CT-stereotaxic drainage of colloid cysts in the foramen of Monro and the third ventricle

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Colloid cysts in the foramen of Monro and third ventricle account for 0.5% to 1% of all intracranial space-occupying lesions. The introduction of computerized tomography (CT) and magnetic resonance imaging has represented a major advance in the early detection of these cysts. The risks associated with the management of benign space-occupying lesions by open surgical procedures have made it necessary to search for safer techniques. The CT-stereotaxic method provides a simple, precise, and safe method of puncturing deep-seated space-occupying cysts. Between January, 1979, and December, 1984, 12 patients with colloid cysts in the foramen of Monro and third ventricle were operated on by this method. The operations were successful, and there were no intraoperative or postoperative complications. The advantages of the CT-stereotaxic method are discussed and the results are presented.

KEY WORDS  • colloid cyst  • stereotaxic surgery  • foramen of Monro  • third ventricle

Clinical Material and Methods

Patient Population

Between January, 1979, and December, 1985, 12 patients with colloid cysts of the foramen of Monro and third ventricle were operated on and the cysts were evacuated by the CT-stereotaxic method. In all of the cases, the diagnosis was based on the CT findings. There were six men and six women, with an average age of 39.4 years.

Of the 12 patients, five had an enlarged ventricular system with occlusion of the foramen of Monro due to hydrocephalus. In addition, CT revealed a hypodense area in two patients, an isodense area in one patient, and a round hyperdense lesion with no or only slight contrast enhancement in the remaining nine patients (Table 1). These findings correlated with those reported by Guner, et al.,\textsuperscript{13} and by Powell, et al.\textsuperscript{14} Seven of the 12 patients had already undergone placement of an atrioventricular or a ventriculoabdominal shunt prior to the stereotaxic operation because of a rapid increase in intracranial pressure (ICP). Five of the 12 patients also had dilated ventricles due to hydrocephalus. In one patient, this ventricular enlargement had not significantly decreased 3 weeks after the shunt procedure.

On the day of admission all of the patients showed signs of increased ICP. Two patients presented with horizontal nystagmus, another two with scotomas, and one with optic atrophy. Altered mentation was present in three patients. Two of the patients were admitted to the hospital with drowsiness and transient loss of consciousness (Table 2).

Operative Procedure

The operation was performed under local anesthesia. The target point was determined in the center of the lesion by a CT-stereotaxic method.\textsuperscript{3,18,20} First, the cyst wall was punctured through a frontal trephination on
Colloid cysts in the foramen of Monro

TABLE 1
Summary of computerized tomography (CT) findings in 12 patients

<table>
<thead>
<tr>
<th>CT Findings</th>
<th>No. Preop</th>
<th>No. Postop</th>
</tr>
</thead>
<tbody>
<tr>
<td>hypodense area</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>isodense area</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>hyperdense area</td>
<td>9</td>
<td>3 (remaining cyst)</td>
</tr>
<tr>
<td>hydrocephalus</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>bifrontal shunt</td>
<td>7</td>
<td>7</td>
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</table>

TABLE 2
Clinical findings before and 1 year after cyst drainage

<table>
<thead>
<tr>
<th>Clinical Findings</th>
<th>No. Preop</th>
<th>No. Postop</th>
</tr>
</thead>
<tbody>
<tr>
<td>increased intracranial pressure</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>symptoms</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>nystagmus</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>scotoma</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>optic atrophy</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>altered mentation</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>somnolence</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

TABLE 3
Results of computerized tomography-stereotaxic evacuation

<table>
<thead>
<tr>
<th>Operative Result</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>completely drained</td>
<td>9</td>
</tr>
<tr>
<td>partially drained</td>
<td>3*</td>
</tr>
<tr>
<td>recurrence</td>
<td>0</td>
</tr>
</tbody>
</table>

* One of these patients underwent a repeat puncture procedure.

the right side and biopsies were taken for histological verification. Then the cyst was entered, with aspiration of the largely gelatinous cystic content. The capsule was then irrigated and evacuated. At regular intervals during the operation, the cyst was demonstrated radiographically with air and contrast agent (Solutrast 300) (Fig. 1). The operation took an average of 2 hours. The patients could be released from the hospital after 3 to 4 days. Angiography was performed before every operation to rule out the rare but nevertheless possible chance of a vascular malformation.

**Operative Results**

Of the 12 patients with colloid cysts in the foramen of Monro operated on by the CT-stereotaxic method, nine had complete evacuation of the cyst and three had partial removal (Table 3). No complications occurred during any of the operations, and no additional neurological deficits were observed either immediately after the operation or 1 year later. During a follow-up period ranging from 15 to 79 months (average 42 months), there have been no signs of recurrence in a colloid cyst that had been completely evacuated.

In one of the three patients in whom the cyst was only partially evacuated, the puncture procedure was repeated and the cyst totally evacuated. The other two patients have shown no indications of growth of the residual cyst. No shunt procedure was necessary after stereotaxic evacuation in the five patients who had not had a shunt placement prior to the stereotaxic technique. In all of these patients, the ventricles returned to their normal size within 2 to 3 weeks (Figs. 2 and 3). In one of the cases in which the ventricles had not reduced in size after the shunt operation, complete reduction of the ventricle lumen, restoration of the collapsed ventricular system, and disappearance of a slight bilateral subdural hematoma were observed within 3 weeks after stereotaxic evacuation. This result was apparently achieved by opening the foramen of Monro and further draining the cerebrospinal fluid (CSF) through bifrontal shunt catheters.

In all 12 patients the symptoms of increased ICP regressed quickly postoperatively, and the patients were symptom-free by the 2nd day after surgery. One patient developed an abscess, which was stereotaxically punctured and evacuated.

**Discussion**

Numerous publications have described the clinical manifestations of colloid cysts: signs of increased ICP including headache, nausea, vomiting, double images, and optic atrophy, accompanied by slight to severe psycho-organic syndromes, psychomotor retardation, and impairment of recent memory. It is also known from the literature that a long undiagnosed colloid cyst can result in acute disturbances of consciousness, coma, and death.
The treatment of colloid cysts is designed to remove the blockage of the CSF circulation caused by the foraminal obstruction, to restore the ICP to normal, and to remove the space-occupying lesion. This can only be achieved by surgical management. Since 1921, various surgical techniques and methods have been tested and recommended by such authors as Cushing, Dandy, and Kahn, et al. The rates of postoperative complications, morbidity, and mortality, however, were relatively high. It therefore became necessary to look for a better technique. After microsurgical methods were introduced into neurosurgery and the transcallosal and transcortical approaches were developed, the results of surgery improved and the risks, particularly of epilepsy, decreased. Nevertheless, the surgical results demonstrated that colloid cysts, although benign lesions, are in fact not always easy to treat. The risks, which should not be underestimated, include intraoperative bleeding, postoperative hydrocephalus, and transient and permanent memory disturbances. McKissock developed a less invasive technique with coagulation of the cyst wall. Gutierrez-Lara, et al., introduced a free-

Fig. 2. Case 1, age 77 years. Left: Computerized tomography scan, sagittal section, showing the hyperdense space-occupying lesion in the area of the foramen of Monro causing obstruction of both foramina and bilateral congestion of the anterior horns. The volume of the space-occupying lesion is 10 ml. Right: Scan obtained 1 year later showing that the anterior horns are now normal without a shunt. The colloid cyst is completely evacuated, and only slight congestion of the third ventricle is seen.

Fig. 3. Case 2, age 42 years. Left: Computerized tomography scan showing the colloid cyst as hypodense with no contrast enhancement. Both foramina of Monro are obstructed and the anterior horns are congested. The volume of the cyst is 13.5 ml. Right: Scan obtained 3 months later showing that the anterior horns are now normal without a shunt. The colloid cyst has been evacuated, but a small residual lesion of approximately 0.3 cu cm can still be visualized (dotted line). The foramina have been reopened, and the patient has no neurological deficits.
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hand technique for puncturing cysts in order to achieve an open route between the cyst and the ventricular system by means of a catheter. This method produced relatively good results and, in 1978, Bosch, et al., published the results of their first successful operations with no postoperative complications after stereotaxic evacuation of the cyst. The development and introduction of the CT-stereotaxic method improved the safety and accuracy of puncturing deep-seated tumors and cysts, so that the evacuation of colloid cysts, is now associated with considerably less intraoperative and postoperative risks and complications.2,8,20

The operation does not take long and can be performed under local anesthesia. There is only minimal strain and discomfort for the patient, and the technique involves practically no risk. In most cases, it renders shunt procedures unnecessary.

References
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Manuscript received April 9, 1986.
Accepted in final form January 13, 1987.
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