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Case Report

Endoscopic resection of a giant colloid cyst in the cavum septum pellucidum: Illustrative case

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ABSTRACT

Background: Colloid cysts (CCs) are a rare type of benign tumor, and the ones >30 mm in diameter are determined as giant CCs. The giant CCs of the cavum septum pellucidum (CSP) are located in the hard-to-reach areas of the brain, and they can be removed microsurgically and endoscopically. At present, the transition from the microsurgical resection to the endoscopic is observed, and researchers demonstrate several benefits of the endoscopic resection over the microsurgical. We noticed the absence of research illustrating the endoscopic resection of the giant CC of the CSP. Therefore, we decided to demonstrate a rare case performed in our hospital.

Case Description: Our patient was a 57-year-old male who had suffered from dizziness, headache, nausea, urinary incontinence, short-term forgetfulness, gait ataxia, cognitive decline, and vision blurring. The eventual diagnosis of the giant CC in the CSP was established, and it was complicated by occlusive hydrocephalus and headache syndrome. The endoscopic resection of the giant CC in the septum pellucidum was performed using the endoscopic transseptal approach.

Conclusion: No complications were observed in the postoperative period. The tumor was removed completely, no recurrence was noted, and only a capsule of the tumor was observed in the control magnetic resonance imaging image taken 3 months after the operation. Considering these results, we conclude that endoscopic removal may have positive and safe outcomes as the surgical treatment method for the giant CCs located in the septum pellucidum.

Keywords: Cavum septum pellucidum, Endoscopic resection, Giant colloid cyst, Third ventricle

INTRODUCTION

Colloid cysts (CCs) are benign tumors composing 0.5–2% of all brain tumors.[6] They are most commonly located in the roof of the third ventricle and rarely can be found in other areas of the brain.[1] They mostly contain gelatinous viscous (The gelatinous material commonly contains mucin, old blood, cholesterol, and ions).[6] Giant CCs are detailed as cysts >30 mm in diameter.[7]

The CC was first described by Wallmann in 1858 as an autopsy finding, and Walter Dandy was the first to remove this kind of tumor in 1921 successfully.[17]

The septum pellucidum has two membranes separated by the cerebrospinal fluid during fetal life.[13] The anterior portion of the space between the two leaflets is called the cavum septum pellucidum (CSP), which is commonly closed by 3–6 months of age.[11] If the membranes of the

septum pellucidum fail to merge fully after birth, the CSP may remain in adulthood.[13] The CC of the CSP is located in the hard-to-reach areas of the brain (almost middle), which is why most of these patients present with symptoms of hydrocephalus, including headache, nausea, vomiting, blurred vision, gait ataxia, and cognitive decline.[17]

The CC in the CSP can be removed microsurgically and endoscopically.[12] At present, there is a trend toward minimally invasive neurosurgery, and a transition from the microsurgical resection to the endoscopic is observed. According to the systematic review of Sheikh *et al.*, the overall postoperative morbidity rate is lower in endoscopic resection.[12] Furthermore, taking into account the blood supply of the CC, intraoperative bleeding can be avoided using this approach. For these reasons, we decided to remove the tumor of our patient endoscopically. However, it is important to note the absence of the reported case of the massive CC located in the CSP. Consequently, we aim to describe the case with the largest (30 × 31 × 35 mm) CC arising from the CSP, obstructing both of the foramina of Monro, pushing internal cerebral veins, and growing downwards into the third ventricle.

CASE DESCRIPTION

Patient D is a 57-year-old male who has suffered from dizziness, headache, and nausea for 2 months but did not seek medical attention. The month before the hospitalization, he experienced symptoms such as episodes of urinary incontinence and short-term forgetfulness, gait ataxia, cognitive decline, and vision blurring. Routine laboratory tests were regular. The eventual diagnosis was the giant CC in the CSP. The main disease was complicated with occlusive hydrocephalus and headache syndrome.

Preoperative images

On magnetic resonance imaging (MRI), a huge, uncommon appearance with the size of 30 × 31 × 35 mm was observed. It had a clear-cut heterogeneous midline. The intraventricular mass extending upwards from the interthalamic region into the lateral ventricles was detected. There was associated obstructive hydrocephalus with periventricular edema [Figure 1a]. The lesion had a fried egg shape. Its character was heterogeneous; it had an intensity gradient from the middle (hyperintense signal) to the edge (isointense) on +C T1axial and coronal images [Figures 1b and c], which suggests a layering pattern. The lesion compressed the right-side thalamus. The lesion extended from the rostrum of the corpus callosum anteriorly to the pillars of the fornix posteriorly [Figure 1d]. Internal veins were displaced infra-laterally over the thalamus, two leaflets of septum pellucidum were extended laterally, and the anterior vein of septum pellucidum was pushed supra-laterally [Figure 1d].

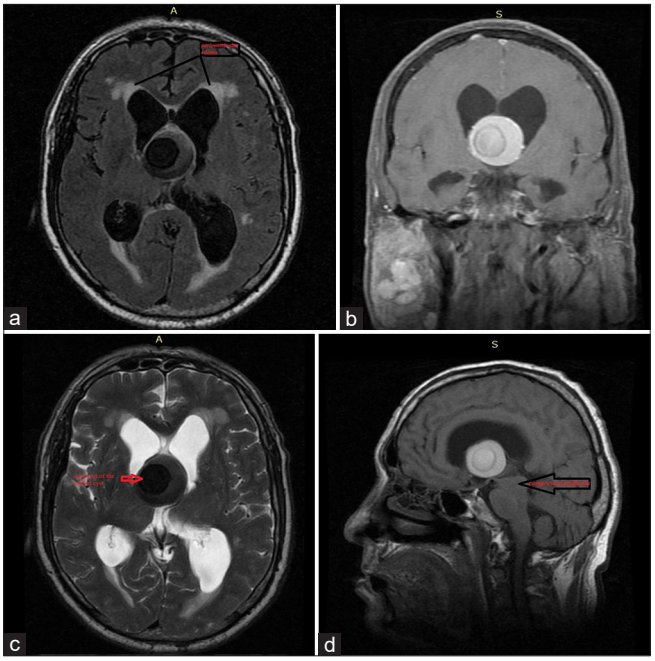

Figure 1: The brain magnetic resonance imaging of the patient before the operation. (a) Axial T 2 flair; (b) T1 coronal with contrast; (c) T2 axial; and (d) T1 sagittal. (a) The arrows show the signs of a periventricular edema of the anterior corn of the lateral ventricle. (a and c) Signs of hydrocephalus and edema of the anterior and posterior horn of the lateral ventricle. (c) The arrow shows a solid part of the colloid cyst (CC). (d) The black arrow shows a giant CC, which is pressing against the midbrain from above.

Operation

The working sheath, the trocar, and the 0°, 45°angled endoscope with a working channel diameter of 5.9 mm and a length of 130 mm were used. During the procedure, monopolar cautery, scissors, and forceps were utilized through the working channel.

The patient was in the supine position. He underwent a right side burr-hole for the endoscopic transseptal approach: 2.5 cm off the midline and 2.5 cm anterior to the coronal suture (Kocher's point) following the recommendation of Azab *et al.*[2] [Figure 2a]. Subsequently, an endoscopic tube was inserted into the right lateral ventricle, where the cerebrospinal fluid was observed to be leaking under pressure. The cerebrospinal fluid sample was taken for analysis. The revision of the right ventricle was performed, during which a narrowing of the right Monro foramen was revealed. Following that, a cerebrotomy was performed 1.5 cm laterally from the septum, where the walls of the capsule were partially visualized. A firm, nonsuctionable solid gray-yellow material was identified inside the lesion, which was not typical for a CC. The removal of the cyst was started using aspiration [Figure 2b] and forceps [Figure 2c]. The solid lesion content was resected in a piecemeal manner.

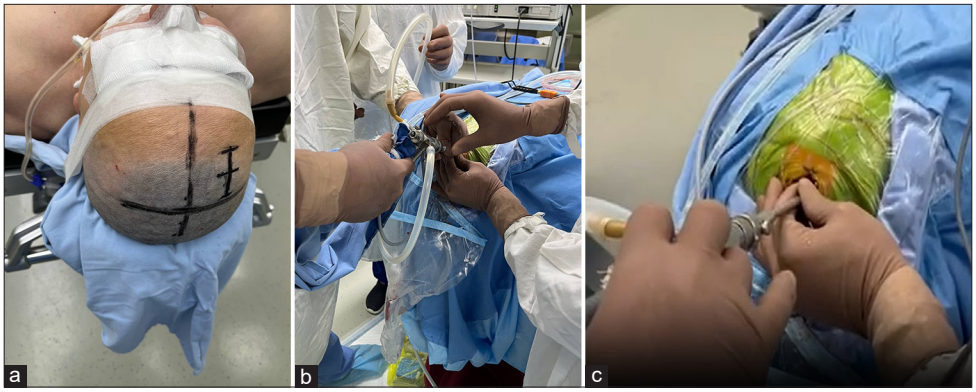

Figure 2: The patient positioning on the operation table. (a) Patient positioning and selection of the burr hole site. (b) Using aspiration for the removal of the cyst. The operator and the assistant worked together during the operation. (c) Using forceps for the removal of the cyst.

During removal, calcified areas were determined, which were crushed to the tube size for exploitation. At the inferior part of the lesion, semisolid gelatinous content compatible with the usual CC was seen and evacuated. The tumor was removed, and a capsule was left behind. The main reason for not dissecting a very thin cyst wall was the risk of bleeding and damage to the underlying structures, such as the pericallosal artery, fornix, and thalamus, which were tightly fused to the cyst capsule.[15] Therefore, the cyst wall was resected partially as much as it was safe to do. When the cyst content was completely evacuated, the foramen of Monro was inspected to see if it was well decompressed and patent. The decompression of the foramen of Monro allows descending to the third ventricle. An endoscopic third ventriculostomy was undertaken to prevent the recurrence of hydrocephalus. There was no clot or bloody product inside the lesion. See Figure 3 for the intraoperative endoscopic images.

Several challenges were met during the operation. First, mechanical fragmentation of the calcified portion of the tumor was difficult due to its high density. Second, regulating the Ringer's Lactate temperature was challenging during the operation since the endoscopic devices require continuous fluid use. Finally, using several surgical instruments simultaneously was not possible through a monoportal endoscope during surgery.

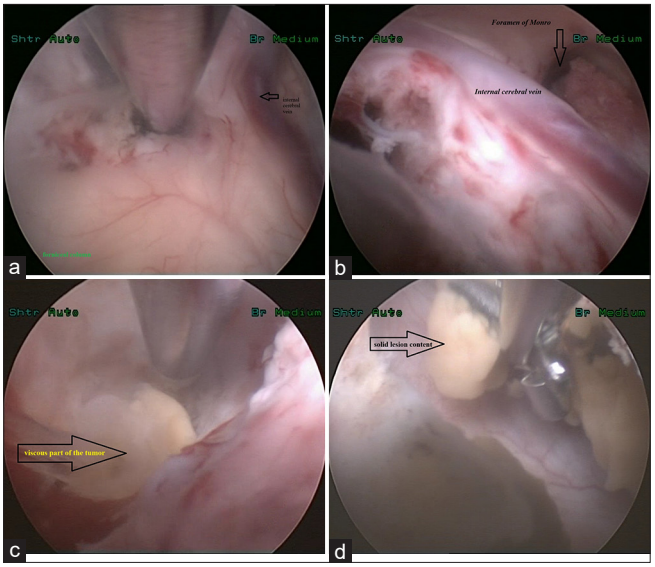

Figure 3: The endoscopic view during the resection of the colloid cyst (CC). (a) The cerebrotomy was performed between the internal cerebral vein (black arrow) and the septum pellucidum. Below is the forniceal column of the brain. (b) Narrowing and lateralization of the foramen of Monro (vertical black arrow) due to the large volume of the CC. (c) Opening the cyst capsule and aspiration of the viscous part of the CC (black arrow). (d) Solid cyst contents were removed with grasping forceps (black arrow).

Histology

In the studied histological preparations, stained with hematoxylin and eosin, a cystic formation was examined, the wall of which is represented by fibrous tissue lined with one layer of columnar epithelium. Epithelial cells in the cytoplasm contained single mucin-containing vacuoles. There were structureless homogeneous eosinophilic masses in the cavity of the cyst. There was fibrosis, full-blooded vessels, and scattered lymphohistiocytic infiltration in the wall of the cyst [Figure 4]. The conclusion of the CC was made.

Postoperation period

The patient's condition was stable after surgery. Control computer tomography (CT) imaging was performed 24 h after the operation. The lateral ventricles were dilated with subependymal edema; air was detected in the anterior horns and subarachnoid space of the frontal region on the right [Figure 5a]. A minimal hemorrhagic component was detected in the posterior horns of the lateral ventricles. The third ventricle was deformed and dilated, with a cystic cavity

and air. The fourth ventricle was unchanged [Figure 5b]. The sagittal postcontrast images showed complete lesion resection where the capsule was left [Figure 5c].

No complications were observed in the postoperative period. Symptoms such as dizziness, headache, and nausea were regressed directly 24 h after the operation. Moreover, the follow-up examination conducted 3 months after the operation detected that urinary incontinence appeared rarely, and vision was improved compared to the preoperative period. The surgical incision was considerably short, comprising two cm; for this reason, the skin in the area of the surgical incision recovered fast. The overall hospital duration period was composed of 3 days.

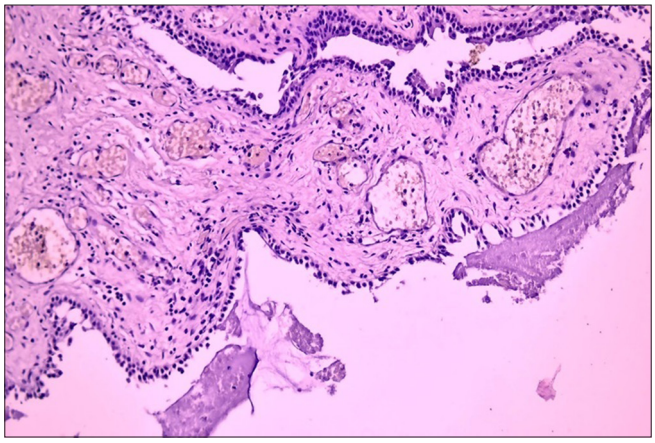

Figure 4: Histological specimen from the tumor resection demonstrates colloid cyst. Stained with hematoxylin and eosin (×200).

Brain MRI imaging was performed about 3 months after the operation [Figure 6]. The tumor was completely removed, no recurrence was noted, and only a capsule of the tumor was observed. However, despite the presence of the capsule, the cerebrospinal fluid circulation was restored, and the volume of the hydrocephalus was reduced. The internal cerebral veins returned to their normal position, and the foramen of Monro was opened.

DISCUSSION

CCs are benign tumors considered developmental malformations. They are composed of an outer fibrous layer and an inner epithelium of ciliated or mucin-producing cells.[6]

Our case was a 57-year-old male who presented with dizziness, headache, nausea, a couple of episodes of urinary

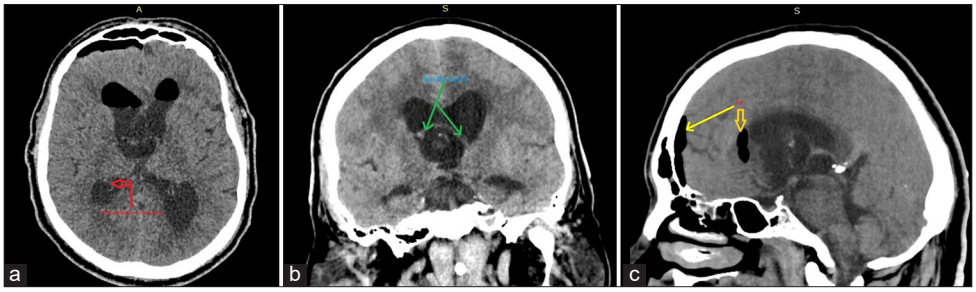

Figure 5: The brain computer tomography (CT) taken 24 h after the operation. (a) CT Axial. (b) CT coronal. (c) CT sagittal. (a) The red arrow shows a hemorrhage component of the posterior corn of the lateral ventricle. (b) The green arrows illustrate a residual capsule.(c) The yellow arrows shows the air in the anterior horns of the lateral ventricle and subarachnoid space of the frontal region.

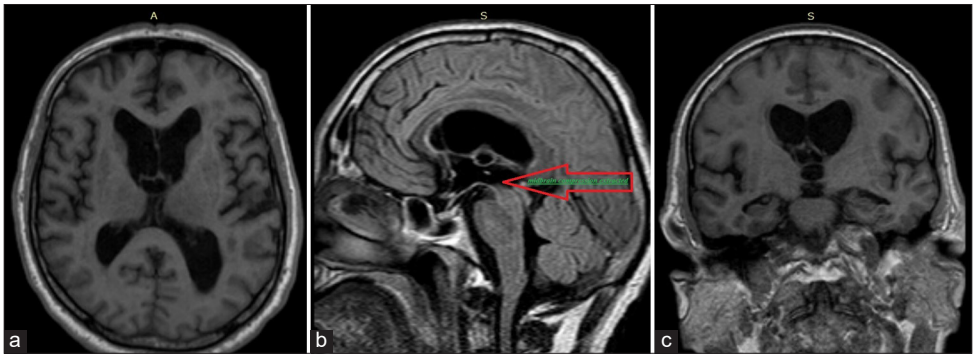

Figure 6: The brain magnetic resonance imaging (MRI) taken 3 months after the operation. (a) MRI T1 axial. (b) MRI flair sagittal. (c) MRI coronal. (b) The red arrow shows that midbrain compression is extracted.

incontinence and short-term forgetfulness, gait ataxia, cognitive decline, and vision blurring. He had a giant cyst (30 × 31 × 35mm), which was resected through an endoscopic approach. Inside the lesion was a firm, hardly suctionable, solid gray-yellow material, which is not common for a CC. Semisolid bright gelatinous content was seen and evacuated at the central part of the lesion.

The giant size and exceptional location of the CCs are signs of an extremely rare type of CC. According to our review, there have been only two published studies of CCs located in the septum pellucidum, which were removed endoscopically,[14,16] and our illustrated case demonstrates the largest reported CC in this location resected endoscopically. The first study described four cases: there were two patients with CCs resected endoscopically, but no information was provided about the size of the cysts, and the other two patients suffered from tectal glioma and tectal lipoma respectively.[14] An endoscopic transcavum interforniceal procedure was performed on each case with the following results: total resection was achieved, and no complications were identified intra or postoperatively.[14] Furthermore, a 38-month follow-up revealed no radiographic or clinical findings of recurrent CC or hydrocephalus.[14] The second study reported about a 33-year-old male with hydrocephalic and ventriculoperitoneal shunting from the neonatal period, and the details on the size of the lesion were not described.[16] Moreover, the study was written in Portuguese.[16] Similarly, a transcavum interforniceal approach was used during the endoscopic resection of the CC in this case, and the residual lesion was left as a result.[16] An 8-month follow-up identified the absence of clinical symptoms, stabilization of hydrocephalus, and the residual lesion, which did not grow during this period.[16]

Beaumont et al. determined the risk factors associated with the symptomatic CC and the development of cyst-related hydrocephalus.[4] As the cyst-related hydrocephalus may result in sudden death, the CC Risk Score (CCRS) was invented to evaluate the severity of the CC located in the third ventricle; the result of the CCRS ≥ 4 was assumed to be high risk, and patients were recommended to undergo the surgical intervention.[4] The patient in our case met all of the risk factors: young age (<65), presence of headache, cyst diameter ≥7, hyperintensity on fluid attenuated inversion recovery MRI, and location of the cyst covering all of the anatomical risk zones. Following this, the outcome of the CCRS in our patient was equal to 5, so the surgical removal was administered decisively in our case.

An endoscopic third ventriculostomy was performed as the hydrocephalus treatment and its recurrence in our case, and after the mass wall opening, the CC was removed endoscopically. According to Samadian *et al*., attentive supervision is advised for CC with small size (<10 mm) and asymptomatic clinical characteristics; the endoscopic removal is recommended for moderate-size (10–20 mm) CCs with ventriculomegaly, T2 bright signal on MRI, and intraforaminal location.[9] Moreover, microsurgical removal is suggested for CC with large (>20 mm) and giant (>30 mm) sizes, as well as symptomatic clinical features.[9] However, there was a case where a huge (51 × 48 × 54 mm) CC located in the velum interpositum was successfully removed endoscopically.[1] Despite the recommendation of Samadian *et al*.,[9] and considering the successful removal of the CC located in the velum interpositum by Arjipour *et al*.,[1] the endoscopic technique was chosen in our case as it could be a more efficient, safe, minimally invasive, less traumatic, and faster method.

Sayehmiri *et al*. conducted a systematic review to compare the surgical outcomes after the microsurgical versus endoscopic removal of the CC located in the third ventricle.[10] According to this review, the microsurgical technique had a higher gross total resection rate and a lower recurrence rate.[10] In contrast, the endoscopic resection technique had a lower mortality rate, a lower shunt dependency rate, a lower rate of postoperative complications, shorter operation time, and shorter hospital duration.[10] The other study compared conventional guided microsurgical and endoscopic approaches among 41 patients with CC in the third ventricle.[8] It concluded that the endoscopic resection had fewer rates of postoperative seizure and neurological deficit.[8] Another study demonstrates a comparison of surgical outcomes for 78 patients who underwent a cyst resection through an endoscopic approach and a craniotomy.[3] It revealed that the endoscopic resection reduced the total inpatient cost by more than 50%, and this cost-effectiveness remained during reoperation.[3] Analyzing the results of these studies and our case results, it seems that the endoscopic resection technique may have more positive outcomes for the CC, including those of the giant size.

It is important to mention the presence of a new surgical tool, an ultrasound aspirator, which allows the forced aspiration of the cyst contents. Ibanez-Botella *et al.* carried out a retrospective descriptive study, which illustrated the surgical outcomes of 11 patients who had the endoscopic resection of the CC of the third ventricle with an ultrasonic aspirator.[5] According to this study, using ultrasound and aspiration provides an opportunity to perform complete resection, decreases the risk of harming surrounding anatomical structures, and advances the feasibility of removal in more solid cysts.[5] Unfortunately, we were not able to carry out the endoscopic resection with this tool due to its absence in our center.

CONCLUSION

Overall, endoscopic removal may have positive and safe outcomes as the surgical treatment method of the giant

CCs located in the septum pellucidum. We recommend that neurosurgeons demonstrate their illustrative cases related to the giant CCs located in the septum pellucidum, as the number of these studies is very limited. Further, a systematic analysis of these case studies is suggested to evaluate the effectiveness of the endoscopic removal of the giant CCs located in the septum pellucidum.

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