Endoscopic surgical excision of third ventricular colloid cyst in upper Egypt: results of 2 years of practice

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Background
Colloid cyst is a benign rare lesion that originates in the third ventricle. Headache, vomiting, visual deterioration, and memory deficits are the most common presenting symptoms. Endoscopic excision of colloid cyst is one of the recent advances in the field of minimally invasive neurosurgery.

Aim
The aim was to assess the efficacy and safety of the endoscope for excision of the colloid cyst.

Patients and methods
In this study, we review our experience in 14 patients who presented to us in two University Hospitals in south of Egypt in 2 years (2016 and 2017). The authors used LOTTA ventriculoscope with HOPKINS wide-angle straightforward telescope 6°.

Results
Of fourteen patients, 13 (92.9%) improved completely postoperatively, and only one (7.1%) patient who had visual deterioration did not improve after surgery. Total to near-total excision was done in 11 (78.6%) patients, and evacuation of the cyst with partial excision was done in three (21.4%) patients.

Conclusion
Endoscopic excision of third ventricular colloid cyst is a safe minimally invasive approach that can be used in patients who present with colloid cyst without the need to do cerebrospinal fluid diversion (shunt).

Keywords:
colloid cyst, endoscopic brain surgery, third ventricle

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Introduction

Third ventricular colloid cysts are rare benign lesions that account for ~ 0.5–2% of all central nervous system tumors [1]. They originate mostly from the roof of the third ventricle and grow slowly either in upward direction into the septum pellucidum or in downward direction to the cavity of the third ventricle. They usually grow anteriorly to reach the foramina of Monro causing obstruction to the cerebrospinal fluid (CSF) pathway and may cause sudden death [2–4].

Histopathologically, a colloid cyst is composed of outer fibrous wall and inner mucin-producing epithelial cells, and the cavity is usually filled with mucoid material, which differs in consistency from one patient to another, as it can be soft mucin or firm material, which is more difficult in aspiration and excision. Recent studies show immunohistochemical evidence that the epithelium is endodermal in origin [5].

Clinical presentation usually occurs owing to hydrocephalus with manifestations of increased intracranial tension, as headache, vomiting, and blurring or diminution of vision are the most common presenting symptoms [6,7]. Colloid cysts also may be an incidental finding during a routine imaging of the brain by computed tomography (CT) scan or magnetic resonance imaging (MRI).

Surgical treatment options include ventriculoperitoneal shunt, stereotactic aspiration, transcortical and transcallosal approaches for microsurgical excision, and endoscopic transventricular excision [1,8].

The most common surgical complications are seizures, hematoma, infection, venous infarct, memory deficit, and limb weakness [1,9].

Since the evolution of endoscopic third ventricular excision of colloid cysts in 1983, there are increase in its use worldwide owing to its better results and decreased complication rate; however, it is still a matter of controversy between neurosurgeons around the world [10,11].

Some reports support the open microsurgical excision over the endoscopic approach, as it has better proximal

control of bleeding between the two-hand technique and hence better chance for complete excision and decrease in the recurrence rate [1,4,5].

On the contrary, there are other reports supporting the endoscopic technique owing to decrease in the complication rate, minimal invasiveness, decrease in the total hospital stay, and decrease in the total cost of treatment [2,4].

We conducted this retrospective study to evaluate our early results and experience in endoscopic approach for excision of third ventricular colloid cysts, in two University Hospitals in South of Egypt, during 2016 and 2017.

Patients and methods

We reviewed 14 patients presented to us in two Neurosurgery Departments in two University Tertiary Hospitals (Assiut University and Aswan University) in the period from January 2016 to January 2018.

All 14 patients were treated surgically by endoscopic transventricular approach.

Preoperative evaluation

All patients were reviewed regarding their medical history, presenting symptoms and signs, age, sex, preoperative imaging (CAT scan and MRI), intraoperative and postoperative course, postoperative complications, improvement of symptoms, and recurrence. Preoperative and postoperative complete visual assessments have been done for all patients (visual acuity, visual field, and fundus examination) by an ophthalmologist.

Preoperative imaging

We evaluated all patients by doing preoperative precontrast and postcontrast CAT scan and MRI of the brain. Preoperative evaluation was done for the size of the cyst, location, the cyst density in CAT scan, contrast enhancement, and the size of the ventricles.

Operative approach

The approach was from the right lateral ventricle except in patients with asymmetric dilatation of the ventricles; in such cases, the access was attempted from the side of maximally dilated lateral ventricle.

We used LOTTA ventriculoscope with HOPKINS (Karl Storz, Tuttlingen, Germany) wide-angle straight forward telescope 6°, Image 1 HD camera head.

The procedure was done under general anesthesia. Head was slightly elevated 20 degree over a gel head rest. Small skin flab is incised with its base lateral, pericranium flab incised in the reverse direction of the skin flab. A burr hole is made 4 cm lateral to mid line and 4 cm anterior to coronal suture in case of directing the endoscope to the foramen of Monro, and in cases of septal cysts, we make the burr hole 2 cm more lateral to midline. Dural opening is made, and brain cortex is cauterized with bipolar diathermy, followed by introduction of the sheath with the obturator reaching the lateral ventricle. Reaching the colloid cyst, the attached choroid plexus is cauterized carefully with preservation of its vascular attachment and cauterize the cyst wall. We opened the cyst wall applying endoscopic micro scissor and then aspirated the contents of the cyst using suction endoscopic cannula and 10 ml syringe. In some cases, the cyst contains a firm material that cannot be aspirated, and in this condition, we used the grasping forceps to make a small bite in the contents until removal of most of it.

Grasping of the cyst wall and trying of excision with minimal traction and rocking movement or rotation or twist the cyst wall (Twisting maneuver) in order to lose the junction of cyst wall and third ventricle was done. In some cases, the cyst wall was removed partially owing to firm adherence of the cyst wall to neurovascular structures. In these cases, the remained part of the cyst wall was coagulated to decrease the rate of recurrence and then hemostasis and irrigation of the ventricle was done.

Postoperative evaluation

To evaluate the outcome, all patients were examined in general and neurologically, and underwent follow-up imaging study at the following intervals: immediately postoperatively (second postoperative day), 1 month postoperatively, 6 months postoperatively, and 12 months postoperatively. We examined the patients searching for recurrence of symptoms, presence of any complications and evaluation of the size of ventricles, presence of hydrocephalus, and degree of excision of the cyst in CAT scan. At the 12th month, we asked for MRI of the brain to evaluate the recurrence of the cyst.

The mean follow-up period for all patients in our study was 12 months postoperatively (February 2018 to February 2019).

Statistical analysis

Data were collected in Excel sheet (Microsoft Office 2016, Microsoft Corporation, Redmond, Washington, United States) and then analysis was done. The results were expressed in term of percentage.

Ethical considerations

The study was conducted after getting ethical clearance and the permission from Assiut University Teaching Hospital administration. Thorough explanation of the purpose of the study and how data will be treated with respect and confidentiality was provided to the participants. The study protocol was approved by the Ethical Committee, Faculty of Medicine, Assiut University, Egypt, IRB# 17300318. All patients and their first-degree relatives were informed about the condition, the disease, risks of surgery and anesthesia, and other surgical treatment options. All patients signed an informed consent.

Results

A total of 14 patients presented to Neurosurgery Departments in Assiut University and Aswan University Hospitals diagnosed with interventricular colloid cyst during the period January 2016 to January 2018.

All 14 patients were operated with endoscopic transventricular approach for colloid cyst excision.

Patients' mean age was 34.63 ± 15.20 years, with age range from 8 to 50 years old.

Regarding the sex, there were five (35.7%) males and nine (64.3%) females.

Symptoms and signs

All patients presented with headache (100%), five patients complained of visual symptoms (blurring of vision), but only one (7.1%) patient had visual deterioration by examination. He only could see the projection of light in both eyes.

Overall, six (42.9%) patients had vomiting. Two (14.3%) patients had disturbance at the conscious level: one of them had Glasgow coma score of 14/15 during examination, and she was pregnant in her third trimester, and the other patient presented with Glasgow coma score 13/15 (Table 1).

Operative details

We found three (21.4%) patients with small-sized ventricles in preoperative brain CAT scan and MRI and intraoperatively after entrance of the endoscope.

Total to near-total excision of the cyst was accomplished in 11 (78.6%) patients, and only evacuation and partial excision was done in three (21.4%) patients. In the latter three patients, we only could evacuate the cysts, as all of them were interseptal, and the cyst wall was adherent to the leaflets of septum pellucidum and internal cerebral veins (Figs. 1 and 2).

Outcome

A total of 13 (92.9%) patients completely improved postoperative, and only one (7.1%) patient had visual deterioration, which did not improve after surgery.

We have only two cases with postoperative complications, one patient with postoperative CSF leak from the surgical site, which improved after 5 days with dehydrating measures and daily dressing. CSF leak stopped with remaining surgical wound swilling owing to subcutaneous CSF, which also improved completely after 1 month. The second patient had postoperative surgical wound infection, which appeared 5 days after surgery and did not respond to daily dressing and empirical antibiotics and required surgery for debridement of the surgical wound, and the patient showed complete improvement after that (Table 2).

Follow-up and recurrence

We have no recurrence in our series during the follow-up period and till the moment of writing this paper. The mean follow-up period was 1 year. There is no recurrence of symptoms and no hydrocephalic changes noticed in follow-up imaging studies. In the three cases with partial excision, we noticed that the cyst remnant stays at the same size in all follow-up images (CAT scan and MRI).

Table 1 Symptoms and signs

Symptoms and signs	*n*=14 [*n* (%)]
Symptoms of increased ICP	13 (92.9)
Visual deterioration	1 (7.1)
DCL	2 (14.3)
Memory deficit	2 (14.3)
Urine incontinence	3 (21.4)
Gait disturbance	1 (7.1)

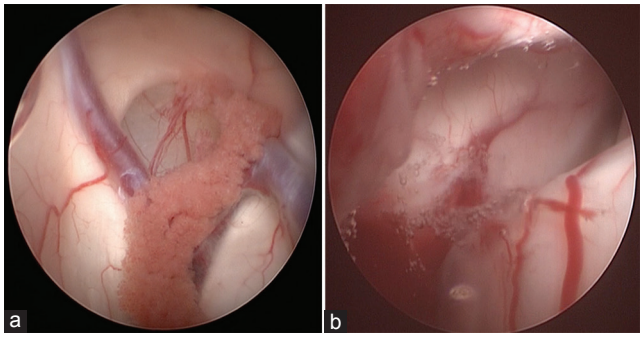
ICP=Intra cranial pressure, DCL=Disturbed conscious level.

Table 2 Outcome

	n=8 [*n* (%)]
Improvement of presenting symptoms and signs	
Improved	13 (92.9)
Improved except vision	1 (7.1)
Complications	
CSF leak	1 (7.1)
Postoperative wound infection	1 (7.1)
No	12 (85.7)
Recurrence	
Yes	0 (0.0)
No	14 (100.0)

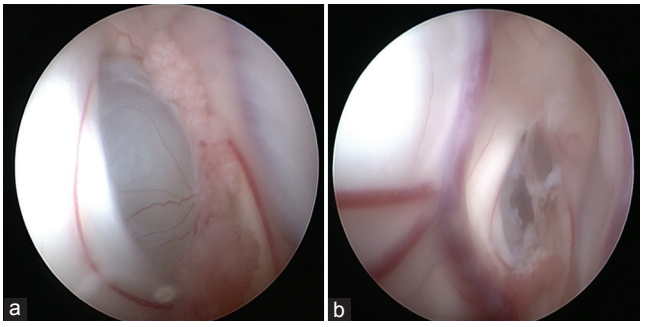
CSF, cerebrospinal fluid.

Figure 1



(a) Foramen of Monro with a colloid cyst before excision with attached choroid plexus; (b) after complete excision of the cyst and appearance of the floor of the third ventricle.

Figure 2



(a) A colloid cyst appearing from the foramen of Monro; (b) after evacuation and partial excision of the cyst.

Discussion

Colloid cysts are rare benign lesions typically located in the third ventricle and represent 0.5–2% of all intracranial tumors [1,12,13].

Transcortical or transcallosal microsurgical approaches for colloid cyst resection were the most traditional treatment; however, endoscopic excision of third ventricular colloid cysts became more popular over the past 3 decades [5,14].

According to our records, five (35.7%) cases were males and nine (64.3%) cases were females, with an average age of 34.63 ± 15.20 years. Samadian *et al.*[10] studied 76 cases with colloid cyst, comprising 63% males and 37% females, with an average age of 37.6 and 34.45 years, respectively. Moreover, in the study by Ibanez-Botella *et al.* [15], the number of males with third ventricular colloid cyst were more than females (17 males and seven females), with a mean age of 39.6 years [10,15].

However, in some, other reports like the study by Brostigen *et al.* [16], most patients were females, and in the study by Horn *et al.* [17], the proportion of males and females was relatively the same.

In our series, the most common symptoms and signs were manifestations of increase intracranial pressure (headache, vomiting, and blurring of vision) (92.9%), disturbed conscious level (14.3%), memory deficit (14.3%), gait disturbance (7.1%), and incontinence of urine (21.4%). Only one patient developed severe visual deterioration, and he was capable of seeing only projection of light, and the rest of the patients' visual chart were within normal. One patient with disturbed conscious level was a 40-year-old pregnant female patient in her third trimester, and the colloid cyst was discovered by MRI in her first trimester after an attack of severe headache, she was under conservative treatment and observation until she developed deterioration of her conscious level. We operated on her urgently after her family signed a high-risk informed consent about the risk for her and for her baby from the general anesthesia and from the surgical approach. Patient improved after surgery, and she delivered her baby after 2 months with good health without any congenital anomalies.

Obstruction of CSF flow at the level of foramen of Monro by the colloid cyst results in increased intracranial pressure, which is the commonest mechanism that initiates the symptoms. Samadian *et al.*[10] reported the presenting symptoms in their series as headache (84.1%), vomiting (42.2%), impaired vision (36.3%), gait instability (23%), and memory disorder (13.9%).

According to computed tomography scan findings in our series, 71.4% patients had a hyperdense cyst and 28.6% had isodense cysts. This was in line with the study by Mishra *et al.* [8], as they reported 75% hyperdense cysts, 15% isodense, and 10% hypodense in computed tomography scan.

All patients were treated surgically with an endoscopic resection of cyst; total and near total resection was achieved in 11 (78.6%) patients, and partial resection in three (21.4%) patients. In our experience, it was possible to do a high rate of complete cyst resection. In the study by Mishra *et al.* [8], they stated that they did a gross total excision in 78% of patients, near-total excision in 11% of patients with a small cyst wall remnant left, and partial excision and cyst aspiration only in 11% of patients. In the systematic review and meta-analysis of 1278 patients done by Sheikh *et al.*[4] for comparison of the results of endoscopic versus microsurgical resection of colloid cysts, they found that the rate of gross total resection in the endoscopic group patients was 58.2%.

In our series, the postoperative complications included CSF leakage in one (7.1%) patient and surgical wound

infection in one (7.1%) patient. The patient with CSF leak responded to conservative treatment, but the patient with wound infection needed re-surgery for debridement of the surgical wound, and he improved completely after the second surgery. All patients in our study improved without the need for ventriculo-peritoneal shunt placement. We did not face any case with postoperative seizures or interventricular hemorrhage. In the study by Sheikh *et al*. [4], they found that the rate of complications in endoscopic group was 10.5%. The most common complications were seizures, interventricular hemorrhage, memory deficit, venous infarction, subdural hematoma, hemiparesis, and meningitis.

None of the patients with either total excision or partial excision and aspiration of the cyst presented with recurrence during an average follow-up period of 1 year. Sheikh *et al*.[4] found that the recurrence rate in the endoscopic group was 3.91%. In the study by Mishra *et al*. [8], there were no recurrence of the colloid cyst or the symptoms even in cases with partial excision with a follow-up period range of 3 weeks to 99 months.

It is believed that endoscopic surgery offers effective treatment for third ventricular colloid cysts with low morbidity, low mortality, low recurrence rate, low rate of 30-day hospital readmissions, decrease in the total hospital stay, and decrease in the overall treatment cost [1,8,17].

Conclusion

Endoscopic excision of third ventricular colloid cyst is a safe minimally invasive approach that can be used in all patients presented with colloid cyst without the need to do CSF diversion (shunt) with favorable outcome, short intraoperative time, short hospital stay, decrease in morbidity, no or low mortality and decrease in the overall cost of treatment. Even partial resection and cyst aspiration can improve the symptoms as with the endoscope we can secure that the foramen of Monro is not obstructed and secure normal CSF pathway.

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Conflicts of interest
There are no conflicts of interest.

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