

Endoscopic Ventriculocystostomy Through the Septum Pellucidum Via the Contralateral Anterior Horn

—Technical Note—

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Abstract

Paraventricular fluid cysts have recently been treated by endoscopic fenestration performed from the cysts to the ventricular system. However, correct orientation and safe navigation of the endoscope may be difficult in patients with abnormal anatomy. Endoscopic fenestration from the ventricular system to a cyst was performed through penetration of the septum pellucidum via the anterior horn of the contralateral lateral ventricle. The advantage of this approach is correct orientation and introduction of the endoscope to the periventricular lesion because the usual landmarks can be identified in the normal contralateral lateral ventricle.

Key words: endoscope, septostomy, paraventricular lesion, porencephalic cyst, posttraumatic cyst

Introduction

Neuroendoscopic procedures based on recent improvements in optics and miniaturization are now widely used in the management of hydrocephalus and intraventricular and periventricular lesions.^{1,2)} Successful treatment of paraventricular fluid cysts by fenestration into the ventricular system has been achieved using endoscopic procedures.³⁾ The cyst cavity must be first cannulated and then fenestration performed from the cyst to the ventricular system, because the lateral ventricle is usually compressed.³⁾ However, correct orientation and safe navigation of the endoscope may be difficult in patients with abnormal anatomy. We present a case of posttraumatic porencephalic cyst in the right frontal lobe successfully managed with endoscopic fenestration through penetration of the septum pellucidum via the anterior horn of the left lateral ventricle.

Case Report

A 20-year-old previously healthy man was admitted to our institution on June 18, 1997 after severe head injury (initial Glasgow Coma Scale score of 6) sus-

tained in a motor vehicle accident. Computed tomography (CT) revealed intracerebral hemorrhage in the right frontal lobe (Fig. 1A). The patient underwent emergency craniotomy, and the hematoma was removed. Subsequently, the patient progressively improved, but he became disoriented with moderate left hemiparesis one month after injury. Follow-up CT obtained 6 weeks after admission revealed a posttraumatic porencephalic cyst in the right frontal

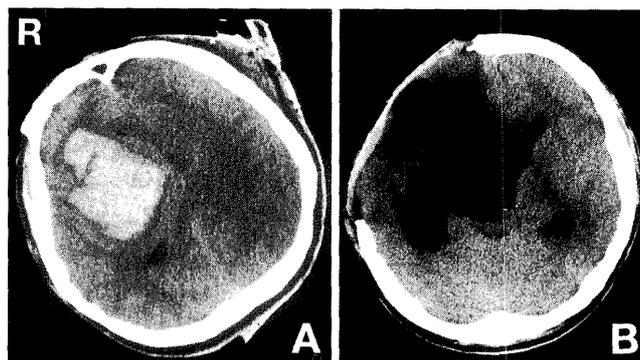


Fig. 1 A: Computed tomography (CT) scan showing intracerebral hemorrhage in the right frontal lobe. B: Follow-up CT scan showing a posttraumatic porencephalic cyst in the right frontal lobe.

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lobe (Fig. 1B). T₁-weighted magnetic resonance (MR) imaging obtained 7 weeks after admission demonstrated a large cystic lesion in the right frontal lobe, appearing as hyperintense to the cerebrospinal fluid (CSF) which contained hyperintense areas that appeared to be traces of the intracerebral hemorrhage (Fig. 2). The anterior horn of the right lateral ventricle was compressed by the lesion and was hardly visible. The midline structures were also displaced to the left. MR imaging also suggested the presence of a one-way communication between the body of the right lateral ventricle and the cyst (Fig. 2B). Introduction of the endoscope into the anterior horn of the right lateral ventricle seemed difficult, so the posttraumatic porencephalic cyst was approached through penetration of the septum pellucidum via the anterior horn of the left lateral ventricle. CT obtained 2 weeks after endoscopic surgery revealed that the size of the cyst had decreased and the lateral ventricle was normal (Fig. 3). The postoperative course was uneventful. Neurological examination found he was alert and had mild hemiparesis. No evidence of symptomatic or radiological recurrence has been found for 3 years after surgery.

Operative Procedure

The procedure was performed under general anesthesia. The patient was placed in the supine position. The endoscope was introduced through a standard coronal burr-hole. A peelaway sheath (14.0F in size; Johnson & Johnson Professional, Inc., Randolph, Mass., U.S.A.) was passed into the anterior horn of the left lateral ventricle. A flexible fiberoptic ventriculoscope (Codman, Inc., Randolph, Mass., U.S.A.) was then inserted into the ventricle through the peelaway sheath. Fenestration of the septum pellucidum between the anterior and posterior septal veins was performed with low-current monopolar coagulation. The hole was subsequently dilated using a 3F Forgathy's balloon catheter. The endoscope was then passed through the fenestration into the right lateral ventricle. The orifice of the cyst was easily identified (Fig. 4). Obstruction by a membrane and debris of oxidized cellulose used for hemostasis in the first operation were observed at the point of communication between the lateral ventricle and the cyst. The debris was removed and the membrane was opened with low-current monopolar coagulation to provide adequate communication between the cyst and the lateral ventricle.

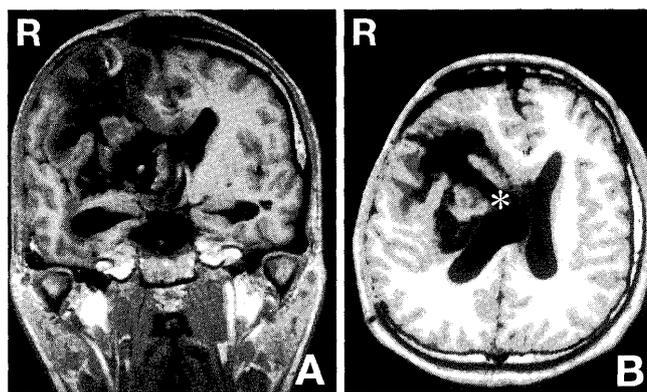


Fig. 2 Preoperative T₁-weighted coronal (A) and axial (B) magnetic resonance images showing a posttraumatic porencephalic cyst in the right frontal lobe. The asterisk indicates a point of communication between the lateral ventricle and the cyst.

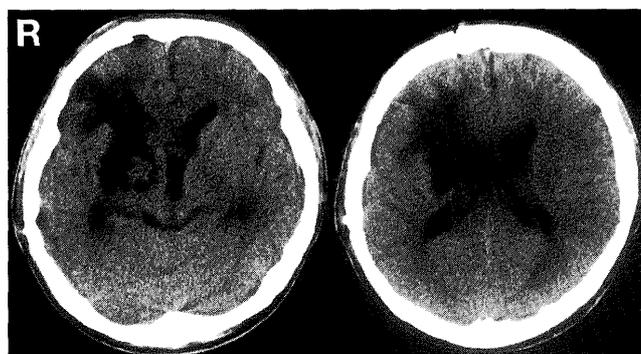


Fig. 3 Postoperative computed tomography scans showing the size of the cyst has decreased.

Discussion

Acquired porencephaly frequently results from various pathological conditions of the cerebral parenchyma.⁵⁾ Development of posttraumatic porencephalic cyst is usually preceded by cerebral contusion and/or hemorrhage causing severe focal damage of the brain. The mechanism causing the increase in size of the cyst is often unclear, but a communication with the ventricle may be present that allows CSF to enter but not exit from the cyst.⁴⁾ In our case, obstruction by a membrane and debris of oxidized cellulose used for hemostasis in the first operation were identified at the point of communication between the lateral ventricle and the cyst. Such debris may have allowed CSF to flow into the cyst, but blocked flow out, as in a ball-valve mechanism.

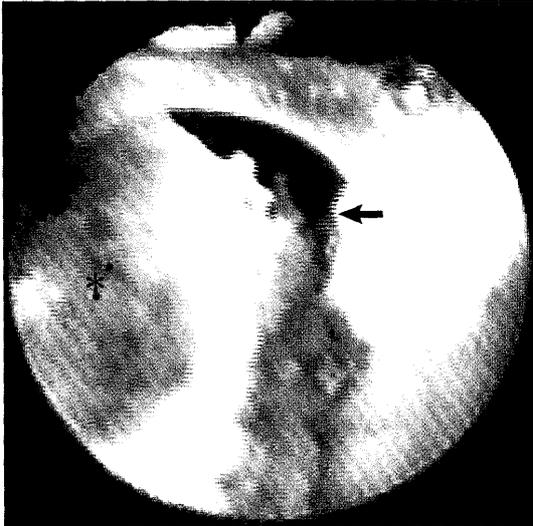


Fig. 4 Endoscopic view of the orifice of the cyst. Obstruction by a membrane and debris (asterisk) of oxidized cellulose used for hemostasis in the first operation were observed at the point of communication between the lateral ventricle and the cyst (arrow).

Symptomatic localized collections of CSF may be treated either by a direct surgical approach or by cyst-peritoneal shunting. Neuroendoscopic procedures are widely used in management of hydrocephalus and intraventricular and periventricular lesions.¹⁻³⁾ However, the correct orientation and safe navigation of the endoscope may be difficult in patients with abnormal anatomy. We could easily reach the opening of the porencephalic cyst through the fenestration of the septum pellucidum, because the flexible endoscope provided enhanced intraoperative maneuverability.⁶⁾ The advantage of this approach is correct orientation and introduction of the endoscope to the periventricular lesion with safe identification of the usual landmarks in the contralateral lateral ventricle.

Recently, a frameless stereotactic system has been combined with neuroendoscopy.^{7,8)} Although the adaptation of an image-guided stereotactic system to

the endoscope allows intraoperative feedback to aid in guiding the tip of the endoscope through the endoscopic procedures, there are some limitations to these systems, which are restricted to the use of rigid endoscopes. The adaptation of an image-guided stereotactic system to flexible endoscopes may increase the safety and efficacy of endoscopic procedures by providing enhanced intraoperative maneuverability.

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Commentary on this paper appears on the next page.

Commentary

Hayashi et al. present a simple and brief case report of the use of neuroendoscopy to decompress a paraventricular cystic lesion. Endoscopic procedures are currently widely used to treat ventricular lesions because of their minimally invasive nature. The principal issue illustrated in this paper is the importance of the orientation and safe navigation based on "neuroanatomical brain mapping." The authors used the contralateral approach through the septum pellucidum to treat a right ventricular cyst because the anatomical landmarks were easier to identify into the non-pathological ventricle. This report shows that minimally invasive techniques and image-guided neurosurgery must have solid neuroanatomical bases, because the intraoperative shift of the usual landmark structures only can be resolved with a profound knowledge of neuroanatomy.

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Like this article, in recent years there have been many reports on the usefulness of neuroendoscopy in the treatment of periventricular and intraventricular lesions. It is essential that landmark anatomical structures be confirmed during a neuroendoscopic procedure. The normal anatomical structure within ventricles, however, can be lost due to infection, intraventricular hemorrhage, or surgery, and we have often experienced disorientation. Use of a navigation system has enabled us to confirm a target site, but at present such use is limited to rigid endoscopy. Consequently, unidirectional endoscopic procedures are possible, but procedures at two sites or more from a separate angle are difficult. Until a navigation system that is compatible with fiberscopy is developed, we believe that there will be cases in which a contralateral approach, whereby the normal anatomy of the ventricle can be confirmed, will be useful, as in this case report.

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