

Anterior Interhemispheric Transcallosal Approach for the Treatment of Colloid Cysts of the Third Ventricle: Results of a Single-Center Retrospective Study

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ABSTRACT

Objective: The cases operated using the microscopic anterior interhemispheric transcallosal approach due to third ventricular colloid cyst during 2015–2020 in our clinic were discussed in the light of the literature.

Methods: Seven patients (four females, three males) operated for colloid cyst of the third ventricle were examined retrospectively in terms of their presentation complaints, neurological examinations, size of the colloid cysts detected, presence/absence of accompanying hydrocephalus, surgery performed, callosal incision diameter used in the surgery, post-operative neurological conditions, complications, epilepsy, and development of disconnection and neurocognitive disorders.

Results: No neurological deficits were observed in the post-operative examinations of any patients. It was observed that the colloid cysts of six patients were completely removed. None of the patients required shunts during their follow-up, and epileptic seizure, disconnection syndrome, and neurocognitive disorders were not observed.

Conclusion: The anterior interhemispheric transcallosal approach is a safe way to treat colloid cysts of the third ventricle for a good total resection, with a short operative time. This is associated with minimal morbidity.

INTRODUCTION

Colloid cysts are benign neoplasms that account for 0.5%–2% of all intracranial tumors and 15%–20% of intraventricular tumors. Histological and immunohistochemical studies have shown that colloid cysts are caused by ectopic endodermal elements migrating to the velum interpositum during the development of the central nervous system. Colloid cysts are located in the anterior third ventricle and can cause obstructive hydrocephalus by blocking the interventricular foramen of Monro; over time; as a result of the secretory activity of epithelial cells, they can increase in size and lead to sudden death.^[1] Patients can remain asymptomatic for a long time.^[2] Colloid cysts can present with paroxysmal headaches and obstructive hydrocephalus. Headaches become more severe in the morning and worsen with leaning forward. Other important symptoms are gait disturbance, nausea, vomiting, and behavioral changes.

Falls associated with sudden weakness of the lower extremities without loss of consciousness have been reported. Impaired memory and new learning ability have been reported as well. Colloid cysts can cause death due to increased intracranial pressure, pulmonary edema, and cardiac dysfunction triggered by cerebral conditions.^[3] Computed tomography (CT) usually reveals a round or oval lesion homogeneously, with two-thirds hyperdense and one-third isodense compared to the surrounding parenchyma. Magnetic resonance imaging (MRI) signal intensities of colloid cysts are variable; the most common appearance is hyperintensity in T1-weighted sequences and iso-hypo-intensity in T2-weighted sequences.^[4] Spontaneous resolution of colloid cysts has been reported.^[5] Asymptomatic lesions <1 cm without ventriculomegaly should be followed up periodically with clinical and radiological evaluation. Surgical treatment should be considered in symptomatic patients, growing cysts, and cases associated with hydrocephalus.^[6]

The objectives of surgical procedures are to achieve a complete resection that prevents long-term recurrence and to restore the cerebrospinal fluid (CSF) pathway with minimal morbidity and mortality.^[2] In this study, patients who were operated on using a microscopic anterior interhemispheric transcallosal approach for colloid cyst of the third ventricle during 2015–2020 in our clinic are discussed in the light of the literature.

MATERIALS AND METHODS

In this study, four of the patients were female (57.1%), three were male (42.8%), and their ages were between 25 and 62 (mean 42.7) (Table 1). Headache was the complaint at their admission, while two patients reported urinary incontinence. No deficit was found in the neurological examination of all patients. In brain CT and contrast-enhanced MRI examinations, six patients were found to have hydrocephalus in addition to the third ventricular colloid cyst. The sizes of the colloid cysts ranged from 12.5 mm to 24.4 mm (mean 17.9 mm). Colloid cyst resection was performed with a microscopic anterior interhemispheric transcallosal approach in all patients whose preoperative preparations were completed (Fig. 1).

Surgical technique

All patients were operated under general anesthesia using neuronavigation in the supine position, with the head slightly flexed with the help of headgear with nails. Craniotomy was performed on the right side with 2/3rd of the coronal suture in the anterior and 1/3rd in the posterior in the midline. After opening the dura, the corpus callosum was reached by microscopically advancing to the interhemispheric region. After a limited callosal incision (Fig. 2), the lateral ventricle was reached, and the CSF was drained. After the fornix, septum pellucidum, choroid plexus, and foramen of Monro were identified, the colloid cyst was resected from the surrounding structures.

RESULTS

No neurological deficit was observed in the post-operative neurological examinations of the patients included

in the study. Total removal of colloid cysts in six patients was confirmed by post-operative contrast-enhanced MRI.

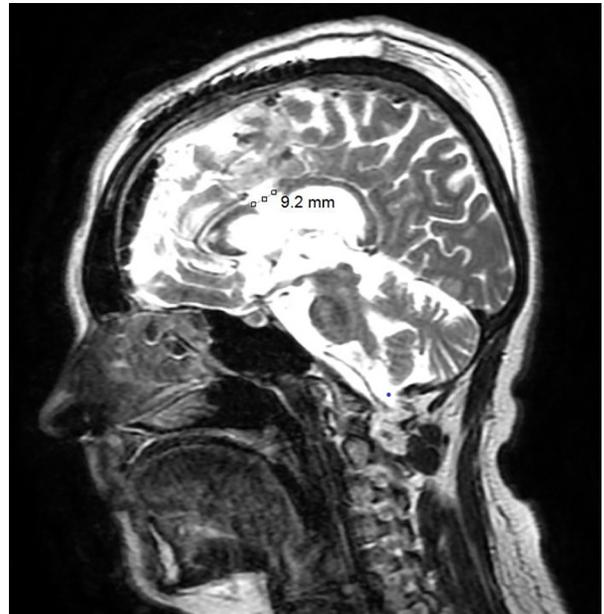


Figure 2. Postoperative sagittal T2-WI revealing the callosal incision margins (9.2 mm).

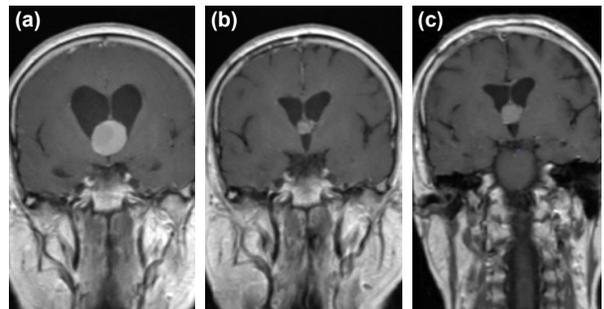


Figure 3. A demonstrative case from the presented series who was operated for a colloid cyst. Preoperative contrast-enhanced coronal section of T1WI revealing the colloid cyst of 3rd ventricle (a). Early postoperative contrast-enhanced coronal section of T1WI revealing a residual lesion (b). Postoperative 4th year contrast-enhanced coronal section of T1WI revealing a larger residual cyst (c).

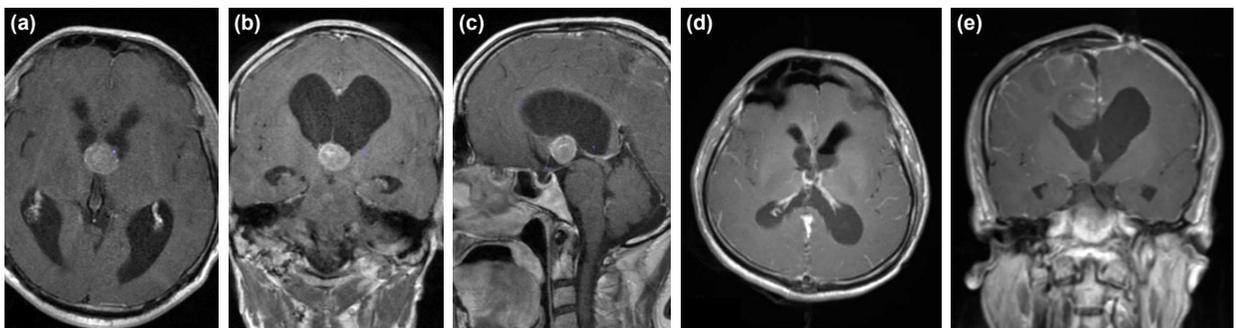


Figure 1. Preoperative contrast-enhanced MRI of a patient from case series revealed a colloid cyst of 3rd ventricle (axial (a); coronal (b); and sagittal (c) T1-WI). Postoperative contrast enhanced MRI of the same patient revealed total resection of the colloid cyst (axial (d); and coronal (e) T1-WI).

Table 1. Cases

Case	Age	Complaint	Neurological examination	Hydrocephalus	Colloid cyst sizes	Surgery performed	Postop neurological examination	Postoperative hydrocephalic index reduction	Recurrence or residual	Callosotomy borders
1	34	Headache	Intact	+	16.5 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	-	20.6 mm
2	48	Headache, imbalance, incontinence	Romberg (+)	+	21.9 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	-	12.5 mm
3	40	Headache, imbalance	Intact	-	14.0 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	-	-	9.0 mm
4	62	Headache, incontinence	Intact	+	24.4 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	+	19.5 mm
5	25	Headache	Intact	+	23.8 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	-	13.7 mm
6	51	Headache, nausea, vomiting	Intact	+	12.5 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	-	17.3 mm
7	39	Headache	Intact	+	12.6 mm	(Microsurgery) Total mass resection via anterior interhemispheric transcallosal approach	Intact	+	-	9.2 mm

In one patient, a residual part was observed due to the adhesion of the cyst wall to the internal cerebral vein, and the patient with post-surgery cyst recurrence in the fourth year was followed up asymptotically (Fig. 3). It was observed that the post-operative hydrocephalus index improved in all patients presenting with hydrocephalus. None of the patients required shunts during their follow-up, and no epileptic seizure was observed. In the post-operative control MRIs, the intraoperative callosal incision margins were measured between 9.0 mm and 20.6 mm (mean 14.6 mm). Further, disconnection syndrome and neurocognitive disorders were not observed in any of the patient.

DISCUSSION

Treatment options for colloid cysts are observation, shunt surgery, stereotactic aspiration, and microscopic or endoscopic resection. There is still no consensus on the most effective surgical approach for resecting colloid cysts of the third ventricle. Ventriculoperitoneal shunt drainage can be used as a treatment option in hydrocephalus-associated colloid cysts, especially in patients with high mortality and morbidity. Shunt procedures provide a relatively simple option for the treatment of colloid cysts; however, in case of shunt dysfunction, bilateral shunt placement or endoscopic septal fenestration, with the ongoing risk of sudden death, are required.^[7]

Stereotactic aspiration of the cyst is a minimally invasive approach that has been discredited due to a high rate of cyst recurrence. The two main surgical options for the treatment of colloid cysts are endoscopic and microscopic resection with a transcortical or transcallosal approach. Microsurgical approaches were traditionally the main approach for the management of colloid cysts until the recent emergence of neuroendoscopy, which offers an alternative minimally invasive approach. However, there is still no clear consensus on which surgical approach is the most effective.^[8]

The microscopic transcallosal approach is a direct and safe way to treat colloid cysts of the third ventricle, especially in the absence of ventriculomegaly. A good total resection rate associated with short operative time and minimal morbidity can be achieved with this approach. Since no cortical incision is made, the risk of epilepsy is very low.^[9] In all of the six cases presented here, the lesion was completely removed, and none of the patients had post-operative epileptic seizures. In the microscopic transcallosal approach, a limited anterior callosotomy does not cause disconnection syndrome and neurocognitive disorders. Long-term good cognitive performance can be observed with a callosal incision of ≤ 1 cm with a meticulous dissection around the fornix.^[10] In the cases we studied, the mean callosal incision was measured as 14.6 mm. Despite the mean callosal incision of our study group is more than 1 cm; neither disconnection syndrome nor neurocognitive disorders were observed. Cyst resection can be achieved with a microscopic transcortical approach with a small in-

cision in the frontal region, especially in patients with significant hydrocephalus; however, the risk of seizure after surgery has been reported to be as high as 25%.^[11]

In a study conducted by Sheikh et al.,^[12] the data of 583 patients with third ventricular colloid cysts treated with the microsurgical technique were compared with 695 patients treated with the endoscopic technique. They concluded that microsurgical resection of colloid cysts is characterized by higher radicality, lower recurrence, and repeated operation rates compared to endoscopic resection.

CONCLUSION

In conclusion, the microscopic transcallosal approach is an effective surgical approach in the treatment of colloid cysts, which is still up-to-date in the era of endoscopy. Although it requires callosotomy and is performed around the fornices, disconnection syndrome and neurocognitive disorders are rare complications.

Ethics Committee Approval

This study approved by the İstanbul Fatih Sultan Mehmet Training and Research Hospital Clinical Research Ethics Committee (Date: 08.10.2020, Decision No: 2020/107).

Informed Consent

Retrospective study.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: A.B., J.H.; Design: A.B., J.H.; Supervision: A.B., J.H.; Fundings: A.B., J.H.; Materials: A.B., J.H.; Data: A.B., J.H.; Analysis: A.B., J.H.; Literature search: A.B., J.H.; Writing: A.B., J.H.; Critical revision: A.B., J.H.

Conflict of Interest

None declared.

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Üçüncü Ventrikül Kolloid Kistlerinin Tedavisi için Anterior İnterhemisferik Transkallosal Yaklaşım: Tek Merkezli Geriye Dönük Çalışmanın Sonuçları

Amaç: Kliniğimizde 2015–2020 tarihleri arasında üçüncü ventrikül kolloid kisti nedeniyle mikroskopik anterior interhemisferik transkallosal yaklaşımla opere edilen olgular literatür eşliğinde tartışılmıştır.

Gereç ve Yöntem: Üçüncü ventrikül kolloid kisti nedeniyle opere edilen yedi hastanın (4 kadın, 3 erkek) başvuru şikayetleri, nörolojik muayeneleri, saptanan kolloid kistlerin boyutları, hidrosefali eşlik edip etmediği, yapılan cerrahi, cerrahi esnasında yapılan kallosal kesi çapları, postop nörolojik durumları, komplikasyon, epilepsi, diskonneksiyon ve nörokognitif bozukluklar gelişip gelişmediği geriye dönük olarak incelendi.

Bulgular: Tüm hastaların ameliyat sonrası nörolojik muayenelerinde bir defisit gözlenmedi. Altı hastanın kolloid kistlerinin total olarak çıkarıldığı görüldü. Takiplerinde hiçbir hastanın şant gereksinimi olmadı, epileptik nöbet, diskonneksiyon sendromu ve nörokognitif bozukluklar gözlenmedi.

Sonuç: Anterior interhemisferik transkallosal yaklaşım, kısa operasyon süresi minimal morbidite ile ilişkili, iyi total rezeksiyon için üçüncü ventrikül kolloid kistlerinin tedavisinde güvenli bir yoldur.

Anahtar Sözcükler: Anterior interhemisferik transkallosal yaklaşım; kist rezeksiyonu; kolloid kist; mikroskopik rezeksiyon.