Interhemispheric transcallosal subchoroidal fornix-sparing craniotomy for total resection of colloid cysts of the third ventricle

Clinical article

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Object. Endoscopic surgery has been reported to be more cost-effective and safer than open craniotomy for resection of colloid cysts, despite a 5–10% conversion rate to craniotomy, a 5% recurrence rate, a 5–10% ventricular shunting rate, a 5–10% epilepsy rate, and a 3–4 day hospital stay. In 1985, the authors developed a interhemispheric, transcallosal, subchoroidal, fornix-sparing approach that allowed safe total resection of the colloid cyst and that appeared to be superior to the endoscopic approach. The long-term results are analyzed and compared with findings in the literature.

Methods. Fifty-seven consecutive colloid cysts were totally removed via a 3 × 3–in paramedian craniotomy flap and a microscopic interhemispheric, transcallosal, subchoroidal approach sparing the ipsilateral fornix. The length of the callosotomy was 1.5–2 cm in all patients. The mean follow-up duration was 12 years (range 2–22 years). A retrospective analysis comparing the authors’ results with those reported in the endoscopic literature was performed.

Results. All patients had 1-year postoperative imaging studies (CT or MR imaging) documenting gross-total resection with no deaths, infection, hemiparesis, seizures, or disconnection syndrome. One surgery was complicated by bilateral subdural hematomas, which were successfully treated. There has been a zero recurrence rate. Three patients required a permanent ventriculoperitoneal shunt (including 2 who required emergency ventriculostomy before surgery). The mean hospital stay was 4.8 days (range 2–24 days). There was 1 patient with permanent short-term memory loss who presented with a herniation syndrome requiring emergency ventriculostomy.

Conclusions. The interhemispheric, transcallosal, subchoroidal, fornix-sparing approach to gross-total resection of colloid cysts is safe and led to a zero recurrence rate with no permanent neurological sequelae including epilepsy, and these results are superior to any reported results with endoscopy. (DOI: 10.3171/2008.4.17495)

Key Words • colloid cyst • craniotomy • fornix • neuroendoscopy • subchoroidal approach

The minimally invasive use of cranial endoscopy for resection of colloid cysts of the third ventricle has been recently advocated to be safer, with shorter operating times, shorter hospitalization, and fewer complications compared with open surgery. Analysis of the literature describing cranial endoscopic removal of colloid cysts of the third ventricle suggests a 20–59% radiographic remnant cyst rate due to the fact that the cyst wall attachment is to the roof of the third ventricle caudal to the foramen of Monro. The symptomatic recurrence rate for these remnant cysts appears to be in the 5–10% range. In 1985, we developed a modification of the interhemispheric, transcallosal approach to include a subchoroidal fornix-sparing opening into the roof of the third ventricle for complete resection of colloid cysts of the third ventricle. We describe our technique, report our results for 57 consecutive colloid cysts treated via this approach, and compare our results to those for endoscopic colloid cyst removal.

Methods

A retrospective analysis of 57 consecutive patients with colloid cysts that were removed via an interhemispheric, transcallosal, subchoroidal, fornix-sparing craniotomy was performed.

Surgical Technique

The patient is placed supine in a semisitting position
Subchoroidal, fornix-sparing craniotomy for colloid cyst resection

(Fig. 1). A 3 × 3–in paramedian scalp flap and a small bone flap are made spanning the coronal suture (Fig. 2). Since 1999, frameless stereotaxy has been used to aid in incision and craniotomy planning. The dura mater is opened based on the superior sagittal sinus, allowing access to the interhemispheric fissure. Using microscopic magnification, the ipsilateral frontal lobe is gently retracted, exposing the pericallosal arteries and the underlying corpus callosum. A 1.5- to 2-cm callosotomy is made between the arteries, allowing access to the ipsilateral ventricle. Since 1999, frameless stereotaxy has aided in precise placement of the callosotomy. The choroid plexus, TSV, septal vein, and foramen of Monro are easily identified along with the colloid cyst. A small cottonoid is placed under the cyst through the foramen of Monro to catch any blood. Bipolar electrocautery is applied to the plexus, which is retracted with a microretractor medially, and the roof of the third ventricle is opened lateral to the plexus and just caudal to the TSV with bipolar electrocautery and microdissection (Fig. 3). The TSV is always preserved, and dissection can take place rostral and caudal to it. This allows access to the attachment of the cyst to the roof of the third ventricle, which also includes the ICVs. Following resection of the cyst, a septostomy is made in the septum pellucidum and a ventricular catheter was placed in all but the last 2 cases. The dura mater is closed, the bone flap fastened back in place with plates, and the scalp is stapled closed. Postoperatively, the ventricular catheter was successfully weaned in all but 3 cases.

Results

Presenting symptoms are documented in Table 1; headache with or without other signs constituted 72% of the presenting symptoms. The mean age of the patients was 36.8 years (range 18–66 years). There were 39 men (68%) and 18 women (32%). The mean size of the colloid cysts was 17 mm (range 9–50 mm). Thirty-nine patients (68%) had bilateral ventriculomegaly, 11 (19%) had unilateral ventriculomegaly, and 7 (13%) had normal lateral ventricles. The mean operating time was 210 minutes. In 2 cases (3.5%), the cyst was removed en bloc through the foramen of Monro. In 49 cases involving the subchoroidal approach, the cyst wall was completely removed, and in 6 cases a very small adherent piece of cyst wall was left on the ICV and bipolar electrocautery was gently applied. The mean hospital stay was 4.8 days (range 2–24 days). In the last 2 patients no ventriculostomy was performed at surgery, and they were discharged on postoperative Days 2 and 3.

There were no deaths and no seizures. There was 1 superficial wound infection (2%). There was 1 case of intraoperative bilateral acute subdural hematomas in a patient with massive bilateral ventriculomegaly, both of TABLE 1: Presenting symptoms in 57 patients with colloid cysts*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. of Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>headache alone</td>
<td>20 (35.1)</td>
</tr>
<tr>
<td>headache w/ nausea &amp; vomiting</td>
<td>12 (21.1)</td>
</tr>
<tr>
<td>incidental finding</td>
<td>8 (14)</td>
</tr>
<tr>
<td>headache w/ drop attack</td>
<td>7 (12.3)</td>
</tr>
<tr>
<td>NPH; 1 patient w/ headache</td>
<td>4 (7)</td>
</tr>
<tr>
<td>head trauma w/ hemorrhage into cyst</td>
<td>2 (3.5)</td>
</tr>
<tr>
<td>headache/coma</td>
<td>2 (3.5)</td>
</tr>
<tr>
<td>psychosis</td>
<td>2 (3.5)</td>
</tr>
</tbody>
</table>

* NPH = normal-pressure hydrocephalus.
which were successfully removed at surgery. There were 3 patients who required VP shunts, including the 2 who presented in coma and the patient with bilateral subdural hematomas. There was 1 case of protracted nausea/vomiting lasting for 5 days, presumably due to blood in the fourth ventricle. There was 1 severe short-term memory deficit in a patient who presented in coma. There were no disconnection syndromes.

Postoperative imaging documented GTR in all cases. The mean long-term clinical follow-up was 12 years (range 2–22 years). There has been no symptomatic recurrence and postoperative imaging at 1 year revealed no colloid cyst in any of the patients. Imaging studies obtained 5 years postoperatively in 23 patients revealed no colloid cyst (Fig. 4).

Discussion

Abdou and Cohen reported in 1998 on 13 cases of third ventricular colloid cysts removed with a cranial endoscope, with 10 (77%) near-complete resections and 3 (23%) incomplete resections. All incomplete resections occurred because the cyst was tucked up underneath the roof of the third ventricle, with 1 (8%) requiring a VP shunt and 1 (8%) converted to an open procedure. Decq et al. reported in 2000 on 15 endoscopic surgeries for colloid cysts in which the mean operating time was 110 minutes. In 3 (20%) there were postoperative residual cysts. There was also 1 recurrence (7%) at 16 months, and the authors stated that posteriorly located cysts prevented successful complete aspiration. Hellwig et al. reported in 2003 on 20 cases treated endoscopically in which the mean operating time was 150 minutes and the mean hospital stay was 7 days. There was 1 postoperative hemorrhage with memory deficit, psychosis, and third nerve palsy; 1 VP shunt (5%) for meningitis with memory deficit; and 1 recurrence treated with a second operation after 6 years. A cooperative study by the Italian neuroendoscopy group reported in 2006 on 61 cysts treated with endoscopy. The mean hospital stay was 6.7 days. Postoperative imaging revealed a remnant cyst with a mean diameter of 4.3 mm in 36 cases (59%), and 7 (11.4%) recurrences at a mean of 32 months, all due to posteriorly located cysts. Table 2 summarizes these results and compares them to our experience. It appears that the endoscopic approach is not safer, is less effective in terms of GTR, and does not shorten the hospital stay. In fact, the symptomatic recurrence rate is higher. As documented in our experience, this is due to the fact that the colloid cyst attachment to the roof of the third ventricle is caudal to the foramen of Monro in > 95% of the cases, and the endoscope cannot visualize this attachment. This subchoroidal, fornix-sparing approach to colloid cysts of the third ventricle can also be used with a transcortical approach.  

Conclusions

The duration of surgery is longer for the open approach by 60–100 minutes. The duration of hospital stay does not appear to be different. We have learned from the endoscopic approach that a ventricular catheter does not have to be placed if there is no spillage of blood into the caudal third ventricle. This may help to shorten the mean hospitalization time further. The complication rate appears to be the same for our technique as for endoscopy. The GTR of a potentially lethal benign tumor appears to be superior with this technique compared with endoscopic removal through the foramen of Monro, thus justifying the extra time spent in surgery, which leads to a significantly lower long-term recurrence rate.

Disclaimer

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Acknowledgment

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References


3. Arnold H: Twenty colloid cysts: comparison of endoscopic

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**Fig. 4.** Representative MR images obtained in patients with colloid cysts. *Left:* Preoperative sagittal MR image showing colloid cyst. *Right:* Postoperative sagittal MR image obtained at 5 years showing no cyst and the remnant callosotomy with reduced ventricular size.
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