Endoscope-assisted clipping of a superior hypophyseal artery aneurysm without removal of the anterior clinoid process

Case report

**Hiroyuki Kinouchi, M.D., Ph.D., Katsuya Futawatari, M.D., Ph.D., Kazuo Mizoi, M.D., Naoki Higashiyama, M.D., Hisashi Kojima, M.D., Ph.D., and Tetsuya Sakamoto, M.D.**

Department of Neurosurgery, Akita University School of Medicine; and Department of Neurosurgery, Akita Kumiai General Hospital, Akita, Japan

A 47-year-old man presented with a superior hypophyseal artery aneurysm and an ipsilateral posterior communicating artery aneurysm. Both lesions were successfully clipped without removal of the anterior clinoid process or retraction of the optic nerve by using endoscopic guidance. The endoscope was introduced into the prechiasmatic cistern and provided a clear visual field around the aneurysm that could not be seen via the operating microscope. The endoscope was useful in the identification of the medially projecting lesion and the small perforating branches of the ophthalmic segment of the internal carotid artery. A fenestrated clip could be introduced around the neck of the aneurysm and placed in the best position under endoscopic guidance. Endoscope-assisted clipping is potentially a very useful procedure for aneurysm surgery.

**Key Words** • anterior clinoid process • dural ring • endoscope • ophthalmic artery • paraclinoid aneurysm

Abbreviations used in this paper: ICA = internal carotid artery; OphA = ophthalmic artery; PCoA = posterior communicating artery; SAH = subarachnoid hemorrhage; SHA = superior hypophyseal artery.
Operation. A left frontotemporal craniotomy was performed. The distal sylvian fissure and the carotid cistern were opened via a left pterional approach, exposing the PCoA aneurysm directly. Unfortunately, the SHA lesion could not be directly visualized, even by retraction of the ICA or the optic nerve. A rigid endoscope (2.7-mm outer diameter and either a 30° or 70° viewing angle [Olympus Optical Co. Ltd., Tokyo, Japan]) was introduced into the prechiasmatic cistern while being monitored with a microscope. The endoscopic image was displayed on a monitor beside the microscope. The endoscope visualized the topographical relationships among the SHA aneurysm and the dural ring, SHA, and optic nerve (Fig. 3). We confirmed that the aneurysm was located completely in the intradural space and that its proximal neck was at the junction of a single SHA, just distal to the dural ring. Dissection of the proximal neck had provided ample space and, thus, we decided that the clip could be applied without removal of any bone structures or resection of the falciform ligament. The SHA aneurysm was successfully clipped using a right-angled fenestrated Sugita clip under microscopic and endoscopic control without any retraction of the optic nerve (Fig. 3). The PCoA aneurysm was also clipped using an angled Sugita clip in the same way. The medial end of the proximal neck and the PCoA, and its perforating branches were all completely visualized through the endoscope during the entire course of clipping (Fig. 4).

Postoperative Course. Postoperative angiograms confirmed complete obliteration of both aneurysms (Fig. 5). The patient’s postoperative course was uneventful and he was discharged without deficits.

Discussion

The OphA typically originates from the anteromedial surface of the ICA, and the SHA usually arises from the posteromedial wall of the ICA, just distal to the dural ring. Therefore, both OphA and SHA aneurysms originate in the medial wall of the ICA. Consequently, when the ipsilateral approach is followed, the microscopic view of these aneurysms is obstructed by the ICA and the optic nerve. Removal of the anterior clinoid process, sectioning of the dural ring, resection of the falciform ligament, or unroofing of the optic canal is necessary to prevent the surgeon from experiencing visual disturbance while inspecting and clipping the aneurysm. Even when these steps are completed, retraction of the optic nerve cannot always be avoided. Relatively small and asymptomatic aneurysms located in the ophthalmic segment have been clipped using the contralateral approach between the optic nerves. This approach can provide an excellent operative view without interference from the ICA and optic nerve. Unfortunately, this approach also has limitations because the operative field is narrow and long, and proximal control of the ICA from the contralateral side is difficult. In addition, SHA aneurysms are often more difficult to visualize than OphA lesions when the contralateral approach is followed.

Using the microsurgical procedure with the aid of the endoscope, we could approach and clip aneurysms that protruded medially and/or posteriorly from the ophthalmic segment of the ICA under direct endoscopic monitoring via the ipsilateral approach. Without the need to resort to relatively invasive surgical procedures, such as removal of bone structures and retraction of the optic nerve, the topographical relationships among the aneurysm and the dural ring, arterial division, and optic nerve can be confirmed. This greatly contributes to minimizing the need for invasive surgery. During and after clipping, the blade of the fenestrated clip inserted beneath the ICA and the optic nerve can be viewed directly through the endoscope, which improves the certainty and safety of surgery performed via the ipsilateral approach. Therefore, the present method displays great potential for the eradication of aneurysms in the ophthalmic segment. It should be kept in mind, however, that proximal arterial control is essential during surgery of large or ruptured ophthalmic segment lesions. In such cases, resection
Fig. 3. Intraoperative microsurgical photographs (A, C, and E) and endoscopic photographs (B, D, and F) showing the left SHA aneurysm. The aneurysm was located on the posteromedial surface of the ICA, adjacent to the distal ring (A and B). The aneurysm was obliterated with a right-angled Sugita clip under microscopic and endoscopic control (C, D, E, and F).

Fig. 4. Intraoperative microsurgical photographs (A, C, and E) and endoscopic photographs (B, D, and F) showing the left PCoA aneurysm. The lesion was located on the posterolateral surface of the ICA (A and B). Before and during aneurysm clipping, the endoscope was introduced medial to the ICA. The PCoA could be monitored by the endoscope during clipping (A, B, C, and D). Both lateral and medial ends of the aneurysm neck were completely obliterated (E and F).
Endoscope-assisted clipping of aneurysms

of the anterior clinoid process aids in proximal control if the cervical ICA has not been exposed.

In addition, the endoscope is quite helpful in treating aneurysms arising from the lateral wall of the ICA, such as PCoA aneurysms, without removal of the anterior clinoid process or retraction of the optic nerve. The endoscope is a rigid endoscope to the microsurgical management of 54 cerebral aneurysms with the preservation of the parent artery.

Conclusions

With the aid of the ipsilateral approach, endoscopic guidance was used to clip an SHA aneurysm and an ipsilateral PCoA aneurysm, without removal of the anterior clinoid process or retraction of the optic nerve. The endoscope is a potentially useful adjunct for aneurysmal clipping in selected cases to minimize bone removal, reduce neural retraction, and ensure the certainty and safety of the surgical results.

References


Address reprint requests to: Hiroyuki Kinouchi, M.D., Ph.D., Department of Neurosurgery, Akita University School of Medicine, 1-1-1 Hondo, Akita 010-8543, Japan. email: kinouchi@nsg.med.akita-u.ac.jp.