Usefulness of Neuroendoscopy in Treating Supracollicular Arachnoid Cysts
—Case Report—

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Abstract
A 12-year-old girl presented with a supracollicular arachnoid cyst manifesting as a compressive headache. Neurological examination on admission revealed no deficit except bilateral papilledema. Stereotactic cyst puncture failed to perforate the cyst wall. The wall was then punctured using microforceps under neuroendoscopic guidance, followed by cystoperitoneal shunting. Her headache disappeared immediately after surgery. Neuroendoscopy is useful in treating a deep-seated arachnoid cyst.

Key words: arachnoid cyst, supracollicular region, stereotactic surgery, neuroendoscope, cystoperitoneal shunting

Introduction
Arachnoid cysts account for approximately 1% of all intracranial space-occupying lesions. Arachnoid cysts are located in the middle cranial fossa in 50% to 60% of cases,10) and are rare in the supracollicular region.1,7,10) We describe the treatment of a supracollicular arachnoid cyst by cystoperitoneal shunting under guidance of stereotactic surgery and neuroendoscopy.

Case Report
A 12-year-old girl was admitted to our hospital with a compressive headache that worsened in the morning on July 25, 1996. Neurological examination disclosed bilateral papilledema, but both visual acuity and ocular movement were normal. Computed tomography (CT) showed a well-circumscribed supracollicular cystic lesion with no enhancement by contrast medium. T1- and T2-weighted magnetic resonance imaging showed the cyst was isointense with the cerebrospinal fluid (Fig. 1 left, center). The lesion was located in the supracollicular region, and compressed the pineal body upward and the cerebellum downward (Fig. 1 right).

Cystoperitoneal shunting was performed on July 31, 1996. Her head was fixed with a Komai-type stereotactic head frame (Mizuho-ika Co., Tokyo) under local anesthesia and the center of the cyst was determined using a target point on the CT scan. Several attempts were made to puncture the cyst wall with a 2 mm diameter stereotactic needle through a burr hole at 6 cm above the inion and 4 cm from the midline under general anesthesia, but the cyst fluid did not escape. A flexible neuroendoscope (2.7 mm in diameter; Target CMI Co., Costa Mesa, Cal., U.S.A.) was inserted instead of the stereotactic needle. Under neuroendoscopic guidance, the cyst wall was indented using the stereotactic needle, then grasped and punctured using microforceps which avoided microvessels on the wall. Cystoperitoneal shunting with a PS medical high pressure valve (Medtronic PS Medical Co., Goleta, Cal., U.S.A.) was performed. Histological examination of the cyst wall specimen identified an arachnoid cyst.

Her headache disappeared immediately after the surgery. Follow-up CT and magnetic resonance imaging 3 months after the surgery showed a decrease in the size of the cyst (Fig. 2 left). No evidence of symptomatic or neuroradiological recurrence has been seen for 11 months after the surgery (Fig. 2 right).
Fig. 1 Axial T₁ (left) and T₂-weighted (center) magnetic resonance images and sagittal T₁-weighted image with gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) (right), showing the cyst contents are isointense with the cerebrospinal fluid, and the cyst wall is not enhanced by Gd-DTPA. The cyst has compressed the quadrigeminal plate and the cerebellum downward.

Fig. 2 Computed tomography scan (left) and sagittal T₁-weighted magnetic resonance image with gadolinium-diethylenetriaminepenta-acetic acid (right) taken 3 months and 11 months after surgery, respectively, showing the cyst has decreased in size.

Discussion

Arachnoid cysts may be treated by fenestration through open surgery or by cystoperitoneal shunting. However, treatment selection is still controversial.²⁵ Eighteen percent to 53% of patients also required cystoperitoneal shunting due to unimproved symptoms or neuroradiological recurrence.²⁵ Two patients with supracollicular arachnoid cyst were initially treated with fenestration by direct surgery. One patient then required cystoperitoneal shunting due to deteriorating headache and enlargement of the cyst.²⁵ Therefore, cystoperitoneal shunting is thought to be more suitable than fenestration to treat deep-seated arachnoid cysts, such as those in the supracollicular region.

Stereotactic puncture has also been used to treat deep-seated midline arachnoid cysts.²⁴ Stereotactic puncture was combined with cystoperitoneal shunting for a recurrent prepontine arachnoid cyst following fenestration by open surgery.²⁶ Six patients with supracollicular arachnoid cysts were treated by cystoventriculostomy, i.e. internal drainage, using stereotactic surgery combined with neuroendoscopy. However, two required reoperation by cystoatrial shunting due to unimproved symptoms.²⁷ We therefore chose cystoperitoneal shunting under stereotactic guidance to treat our patient. Stereotactic puncture failed due to the marked pliability of the cyst wall. Failure of cyst penetration with a ventricular catheter was previously reported in a patient with a large suprasellar arachnoid cyst.²⁸ The wall was merely indented by the catheter under intraoperative ultrasonography, so additional puncture using a metal catheter was required to introduce the shunt catheter. In this previous case, marked pliability of the cyst wall may have caused difficulty in inserting the shunt catheter. In our case, the cyst was relatively small and more deep-seated so the conditions of the cyst and the relationship with the surrounding brain structures would have been difficult to assess by ultrasonography. Therefore, we did not advance the needle to avoid injuring crucial surrounding structures. The neuroendoscopic technique allowed us
to achieve reliable cyst penetration, to take a specimen of the wall, and to observe the surrounding structures through the transparent cyst wall. We conclude that neuroendoscopic assistance in stereotactic procedures is safe and reliable, such as in cystoperitoneal shunting for treating deep-seated arachnoid cysts.

References

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