Bruns syndrome caused by intraventricular neurocysticercosis treated using flexible endoscopy

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Object. Neurocysticercosis is the most frequent cause of hydrocephalus in adults in regions where the disease is endemic, including Latin America. The prognosis for intraventricular neurocysticercosis is worse than that for the intraparenchymal form of the disease, making treatment especially important. Although active and viable intraventricular cysts produce no reaction in the host, they can cause noncommunicating hydrocephalus, whose onset is frequently abrupt. Sometimes the increasing intracranial pressure due to obstruction of the cerebral aqueduct (ball-valve mechanism) is intermittent, producing relapsing/remitting symptoms; this life-threatening phenomenon is called “Bruns syndrome.”

Methods. Between 1996 and 2004, among a group of 285 patients with neurocysticercosis and Bruns syndrome caused by cysticercal cysts of the third ventricle was diagnosed in seven patients by using magnetic resonance imaging. An endoscopic procedure with a flexible cerebral endoscope was performed, intact parasitic cysts were removed, and a complete exploration was undertaken to look for more cysticercal cysts in the whole ventricular system and the subarachnoid basal cisterns. There were no deaths or complications. All seven patients were asymptomatic during a follow-up period ranging from 1 to 5 years.

Conclusions. Flexible cerebral endoscopy allows one, in a minimally invasive manner, to approach the ventricular system and subarachnoid basal cisterns and to remove intraventricular neurocysticercal cysts. Flexible endoscopy is an alternative treatment for Bruns syndrome caused by neurocysticercosis of the third ventricle.

KEY WORDS • Bruns syndrome • intraventricular neurocysticercosis • flexible neuroendoscopy

Neurocysticercosis is caused by the larval form of Taenia solium (cysticerci) and is the most frequent helminthic infection of the central nervous system. It is the most frequent cause of seizures and hydrocephalus in adults from regions where the disease is endemic, including Mexico, Central and South America, Asia, Africa, and eastern Europe. It has recently become more prevalent in North America, particularly the southern tier states, because of emigration from other regions of the world.

The clinical picture of neurocysticercosis ranges from asymptomatic infection to severe, life-threatening disease. Intraventricular involvement is often more difficult to manage because of obstruction of CSF pathways as well as ependymal and arachnoidal inflammation. The intraventricular type occurs in only 7 to 20% of cases of neurocysticercosis. Intraventricular neurocysticercosis, especially of the third ventricle, can cause obstruction of the cerebral aqueduct with consequent intracranial hypertension due to obstruction of the CSF pathway. Mobile deformable lesions may cause intermittent or positional CSF obstruction with episodic elevations in intracranial pressure due to a ball-valve mechanism (Bruns syndrome), causing life-threatening acute obstructive hydrocephalus. Abrupt intermittent obstruction of the CSF flow may last from hours to days. Sudden alterations in head position may change the location of the cyst, triggering or relieving headaches or producing a fleeting loss of strength or muscle tone. Abrupt permanent obstruction may cause acute hydrocephalus leading to stupor, coma, and death due to brain herniation.

In this report, we describe the successful endoscopic treatment of seven patients with neurocysticercosis in the third ventricle who had presented with signs and symptoms of intermittent intracranial hypertension. The principal goals of treatment were to remove safely the cysticercal cyst from the third ventricle and to search for other parasitic cysts in any other part of the ventricular system or subarachnoid basal space in a minimally invasive manner while causing no brain damage.

Clinical Material and Methods

Patient Population

Between 1996 and 2004, from a group of 285 patients with neurocysticercosis, only seven clinically present-
Flexible endoscopy in the treatment of neurocysticercosis

TABLE 1
Summary of clinical characteristics in seven patients with Bruns syndrome caused by intraventricular neurocysticercosis*

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Signs &amp; Symptoms</th>
<th>MRI Findings</th>
<th>Endoscopic Findings</th>
<th>Follow Up (yrs)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22, M</td>
<td>headache &amp; vomiting</td>
<td>cyst in TV</td>
<td>unique cyst in TV</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>31, F</td>
<td>headache &amp; papilledema</td>
<td>cyst in TV &amp; arachnoiditis</td>
<td>cyst in TV &amp; IPC</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>17, F</td>
<td>headache &amp; visual alterations</td>
<td>cyst in TV &amp; ventricular dilation</td>
<td>unique cyst in TV</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>28, M</td>
<td>headache &amp; vomiting</td>
<td>cyst in TV &amp; ventricular dilation</td>
<td>unique cyst in TV</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>43, M</td>
<td>lethargy</td>
<td>cyst in TV</td>
<td>unique cyst in TV</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>54, M</td>
<td>headache, vomiting, &amp; diplopia</td>
<td>cyst in TV &amp; ependymitis</td>
<td>several cysts in TV &amp; ependymitis</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>35, F</td>
<td>headache &amp; Parinaud sign</td>
<td>cyst in TV</td>
<td>unique cyst in TV</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

* IPC = interpeduncular cistern; TV = third ventricle.
† All patients remained asymptomatic at the last follow up.

ed with intermittent intracranial hypertension or Bruns syndrome caused by a cysticercal cyst in the posterior portion of the third ventricle, which was diagnosed on MR imaging. Patient ages ranged from 17 to 54 years (Table 1).

Method of Cyst Removal

Neurocysticercal cyst removal was performed with the patient in a state of general anesthesia. With the patient supine, the scalp was shaved around the right forehead and then prepared and suitably draped. A 2.5-cm longitudinal skin incision was made slightly anterior to the coronal suture and 3 cm from the midline. The bur hole was placed at this site, a blunt ventricular needle was passed into the anterior horn of the right lateral ventricle, and the needle was exchanged for the peel-away plastic sheath (Codman Johnson & Johnson, Raynam, MA) through which the flexible endoscope was introduced into the ventricle.

Within the lateral ventricle, we found the foramen of Monro, the forix, the choroid plexus, the septum pellucidum, the head of the caudate nucleus, the thalamus, and the thalamostriate and anterior septal veins. Via the foramen of Monro, we reached the third ventricle, which is divided in two portions (anterior and posterior) by the interthalamic adhesion. In the anterior portion we observed the optic chiasm, optic recess, anterior commissure, infundibular recess, tuber cinereum, premamillary membrane, and mammillary bodies; in the posterior portion we observed the orifice of the cerebral aqueduct, posterior commissure, habenular commissure, pineal recess, and velum interpositum.

In all patients a unique cysticercal cyst was found freely moving in the posterior portion of the third ventricle, occluding the cerebral aqueduct. Using grasping forceps, the cyst was removed intact from the third ventricle; in the patients in Cases 2 and 6 other cysticercal cysts were also removed (Table 1).

The endoscopic procedure was completed with an exploration of the fourth ventricle and the cisterna magna through the cerebral aqueduct. A third ventriculostomy together with Liliequist membranotomy was performed to reach the subarachnoid basal space. All of these procedures were conducted with the purpose of removing additional parasitic cysts.

Results

In all patients the unique cysticercal cyst in the third ventricle was the only one found, except in one patient who harbored two cysts in the third ventricle and in another patient who had a cystercicus celluloseae in the interpeduncular cistern, which were also removed.

There have been no deaths or any kind of surgical complication among the patients in this series, and no one required another type of neurosurgical procedure. After the cysticercal cyst was removed, signs and symptoms of the Bruns syndrome disappeared in all patients, and MR images obtained 1 month after the endoscopic procedure were normal and showed no intraventricular cysticercal cyst (Fig. 1). No patient required additional antiparasitic drugs after the endoscopic procedure. All patients remained asymptomatic and their cerebral functions were normalized during a follow-up period of 1 to 5 years.

Discussion

Cerebral endoscopy, as part of a minimally invasive neurosurgical procedure, has replaced the use of an extracranial shunt and open craniotomies in the treatment of certain brain diseases. There are two modalities of brain endoscopy: rigid and flexible. Worldwide, rigid endoscopy is used more often than the flexible technique in treating certain brain pathological entities such as intraventricular and para-ventricular tumors, intraventricular and intraparenchymal hematomas, congenital or acquired hydrocephalus, and so forth.5,8,11–14

In Latin America, neurocysticercosis is one of the primary causes of hydrocephalus in adults. The pathophysiological changes that produce hydrocephalus are, first, the obstruction of CSF flow in any intraventricular foramen including the cerebral aqueduct by a free-moving cysticercal cyst, and, second, the failure of CSF absorption by the non-functioning arachnoid granulations caused by inflammatory processes.

In cases of a cysticercal cyst moving freely in the third ventricle, the parasite can occlude the entry of the cerebral aqueduct with repositioning of the patient’s head and the displacement of the cyst into the posterior portion of the third ventricle, causing intermittent obstruction of the cerebral aqueduct and intracranial hypertension. In such cases, flexible neuroendoscopy has allowed us to explore and approach the posterior portion of the third ventricle and remove the parasite. Endoscopic exploration has also permitted us to look for cysticercal cysts in all sites of the ventric-
ular system and the subarachnoid basal cisterns without damage to surrounding brain tissue. This type of procedure is not possible with a rigid endoscope.

Conclusions

Intraventricular neurocysticercosis continues to be a potentially fatal condition in which the rate of permanent morbidity is high. Although active and viable intraventricular cysts do not produce host reactions, they can obstruct CSF flow, leading to the complex clinico-pathological entities of hydrocephalus or Bruns syndrome. The cysts can migrate throughout the ventricular system, inducing acute intermittent or permanent increased intracranial pressure or hydrocephalus.

Undoubtedly, flexible cerebral endoscopy, as the procedure of choice in treating hydrocephalus, has resolved many problems that exist with the placement of a ventriculoperitoneal shunt and has allowed free movement in the ventricular system, which obviously is impossible with the rigid endoscope. This procedure has proven especially useful in cases of intraventricular neurocysticercosis to remove cysts from anywhere in the ventricles and even the subarachnoid basal space.

References


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