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*AJNR Am J Neuroradiol* 2003, 24 (6) 1133-1135  
<http://www.ajnr.org/content/24/6/1133>

This information is current as  
of July 29, 2025.

## Persistent Stapedial Artery: MR Angiographic and CT Findings

Turgut Yilmaz, Cem Bilgen, Recep Savas, and Hudaver Alper

**Summary:** A 2-year-old girl was found to have a pink pulsatile mass behind the right tympanic membrane on physical examination. We report the high-resolution CT and MR angiographic findings of persistent stapedial artery with hypoplasia of the A1 segment of the right anterior cerebral artery.

A persistent stapedial artery is a rare congenital vascular anomaly that may present a technical problem during middle ear surgery. The stapedial artery is transiently present in normal fetal development and connecting the future external carotid artery to the internal carotid artery (ICA). In this article, we report the high-resolution CT and MR angiography findings of persistent stapedial artery with hypoplasia of A1 segment of right anterior cerebral artery.

### Case Report

A 2-year-old girl was found to have a pink pulsatile mass behind the right tympanic membrane during routine otoscopic examination. Glomus tympanicum was suspected clinically. The patient did not have any complaint. The other findings from the physical examination and the patient's vital signs were unremarkable. Hearing loss was not established. The patient's short medical history was also normal. She was born after an uncomplicated 40-week pregnancy. The results of biochemical analysis and the hematologic profile were normal. High-resolution temporal-bone CT examination was performed with a Somatom Plus scanner (Siemens, Erlangen, Germany) with section thickness of 1 mm and a pitch of 1. The CT study showed absence of the right foramen spinosum (Fig 1). The left foramen spinosum was normal. The right internal carotid artery had an aberrant course running laterally in the middle ear cavity without an osseous canal. Soft-tissue attenuation was seen connecting the right internal carotid artery to the tympanic segment of the facial nerve (Fig 2). A small vascular structure left the carotid canal and entered the middle ear. It continued toward the stapes and then traveled in small segment of the facial canal. Following the facial nerve canal, the small vascular channel reached the middle cranial fossa (Fig 3). We then performed multisection 3D time-of-flight MR angiography (TR/TE, 39/7; matrix, 192 × 512; section thickness, 32 mm) with a 1.5-T MR machine (Vision; Siemens, Erlangen, Germany). The MR angiograms showed hypoplasia of the petrous vertical portion of the right internal carotid artery, the aberrant course of the right internal carotid artery in the middle ear, and



FIG 1. Axial CT scan shows a normal left foramen spinosum (single white arrow) and an absent right foramen spinosum. The right ICA is laterally displaced into the middle ear (double white arrow). The left ICA is in a normal position (black arrow).

the collateral supply of the right internal carotid via inferior tympanic and caroticotympanic anastomoses (Fig 4). The stapedial artery arose from the aberrant right ICA (Fig 5), and hypoplasia of the right A1 segment of the anterior cerebral artery was observed (Fig 6).

### Discussion

A persistent stapedial artery is a rare vascular anomaly, with a histopathologic incidence of two in 1400 specimens (1). This rare congenital vascular anomaly can be appear as a reddish pulsatile mass on otoscopic examination, or it can be incidentally found during middle ear surgery. Inadvertent damage to a large persistent stapedial artery results in profuse bleeding, and it can be confused with other middle ear masses (2). For these reasons, the preoperative diagnosis of a persistent stapedial artery is important. The differential diagnosis of a persistent stapedial artery can be made on the basis of CT, conventional angiography, or MR angiography findings.

The embryologic development of the branchial system produces six paired aortic arches and corresponding arteries. The six arches develop in numerical order and are not all present at the same time. The first arch gives rise to the mandibular artery, which later regresses. Embryologically, the primitive second aortic arch gives rise to the hyoid artery that, in turn, gives rise to the stapedial artery near its origin from

Received August 23, 2002; accepted October 21.

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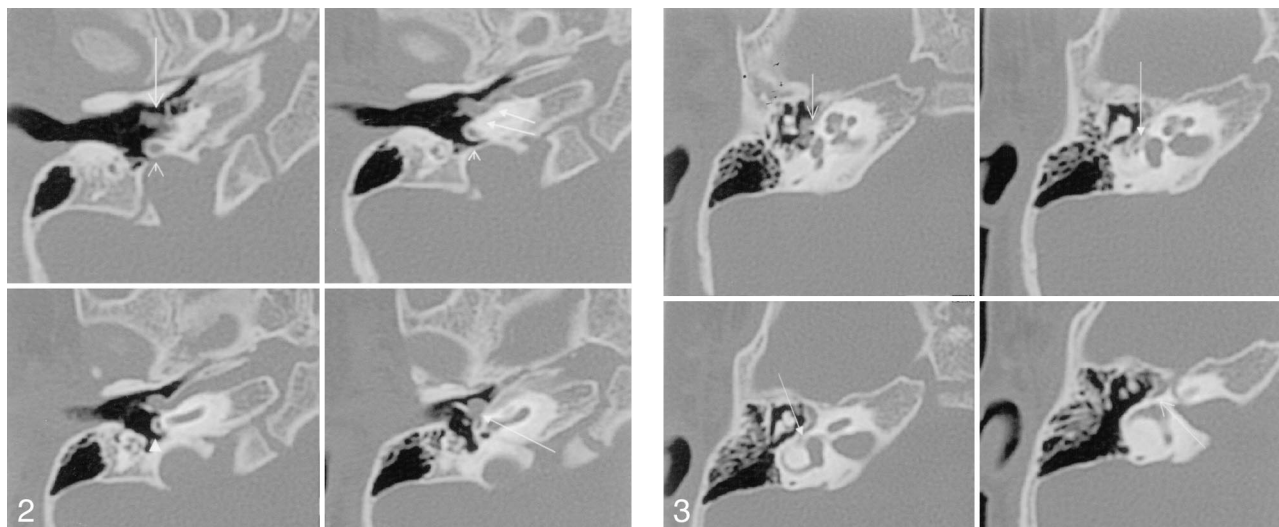


FIG 2. Axial images from inferior to superior: *top left, top right, bottom left, and bottom right*. The facial canal (*arrowhead*) is enlarged in the first three images. The small vascular channel can be seen leaving the vertical aberrant segment of right ICA at the level of the stapedial crura in the last image (*arrows*).

FIG 3. Axial images from inferior to superior: *top left, top right, bottom left, and bottom right*. Following the facial nerve canal (*arrow* in the first three images), the small vascular channel reaches the middle cranial fossa (*arrow*, last image). This represents the position of the geniculate ganglion turn of the facial nerve canal.

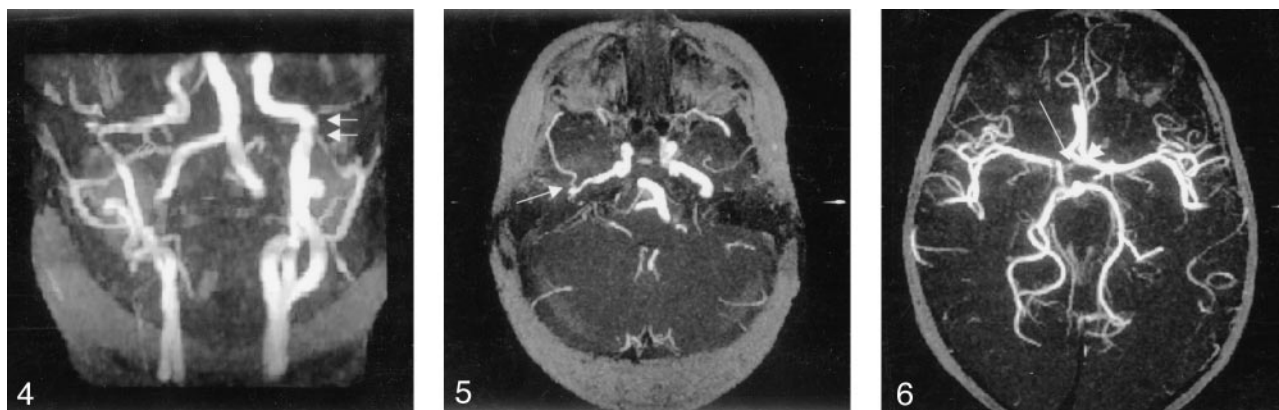


FIG 4. Coronal 3D time-of-flight MR angiogram shows hypoplasia of the petrous vertical portion of the right ICA, the normal left internal carotid artery (*double arrow*), and the collateral supply of the right ICA.

FIG 5. Axial MR angiogram shows the persistent stapedial artery arising from the aberrant ICA (*arrow*).

FIG 6. Axial MIP MR angiogram shows hypoplasia of the right A1 segment of the anterior cerebral artery.

the internal carotid in the 40th or 50th week of the fetal life. The stapedial artery pierces the stapes primordium, leaving its imprint as the obturator foramen and producing its annular shape. In an embryo with a diameter of 12–15 mm, the stapedial artery divides into a dorsal branch (future meningeal artery) and a ventral division (maxillary and mandibular arteries). Finally, branches from the stapedial artery link with the branches developing from the external carotid artery. While this annexation is taking place, the hyoid artery and stem of the stapedial artery disappears during the third fetal month (3).

When a stapedial artery persists in postnatal life, the middle meningeal artery arises from it. The foramen spinosum is absent; it normally contains the middle meningeal artery. A persistent stapedial artery arises from the petrous ICA, entering the hypotym-

panium in an osseous canal. It goes upward between the crura of the stapes. Then, it enters the facial canal and extends a short distance, together with facial nerve. Two millimeters behind the geniculate ganglion, it leaves the facial canal and then travels anteriorly and cephalad in the extradural space of the middle cranial fossa (3–5).

A persistent stapedial artery may be isolated anomaly, or it may occur with an aberrant ICA. In the latter case, the vertical portion of the ICA is absent. The proximal and distal segments of the ICA connect via inferior tympanic and caroticotympanic anastomoses (4, 5). In our case, the persistent stapedial artery was associated with an aberrant ICA. The other vascular anomaly was hypoplasia of the right A1 segment of the anterior cerebral artery. To our knowledge, this association has not been reported in literature. This is

such a common variation that it is not likely to be related to the persistent stapedia artery.

A persistent stapedia artery can cause conductive hearing loss and pulsatile tinnitus, but most patients reported in literature were asymptomatic (6). If a persistent stapedia artery is symptomatic and if ligation is considered, an arteriogram is obtained to ensure that the artery does not represent an end artery or that it does not provide a substantial supply to sensitive tissue. In the present case, the patient did not have any complaint, and the persistent stapedia artery was diagnosed incidentally. Ligation of the persistent stapedia artery can be performed in symptomatic patients.

When a pulsatile mass is present behind the tympanic membrane, the differential diagnosis includes a glomus tympanicum tumor and an aberrant carotid artery or jugular bulb. The diagnosis can be suggested by absence of the foramen spinosum on the CT scans; however, this finding is nonspecific and may be seen when the middle meningeal artery takes its origin from the ophthalmic artery.

## Conclusion

The persistent stapedia artery is a rare vascular anomaly. When a pulsatile mass is present behind the tympanic membrane or when a persistent stapedia artery is suspected, the differential diagnosis can be made by means of CT, MR angiography, or conventional angiography to prevent complications with internal ear surgery.

## References

1. Schuknecht HF. **Sensorineural hearing loss following stapedectomy.** *Arch Otolaryngol* 1962;54:336–347
2. Mutlu C, Costa SS, Paparella MM, Schachern PA. **Clinical-histopathological correlations of pitfalls in middle ear surgery.** *Eur Arch Otorhinolaryngol* 1998;255:189–194
3. Guinto FJ, Garrabrant EC, Radcliffe WB. **Radiology of the persistent stapedia artery.** *Radiology* 1972;105:365–369
4. Silbergleit R, Quint DJ, Mehta BA, et al. **The persistent stapedia artery.** *AJNR Am J Neuroradiol* 2000;21:572–577
5. Thiers FA, Sakai O, Poe DS, Curtin HD. **Persistent stapedia artery: CT findings.** *AJNR Am J Neuroradiol* 2000;21:1551–1554
6. Govaerst PJ, Marquet TF, Cremers WR, Offesiers FE. **Persistent stapedia artery: does it prevent successful surgery?** *Ann Otol Rhinol Laryngol* 1993;102:724–728