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Surgical Management of Third Ventricular Colloid Cysts: The Fate of Open Microsurgery

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ABSTRACT

AIM: To report our experience with the outcomes of open microsurgical management of third ventricular colloid cysts.

MATERIAL and METHODS: This retrospective study presents the surgical outcomes of 33 patients who underwent open microsurgical resection—either through the interhemispheric transcallosal or transcortical transventricular approach—for third ventricular colloid cysts between 2010 and 2023.

RESULTS: The mean follow-up period was 41.57 months. All patients were symptomatic, and severe, intractable headache was the most common presenting symptom. No perioperative mortality or postoperative infection occurred. During follow-up, five patients (15.15%) developed shunt-dependent hydrocephalus, and eight (24.24%) developed seizures. At the last follow-up, seven of the eight patients were seizure-free and no longer required antiepileptic medication. Thirty-two patients (96.96%) had no recurrence, and in one patient with a small residual lesion, no progression was observed.

CONCLUSION: Open microsurgery, whether via the interhemispheric transcallosal or transcortical transventricular approach, is safe and offers a high likelihood of total resection with low recurrence. Shunt-dependent hydrocephalus and postoperative seizures remain the most common complications, underscoring the need for long-term surveillance, particularly for late-onset seizures even after complete removal. Although endoscopic surgery is now widely adopted, our findings demonstrate that open microsurgery continues to be a reliable and durable option with favorable recurrence and complication profiles.

KEYWORDS: Colloid cyst, Endoscopy, Microsurgery, Transcallosal, Transcortical

ABBREVIATIONS: MRI: Magnetic resonance imaging, CT: Computed tomography, EVD: External ventricular drain, VP-shunt: Ventriculoperitoneal shunt, CSF: Cerebrospinal fluid, AED: Anti-epileptic drug, SPSS: Statistical package for the social sciences

INTRODUCTION

Colloid cysts are histopathologically benign lesions typically located in the third ventricle near the foramen of Monro, although rare cases have been reported in other sites such as the fourth ventricle and the olfactory groove (12). They account for approximately 2% of all intracranial

space-occupying lesions and may lead to obstructive hydrocephalus, which carries a risk of sudden death (1). Most patients present with symptoms of increased intracranial pressure—such as headache, nausea, vomiting, and blurred vision—due to hydrocephalus. Notably, 30–60% of colloid cysts are asymptomatic and detected incidentally (2).

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Open microsurgery, performed via the interhemispheric transcallosal or transcortical transventricular approach, has traditionally been considered the standard treatment owing to its high rate of total resection and low recurrence. However, advancements in minimally invasive techniques and the growing use of endoscopic approaches—associated with fewer complications, shorter operative time, and reduced hospitalization—have led many neurosurgeons to prefer endoscopy. Despite this trend, some authors have shifted back to open microsurgery due to its higher likelihood of complete removal and lower reoperation rates compared with endoscopic surgery (10). The current literature reflects ongoing debate regarding whether open or endoscopic surgery yields superior outcomes. Furthermore, no consensus has been reached on which open microsurgical route—interhemispheric transcallosal or transcortical transventricular—is optimal (3,8).

Although endoscopic techniques now predominate, evaluating the long-term durability and complication profile of open microsurgery performed using modern microsurgical instruments and neuronavigation remains important. Our series represents contemporary outcomes and adds updated evidence supporting the continued role of microsurgical resection.

This study aims to retrospectively present the operative outcomes and complications of patients who underwent open microsurgery for third ventricular colloid cysts at our institution between 2010 and 2023.

■ MATERIAL and METHODS

This study was approved by the Local Ethics Committee of Istanbul University-Cerrahpasa, and all patients provided written informed consent before surgery (IRB no: sRT7i93s, date: 23.02.2025).

Patients

This retrospective, single-center analysis included consecutive patients operated on by the same neurosurgical team

to minimize inter-surgeon variability. Patients who underwent open microsurgical resection for third ventricular colloid cysts between 2010 and 2023 were enrolled. Patients treated using endoscopic resection were excluded.

Methods

Data were retrospectively retrieved from our institutional electronic database for all patients with third ventricular colloid cysts who underwent open microsurgical resection during the study period. Pre- and postoperative clinical and radiological findings, as well as surgical outcomes, were evaluated. Histopathological confirmation of colloid cysts was obtained from the Department of Pathology.

All patients underwent preoperative contrast-enhanced magnetic resonance imaging (MRI) of the head, followed by early postoperative MRI within 24 hours of surgery. After discharge, the first follow-up MRI was performed at the third postoperative month, and subsequent imaging was obtained annually. For patients residing far from our center and unable to attend in-person visits, follow-up information was collected via telephone.

Surgical Approach

Two open microsurgical approaches were used: the interhemispheric transcallosal route (Figure 1) and the transcortical transventricular route (Figure 2). The choice of approach was based primarily on the surgeon's preference and experience, regardless of cyst size or specific location within the third ventricle. Both techniques are well established in the literature and are familiar to neurosurgeons; therefore, a detailed description is omitted here. Neuronavigation and an operating microscope were used for all procedures.

Statistical Analysis

All statistical analyses were performed using SPSS software (version 22.0; IBM Corporation, Chicago, IL, USA). Mean values and standard deviations (mean $\pm$ SD) were calculated for

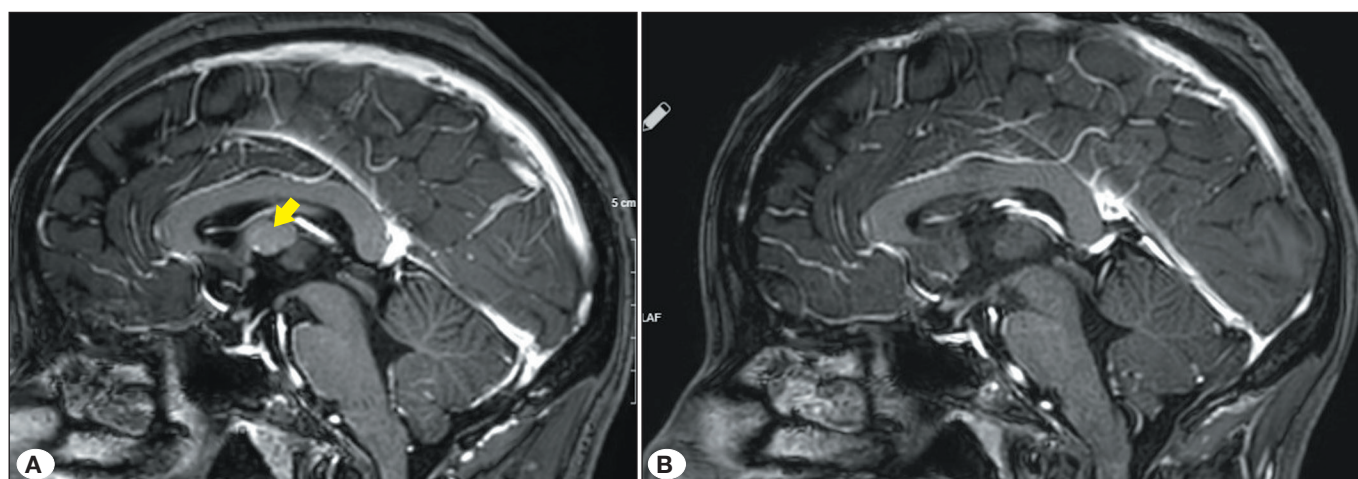


Figure 1: This 41-year-old patient presented with a severe headache. **A)** Preoperative, sagittal, T1W contrast enhanced cranial magnetic resonance imaging (MRI) scan showed colloid cyst within the third ventricle obstructing the foramen of Monro (arrow). Trans-cortical transventricular approach was performed. **B)** Early post-operative, sagittal, T1W contrast enhanced cranial MRI showed gross total resection.

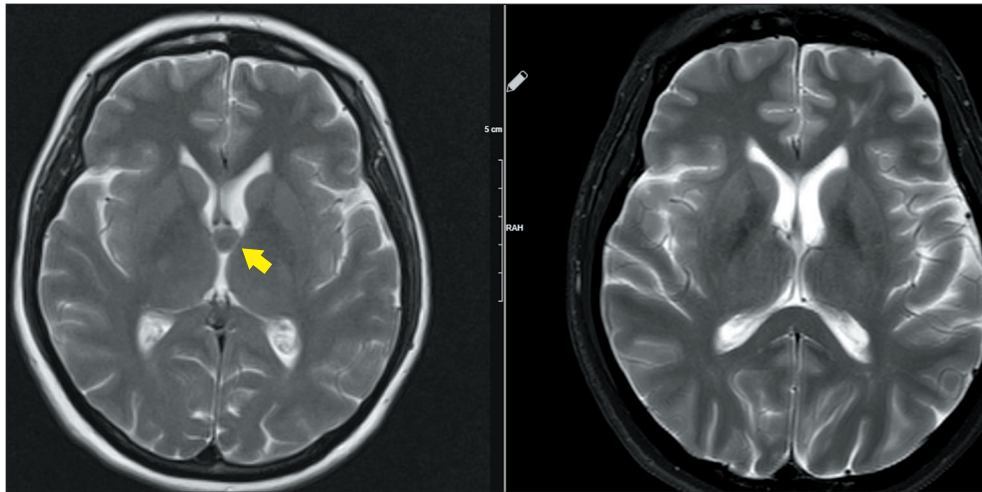


Figure 2: This 46-year-old patient presented with headache. Preoperative T2 weighted (W), axial cranial magnetic resonance imaging (MRI) scans showed colloid cysts within the third ventricle (arrow). The lesion was removed by inter-hemispheric trans-callosal approach. Six years after surgery, cranial MRI noted no recurrence or any residual cyst.

continuous variables, and frequencies and percentages were reported for categorical variables.

RESULTS

Between 2010 and 2023, 35 patients underwent surgery for third ventricular colloid cysts. Two patients treated endoscopically were excluded; thus, 33 patients who underwent open microsurgical resection formed the study cohort submitted to *Turkish Neurosurgery*.

Demographics and Clinical Presentation

The cohort included 23 females (69.9%) and 10 males (30.3%), with a mean age of 38.30 ± 10.92 years (range, 18–57 years). All patients were symptomatic, and all presented with severe, medication-refractory headaches. Additional symptoms included nausea/vomiting in 6 patients (18.18%) and gait imbalance in 1 patient (3.33%).

Neurological examination was normal in 32 patients (96.96%), while 1 patient (3.33%) presented with confusion secondary to hydrocephalus. One patient with a normal neurological examination had a ventriculoperitoneal (VP) shunt placed previously at another center. Preoperative acute hydrocephalus was observed in 5 patients (15.2%), all of whom required external ventricular drainage (EVD) before cyst resection.

Radiology

All patients underwent preoperative contrast-enhanced MRI, with computed tomography (CT) performed when necessary. MRI demonstrated ventriculomegaly in 17 patients (51.5%), including 4 patients with acute hydrocephalus. The cyst was located anterior to the foramen of Monro in 17 patients (51.5%) and at the foramen of Monro in 16 patients (48.5%). No cysts were found posterior to the foramen of Monro.

Surgery

All patients underwent open microsurgical resection. The interhemispheric transcallosal approach was used in 27 patients (81.8%), and the transcortical transventricular approach in 6 patients (18.2%). The nondominant hemisphere was pre-

ferred for cortical entry. EVD placement was performed at the end of resection in 5 of the 6 transcortical cases and in 8 of the 27 transcallosal cases.

Postoperatively, EVDs were routinely monitored for 3 days. If neurological status remained stable and CT showed no ventricular enlargement after clamping on day 3, the EVD was removed. Contrast-enhanced MRI performed within 24 hours after surgery assessed for residual cyst.

Gross total resection was achieved in 32 patients (96.96%). One patient undergoing the transcallosal approach had a small residual cyst at the roof of the third ventricle. The mean hospital stay was 7.75 ± 6.21 days.

Surgery-Related Complications

No cases of meningitis or other infections occurred. One patient developed postoperative fever on day 2; cultures were negative, and the fever resolved with antibiotics. One patient experienced cerebrospinal fluid (CSF) fistula and subsequent ventricular enlargement requiring VP shunt placement.

In total, 5 patients (15.15%), including the CSF fistula case, required VP shunts for postoperative hydrocephalus. Only one of these patients had undergone the transcortical approach. All postoperative shunt courses were uneventful.

Seizures occurred in 8 patients (24.24%), all of whom had undergone the transcallosal approach. Seven experienced early postoperative seizures and were treated with antiepileptic drugs (AEDs). At final follow-up, these seven were seizure-free and no longer required AEDs. One patient developed a late seizure in the fifth postoperative year. MRI showed no abnormalities; however, electroencephalography revealed distinct, widespread, short-term delta paroxysms in the frontal regions. AED therapy was initiated, and the patient remained seizure-free.

Follow-Up

The mean follow-up duration was 41.57 ± 22.35 months (range, 3–96 months). There was no mortality, and all patients had normal neurological examinations at the last follow-up. Contrast-enhanced MRI showed no recurrence in 32 patients

(96.96%), and no progression of the small residual lesion in one patient. All VP shunts functioned appropriately, and no patient developed recurrent hydrocephalus. All patients except one were seizure- and medication-free at the final assessment.

■ DISCUSSION

Colloid cysts of the third ventricle are rare, benign lesions originating from remnants of the embryonic paraphysis (7). They are typically located at or near the foramen of Monro and often present with symptoms of hydrocephalus. However, these lesions may remain asymptomatic for years, and many are detected incidentally (2,13). Although the management of asymptomatic third ventricular colloid cysts remains controversial, close follow-up is recommended for younger patients with cysts situated near the foramen of Monro (14).

Surgical treatment—whether open or endoscopic—is curative but technically demanding because of the deep location of the cysts. The primary surgical goal is gross total resection without residual cyst. With the advent of neuroendoscopy, open microsurgery fell out of favor, and many neurosurgeons shifted toward endoscopic techniques in pursuit of minimized brain manipulation and shorter hospital stays. Although endoscopy is appealing for these reasons, higher residual cyst rates have been reported compared with open microsurgery (4,6,8,10). This explains why some senior neurosurgeons who previously performed open microsurgery have recently abandoned the endoscopic approach and returned to open microsurgical techniques (6,10). Our rate of gross total resection is high and satisfactory, consistent with current literature. Furthermore, meta-analyses have shown that patients operated on via the endoscopic approach have the highest rate of reoperation compared with those undergoing open microsurgery, either through the transcortical or transcallosal approach (3,8,11).

It should be noted that, due to the low incidence of third ventricular colloid cysts, reporting large patient cohorts from a single neurosurgical center is challenging. Therefore, comparing surgical outcomes, particularly complication rates, with current literature is difficult, and we largely rely on systematic reviews and meta-analyses. Moreover, almost all studies are retrospective, and the data collected in these reviews span decades during which both endoscopic and microsurgical techniques—and, importantly, neuronavigation methods, as well as surgeons' experience—have significantly advanced. These factors may explain why earlier studies reported higher complication rates compared with studies conducted within the last decade (8).

Except for a few studies (10), most clinical studies indicate that endoscopic removal of third ventricular colloid cysts is associated with the lowest incidence of morbidity and mortality compared with open microsurgery. Beyond the typical complications such as infection, vascular injury, and motor weakness, post-surgical hydrocephalus and seizures are particularly noteworthy. Contrary to conventional belief, open microsurgery via the transcortical transventricular approach for lesions within the ventricular system is not always associated with higher rates of shunt dependence or postoperative sei-

zures. Our experience with intraventricular tumors and colloid cyst removal via open microsurgery showed a very low rate of postoperative hydrocephalus and seizures (9).

In this study, five patients (15.15%) required a ventriculoperitoneal (VP) shunt after surgery, and only one underwent the transcortical transventricular approach. Our results support the higher incidence of shunt dependence following the interhemispheric transcallosal approach, as reported in the literature (3,8). Regarding postoperative seizures, earlier studies reported higher incidence following the transcortical transventricular approach (3,8,11). In contrast, we observed a lower incidence of postoperative seizures: eight patients (24.24%) experienced seizures, all of whom underwent surgery via the interhemispheric transventricular approach. At the last follow-up, all but one patient were seizure-free and off antiepileptic drugs. One patient, despite gross total removal, developed a late seizure, highlighting that achieving gross total resection and remaining seizure-free initially does not guarantee the absence of late seizures. Patients should therefore be closely monitored.

The higher incidence of postoperative seizures may be related to the sacrifice of some cortical veins during interhemispheric dissection. We believe that a smaller cortical incision over the middle frontal gyrus and the use of neuronavigation may explain the lower incidence of postoperative seizures observed in modern transcortical approaches. In our series, there were no cases of infection, death, vascular injury, or motor weakness, consistent with low complication rates reported in current literature (3,8,11).

Finally, we disagree with the notion that open microsurgery for third ventricular colloid cysts is always associated with prolonged hospitalization. The mean hospital stay in our series was not long, and some studies have found no significant difference in mean hospital stay between endoscopic surgery and open microsurgery (10).

We emphasize that the purpose of this study is not to promote open microsurgery over endoscopic surgery for third ventricular colloid cyst removal. Our patient cohort is not designed for a direct comparison of the two modalities. Similarly, our sample size is insufficient to compare outcomes between the interhemispheric transcallosal and transcortical transventricular approaches.

Our intention is to highlight that open microsurgery is *not* an alternative to endoscopic surgery; rather, endoscopic surgery is an alternative to open microsurgery, which remains the standard technique from which newer methods are derived. Based on systematic reviews and meta-analyses (3,5,8,11) and on our experience, open microsurgery consistently provides higher rates of gross total resection and lower recurrence and reoperation rates.

For both surgeons and patients, achieving gross total resection without major complications is the most desirable outcome. Residual cysts inevitably grow and may require reoperation, which increases complication risk, hospitalization duration, and cost. Open microsurgery permits bimanual dissection of the cyst wall from critical neurovascular structures

within the lateral ventricle, such as the internal cerebral veins and fornix. Bimanual maneuvering is more difficult and often more limited in endoscopic procedures. Thus, the potential benefits of endoscopy must be weighed carefully against the risk of remnants and future reoperations, particularly in younger patients.

Study Limitations

The retrospective design and relatively small sample size constitute the primary limitations of this study. The absence of an endoscopic comparison group also prevents direct evaluation of the two techniques. Nonetheless, our data provide updated, contemporary microsurgical outcomes from a single center with a consistent operative strategy, contributing meaningful evidence to the existing literature.

Another limitation is the lack of pre- and postoperative neurocognitive assessments, which restricts our ability to comment on cognitive outcomes. Larger prospective studies comparing endoscopic and open microsurgical techniques are needed to address the key unresolved question: *Which approach is superior?*

CONCLUSION

Open microsurgery via the interhemispheric transcallosal or transcortical transventricular approach is a safe procedure associated with a high rate of total cyst removal and low recurrence rate. Shunt-dependent hydrocephalus and postoperative seizures are the most common complications, warranting close long-term follow-up, including surveillance for late-onset seizures even after complete resection. When performed in experienced hands at specialized centers, open microsurgery remains a valid and durable treatment option for third ventricular colloid cysts.

Declarations

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Availability of data and materials: The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Disclosure: The authors declare that there are no conflicts of interest related to this study.

AUTHORSHIP CONTRIBUTION

Study conception and design: HMC, TT

Data collection: UCO, BK

Analysis and interpretation of results: RK, AMK

Draft manuscript preparation: MU, AMK

Critical revision of the article: HMC, TT

Other (study supervision, fundings, materials, etc...): BK, RK, MU

All authors (HMC, UCO, BK, RK, TT, AMK, MU) reviewed the results and approved the final version of the manuscript.

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