Neuroendoscopic surgery for colloid cyst of the third ventricle: Review of 2 cases
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Summary
Colloid cyst of the third ventricle is a relatively rare intracranial tumor. It generates tremendous interest for the neurosurgeon because of its benign nature, deep location and an excellent prognosis when diagnosed early and excised. However the treatment of this benign tumor remains controversial and the best surgical option has not been established. Microsurgical resection or ventriculoperitoneal shunt placement was for a long time the only means of treatment for patients with colloid cysts. In the past few years, however, endoscopic procedures have gained increasing significance and have been used more widely. In BSMMU endoscopic treatment for colloid cyst was performed recently in two cases. The technique, consisting of cyst fenestration, aspiration of the colloid and removal of the internal layer of the wall, was effective in restoring CSF circulation. In the early postoperative period, both the patients had excellent outcome, with clinical signs improving immediately. The analysis of immediate postoperative computed tomographic scan revealed no remaining cyst wall and decrease in ventricular size to some extent. Continued improvement of endoscopic techniques and instruments, together with good short-term results in endoscopically treated patients have established this method as an alternative to microsurgical techniques and might even set a new standard for treatment.

Introduction
Colloid cysts are benign congenital tumors that almost always arise from the anterior third ventricle (immediately posterior to the foramen of Monro)\(^1\,^2\). These epithelium-lined cysts are problematic because of their location; colloid cysts can cause serious morbidity and acute obstructive hydrocephalus that may lead to occasional mortality\(^2\,^3\).

Approximately 0.5-1% of all primary brain tumors and 15-20% of all intraventricular masses (most common) are colloid cysts\(^2\). The usual location of colloid cyst at the level of foramen of Monro have led at least four theories of pathogenesis. Derivation from choroidal epithelium, from ependymal cells, and from paraphysis have been described. In addition Hiron et. al.1978 suggest that colloid cysts arise from an endodermal source rather then neuroepithelial sources\(^15\).

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Figure 1: showing the foramen of Monro in relation with septal, thalamo-striate veins and choroids plexus.

In 1910, Sjovall hypothesized that colloid cysts were remnants of the paraphysis, an embryonic midline structure within the diencephalic roof immediately rostral to the telencephalic border. The cells of the...
paraphysis are similar to those found in colloid cysts associated with falls without loss of consciousness has been reported.

Colloid cyst may obstruct the foramen of Monro completely and irreversibly, resulting in sudden loss of consciousness and if patients are not treated, coma and subsequent death due to herniation. This theory of death secondary to herniation has recently been challenged with an alternative theory that suggests that sudden death in patients with colloid cysts may be related to acute neurogenic cardiac dysfunction (secondary to acute hydrocephalus) and subsequent cardiac dysfunction, cardiac arrest rather than herniation.

The 3 approaches most commonly used for colloid cyst surgery. These are: 1. Microneurosurgery A) Transcortical approach B) Interhemispheric transcallosal approach 2. Endoscopic neurosurgery 3. Steriotactic aspiration.

Materials and method
In this study 2 patients recently underwent endoscopic removal of colloid cyst in BSMMU in 2008. The endoscopic approach was the same as the transcortical approach, except that the former is accomplished through a burr hole. The cyst is punctured and aspirated through the working channels of the endoscope. The basic requirement were: 1. Operating sheath 2. Rigid endoscope with optics 3. One working channel & two irrigation channels 4. Puncture needle 5. Grasping forceps 6. Bipolar coagulation device.

Surgical technique
The patient is placed in the supine position on the operating table. The neck is flexed approximately 450 to the horizontal plane and neutral in the vertical plane. The burr hole is placed 5 to 6 cm. from the midline and 11 cm behind the nasion on the nondominant side. Provisions should be made to convert the procedure into an open, transcortical approach if necessary. The lateral ventricle, free-hand needle ventricular puncture was performed before the endoscope was introduced. We did by a rigid 00 endoscope of 5 mm outer diameter for best optical clarity. Once anatomical landmarks and the tumor were identified, the cyst was punctured and the contents evacuated. When the cyst contains inspissated, firm material, cup forceps were required to remove the contents in a piecemeal fashion. Intermittent irrigation and bipolar cautery were done to keep the operative field clear.

Postoperative management
Ventricular catheter was placed intraoperatively to safeguard against ventricular dilatation. It remained clamped & was removed on 3rd POD. Inj. Methyl Prednisolone 500mg daily for 5 days to prevent chemical meningitis.

Result
The charts of 2 patients who underwent endoscopic removal of colloid cyst were reviewed.

Table 1: Summery of cases, presenting symptoms, radiographic findings and outcome

<table>
<thead>
<tr>
<th>Case no</th>
<th>Age/sex</th>
<th>Symptoms</th>
<th>Hydrocephalus</th>
<th>Tumour size(cm)</th>
<th>Complications</th>
<th>Followup</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35/m</td>
<td>Headache</td>
<td>–</td>
<td>+ +</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>–6 months, No visual problem</td>
<td></td>
<td></td>
<td></td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>No</td>
<td>No headache</td>
</tr>
<tr>
<td>2</td>
<td>12/m</td>
<td>Headache</td>
<td>–</td>
<td>+ +</td>
<td>Pyogenic meningitis</td>
<td>1 months</td>
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<td></td>
<td></td>
<td>–8 months, Vomiting, Diplopia</td>
<td></td>
<td></td>
<td></td>
<td>No headache</td>
</tr>
</tbody>
</table>

Discussion
Neuroimaging Studies
CT scan: Colloid cysts appear homogenous, with two thirds of them appearing hyperdense to the surrounding parenchyma and one third appearing isodense to the surrounding parenchyma. The lesions are well delineated and are usually round or ovoid. Occasionally, the lesions have a thin rim of enhancement after contrast injection, but they are typically

The ORION. Vol 31, September 2008
nonenhancing and are not calcified. The size of these cysts varies but most are 5-25 mm$^{3,4}$. 

**MRI:** The appearances of colloid cysts on MRIs are variable. The most common appearance is hyperintensity on T1 and hypointensity on T2. The amount of rim enhancement is variable. The variable MRI signals do not correlate with the fluid density of cyst contents, although a MRI is valuable in differentiating a colloid cyst from a basilar tip aneurysm, which may have similar appearance on a CT scan$^{3,7}$.

**Surgical management:** In 1983 Powell et al.$^{14}$ were the first to suggest endoscopic removal of colloid cysts. This was followed by several cases confirming the ability to remove colloid cysts successfully. In 1994 Lewis et al.$^{13}$ published a compelling series in which they compared endoscopic and microsurgical procedures for the removal of cysts, concluding that endoscopy was superior in terms of operative time and postoperative recovery. Since then many other studies have reinforced the advantages of the endoscopic technique.

The advantages are-
1. Less damage of brain tissue
2. Excellent view of intraventricular anatomy
3. Assessment of relation of lesion to surrounding structures

Each approach has specific risks and complications. The transcortical approach carries an increased incidence of epilepsy$^9$. The transcallosal approach decreases the risk of postoperative epilepsy but risks venous infarction and contralateral leg weakness from prolonged retraction. An extensive callosal resection may also cause temporary mutism$^{1,11}$.

The CT scan is an important preoperative study because the viscosity of the cyst contents correlates more closely to the radiodensity visible on a CT scan than to the density visible on MRI. The viscosity of cyst contents determines the most appropriate surgical approach. A hyperdense cyst is more likely to have solid contents and is more difficult to drain. Hyperdensity may also correlate with a reduced capacity to enlarge over time$^{3,5}$.
Excessive manipulation of the fornix may affect memory. The endoscopic approach is the least invasive, but it can be used only on cysts that can be aspirated. Large cysts cannot be removed with this technique. A steeper learning curve exists with the endoscopic technique. Hydrocephalus can persist after surgery, even after resection of the cyst. This complication may be secondary to spillage of the cyst contents or to bleeding during surgery. A ventricular catheter may be placed intraoperatively to safeguard against ventricular dilatation.

Conclusion
Colloid cysts of the third ventricle represent 0.5-2% of all intracranial tumors. The endoscopic approach for the removal of colloid cysts of the third ventricle represents a safe procedure and can be considered a very good option for the treatment of these rare lesions.

Reference