26,29]</sup> However, an aneurysm in the internal auditory canal

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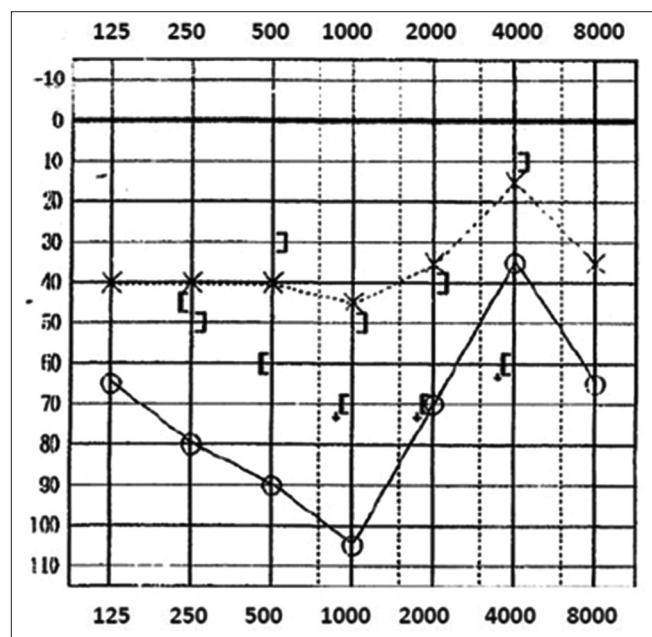
(IAC) is rare; only 25 cases have been reported thus far.<sup>[3,5,6,8,9,11,13,14,15,17-20,22,25,29,32,33,35,37,38,40,41]</sup> It generally presents with subarachnoid hemorrhage (SAH). Herein, we have reported an extremely rare case of intrameatal aneurysm caused by dissection of the AICA, presenting initially with the eighth nerve palsy and then the seventh nerve palsy without SAH.

## CASE REPORT

A 68-year-old woman with hypertension and dyslipidemia had intermittent right retroauricular pain, which was controlled by analgesics. Two weeks later, she presented with severe vertigo and nausea accompanied with the right-sided deafness and tinnitus. Computed tomography (CT) showed no abnormalities such as SAH or hematoma. Neurological examination showed no abnormalities, except unilateral deafness and persistent spontaneous left beating nystagmus. Pure tone audiogram revealed severe sensorineural hearing loss with an average air conduction threshold of 92.5 dB [Figure 1].

Magnetic resonance imaging (MRI) showed no abnormalities suggestive of prior SAH on fluid attenuated inversion recovery (FLAIR) and T2\* images [Figure 2a]. In source images of magnetic resonance angiogram (MRA), a 3 mm tiny mass was located in the right IAC [Figure 2b].

MRA showed narrowing in the premeatal portion of the lateral pontine segment and aneurysmal dilatation in the meatal portion, the string and pearl sign, in the right AICA,



**Figure 1:** Pure tone audiogram at the initial presentation of vertigo. Right side air conduction and bone conduction hearing dropped severely, with an average threshold of 92.5 dB of air conduction hearing.

suggestive of dissecting aneurysm [Figure 2c and d]. Based on the presumptive diagnosis of vestibular and cochlear ischemia and neuritis caused by dissecting aneurysm, the patient was treated with hydrocortisone drip infusion (initial dose of 500 mg, which was tapered to 100 mg over 8 days), oral Vitamin B12, and adenosine triphosphate disodium. This provided considerable improvement of vertigo. Due to the absence of rupture and with the improvement of symptoms, the patient was placed under strict blood pressure control and close monitoring instead of undergoing direct intervention for the lesion. On the follow-up visit at 3 months after onset, the patient was almost vertigo free, with slight improvement of air conduction hearing, with a threshold of 67.5 dB.

Five months after onset, the patient had transient right retroauricular pain again, followed by right facial paresis, which gradually progressed to House–Brackmann (HB) Grade IV. The average air conduction hearing was almost same as 2 months before, with a threshold of 73.8 dB. MRA showed a similar degree of narrowing of the AICA and intrameatal aneurysm with different shape [Figure 3a]. Digital subtraction angiography confirmed the dissecting aneurysm and aplasia of the ipsilateral posterior inferior cerebellar artery (PICA) [Figure 3b]. FLAIR and T2\* MR images showed no evidence of the present and previous SAH. The patient was administered a tapering dosage of oral prednisolone (initial dose of 30 mg) for 2 weeks. Her facial nerve paresis greatly improved to HB Grade II during the 6-month follow-up.

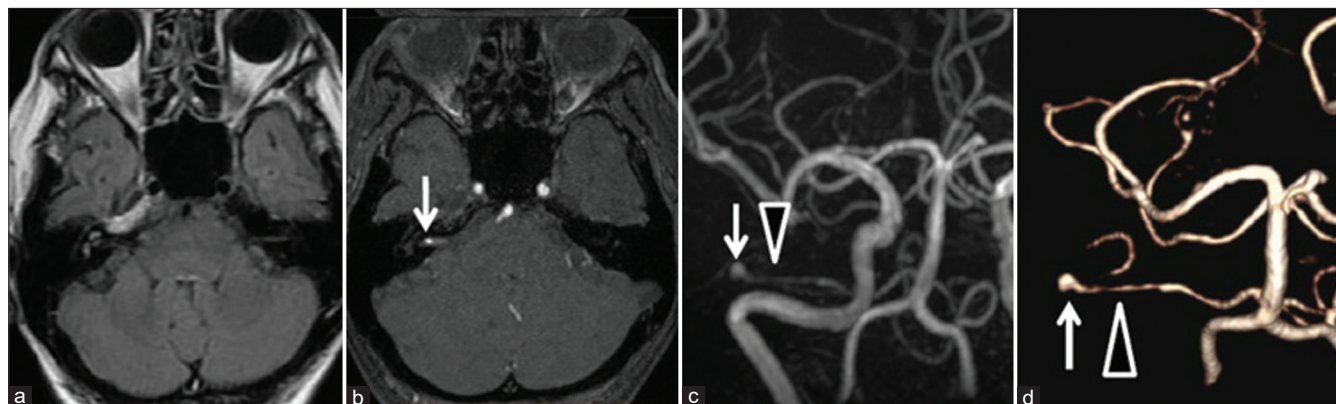
MRA at 18 months after onset showed slight increase in diameter of the AICA and slight decrease in the aneurysmal size compared to those 13 months before [Figures 4a and b]. At the latest follow-up, 21 months after onset, the patient was working as a helper for a nursing home despite her right-sided hearing loss and slight right facial paresis.

Due to the absence of rupture during the clinical course, mild residual symptoms, improvement in the narrowing of the parent artery, and supposed wide irrigation area by the AICA due to the lack of ipsilateral PICA, we considered further follow-up under blood pressure control rather than direct intervention, which may result in serious neurological sequelae.

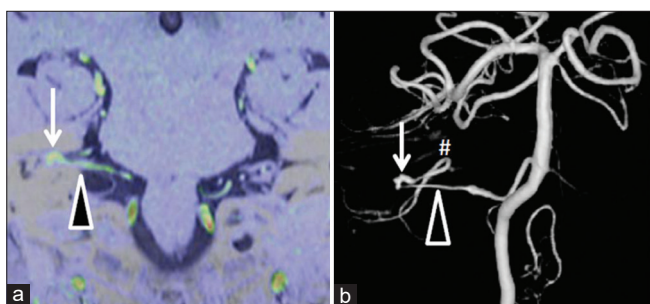
## DISCUSSION

This is a rare case with intrameatal dissecting AICA aneurysm that presented with the eighth and then seventh nerve palsy without hemorrhage.

The AICA is anatomically divided into four segments – anterior pontine, lateral pontine, flocculopeduncular, and cortical segment.<sup>[27]</sup> The lateral pontine segment is further divided into three portions – premeatal, meatal, and postmeatal segments. AICA aneurysm is more frequently



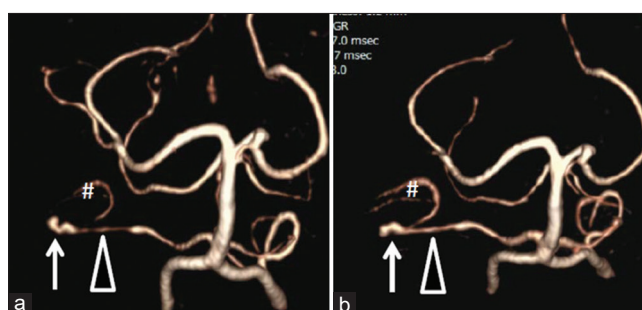
**Figure 2:** Magnetic resonance imaging at the initial presentation. (a) A fluid-attenuated inversion recovery image of cerebellopontine angle showed no subarachnoid hemorrhage nor mass lesion. (b) A source image of magnetic resonance angiography (MRA) showed a dot (arrow) of arterial flow in fundus of the right internal auditory canal (IAC). (c) MRA showed thinning of right anterior inferior cerebellar artery (AICA) (arrowhead) in premeatal portion of lateral pontine segment and aneurysmal dilatation (arrow) in its meatal portion. (d) Volume rendering image also showed “string (arrowhead) and pearl (arrow)” in the AICA.



**Figure 3:** Angiogram at the emergence of facial nerve palsy 5 months after onset. (a) MRA source image superimposed on coronal 3D-constructive interference in steady-state image showed lateral pontine segment (arrowhead) of the anterior inferior cerebellar artery (AICA) and the aneurysm (arrow) in the fundus of IAC. (b) Digital subtraction angiogram showed thinning of the AICA (arrowhead) proximal to aneurysm (arrow) suggesting the dissection of the AICA. Flocculopeduncular segment was noted (#). Ipsilateral posterior inferior cerebellar artery was absent.

located in its proximal part from the BA-AICA junction to the premeatal segment than its distal part from the meatal segment to the cortical segment.<sup>[4,10,26,29]</sup> Among a series of 34 AICA aneurysms reported by Gonzalez, only four arose from the distal part.<sup>[10]</sup>

To the best of our knowledge, intrameatal AICA aneurysm has been reported in only 26 patients (21 women), including our patient.<sup>[3,5,6,8,9,11,13,14,15,17-20,22,25,29,32,33,35,37,38,40,41]</sup> The patients' ages ranged from 35 to 83 years, with a mean age of  $61.3 \pm 14.0$  (standard deviation) and median age of 62 years. The comorbidities included hypertension in seven patients, dyslipidemia in four patients, and diabetes mellitus in three patients. Three patients also had arteriovenous malformation (AVM) distal to the AICA aneurysm.<sup>[9,19,38]</sup> Dissection involving the AICA was observed in three patients.<sup>[8,11]</sup>



**Figure 4:** Change in appearance of the AICA on volume rendering MRA images. (a) At the emergence of facial palsy 5 months after onset arrow: aneurysm, arrowhead: lateral pontine segment of AICA, #: flocculopeduncular segment of AICA. (b) At 18 months after onset, the aneurysm size slightly decreased (arrow), caliber of the AICA (arrowhead) slightly increased, and flocculopeduncular segment (#) became apparent compared to that 13 months before.

Twenty-one (80.8%) patients were admitted due to SAH as the initial presentation.<sup>[3,6,8,11,13,14,15,17-19,22,25,29,32,33,35,37,40,41]</sup> Among these 21 patients, tinnitus was observed in two,<sup>[18,25]</sup> hearing disturbance in four,<sup>[13,14,32,41]</sup> vertigo/dizziness in three,<sup>[15,25,37]</sup> and mild-moderate facial palsy in seven patients on neurological examination on admission.<sup>[3,13,15,22,32,33]</sup> A history revealed hearing disturbance and mild facial palsy preceding SAH in one patient.<sup>[22]</sup> Hunt and Hess SAH scale was I in three,<sup>[29,33]</sup> II in 10,<sup>[11,13,15,17,25,32,33,35,37,40]</sup> III in seven,<sup>[6,8,12,18,19,22,41]</sup> and unknown in one patient.<sup>[3]</sup> Intervention for aneurysm was performed in all cases where 17 patients underwent craniotomy<sup>[3,6,13,14,15,17-19,22,25,32,33,35,37,40,41]</sup> and four patients underwent endovascular occlusions.<sup>[8,11,29]</sup> Among the 17 patients who underwent craniotomy, aneurysmal clipping was performed in nine,<sup>[14,17,18,22,33,37,41]</sup> trapping was performed in seven,<sup>[3,13,15,19,25,32,35]</sup> and



trapping and distal AICA anastomosis was performed in one.<sup>[6]</sup> At the last follow-up, the modified Rankin score was 0 in four,<sup>[11,29,33,41]</sup> 1 in nine (eighth and/or seventh nerve symptoms),<sup>[13,14,17,19,22,25,35,37,40]</sup> 2 in five,<sup>[6,15,18,29,32]</sup> 3 in one,<sup>[8]</sup> 6 (dead) in one,<sup>[33]</sup> and unknown in one patient.<sup>[3]</sup>

Five (19.2%) patients, including our patient, sought medical attention due to acute or slowly progressing eighth nerve symptom without SAH [Table 1].<sup>[5,9,20,38]</sup> Two of them had AVM,<sup>[9,38]</sup> one had mycotic aneurysm,<sup>[5]</sup> and our patient had dissecting aneurysm; the causative factor was not described in one patient.<sup>[20]</sup> The preoperative diagnosis was schwannoma in two patients.<sup>[5,20]</sup> Two patients developed SAH 5 days and 18 months after diagnosis.<sup>[20,38]</sup> Clipping,<sup>[20]</sup> excision,<sup>[5]</sup> endovascular occlusion,<sup>[38]</sup> and coating<sup>[9]</sup> were performed. Four out of these five patients were alive at the last follow-up.<sup>[5,9,20]</sup> Our case is the only one that was followed up for more than 20 months without intervention.

Among the 16 cases of dissecting AICA aneurysms reported,<sup>[1,4,7,8,12,16,21,28,30,31,34,36]</sup> 13 presented with SAH<sup>[1,4,8,12,16,21,28,31,34,36]</sup> and three, including our case, presented with nonhemorrhagic symptoms.<sup>[7,30,36]</sup> The reported treatment for the lesion included endovascular occlusion of the parent artery in 10,<sup>[1,4,7,8,16,21,28,31,36]</sup> surgical trapping in two,<sup>[34,36]</sup> and no direct intervention in four cases.<sup>[12,30,36]</sup> One patient developed cerebellar infarction after endovascular occlusion.<sup>[36]</sup>

The patient in this case report had an unruptured dissecting AICA aneurysm. The natural course of unruptured

intracranial arterial dissection is completely different from that of ruptured one. The recurrent bleeding rate of ruptured dissecting aneurysm is quite high at 14.1–71.4%.<sup>[23,39]</sup> The first rupture is, however, quite rare occurring only 1% among 98 unruptured dissecting aneurysms, including 31 aneurysms located in arteries other than the vertebral artery.<sup>[24]</sup>

Although our patient's right ear deafness persisted, she was able to work and right facial nerve palsy and narrowing of dissected segment of AICA showed some improvement at the last follow-up. Surgical trapping or endovascular treatment may result in worsening of facial nerve palsy and infarction in the cerebellum and/or brachium pontis considering the suspected wide area irrigated by the AICA in our patient. Due to these reasons, we chose a strategy of close monitoring under blood pressure control for this particular case.

## CONCLUSION

We have reported the first case of intrameatal dissecting AICA aneurysm presenting with the eighth nerve symptom without SAH, which did not rupture for >20 months under blood pressure control.

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**Table 1:** Five reported cases with intra-auditory canal anterior inferior cerebellar artery aneurysms first presenting with the eighth nerve symptoms without hemorrhage.

Author (year)	Age/sex	Symptoms	Background	Preoperative diagnosis	Concomitant vascular lesion	Suspected etiology	Treatment	Outcome
Gleeson <i>et al.</i> <sup>[9]</sup> (1989)	57/F	VIII (Hearing disturbance)	Healthy	Intra-IAC mass	AVM on peripheral AICA	Flow related	Coating	Alive
DiMaio <i>et al.</i> <sup>[5]</sup> (2003)	60/F	VIII (Dizziness)	Healthy	Schwannoma	No	Mycotic	Excision	Alive
Willms <i>et al.</i> <sup>[38]</sup> (2016)	81/F	VIII (Vertigo) and VII →SAH (5 days later)	NM	Aneurysm	AVM on peripheral AICA	Flow related	Coiling	Died of mesenteric artery occlusion the next day
Liang <i>et al.</i> <sup>[20]</sup> (2020)	65/M	VIII (Hearing disturbance) and VII →SAH (18 months later)	HT, HL	Schwannoma	No	NM	Clipping	Alive with VII paralysis
Present case (2021)	77/F	VIII (Dizziness) → VII (5 months later)	HT, HL	-	No	Dissection	Observation	Alive with VIII palsy and mild NII paresis

VIII: 8th cranial nerve, VII: 7th cranial nerve, IAC: Internal auditory canal, AVM: Arteriovenous malformation, NM: Not mentioned, HT: Hypertension, HL: Hyperlipidemia, SAH: Subarachnoid hemorrhage

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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