Ann Med Res 2020;27(11):2940-4

Annals of Medical Research

DOI: 10.5455/annalsmedres.2020.04.288

Original Article

Clinical results and complications in patients Operated for colloid cyst

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Abstract

Aim: The present study aimed to report the peri- and postoperative complications in patients undergoing third ventricular colloid cyst resection using a microsurgical approach.

Materials and Methods: A total of 29 patients with symptomatic third ventricular colloid cysts were operated upon via the microsurgery method at two different neurosurgery clinics, and their data were analyzed retrospectively.

Results: Among them, 12 (41.4%) were men, and 17 (58.6%) were women. The mean age was 34.24 ±16.43 years, and the age range was 1–70 years. Headache was the most common symptom at reference and occurred in 21 (72.4%) patients. Also, ataxia was the presenting symptom in 7 (24.1%) of our patients, vomiting in 6 (20.7%), visual loss in 6 (20.7%), epileptic seizures in 4 (13.8%), incontinence in 4 (13.8%), and loss of consciousness in 1 (3.4%). Moreover, 19 (65.5%) had hydrocephalus, and two of them with weak consciousness were operated after the application of a preoperative external ventricular drainage system

Conclusion: The interhemispheric transcallosal approach is the most commonly used method in colloid cyst microsurgery, and the most frequent surgical complication is venous infarction secondary to this approach. Thus, the significant results of infarct that occurred in patients with preoperative hydrocephalus suggest that this complication could be controlled more easily if the hydrocephalus and intracranial pressure are followed up more carefully in the pre- and perioperative periods.

Keywords: Colloid cyst; complication; hydrocephalus; transcallosal; venous infarction

INTRODUCTION

The third ventricle is a small cleft-like space between the two thalami. The most common tumors in the third ventricle are colloid cysts, which are often located in its rostral part adjacent to the foramen of Monro (1,2). These are rare congenital intracranial tumors, accounting for 0.5%–2% of all such tumors. The secreting potential of the inner epithelium determines their natural behavior. Histological and immunohistochemical studies have shown that colloid cysts originate from ectopic endodermal cells that migrate to the velum interpositum during the development of the central nervous system (3).

In asymptomatic patients, early deceleration in the growth rate and dehydration of the content may occur immediately before or after inhibiting the cerebrospinal fluid (CSF) circulation. Contrarily, the increase in the secretion and growth rate leads to the rapid emergence of clinical findings. The symptoms and signs of symptomatic colloid cysts include short-term headaches, lack of memory, visual impairment, papillary edema, dizziness, ataxia, incontinence, coma/decreased consciousness, or sudden death (1,2). Although an agreement on the indications for surgical resection in symptomatic patients has been established, surgery in incidentally detected patients remains controversial. The cysts contain a viscous gelatin material with variant densities, and accordingly, their densities in computed tomography (CT) or magnetic resonance imaging (MRI) are highly variable (4).

Patients with tumor sizes >1 cm at T2 MRI, age, and ventricular dimensions help to select surgical candidates. Patients often present in the 4th and fifth decades (5). Many approaches for the treatment of the colloid cysts of the third ventricle have been described. Traditionally, a transcortical or transcallosal approach has been used at first to treat them (6). Other alternative options include ventriculoperitoneal shunt and infratentorial

Received: 01.04.2020 **Accepted:** 30.10.2020 **Available online:** 18.11.2020
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supracerebellar, stereotactic, transventricular, and, recently, endoscopic approaches (6).

Several complications, such as wound infection, intracystic or intraventricular and epidural hematoma, venous infarction, and death, were reported in the literature regarding the surgical resection of colloid cysts (2,3).

We aimed to describe the symptoms, incidence, surgical approaches, complications, and outcomes of 29 previously defined patients.

MATERIALS and METHODS

The data of 29 patients who were operated in Dokuz Eylul University Medical Faculty Hospital and Izmir Katip Celebi University Ataturk Training and Research Hospital between 2008 and 2019 were reviewed retrospectively. Moreover, this study was approved by the Ethics Committee (23.05.2019; decision number, 234).

The archival records, patient files, radiological archives, and pathology results were examined. Additionally, the data obtained from the hospital records kept during the hospitalization period of the patients and from the periodic routine controls were investigated.

The patients who had low Glasgow Coma Scale (GCS) scores at the time of the first admission to the emergency department and the radiological appearance of hydrocephalus underwent external ventricular drainage (EVD) under emergency conditions (Figure 1). Other patients were operated with the transcranial method via an interhemispheric or infratentorial supracerebellar technique according to the surgeon's preference. Furthermore, the patients were evaluated in the clinic postoperatively and called for control at appropriate intervals after discharge (Figure 2).

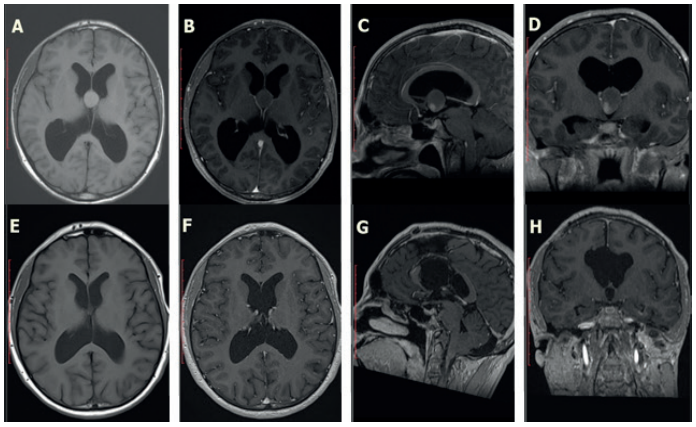


Figure 1. 29-year-old man, headache, ataxia, preoperative cranial MRI, A,B,C,D: Axial T1, axial T1-enhanced, sagittal T1-enhanced, coronal T1-enhanced sequences, Postoperative 1 year MRI, D,E,F,G: Axial T1, axial T1-enhanced, sagittal T1-enhanced, coronal T1-enhanced sequences

The age, gender, admission complaints, examination findings, surgical approaches with postoperative details, any postoperative complications, and follow-up findings of all patients included in the study were reviewed. Furthermore, all patient files were examined and were added to the data.

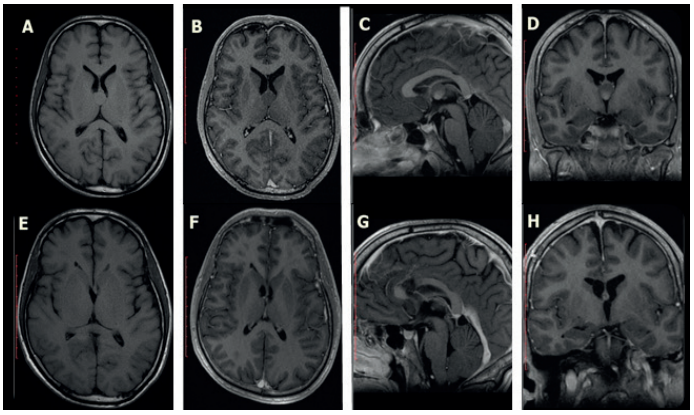


Figure 2. 35-year-old man, headache, preoperative cranial MRI A,B,C,D: Axial T1, axial T1-enhanced, sagittal T1-enhanced, coronal T1-enhanced sequences,Postoperative 1 month MRI, D,E,F,G: Axial T1, axial T1-enhanced, sagittal T1-enhanced, coronal T1-enhanced sequences

RESULTS

Among the 29 patients who were operated in our study, 12 (41.4%) were male, and 17 (58.6%) were female. The youngest and oldest were 1 year and 70 years old, respectively, and the mean age was 34.24 ± 16.43 years (Table 1).

Table 1. Distribution of patients according to age, gender, and complaint

	N (%)
Mean age (years)	34.24 ±16.43 (170)
Male/Female	12 (41.4%)/17 (58.6%)
Pediatric < 16 years	4 (13.8%)
Adult > 16 years	25 (86.2%)
Symptoms	
Headache	21 (72.4%)
Ataxia	7 (24.1%)
Vomiting	6 (20.7%)
Seizure	4 (13.8%)
Loss of vision	6 (20.7%)
Urinary incontinence	4 (13.8%)
Loss of consciousness	1 (3.4%)
Hemiparesis, cranial nerve paresis	0 (0.0%)

The most common symptom at the time of admission was a headache, and 21 patients (72.4%) were admitted to the hospital with this complaint. Four (13.8%) patients presented with a generalized tonic-clonic seizure at the emergency department. After the colloid cyst was detected in the imaging studies of these patients, they underwent surgery with elective surgical preparations. None of the patients had hemiparesis and cranial nerve palsy during the period of admission and time until the operation (Table 1). According to the preoperative CT and MRI findings of the patients, calcification was seen in seven patients (24.1%), and hemorrhage within the cyst was detected in six (20.7%). However, the preoperative

CT images of three patients could not be obtained. Also, MRI revealed an isointense appearance in 7 (24.1%) and 4 (13.8%) patients in the T1 and T2 sequences, respectively (Table 2).

Table 2. Distribution of patients according to radiological parameters

MRI	N (%)
T1	
Hypointense	5 (17.2%)
Isointense	7 (24.1%)
Hyperintense	9 (31.0%)
Unknown	8 (27.6%)
T2	
Hypointense	6 (20.7%)
Isointense	4 (13.8%)
Hyperintense	11 (37.9%)
Unknown	8 (27.6%)
CT	
Hemorrhage	6 (20.7%)
Calcification	7 (24.1%)
Location of the lesion according to the third ventricle	
Anterior	20 (69.0%)
Posterior	4 (13.8%)
Inferior	3 (10.3%)
Superior	2 (6.9%)
Location according to the Foramen Monro	
Foraminal	16 (55.2%)
Retroforaminal	12 (41.4%)
Extraforaminal	1 (3.4%)

When the preoperative radiological examinations of 29 patients were evaluated, 20 (69.0%) of them had a colloid cyst located in the anterior part of the third ventricle. Much as when the localization of the lesions according to the foramen of Monro was examined, the foraminal location was noted in 16 patients (55.2%) (Table 2).

In 19 patients (65.5%), hydrocephalus was detected in preoperative imaging. Two patients (6.9%) who had low GCS scores due to acute hydrocephalus were operated immediately after the EVD system was applied. A ventriculoperitoneal shunt (V–P shunt) was implanted to one of our patients due to hydrocephalus in another hospital before colloid cyst surgery. The supracerebellar infratentorial and interhemispheric transcallosal approaches were performed in 1 and 28 patients, respectively. Consequently, gross total resection (GTR) was achieved in 27 of 29 patients, and subtotal resection (STR) was performed in 2 patients. In these two patients, resection was limited due to vascular adjacency and perioperative hemorrhage. Additionally, in five patients, perioperative cyst rupture occurred, and in 24, the colloid cyst was excised along with the cyst wall. Only one of our patients developed a complication (epidural hematoma) requiring early surgical intervention and underwent emergency reoperation to evacuate the epidural hematoma. This patient also was discharged on the 6th postoperative day without any neurological deficit (Tables 3-4).

Table 3. Surgical outcomes and complications

Hydrocephalus, Evans ratio (ER)*	N (%)
ER > 30/ER < 30/unknown	19 (65.5%)/9 (31.0%)/1 (3.4%)
EVD/shunt +	2 (6.9%)/2 (6.9%)
Supracerebellar infratentorial/ Interhemispheric transcallosal	1 (3.4%)/28 (96.6%)
GTR/STR **	27 (93.1%)/2 (6.9%)
Hospitalization (days)	7.47± 3.20(215)
Follow-up time (months)	27.41±29.54 (0.593)

*** The hydrocephalus measurements of patients were evaluated according to the Evans ratio. One patient could not be measured because of the lack of radiological data**
+ Two patients underwent surgery after the application of the EVD procedure due to acute hydrocephalus under emergency conditions. In one patient who underwent subtotal resection, hydrocephalus developed at the 6-month follow-up, and V–P shunt operation was performed.
**** Perioperative cyst rupture occurred in five patients. GTR could be performed in only three patients, and the other two underwent STR due to vascular adjacency and bleeding**

In the postoperative imaging of 29 operated patients, hydrocephalus persisted in 4 of them. After recurrence was detected in one of these patients, this patient was reoperated, and the V–P shunt procedure was performed at the 6th postoperative month. Radiologically, early postoperative CT revealed pneumocephalus, infarction, contusion, and ventricular hemorrhage. Hemiparesis was observed in four patients with infarction (Table 4). Also, one patient died in the hospital on the 15th postoperative day. Apart from that, no mortality in patients was noted in the 6-month follow-up.

Table 4. Postoperative complications

Complications	N (%)
Pneumocephalus	20 (69%)
EDH > 10 mm	1 (3.4%)
Intracystic hematoma	3 (10.3%)
Hemiparesis	4 (13.8%)
Intraventricular hemorrhage	14 (48.3%)
Infarction	5 (17.2%)
Contusion	7 (24.1%)
Loss of memory	3 (10.3%)
Recurrence	1 (3.4%)
Exitus	1 (3.4%) *

*** One patient developed postoperative meningitis and failed to respond to the treatment and died**

DISCUSSION

Although colloid cysts are benign brain tumors, their evolution, location, prognosis, and treatment are still controversial. For this reason, they have been treated with various surgical approaches over the years. Traditionally, the transcortical or transcallosal microsurgical approaches are preferred for the resection of these cysts. Furthermore, endoscopic approaches that are less invasive have recently been applied (6).

In the studies conducted, the most frequent complaint of the patients who underwent surgery for symptomatic colloid cyst was headache (4,7-9). Additionally, headache (72.4%) was the most common presenting symptom in our study, similar to the literature.

Some studies have reported that the rate of surgery for symptomatic colloid cysts was higher in men (2,6), while others noted this to be higher in women (7). Not only were the rates quite close to each other, but they also appeared to be equal in a few reports (6). In our study, which included 29 patients, 17 (58.6%) of them were female.

To date, the surgical resection of symptomatic colloid cysts is an acceptable approach. GTR with no, if possible or minimum morbidity to the patient is a must for the surgery (1,2). In our study, the GTR rate was found to be 93.1% (27/29), similar to some studies. This rate varies between 58% and 93% in the literature (1,2,7). The recurrence rate of third ventricular colloid cysts is low; however, the risk increases in patients who underwent STR (1,7). In our study, 3.4% (1/29) recurrence results were obtained. This case was an STR one, and the patient was reoperated for the second time after 6 months. Samadian et al. in their study of 112 patients (6) and other studies in the literature (10) revealed that the resection of colloid cysts with a hypointense T2 sequence in MRI was more difficult. In our study, no significant difference was found in the resection and recurrence of colloid cysts with a hypointense T2 sequence in MRI.

In our study, we divided the colloid cysts into three groups according to the foramen of Monro: foraminal, retroforaminal and extraforaminal. According to these results, the detection of preoperative radiological hydrocephalus in foraminal colloid cysts was found to be significant (p = 0.031). In our series, two patients (6.9%) needed EVD preoperatively, whereas none of them had EVD after the operation. In a study performed by Konovalov et al., 377 patients with colloid cyst underwent microsurgical resection, and 18 (4.76%) underwent EVD. However, the rate of EVD in cases operated by the endoscopic approach was reported to vary between 45% and 77% (6), suggesting that the reason for the difference between the ratios was due to the flow physiology of the ventricular CSF returned to normal earlier in microsurgical resection. This argument could be supported by pre- and postoperative CSF flow MRI for these patients. In the literature, the need for shunts in patients undergoing microsurgical resection is similar to our study (2,3).

In a study of 35 cases of endoscopic colloid cysts performed by Greenlee et al. (11), retroforaminal localization in 6 patients (17%) was converted to the microsurgical approach perioperatively, and resection was achieved. Moreover, in recent studies, complications such as ventricular hemorrhage, anterior septal–thalamostriate–internal cerebral vein complex injuries, and transient memory loss have been reported in patients with retroforaminal colloid cysts undergoing endoscopic resection (3,9,12). In our study, ventricular hemorrhage was observed in 14 cases (48.3%), and memory loss developed in 3 (10.3%). Patients with memory loss almost recovered utterly within the first month. However, four of the patients with ventricular hemorrhage had a radiological contusion and venous infarction and had hemiparesis. At 6 months of follow-up, three patients had a complete improvement in muscle strength loss, while one recovered enough to maintain their personal needs alone. In our study, the development of complications in foraminal colloid cysts was found to be significant (p =0.047).

Venous infarction is a common condition in the interhemispheric transcallosal approach. In our study, it developed in five patients (17.2%); 4 of them had clinical symptoms (hemiparesis). As a result of our study, the development of infarction in patients with preoperative hydrocephalus was found to be significant (p= 0.032). According to these results, it could be predicted that if preoperative hydrocephalus is better controlled, secondary venous infarcts may decrease.

Most of the complications seen in our study were the findings on radiological imaging and did not have clinical reflections. One of them presented as postoperatively observed pneumocephalus. In the early postoperative brain CT, 20 patients (69%) had pneumocephalus, and all of them regressed with medical treatment. In our study, the presence of postoperative pneumocephalus was found to be significant in colloid cysts with calcification on preoperative brain CT (p = 0.007).

Postoperative intra-cystic hematoma developed in three (10.3%) patients, but an additional surgical intervention was not planned for them. One patient had a postoperative epidural hematoma and underwent an urgent reoperation.

Surgical mortality refers to patients who died within the first 30 postoperative days. In another study, this rate varied between 0% and 4% (7). The incidence of meningitis in cases operated using the transcallosal approach was reported to be 1.1% in the literature (2). In our study, one patient had meningitis in the postoperative period and died. Therefore, mortality was 3.4% (1/29).

CONCLUSION

The successful resection of symptomatic third ventricular colloid cysts with minimum complication via the transcallosal interhemispheric approach is possible inexperienced clinics. However, due to the correlation found in hydrocephalus and venous infarction, more

aggressive interventions for hydrocephalus could reduce the risk of postoperative venous infarction and facilitate perioperative surgical resection.

Conflict of interest: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports.

Ethical approval: The data of 29 patients who were operated in Dokuz Eylül University Medical Faculty Hospital and Izmir Katip Celebi University Ataturk Training and Research Hospital between 2008 and 2019 were reviewed retrospectively. Moreover, this study was approved by the Ethics Committee (23.05.2019; decision number, 234).

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