Intrameatal Aneurysm Successfully Treated by Meatal Loop Trapping
—Case Report—

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Abstract

A 77-year-old female presented with a rare intrameatal aneurysm manifesting as sudden onset of headache, hearing loss, tinnitus, and vertigo associated with subarachnoid hemorrhage. Meatal loop trapping was performed. After surgery, the patient’s functions recovered almost completely, probably because of the preservation of the 7th and 8th cranial nerves and the presence of effective collaterals in the area supplied by the anterior inferior cerebellar artery.

Key words: anterior inferior cerebellar artery, cerebral aneurysm, internal auditory artery, internal acoustic meatus, trapping

Introduction

Intrameatal aneurysms (IMAs) are a very rare and special type of aneurysm of the distal anterior inferior cerebellar artery (AICA), characterized by the location of the entire aneurysm within the internal acoustic meatus.6) IMA causing subarachnoid hemorrhage (SAH) is likely be accompanied by damage to the 7th and 8th cranial nerves. Furthermore, surgery to prevent rebleeding from IMA can aggravate such damage. No patient has recovered from IMA without residual neuropathy, as hearing loss persisted in all reported cases.3,4,6,9) We recently treated a case of IMA by meatal loop trapping and the patient almost completely recovered all functions.

Case Report

A 77-year-old female suddenly developed tinnitus and lost consciousness. On admission, she was alert but complained of severe headache, impaired hearing on the right, tinnitus, and vertigo. Nuchal rigidity was the only objective symptom observed. Computed tomography (CT) revealed moderate SAH in the posterior fossa. Left vertebral angiography disclosed a saccular aneurysm (4 mm diameter) of the right distal AICA, protruding into the internal acoustic meatus (Fig. 1 left).

A right lateral suboccipital craniectomy was performed on the 2nd day after admission. The cerebellar hemisphere was retracted medially and the internal acoustic meatus was exposed. The postmeatal segment of the AICA ran from the internal acoustic

Fig. 1 Left vertebral angiograms, before surgery (left) showing a saccular aneurysm in the meatal segment of the right anterior inferior cerebellar artery (AICA) (arrows), and after surgery (right) showing the AICA is interrupted after the medial branch and the aneurysm has disappeared.
pore to the area above the 8th cranial nerve, and the premeatal segment entered the internal acoustic pore between the 7th and 8th cranial nerves (Fig. 2). However, the aneurysm, including its neck, could not be seen. The presence of an IMA was confirmed by tracing the proximal and distal AICA. Opening the internal auditory meatus and exposing the aneurysm carried a high risk of damage to the 7th and 8th cranial nerves, so we immediately conducted temporary trapping of the meatal loop using two clips. The auditory brainstem response (ABR) was monitored during surgery. After trapping, the ABR on the right following stimulation of the right ear was unclear, but the ABR following stimulation of the left ear continued to show waves III, IV, and V (Fig. 3). No noteworthy changes in vital signs were observed after trapping. Therefore, we judged that the patient's brainstem function had been preserved after meatal loop trapping. Permanent trapping was then completed.

The postoperative course was uneventful. The patient had recovered almost completely at discharge 4 weeks after surgery. Postoperative vertebral angiography revealed that the aneurysm had disappeared, and that the right AICA had become interrupted after the medial branch (Fig. 1 right). However, CT revealed no infarcted area in the cerebellum or brainstem. Facial paresis did not develop. Impaired hearing, evident immediately after surgery, subsided gradually. The right ABR was almost completely normal 3 weeks after surgery (Fig. 3). Air conduction audiography revealed a hearing level 15 dB lower on the right than on the left, but bone conduction audiography revealed no laterality (Fig. 4). These results suggested that her auditory function in the area proximal to the internal ear had normalized almost completely.

Discussion

Only four cases of IMA (all in young females) have...
be reported (Table 1). In all four patients, IMA was detected during management of SAH. All four had hearing loss, and three had facial nerve palsy as well. Opening the internal acoustic meatus and exposing the aneurysms was attempted surgically in three patients, but neck clipping was successful in only one case. The other two of these three patients eventually underwent meatal loop trapping. The remaining patient was considered as unlikely to recover functions associated with the 7th and 8th cranial nerves and underwent only meatal loop trapping. Rebleeding was prevented in all patients, but the functions associated with the 7th and 8th cranial nerves were not recovered satisfactorily, as hearing was lost. In contrast, our patient almost completely recovered all functions.

Since IMA grows in close contact with the 7th and 8th cranial nerves within the narrow internal acoustic meatus, it is quite difficult to free or clip the aneurysms, as well as preserve these nerves. Neck clipping without damaging these nerves was not possible in previous cases of IMA, and damage to these nerves was primarily responsible for postoperative neurological dysfunctions. Our success in achieving almost complete functional recovery in the present case is primarily attributable to the success in preserving these nerves during surgery. The greatest advantage of meatal loop trapping, which does not require manipulation of the internal acoustic meatus, is preservation of these nerves. However, meatal loop trapping was never used as the technique of first choice, except in the case of IMA with complete loss of the functions associated with these nerves, because meatal loop trapping involves the risk of ischemic damage to the area supplied by the AICA, i.e., the risk of causing ischemia of the 7th and 8th cranial nerves, cerebellum, and brainstem.

Obstruction of the internal auditory artery may lead to ischemia of the 7th and 8th cranial nerves. In our patient, ischemia of these nerves was indicated by changes in intraoperative ABR data taken immediately after trapping, but no permanent damage to these nerves occurred. This favorable result may be due to the following factors: Collaterals (e.g. the routes of circulation leading from the carotid circulation through the temporal bone into the internal ear) were present in the area around the 7th and 8th cranial nerves; and these collaterals had the potential to become strengthened rapidly when needed. Obstruction of the peripheral branches of the AICA or the recurrent artery may also cause ischemia of the cerebellum and brainstem. However, both clinical data and diagnostic imaging ruled out the presence of cerebellar or brainstem ischemia in our patient, probably because the anastomoses between the AICA and other cerebellar arteries functioned satisfactorily as collaterals. No cases of distal AICA aneurysms have been complicated by cerebellar or brainstem damage after meatal loop trapping, so meatal loop trapping is unlikely to induce cerebellar or brainstem damage, unless the recurrent artery bifurcates from

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### Table 1 Summary of cases of intrameatal aneurysm

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Age/Sex</th>
<th>Presentation</th>
<th>Surgery</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hori et al. (1971)</td>
<td>35/F</td>
<td>SAH, VII, VIII</td>
<td>trapping</td>
<td>VIII (deafness)</td>
</tr>
<tr>
<td>Kamano et al. (1988)</td>
<td>58/F</td>
<td>SAH, VII, VIII</td>
<td>trapping</td>
<td>VII, VIII (deafness)</td>
</tr>
<tr>
<td>Inoue et al. (1987)</td>
<td>43/F</td>
<td>SAH, VIII</td>
<td>clipping</td>
<td>VII, VIII (deafness)</td>
</tr>
<tr>
<td>Spallone et al. (1995)</td>
<td>46/F</td>
<td>SAH, VII, VIII</td>
<td>trapping</td>
<td>VII, VIII (deafness)</td>
</tr>
<tr>
<td>Present case</td>
<td>77/F</td>
<td>SAH, VIII</td>
<td>trapping</td>
<td>no deficit</td>
</tr>
</tbody>
</table>

SAH: subarachnoid hemorrhage; VII and VIII: 7th and 8th cranial nerve paresis, respectively.

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the meatal loop.\textsuperscript{7)}

The almost complete functional recovery achieved in our patient is attributable to the preservation of the 7th and 8th cranial nerves by the selection of meatal loop trapping and to the presence of collaterals in the area supplied by the AICA (especially the internal auditory artery) which functioned satisfactorily at the onset of ischemia. However, preoperative determination of the presence or the capacity of such collaterals is not possible at present.\textsuperscript{5,9)} Therefore, we cannot suggest that meatal loop trapping is the procedure of choice for treating IMA on the basis of only this case. Evaluation of the usefulness of this technique on the basis of further experience is desirable.

References


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