



OLGU SUNUMU / CASE REPORT

Interhemispheric transcallosal transforaminal approach to benign lesions located anteriorly in the third ventricle: case series

Üçüncü ventrikül anterior yerleşimli benign lezyonlarda interhemisferik transkallozal transforaminal yaklaşım: olgu serisi

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Abstract

Benign or malignant masses located in the third ventricle may present with various clinical signs. In this paper, we report three cases of colloid cyst and a rare cavernous hemangioma located in the third ventricle. This infrequent localization of cavernous hemangioma was discussed under the light of the lesions' clinical and radiological features, and the outcomes of the interhemispheric transcallosal transforaminal surgical approach. Interhemispheric transcallosal and transforaminal approach is a safe route for total excision of benign lesions, such as colloid cyst and cavernous hemangioma, which are located anteriorly in the third ventricle.

Key words: Colloids cyst, cavernous hemangioma, interhemispheric approach.

Öz

Benign veya malign karakterli üçüncü ventrikül yerleşimli kitleler farklı klinik bulgular ile presente olabilirler. Bu çalışmamızda üçüncü ventrikül yerleşimli 3 kolloid kist ve nadir olan bir kavernöz hemanjiomdan oluşan olgularımız değerlendirilmiştir. Olguların klinik, radyolojik bulguları ve interhemisferik transkallosal transforaminal cerrahi yaklaşımın sonuçları ile beraber kavernöz hemanjiomun sık rastlanmayan bu yerleşimi tartışılmıştır. Ventrikül anterioruna yerleşmiş kolloid kist ve kavernöz hemanjiom gibi benign lezyonlarda interhemisferik transkallozal ve transforaminal yaklaşım total eksizeyon için güvenli bir yoldur.

Anahtar kelimeler: Kolloid kist, kavernöz hemanjiom, interhemisferik yaklaşım.

INTRODUCTION

Many benign and malignant tumors and cysts are located in the third ventricle. Craniopharyngiomas, gliomas, ependymomas, colloid cysts, and choroid plexus papillomas are the primary lesions located in the third ventricle. Cavernous hemangiomas have also rarely been reported to be located as primary lesion in the third ventricle. Meningiomas, optic nerve and hypothalamic gliomas, pituitary adenomas and craniopharyngiomas originating from the tissues surrounding this region may show secondary extension to the third ventricle^{1,2,3}.

Lesions located in the third ventricle may manifest with a wide variety of clinical signs, which may be

non-specific or related to hydrocephalus. The risk of obstructive type hydrocephalus particularly increases the importance of lesions located in this region. These lesions may lead to headache, vomiting, altered consciousness, psychiatric symptoms, or even sudden death. Symptomatic mass lesions located in the third ventricle are easily demonstrated, and sometimes incidentally detected, by modern diagnostic methods such as computerized tomography (CT) and magnetic resonance imaging (MRI)^{4,5}.

Mass lesions located in the third ventricle can be accessed by various surgical routes. Transcortical-transventricular, transcallosal-transforaminal, transcallosal-interforniceal, transcallosal-subchoroidal trans-velum interpositum, subfrontal

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or pterional trans-lamina terminalis approaches or their combinations with microsurgical techniques are the frequently used surgical methods^{1,2,6}.

In this study, we reported benign lesions located in the third ventricle, consisting of three colloid cysts and one rare cavernous hemangioma. This infrequent localization of cavernous hemangioma was discussed under the light of the lesions' clinical and radiological features, and the outcomes of the interhemispheric transcallosal transforaminal surgical approach.

CASES

Four cases operated for a primary benign mass located in the third ventricle between 2010 and 2016 were retrospectively examined. Admission symptoms, age, sex, symptom duration, lesion size, applied surgical method, pathology results, and postoperative complications were analyzed (Table 1).

Two cases were female and 2 were male. Their mean age was 42 years (19-65 years). Their symptoms included diplopia, loss of consciousness, personality changes, and drop attacks. The time range for symptom development was 1-30 days.

In all cases, cortical veins draining into superior sagittal sinus were evaluated by an MR venography at the preoperative period. In all cases, the third ventricle was accessed via a transcallosal transforaminal route using an interhemispheric approach after craniotomy incision that passed the midline following a horse shoe skin incision, 2/3 of which remained anterior to the coronary suture and 1/3 of which remained posterior to the coronal suture. No signs of disconnection due to callosotomy were observed in any of the patients.

Case 1

A 19-year-old woman presented with diplopia for 15 days. Neurological examination revealed left-sided 6th nerve palsy. Cranial MRI showed a non-contrast enhanced well-circumscribed mass lesion with a diameter of 13 mm anteriorly in the third ventricle, appearing isointense on T1 weighted images and hyperintense on T2 weighted images and expanding the lateral ventricle on the left side (Figure 1a,1b). Since the cortical bridging veins draining into sagittal sinus on the right side were densely packed (Figure 1c) and the left lateral

ventricle was large, a left interhemispheric intervention was preferred (Figure 2). An MRI taken within 24 hours after the operation showed no residue (Figure 1d). A lumbar drainage was applied because the patient had postoperative cerebrospinal fluid (CSF) fistula. Pathology examination revealed a colloid cyst. No neurological deficit or recurrence developed during a follow-up of 1.5 years.

Case 2

A 41-year-old male with personality changes occurring for a month. MRI demonstrated hydrocephalus and a 26-mm multilobulated, well-circumscribed, non-contrast enhanced mass lesion located in the anterior part of the third ventricle, which appeared hyperintense on T1 weighted images and hypointense on T2 weighted images (Figure 3). A right interhemispheric approach was preferred (Figure 4). An MRI taken within the first 24 hours after the operation showed no residue (Figure 3). Memory loss observed at the early postoperative period completely recovered within one month. Pathological diagnosis was cavernous hemangioma. During a follow-up of 9 years no neurological deficit or recurrence developed.

Case 3

In a 43-year-old female with sudden drop attacks and diplopia. MRI demonstrated a well-circumscribed, non-contrast enhanced mass that was 20 mm in diameter and that appeared hyperintense on T1 weighted images and hypointense on T2 weighted images. A right interhemispheric approach was preferred. No residue was observed on cranial MRI obtained within the first 24 hours after the operation. Pathologic examination revealed a colloid cyst. During a follow-up of 6 years no neurological deficit was observed.

Case 4

A 65-year-old male with drop attacks for a month underwent a cranial MR that demonstrated a well-circumscribed, non-contrast enhanced mass in the anterior part of the third ventricle, which was 12 mm in diameter and which appeared isointense on T1 weighted images and hyperintense on T2 weighted images. A right interhemispheric intervention was preferred. No residue was observed in a cranial MRI obtained within the first 24 hours after the operation. During a follow-up of 3 years, no neurological deficit developed.

Table 1. Demographic and clinical presentation of cases

Case	Age, Sex	Clinical presentation	Mass diameter (mm)	Surgical intervention	Extended GOS	Pathology
1	19,F	Diplopia	13 mm	Left interhemispheric transcallosal	8	Colloid cyst
2	41, M	Personality changes	26 mm	Right interhemispheric transcallosal	7	Cavernous hemangioma
3	43, F	Drop attacks and diplopia	20 mm	Right interhemispheric transcallosal	8	Colloid cyst
4	65, M	Drop attacks and diplopia	12 mm	Right interhemispheric transcallosal	8	Colloid cyst

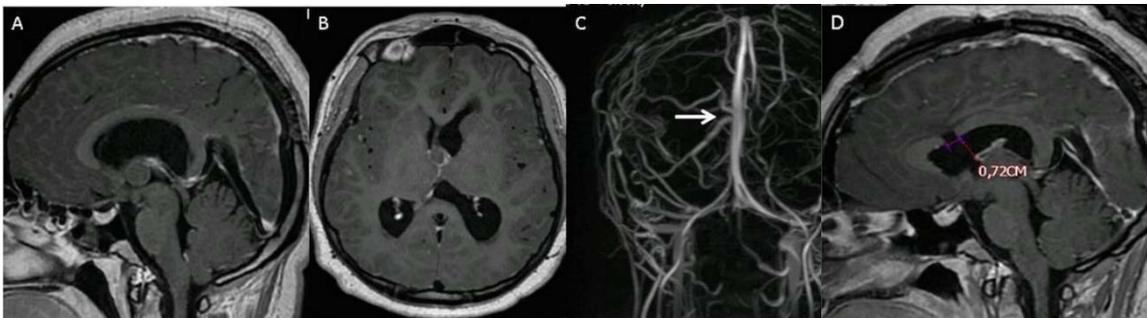


Figure 1. The sagittal and axial MRI T1 sections with contrast show an isointense, non-contrast enhanced colloid cyst in the anterior part of the third ventricle (A,B) of our first case. The venographic examination of the same case demonstrates veins draining into sagittal sinus at the level of coronary suture on the right side, necessitating a left interhemispheric approach (C). Postoperative MRI demonstrates a totally excised colloid cyst and callosotomy (D).

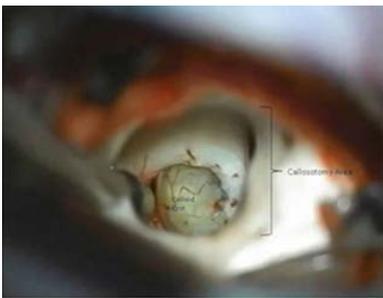


Figure 2. The intraoperative appearance of foramen monro and the colloid cyst from the callosotomy area after left interhemispheric transcallosal approach.

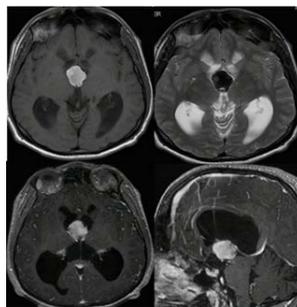


Figure 3. The radiological appearance of the multilobulated cavernous hemangioma located in the anterior part of the third ventricle, which appears hyperintense on T1, hypointense on T2, and non-contrast enhanced.



Figure 4. Septal vein, choroid plexus, and cavernous hemangioma after right interhemispheric transcallosal approach.

DISCUSSION

The third ventricle is located in the central brain and surrounded by centers responsible for motor, endocrinological and vegetative control in addition to important neural structures such as corpus callosum, anterior commissure, thalamus, and pyramidal tract^{2,7,8}. Many neoplastic and inflammatory lesions may be located in the third ventricle. Astrocytomas, suprasellar germinomas, ependymomas, glioblastoma multiforme, craniopharyngiomas, subependymal giant cell astrocytomas, colloid cysts, dermoid epidermoid tumors, meningiomas, neurocysticercosis, and cavernous hemangiomas may all be located in this region^{3,6}. Herein, we reported benign lesions of colloid cyst and cavernous hemangioma located anteriorly in the third ventricle not originating from adjacent tissues.

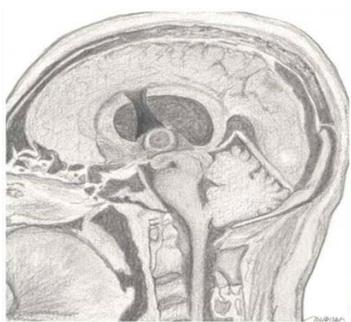


Figure 5. Illustration of surgical approach to third ventricle lesion.

In general, lateral ventricle is accessed via transcallosal, transcortical, and endoscopic routes. After lateral ventricle is accessed, the third ventricle may be entered via transforaminal, transcallosal-subchoroidal trans-velum interpositum and interforaminal routes. The transcallosal approach is the most preferred method since a complete command of the third ventricle can be gained from its superior aspect with this approach^{7,9}. In all of our cases, the lesions were directly accessed via interhemispheric transcallosal transforaminal approach (Figure 5).

While Apuzzo et al. stressed the importance of the angiography to verify the presence of venous collaterals draining into sagittal sinus in the interhemispheric transcallosal approach, Yaşargil and Türe reported the importance of magnetic resonance (MR) venography to define venous drainage and the relationship between anterior septal

vein and internal cerebral vein^{10,11,12}. Kasowski et al. usually preferred the non-dominant hemisphere for the approach to the ventricular system; intervention from the contralateral hemisphere may be preferable when a large surgical corridor can be opened¹³. In our first case, a left-sided interhemispheric approach was used since the right side had a denser venous drainage of the surgical field and the left side had larger lateral ventricle in MR venography and MRI. In our other three cases, the masses were accessed by a right interhemispheric approach.

Apuzzo et al. recommended interforaminal approach for lesions in the anterior and middle parts of the third ventricle when the transforaminal approach is inadequate⁶. Since all of our lesions were located in the anterior part of the third ventricle and they were all benign lesions not invading the ventricular walls, a total command of the masses could be gained. Colloid cysts have drawn the attention of brain surgeons by virtue of their disputed origin, benign histology, dramatic clinical presentations, and various treatment options¹⁴. In a study by Pollock et al. that explored the natural course of colloid cysts, 8% of the cases became symptomatic¹⁵. Symptomatic cases may present with headache, hydrocephalus, diplopia, drop attacks, or psychiatric disorders, but the condition may also result in sudden death^{4,5,7,15}. Our cases had no acute hydrocephaly but diplopia, drop attacks, and personality changes. Sudden death has been linked to the proximity of cardiovascular centers to the third ventricle or to sudden-onset hydrocephaly¹⁶. The mechanism of drop attacks has been linked to transient CSF flow blockage; however, as Kelly also stressed, other symptoms are not specific for colloid cysts located in the third ventricle^{15,16,17}. Total excision of colloid cysts is recommended in symptomatic cases since simple cyst aspiration is not sufficient¹¹.

Conservative treatment may be appropriate for asymptomatic supratentorial parenchymal cavernous hemangiomas. However, cavernous hemangioma within the third ventricle pose danger for vital structures around it⁴. Cavernous hemangioma is quite rare in the third ventricle, as such a literature scan revealed only 29 cases so far³. Cavernomas in the third ventricle are divided into four groups depending on their origin and their relationship with the third ventricle: suprachiasmatic, lateral wall, foramen monro, and floor¹⁸. According to this classification, our case was a foramen monro lesion.

Katayama et al. reported that cavernous hemangiomas in the third ventricle may grow slowly to transform into giant malformations due to lower mechanical resistance because of the lack of any surrounding brain tissue, and to recurrent bleeding episodes within lesions¹⁹. We also observed old foci of bleeding within a cavernoma lesion intraoperatively. Moreover, extralesional bleeding may also occur, albeit rarely. Therefore, cavernous hemangiomas located within the third ventricle should be aggressively treated^{3,18,19}. Surgical excision of intraventricular cavernous hemangiomas is simple since these lesions are well-circumscribed, intervascular neural tissue is lacking, and their vascular supply is lower. However, surgical risk is higher in this region owing to its complex anatomy and its neighborhood with deep venous structures. Risk of re-growth and extralesional bleeding can only be prevented by total excision²⁰.

In case of the failure to excise a lesion totally, cavernous hemangiomas may present with bleeding, and colloid cysts may recur. Therefore, the content of these benign lesions should be debulked after opening their capsule, and care must be taken to excise them totally, without injuring surrounding venous structures, choroid plexus, and the walls of the third ventricle which host important anatomic structures.

Interhemispheric transcallosal and transforaminal approach is a safe route for total excision in benign lesions such as colloid cyst and cavernous hemangioma that are located in the anterior part of the third.

REFERENCES

- Kononov AN, Gorelyshev SK: Surgical treatment of anterior third ventricle tumours. *Acta Neurochir(Wien)*. 1992;118:33-9.
- Erturk M, Kayalioglu G, Ozer MA, Ozgur T. Morphometry of the anterior third ventricle region as a guide for the transcallosal-interforaminal approach. *Neurol Med Chir (Tokyo)*. 2004;44:288-92; discussion 292-93.
- Han MS, Moon KS, Lee KH, Kim SK, Jung S. Cavernous hemangioma of the third ventricle: a case report and review of the literature. *World J Surg Oncol*. 2014 29;12:237.
- de Witt Hamer PC, Verstegen MJ, De Haan RJ, Vandertop WP, Thomeer RT, Mooij JJ, van Furth WR High risk of acute deterioration in patients harboring symptomatic colloid cysts of the third ventricle. *J Neurosurg*. 2002;96:1041-45.
- Silva D, Matis G, Chrysou O, Carvalho Junior EV, Costa L, Kitamura M. Sudden death in a patient with a third ventricle colloid cyst. *Arq Neuropsiquiatr*. 2012;70:311.
- Apuzzo ML, Chikovani OK, Gott PS, Teng EL, Zee CS, Giannotta SL, Weis MH: Transcallosal, interforaminal, approaches for lesions affecting the third ventricle: Surgical considerations and consequences. *Neurosurgery*. 1982;10:547-54.
- Danaila L, Radoi M. Surgery of tumors of the third ventricle region. *Chirurgia (Bucur)*. 2013;108:456-62.
- Wen HT, Rhoton AL Jr, de Oliver EP: Transchoroidal approach to the third ventricle: an anatomic study of the choroidal fissure and its clinical application. *Neurosurgery*. 1998;42:1205-17; discussion 1217-9.
- Bellotti C, Pappada G, Sani R, Oliveri G, Stangalino C. The transcallosal approach for lesions affecting the lateral and third ventricles: surgical considerations and results in a series of 42 cases. *Acta Neurochir (Wien)*. 1991;111:103-7.
- Apuzzo ML. Commentary. *Neurosurgery*. 1990;26:542
- Yaşargil MG, Abdulrauf SI. Surgery of intraventricular tumors. *Neurosurgery*. 2008;62:1029-40.
- Türe U, Yaşargil MG, Al-Mefty O: The transcallosal-transforaminal approach to the third ventricle with regard to the venous variations in this region. *J Neurosurg*. 1997;87:706-15.
- Kasowski HJ, Nahed BV, Piepmeyer JM Transcallosal transchoroidal approach to tumors of the third ventricle. *Neurosurgery*. 2005;57:361-66.
- Symss NP, Ramamurthi R, Rao SM, Vasudevan MC, Jain PK, Pande A. Management outcome of the transcallosal, transforaminal approach to colloid cysts of the anterior third ventricle: an analysis of 78 cases. *Neurol India*. 2011;59:542-47.
- Pollock BE, Huston J 3rd: Natural history of asymptomatic colloid cysts of the third ventricle. *J Neurosurg*. 1999;91:364-69.
- Ryder JW, Kleinschmidt-DeMasters BK, Keller TS. Sudden deterioration and death in patients with benign tumour of the third ventricle area. *J Neurosurg*. 1986;64:216-23.
- Kelly R. Colloid cysts of the third ventricle: Analysis of twenty-nine cases. *Brain*. 1951;74:23-65.
- Sinon G, Zager EL, Grossman RI, Gennarelli TA, Flamm ES. Cavernous malformations of the third ventricle. *Neurosurgery*. 1995;37:37-42.
- Katayama Y, Tsubokawa T, Maeda T, Yamamoto T: Surgical management of cavernous malformations of the third ventricle. *J Neurosurg*. 1994;80:64-72.
- Li ST, Hu WZ, Kochanski R, Zhang WC, Tao BB; Lu HT et al. Cavernous angiomas of the third ventricle: a series of eight patients and review of the literature. *Journal of Neurological Sciences (Turkish)*. 2012;29:863-76.