Aneurysm in the internal auditory meatus

Case report

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The successful surgical treatment of an intrameatal aneurysm is reported,
and the signs, symptoms, and neurootological findings discussed. Anatomical
consideration of the course of the anterior inferior cerebellar artery and origin
of internal auditory artery are emphasized.

KEY WORDS · intracranial aneurysm · internal auditory meatus ·
    anterior inferior cerebellar artery

Among aneurysms of the vertebrobasilar
system, an aneurysm of the anterior
inferior cerebellar artery located in
the internal auditory canal is very rare. In
reviewing the literature, we could find only
two surgical cases.2,4,5 We are reporting a
third case.

Case Report

A 35-year-old woman was in good health
until September 26, 1969, when she sud-
denly had a severe headache with subse-
quent nausea and repeated vomiting: after 1
week, the headache gradually improved. On
October 22, she experienced a peculiar sen-
sation as if stored water abruptly poured out
of her left ear; shortly thereafter the se-
vere headache and repeated vomiting re-
turned. The next morning, she was admitted
to a local hospital, where lumbar puncture
was performed. The cerebrospinal fluid was
bloody and the pressure 270 mm H2O. On
November 2, facial palsy appeared on the
left side, and 2 days later she noticed a left
hearing loss and tinnitus. The headache and
tinnitus increased in severity, and on Nov-
ember 21 she was transferred to the Tokyo
Metropolitan Police Hospital.

Examination. Vital signs and general
physical examination were normal. The pa-
ient was fully alert and oriented, complaining
of a continuous headache at the midportion
of the left occipital region, which increased
on body movement. She complained of a stiff
neck but the neck moved normally on test-
ing. Motor and sensory examination was
normal; there was no dysdiadochokinesis or
hypotonia or signs of pyramidal disease.
Handwriting was normal. Although she felt
unsteady on standing and walking, the Rom-
berg was absent and gait was normal. Eye
movements were normal but there was hori-
zontal nystagmus on right lateral gaze. Pu-
pillary reaction and fundi were normal. The
left corneal reflex was diminished, but facial
sensation was normal. There was a droop of
the left corner of the mouth, and the left eye
did not close fully. There was some hearing
impairment on the left, and taste was im-
paired on the anterior two thirds of the left
side of the tongue. Other cranial nerves were
normal.
Otological Examination. The pure tone audiogram on November 22 (Fig. 1 left) showed slight perceptive loss on the left involving both low and high frequencies with a dip at 4000 Hz. The pure tone average for the “speech frequency range” was 27 dB (American Standards Association, or ASA, standard). Reexamination on December 1 showed some improvement, however, in which the dip at 4000 Hz was diminished (Fig. 1 right). No evidence of recruitment was noted in the alternate binaural loudness balance (ABLB) test. Bekesy audiometry revealed a type 1 tracing pattern at 2000 Hz in both ears, namely, there was no temporary threshold shift. The discrimination score in the left ear was 28%, which was much lower than that expected from pure tone threshold. The acuity of directional hearing by the receiver method was impaired. Horizontal and rotatory spontaneous nystagmus to the right were observed. When the eyes were covered, nystagmus beating to the right was recorded by electronystagmography. Horizontal and rotatory positional nystagmus was seen with the Frenzel glass when the patient was supine, and was intensified when the head was twisted to the right. Caloric stimulation with 60 ml of ice water revealed no response on the left side. Examinations of eye tracking and optokinetic nystagmus were within normal range. The results of these neurootological examinations suggested a localized retrolabyrinthine lesion.

Laboratory examination including a complete blood count, serum chemistry, and urinalysis were normal. The electrocardiogram (EKG) was normal. The cerebrospinal fluid was xanthochromic under a pressure of 120 mm H₂O, with 26 cells/mm³, negative Nonne-Apelt and Pandy tests. Skull films disclosed some enlargement of the left internal auditory meatus (Fig. 2). Carotid angiography showed no aneurysm and no evidence of dilatation of the ventricular system. Left vertebral angiography showed an aneurysm in the internal auditory canal (Fig. 3), apparently originating from the anterior inferior cerebellar artery. Basal cisternography

Fig. 1. Left: Pure tone audiogram on November 22, 1969. Right: Pure tone audiogram on December 1, 1969.

Fig. 2. Plain skull film showing enlargement of the left internal auditory canal.
Aneurysm in the internal auditory meatus

showed no filling defect or intracerebellar hematoma, and extrameatal extension of the mass was denied.

**Operation.** On December 3, under endotracheal general anesthesia in the sitting position, a left suboccipital craniectomy was performed. Exploration of the cerebellopontine angle revealed no hematoma, although there was some hemosiderin deposit and adhesion of the arachnoideal membrane to the surface of the cerebellar hemisphere. Cerebellar uncapping was done, and the left internal auditory meatus was opened by Surgiairtome (Hall International, Inc.). The aneurysm was seen, but adhesions from the surrounding structure prevented further manipulation. Clipping of the neck of the aneurysm was abandoned, and trapping was performed whereby the artery looping into the porus of the internal meatus was clipped at its points of entry and exit. The artery distal to the aneurysm could not be pursued. The aneurysm was punctured but no blood was obtained.

**Postoperative Course.** Recovery was uneventful. Immediately after the operation, the patient showed total deafness on the left side and the facial palsy increased; 1 month later, however, the facial palsy had almost completely disappeared. Postoperative angiography revealed no aneurysm in the meatus (Fig. 4). The patient was discharged from the hospital on December 21, 1969, without any complication except for leftsided deafness and tinnitus.

**Discussion**

In 1967, Castaigne, *et al.*, reported the first successful surgical treatment of an intrameatal aneurysm, and Hitselberger and Gardner presented another case the following year. We could find only these two cases in the world literature. Thus, this type of aneurysm is very rare among the vertebrobasilar aneurysms that are now so commonly reported in the neurosurgical literature.

Diagnosis of this lesion is not difficult. The onset in our case was dramatic, and, from the symptoms and signs, a cerebellopontine angle lesion was easily suspected. Four-vessel study in the attack of subarachnoid hemorrhage may reveal the aneurysm. The neurootological examination revealed a retrolabyrinthine lesion, the intrameatal aneurysm causing compression of the eighth nerve from the outside.

What is interesting from the neurosurgical viewpoint is the importance of the anterior inferior cerebellar artery in surgery of a cerebellopontine angle lesion. The anatomy of the artery around the porus of the internal auditory meatus needs to be discussed. Some authors have stressed that the ori-
Anatomical variations in the origin of the internal auditory artery

<table>
<thead>
<tr>
<th>Author, Year</th>
<th>AIC* (%)</th>
<th>Basilar (%)</th>
<th>PIC* (%)</th>
<th>Vertebral (%)</th>
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<td>Watt et al. (1935)</td>
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<td>Lelli (1939)</td>
<td>80† 17†</td>
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<td>3</td>
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<td>Mazzoni (1969)</td>
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* AIC = Anterior inferior cerebellar artery; PIC = posterior inferior cerebellar artery.
† Accessory anterior inferior cerebellar artery.

The origin of the internal auditory artery is not from the basilar but from the anterior inferior cerebellar artery (Table 1). According to Mazzoni and Hansen, despite the great variety in the origin and course of the cerebellar artery, there is a rather consistent pattern at the porus of the internal auditory meatus. The anterior inferior cerebellar artery branches at the porus into the subarcuate artery to the cerebellum and the internal auditory artery that enters the meatus to reach the inner ear. This artery is a loop-shaped artery. Atkinson reported that the anterior inferior cerebellar artery was divided into two branches before or after crossing the eighth nerve, namely, the lateral and medial branches. The former passes directly laterally and curls round the upper edge of the flocculus, where it lies on the surface of the middle cerebellar peduncle and then passes on to the cerebellar hemisphere proper to anastomose with other arteries. This lateral branch gives off small arteries that supply the middle cerebellar peduncle and an area of variable size in the lateral tegmental region of the lower two-thirds of the pons. The main artery itself also sends small vessels into the pons, supplying chiefly its lateral part as far superiorly as the junction of the upper and middle thirds and inferiorly the lateral third of the upper part of the medulla oblongata.

A clip on the artery as it crosses the eighth nerve will immediately deprive the lateral branch of blood supply if no anastomosis exists through one of the following three routes, namely, the posterior inferior cerebellar artery, the superior cerebellar artery, and the branch from the basilar artery near its junction with the vertebral artery (which is usually very small but occasionally large). Furthermore, the clip may initiate retrograde thrombosis in the main proximal stem artery and impair the whole of the arteries distributed to the pons. Irreversible damages are likely to occur from swelling or infarction in the autonomic pathway, which conveys impulses from the vasomotor and respiratory regulation center in the tegmentum of the pons. This is a grave danger to a patient.

In our case, the aneurysm was situated at the point where the internal auditory artery branches from the loop-shaped anterior inferior cerebellar artery, and this compressed the facial and acoustic nerve. Luckily the dangerous complication did not occur despite clipping of the anterior inferior cerebellar artery, because the anastomotic branches via the arteries mentioned above were well developed. Function returned to the facial nerve, but did not to the auditory nerve since its feeding artery had been clipped. The most desirable procedure in such a case would have been to clip the neck of the aneurysm. To perform this, we should have applied the microsurgical techniques now available.

We neurosurgeons should know the anatomy and physiology of the anterior inferior cerebellar artery thoroughly, for its surgical importance is great.

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References

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