Suprapineal recess: an alternate site for third ventriculostomy?

Case report

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This 30-year-old woman presented with clinical symptoms and signs of intracranial hypertension and Parinaud syndrome secondary to ventriculoperitoneal shunt dysfunction. Magnetic resonance (MR) imaging revealed gross triventricular hydrocephalus with a large suprapineal recess due to aqueductal stenosis. Using an endoscopic approach, a ventriculostomy was performed within the floor of the dilated suprapineal recess. Following this procedure the patient experienced alleviation of all her neurological symptoms and signs. Postoperative MR imaging and cerebrospinal fluid flow studies demonstrated a functioning ventriculostomy. The anatomy of the suprapineal recess and its suitability for endoscopic ventriculostomy are discussed.

KEY WORDS • aqueductal stenosis • hydrocephalus • neuroendoscopy • suprapineal recess • third ventriculostomy

ENDOSCOPIC third ventriculostomies are increasingly performed for the treatment of obstructive noncommunicating hydrocephalus. High success rates of approximately 80% have been reported in several large series. With technological advances in endoscopic equipment, the indications for cranial neuroendoscopy have expanded to encompass the treatment of intracranial cysts, stent placement, and endoscopic-assisted microneurosurgery; however, third ventriculostomy is by far the most commonly performed neuroendoscopic procedure. The ventriculostomy puncture is usually made within the floor of the anterior third ventricle in between the mammillary bodies and the infundibular recess. Other sites within the ventricle have also been proposed are but rarely used.

Case Report

History and Examination. This 30-year-old woman with longstanding and previously treated hydrocephalus presented with ventriculoperitoneal shunt dysfunction. She had experienced a 2-month period of progressively severe generalized headaches, which were associated with vomiting and lethargy. Clinical examination revealed upward gaze restriction, light near-dissociation, and convergence failure that were consistent with Parinaud syndrome. Funduscopic examination demonstrated early papilledema. The remainder of the results of the neurological examination were normal. Computerized tomography and MR imaging revealed dilation of the lateral and third ventricles but a normal fourth ventricle (Fig. 1). In particular, the third ventricle was markedly dilated with a "ballooned" suprapineal recess. The imaging studies revealed the ventricular catheter in the frontal horn of the right lateral ventricle. Magnetic resonance imaging studies demonstrated that there was no significant flow of CSF through the aqueduct. The treatment options of shunt revision or ETV were discussed with the patient, who elected to undergo the latter procedure.

Operation. At surgery, a rigid neuroendoscope was introduced through a burr hole made just anterior to the coronal suture and into the right lateral ventricle; the endoscope was then navigated through the foramen of Monroe into the third ventricle. The anterior part of the third ventricular floor was visualized but was found to be thickened and too
Posterior third ventriculostomy

Restrictive size at that site. In contrast, the floor of the dilated suprapineal recess was thin and translucent, allowing a good view of the vessels in the quadrigeminal cistern. We believe that the clear visibility of the suprapineal recess was made possible by the more anterior approach and by the grossly dilated suprapineal recess. The floor of the recess was punctured and then enlarged using a Fogarty catheter, thus establishing good CSF flow. We elected not to manipulate or remove the patient’s preexisting ventriculoperitoneal shunt.

Postoperative Course. Postoperatively, all of the patient’s symptoms resolved and she was discharged home after 2 days. At the 6-month follow-up review, she remained asymptomatic with regression of all preoperative neurological signs. Repeated MR imaging revealed normal-sized ventricles and confirmed a good flow of CSF through the ventriculostomy into the cisternal spaces posteriorly (Fig. 2). The patient remains well at the most recent 2-year follow up. A computerized tomography scan of the head was performed to confirm that the ventricular size remained stable.

Discussion

Endoscopic third ventriculostomy offers an effective alternative to shunt placement procedures in the treatment of obstructive hydrocephalus. In an outcome analysis of 100 consecutively performed ETVs, Hopf, et al.,6 reported an overall success rate of 76%. In their series, benign space-occupying lesions and nontumorous aqueductal stenosis were associated with success rates of 95% and 83%, respectively. It is, therefore, imperative that cautious selection of patients must be made to optimize results from ETV. In another analysis of 98 ETVs, Brockmeyer, et al.,2 demonstrated that the success rate varied according to diagnosis and age of the patient. Their best results were achieved in patients with aqueductal stenosis, tectal plate tumors, myelomeningoceles, and posterior fossa tumors. Similarly, Fukuhara and colleagues1 reported that late-onset aqueductal stenosis was associated with the best clinical outcome. They also found that factors predictive of failure of ETVs include Chiari Type I malformation, shunt infection at presentation, history of shunt infection, three or more previous shunt revisions, and postoperative meningitis.

Enlargement of the suprapineal recess is known to occur when the third ventricle dilates. The case of a cyst formation within the suprapineal recess has been reported: the authors argued that the cyst may have been caused by or have contributed to the observed aqueductal stenosis.15 Pseudocystic dilation of the suprapineal recess has also been reported.9 Marked dilation of this recess may produce symptoms and signs of tectal compression; however, in our experience, occurrence of Parinaud syndrome in the setting of adult-onset aqueductal stenosis is distinctly unusual.

When viewed from within the ventricle via the endoscope, structures in the posterior wall of the third ventricle (from superior to inferior) include the suprapineal recess, habenular commissure, pineal body and its recess, the posterior commissure, and the sylvian aqueduct.13 The suprapineal recess is situated between the lower layer of the tela choroidea in the roof and the pineal gland. The quadrigeminal and perimesencephalic cisterns are external to the suprapineal recess. These cisterns contain parts of the deep venous system, major arteries, and significant perforating vessels, which are of immense neurosurgical importance.14 Various sites suitable for third ventriculostomy have been reported, each being associated with a specific subset of risks and pitfalls that must be recognized by the neuroendoscopist. The ideal and safest site for third ventriculostomy is in the floor of the third ventricle, between the infundibular recess and the mammillary bodies. This site allows diversion of CSF from the third ventricle into the interpeduncular cistern.15 It must be recognized, however, that even in the best hands, ventriculostomy puncture at this site can sometimes lead to basilar artery injury and hypothalamic dysregulation, with potentially fatal consequences.10 Other methods of ventriculostomy such as fenestration into the cistern of lamina terminalis and chiasmatic cistern have also been described.5 These approaches, at least from a theoretical point of view, may also increase the risks of injuring the optic chiasm or anterior commissure, or of perforating vessels to the hypothalamus.4

An alternate site for a third ventriculostomy could be at the level of the suprapineal recess, which opens the ventricle into the quadrigeminal and perimesencephalic cisterns.12

The danger here lies in the potential injury to important perforating vessels, which may result in brainstem ischemia and/or major hemorrhage. There have been two case reports describing ventriculocystocisternostomy for quadrigeminal...
cistern arachnoid cysts. The technique used was an endoscopic approach involving a single coronal burr hole, fenestration of the posterior third ventricle with a rigid endoscope, and subsequent fenestration of the cyst with a flexible endoscope. Bhatia, et al., reported on two cases of spontaneous rupture of the suprapineal recess resulting in relief of symptoms of intracranial hypertension. The observation made by these authors provides indirect support for the notion that the suprapineal recess could be an alternate site for placement of a third ventriculostomy. Our patient had a symptomatic massive dilation of the suprapineal recess. Because the recess wall was thin and translucent, we were able to achieve excellent visualization of vascular structures within the quadrigeminal cistern, which allowed us to perform the ventriculostomy with a rigid endoscope without intraoperative complications. Decompression of the recess along with the rest of the ventricular system produced complete resolution of all signs and symptoms of tectal compression and intracranial hypertension. To the best of our knowledge, this represents the first report of a successful posterior ETV.

Conclusions

The posterior part of the third ventricle provides neuroendoscopists with another potential site of ventriculostomy in the management of patients with obstructive hydrocephalus. This site could provide a safe and effective option in the absence of other more favorable sites, particularly if the suprapineal recess wall is thin and translucent.

References


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