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Technical Notes & Surgical Techniques

Technical and anatomical aspects of endoscopically assisted septostomy in unilateral ventriculoperitoneal shunt placement for the management of isolated lateral ventricles

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ABSTRACT

Background: Isolated lateral ventricle is a specific form of non-communicating hydrocephalus that is caused by an obstruction of the foramen of Monro. The condition was previously treated with bilateral shunt placement. However, the emergence of endoscopic surgery has provided more options in the management of this condition.
Case description: 46-year-old female presented with obstructive hydrocephalus caused by a right thalamic primary central nervous system B-cell lymphoma. Endoscopic septostomy with unilateral shunt placement was performed because of bilateral foramen of Monro obstruction.
Conclusion: Endoscopic septostomy can be used as a tool to avoid bilateral shunt placement in certain cases of bilateral isolated lateral ventricles.

1. Introduction

Isolated lateral ventricle is a specific form of non-communicating hydrocephalus that is caused by an obstruction of the foramen of Monro. The obstruction can be due to neoplastic lesions, congenital lesions (choroid plexus cyst or hypertrophy, atresia of foramen of Monro), ventriculitis, or intraventricular hemorrhage, and iatrogenic causes [1].

The condition was previously treated by shunt insertion, but the emergence of endoscopic surgery has provided more options in the management of isolated lateral ventricles. The cerebral spinal fluid pathway can be restored by fenestration of the septum pellucidum or plasty of the foramen of Monro [2] with possible concurrent shunt placement.

In this article we present a case of central nervous system lymphoma causing bilateral isolated lateral ventricles. Endoscopic septostomy with placement of unilateral ventriculo-peritoneal shunt was performed.

2. Clinical presentation

A 46-year-old female presented with a 5-day history of headaches, progressive confusion, poor short-term memory, and difficulty walking. Three months prior, the patient was diagnosed with diffuse large B-cell lymphoma of the right thalamus by stereotactic biopsy and had received 2 cycle of Rituximab/Ara-C/Methotrexate. She had a history of systemic amyloidosis with bone marrow and hepatic involvement. She also had a history of renal failure and a cadaveric renal transplant for which she remained on chronic immunosuppressive medication. There was a history of prior left sided craniotomy for intracerebral hematoma and subdural hematoma with resulting epilepsy.

Physical examination revealed a disoriented patient with bilateral equal and reactive pupils 2 mm in size with papilledema present. She was unable to stand from a sitting position and had a mild left pronator drift. Initial blood workup showed thrombocytopenia.

Enhanced CT of the brain showed a right thalamic mass causing obstructive hydrocephalus from bilateral blockage of the foramen of Monro (Fig. 1). Prior T2 and susceptibility weighted MRI performed for surveillance 1 month prior had shown an area in the anterior septum that was void of septal veins and amenable to septostomy (Fig. 2). A repeat MRI was not thought to provide additional information as accurate neuronavigation could be performed with volumetric contrast enhanced CT at 1 mm intervals. The management options were reviewed with the patient including palliation versus CSF diversion to allow for second line therapy with radiation. The types of CSF diversion considered were external ventricular drainage, biventricular shunt, or septostomy and univentricular shunt placement. After a thorough discussion with both the patient and the family about the risks and benefits of intervention, a decision was taken to perform CSF diversion. The goal of the surgery was to relieve the obstructive hydrocephalus and allow

Abbreviations: Ara-C, cytosine arabinoside; CSF, cerebrospinal fluid; CT, computed tomography; MRI, magnetic resonance imaging; ETV, endoscopic third ventriculostomy.

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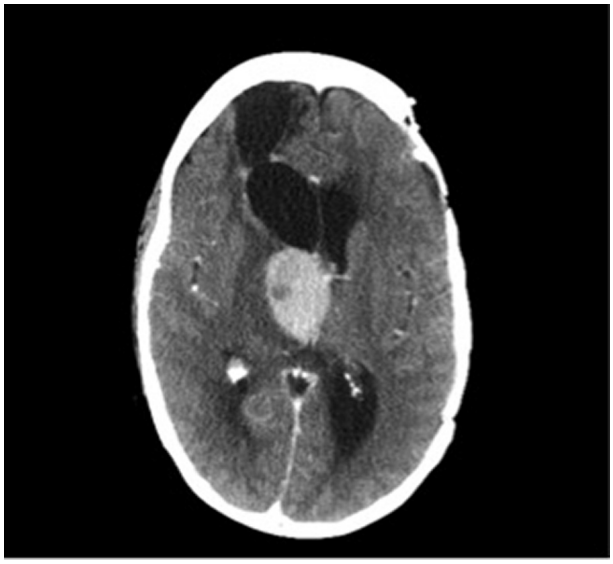

Fig. 1. Contrast enhanced CT of the brain showing a right thalamic mass with lateral ventricular enlargement due to obstruction of bilateral foramina of Monro.

the patient to receive radiation therapy for the treatment of primary CNS lymphoma that was unresponsive to chemotherapy. Given that the patient was thrombocytopenic, she received platelet transfusions to increase the platelet count to above 100,000/mL prior to surgery.

3. Operative technique

The patient underwent general anesthetic induction, intubation and ventilation. Foley catheter and sequential compression stockings were applied. Vancomycin 1 g and Ceftriaxone 1 g were given as prophylactic antibiotics. Dexamethasone 10 mg was also administered before surgery. The patient was placed in a supine position with shoulder roll under the right scapula. The head was turned to the left and it was supported in a three-pin Mayfield head fixation. We ensured that the head in the Mayfield frame was aligned with the neck, chest, and abdomen to facilitate tunneling of the distal catheter. The neuronavigation system was registered. We planned the entry in the right frontal region at the level of the coronal suture and in line with the mid-pupillary line. This was confirmed with the navigation and the entry point as well as the target point in the frontal horn of the right lateral ventricle was selected in order to allow the correct angulation for visualization of the septum pellucidum for the septostomy procedure (Fig. 3). We designed a curvilinear incision with the base pointing posteriorly at this right frontal site. We also drew a linear incision 2 cm above the pinna of ear and 2 cm posterior to the external auditory canal line. This was the junction point for tunneling of the distal catheter to the neck, chest and abdomen. A 4 cm linear incision was drawn three fingerbreadths below the costal margin in the right upper quadrant of the abdomen. The scalp incisions as well as the abdominal incision were then infiltrated with 0.25% Marcaine with 1/200,000 epinephrine.

We began with opening the right frontal scalp incision as well as the right parietal incision. Next, the abdominal incision was opened and the peritoneum was accessed. The distal catheter was tunneled from the parietal incision down to the abdominal incision. Then the more proximal part of the distal catheter was tunneled from the parietal incision to the frontal incision. A medium pressure flow control valve was attached to the distal catheter. A right frontal burr hole was made at the selected entry point with diameter of 25 mm. The dura was cauterized with bipolar cautery and incised in a cruciate fashion to allow a 14-French peel-away sheath to be introduced. The pia was cauterized and divided sharply with an 11-blade scalpel. The catheter introducer PCI handle kit (Medtronic, Minneapolis, MN, USA) was used within the stylet of the 14-French peel-away sheath to direct the peel-away sheath into the frontal horn of the right lateral ventricle along the planned trajectory. We entered the right frontal horn. The navigation probe and stylet of the peel-away sheath were removed. Clear CSF was obtained and the

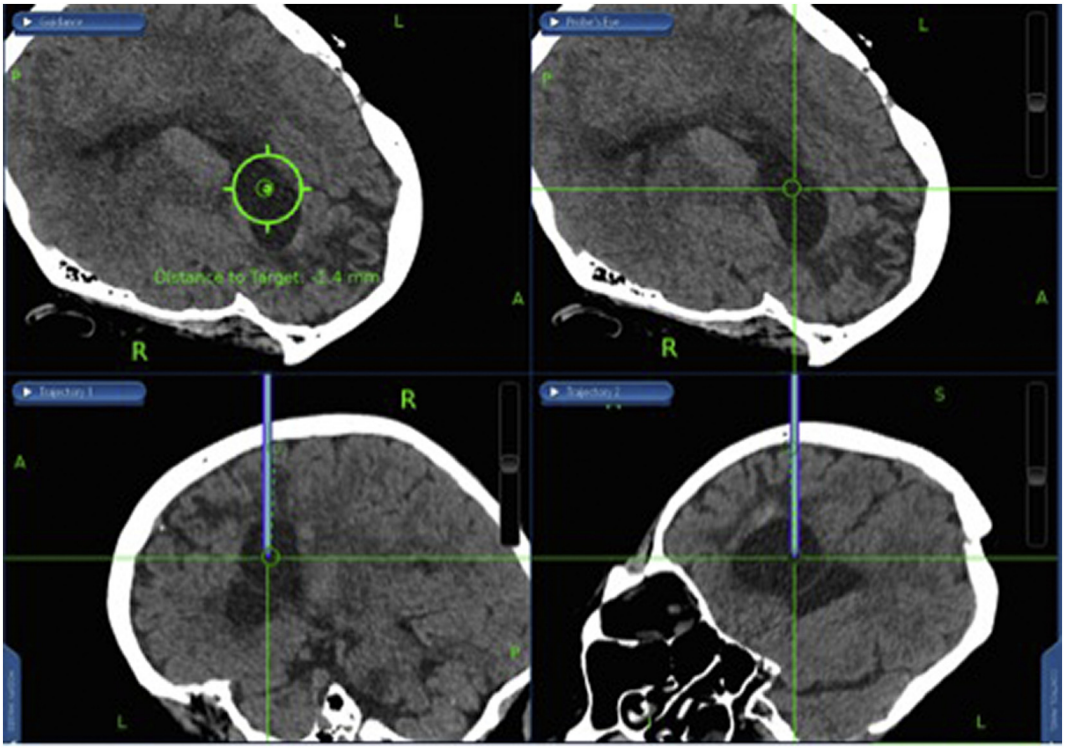

Fig. 2. T2-weighted MRI in the coronal plane (A) and susceptibility weighted MRI in the axial plane (B) demonstrating an area (arrow) devoid of septal veins amenable to septostomy. The MRI was performed 1 month prior to the acute presentation of obstructive hydrocephalus.