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ORIGINAL ARTICLE

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Transcortical-transventricular approach in colloid cysts of the third ventricle: surgical experience with 26 cases

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Abstract Colloid cysts of the third ventricle account for 0.5–2% of all intracranial tumors. The treatment of these benign tumors remains controversial, and the best surgical option has not yet been determined. Between 1995 and 2002, 27 patients with colloid cysts of the third ventricle presented at our clinic. Twenty-six underwent transcortical-transventricular approaches. One refused surgical treatment. There was no surgical mortality. The main morbidity was epileptic seizures in two patients. Overall outcome was good in all patients. The mean follow-up period was 3.4 years. There were no tumor recurrences. The transcortical-transventricular approach can be used safely to excise third ventricle colloid cysts with low risk of mortality and morbidity.

Keywords Colloid cyst · Outcome · Transcortical-transventricular · Treatment

Introduction

Colloid cysts of the third ventricle are rare and comprise 0.5–2% of all primary brain tumors [1, 2, 3, 4]. These benign and congenital tumors are considered an ectopic endodermal migration in the velum interpositum during development of the central nervous system [5]. Despite their rarity, by the development of modern neuroradiological interventions such as computed tomography (CT) and magnetic resonance imaging (MRI), detection of colloid cysts of the third ventricle has become more frequent and accurate [1].

Although the treatment of asymptomatic colloid cysts without ventricular enlargement remains controversial, the current opinion is that the symptomatic cysts should always be treated. The operative mortality and morbidity have been reduced dramatically by the development of modern neurosurgical techniques. There are various surgical approaches for the treatment of third ventricle colloid cysts, such as transcortical-transventricular [6], transcallosal [7], endoscopic [8, 9, 10], and stereotactic microsurgical [11], but the best surgical option has not yet been determined.

In this report, we present the results of the transcortical-transventricular approach in 26 patients with colloid cysts of the third ventricle. Clinical records, radiological features, and follow-up notes of patients are also presented.

Patients and methods

Between 1995 and 2002, a total of 27 patients with colloid cysts of the third ventricle were managed in our neurosurgical department. The symptoms and signs, radiological findings, operative results, and follow-up notes were studied. Computed tomography or MRI was performed in all cases (Fig. 1). Cyst size was measured based on the maximum diameter of the cyst on CT or MRI scans. The cysts were divided into three categories: small (<1.5 cm), medium (1.5–3 cm), and large (>3 cm). Twenty-six patients were treated surgically with a transcortical-transventricular approach through the middle frontal gyrus of the nondominant lobe. The operative microscope was used for surgery in all cases. One patient, in whom the diagnosis was made incidentally on CT after a traffic accident, refused surgery. In surgically treated patients, the duration of the follow-up period varied between 8 months and 6.5 years, with a mean of 3.4 years. Computed tomographic scans were obtained in 20 patients and MRI in six during follow-up period (Fig. 2).

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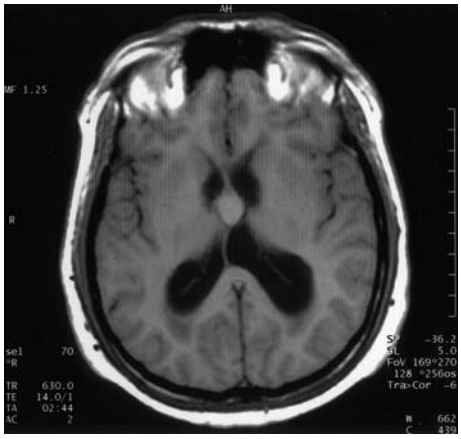

Fig. 1 A 35-year-old male presented with headache, vomiting, and nausea. The preoperative T1-weighted axial MR image shows an isointense colloid cyst causing hydrocephalus by obstructing the foramen of Monro bilaterally

Results

Fourteen patients were female and 13 were male. The mean age was 34.2±13.4 years (range 12–61) at the time of diagnosis. Headache (93%), and vomiting and/or nausea (48%) were the most common symptoms on admission (Table 1). The mean duration of symptoms varied from 4 days to 2 years, with a mean of 8.9±12.9 months. Scans on CT and MRI were conducted in 23 patients. In three patients, only MRI scans were obtained. The cysts were small in two patients (7%), medium in 24 (89%), and large in one (4%) (Table 2). Ventricular dilatation was observed in all patients on CT and/or MRI. There was no mortality after surgical treatment. The most common complication was seizures in two patients (8%). An additional complication was wound infection in one patient (4%) that was treated with antibiotics alone. Clinical and radiological recurrence was not observed during the follow-up period.

Table 1 Presenting symptoms

Symptom	Incidence (%)
Headache	93
Vomiting and/or nausea	48
Gait disturbance	44
Seizures	15
Drop attacks	15
Memory disturbance	11
Visual disturbance	11
Mental changes	7
Urinary incontinence	7
Coma[a]	4
Incidental	4

[a] The 32-year-old female was admitted to another hospital in a comatose state and referred to our clinic after treatment with ventriculoperitoneal shunting

Table 2 Cyst size on CT or MRI scan

Cyst size	Incidence (%)
<1.5 cm (small)	7
1.5–3 cm (medium)	89
>3 cm (large)	4

Discussion

Although colloid cysts of the third ventricle can appear at any age, they rarely occur in children [5]. Although some series in the literature report a male dominance [8, 12, 13, 14], others have equal numbers among the sexes [2, 3, 15, 16], as noted in our series.

Colloid cysts of the third ventricle are usually located at the level of the foramen of Monro. Therefore, many of these patients present with symptoms of increased intracranial pressure and hydrocephalus [1, 4]. The most common symptom is headache [2, 3, 8, 11, 12, 16, 17, 18]. It was observed in 25 patients (97%) in our series, and the average duration of symptoms at presentation was 8.9±12.9 months.

Colloid cysts of the third ventricle can also be a possible cause of sudden death resulting from acute

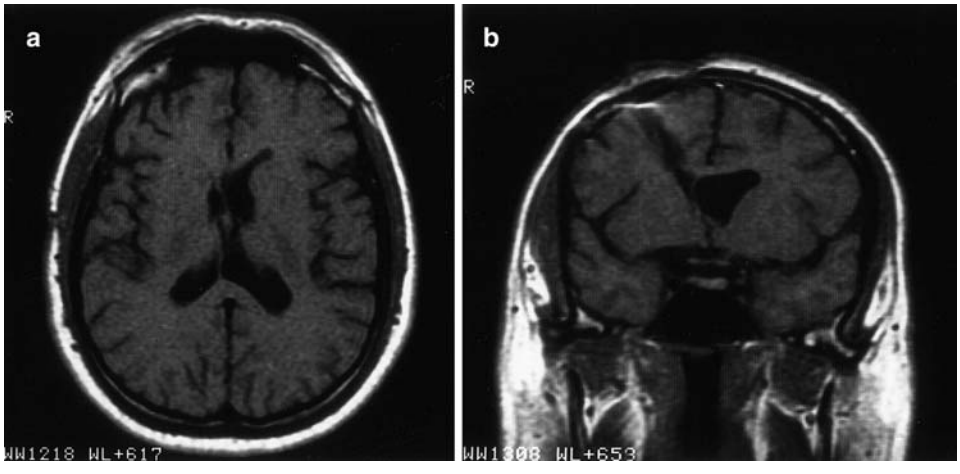

Fig. 2a, b Postoperative, T1-weighted MR imaging. **a** Contrast-enhanced, axial image obtained 12 months after operation. **b** Coronal image showing the operative path through the white matter of the right frontal lobe

obstruction of cerebrospinal fluid pathways [3, 19, 20]. In our series, one patient had been admitted to another hospital with sudden neurological deterioration and in a comatose state and referred to our clinic after her acute hydrocephalus was treated by ventriculoperitoneal shunt. She was operated on 3 days after admission and treated with removal of the cyst via the transcortical-transventricular route. The previous ventriculoperitoneal shunt was also removed.

Colloid cysts of the third ventricle can be also asymptomatic, and the diagnosis may be incidental. Their natural history is not well known. In patients whose cysts are incidentally discovered, the optimal treatment still seems controversial. Camacho et al. reported 24 patients with colloid cysts in whom no surgery was recommended. With a mean follow-up interval of 19.3 months, none of those patients exhibited cyst-related symptoms [15]. The authors suggested that incidentally discovered colloid cysts may be monitored by follow-up examination in the appropriate medical setting [15]. Pollock and Huston presented 58 patients with asymptomatic, untreated colloid cysts and a mean clinical follow-up period of 79 months [18]. They reported the 2-, 5-, and 10-year incidences of cyst-related symptom development to be 0%, 0%, and 8%, respectively [18]. Hernesniemi and Leivo reported sudden death in a patient with small colloid cyst less than 12 mm diameter during the follow-up period without surgery [3]. In our series, there was one patient (35 years old, male, colloid cyst 11 mm in diameter) in whom the diagnosis was made incidentally with CT scan after a traffic accident. This patient refused surgical treatment. Therefore, clinical and neuroradiological follow-up were recommended, but the patient was lost to follow-up review in the first month.

We do not have enough experience in patients with asymptomatic colloid cysts in our series. However, this is a benign disease, and patients might be preserved from lethal complications such as sudden neurological deterioration and sudden death due to acute obstruction of CSF pathways, especially with colloid cysts more than 10 mm in size. Hamer et al. reported that the risk of acute deterioration in symptomatic patients with colloid cysts in the Netherlands is estimated to be 34% [21]. Although they suggest the estimated risk for patients in whom asymptomatic colloid cysts have been identified incidentally is considerably lower, they strongly advocate the use of appropriate neurosurgical intervention in patients presenting with symptomatic colloid cysts [21].

In our series, medium-size colloid cysts (1.5–3 cm) were found in 24 patients (89%). This proportion was greater than in the series of Desai et al. [12]. It is possible to detect colloid cysts of the third ventricle by modern neuroradiological investigations with ease, especially in the early period.

There are numerous surgical approaches for treating colloid cysts of the third ventricle, but none has gained overall acceptance. Endoscopic colloid cyst excision has been reported to be a good and safe alternative [8, 9, 10, 22, 23, 24]. Recently, Hellwig et al. reported favorable results in 18 of 20 patients treated with endoscopic surgery and follow-up periods ranging from 1 to 10 years [9]. The recurrence rate in their series was 5%, and they reported short operative and hospitalization times. Similarly, Lewis et al. and Longatti et al. reported that the endoscopic approach required shorter operating time and hospital stay [24, 25].

Endoscopic techniques are being used increasingly for colloid cyst surgery, but this management requires experience. Although the development of sophisticated endoscopic instruments and combination of endoscopic surgery with neuronavigation has lowered complication rates, there is no doubt that there is a real learning curve for this surgical technique. Fornix damage due to manipulation of the endoscopic sheath, thermal injuries due to excessive electrocoagulation, intraoperative hemorrhage, and aseptic ventriculitis are potential complications associated with endoscopic surgery [8, 9, 23]. However, compared to microsurgical techniques, endoscopy cannot offer complete excision of colloid cysts of the third ventricle and carries a potential recurrence risk [8]. Decq et al. reported 22 patients with third ventricle colloid cysts that were operated on by endoscopy with an average follow-up period of 2 years [26]. They observed residual cysts with an average diameter of 9 mm in eight patients (36%) [26]. Long-term follow-up studies are needed to clarify and confirm the recurrence rate after endoscopic colloid cyst surgery.

The stereotactically guided cyst aspiration technique was first described by Bosch et al., who used it in four patients in 1978 [27]. Although some series reported successful outcomes [27, 28], the long-term results of this technique are still controversial. Mathiesen et al. reported the long-term outcomes of sixteen patients treated by stereotactically guided aspiration [29]. Thirteen of these patients required reoperation due to acute comatose state, failure to achieve permanent reduction of the cyst, or symptomatic hydrocephalus, and the authors concluded that this technique fails to represent a permanent treatment [29].

Kondziolka and Lunsford performed CT-guided stereotactic aspiration in 22 patients with colloid cysts and reported that stereotactic aspiration alone was successful in 50% of the cases [28]. They reported that the appearance on preoperative CT scan of hypodense or isodense cysts predicted low viscosity of cyst contents, which correlated favorably with successful stereotactic aspiration [28]. The authors suggested that high-viscosity cysts account for approximately two thirds of all colloid cysts [11]. The high viscosity of cyst material may result in incomplete removal due to its displacement away from the aspirating needle. In such cases, microsurgical resection using a stereotactic transventricular approach was recommended [11]. The stereotactic transcortical-transventricular approach provides effective management in patients with colloid cysts of the third ventricle, even in the absence of hydrocephalus [11, 15].

Although microsurgery is the gold standard for treatment, it is still controversial whether the transcallosal or

transcortical approach is better. Jeffree and Besser reported no difference between these two approaches in complication or outcome [2]. The transcallosal approach has been recommended for resection of colloid cysts, which do not produce hydrocephalus, as the transcortical approach may be difficult in these cases [3]. However, this approach requires some experience in microsurgery. Interhemispheric retraction, venous injury, and callosal section are the disadvantages of the transcallosal route [3]. Its most significant complication is cortical venous infarct secondary to cortical vein occlusion [3, 12, 14, 15, 25]. Callosal section may also result in the disconnection syndrome, characterized by severe impairment of interhemispheric transfer of sensory, motor, and tactile information [30].

Twenty-six of the patients in our series had their colloid cysts removed without mortality via the transcortical-transventricular route. This route was chosen because: (1) ventricular enlargement was observed in all patients on CT and/or MRI scan, and (2) we already have experience in this operative approach. The main morbidity was the development of seizures in two patients (8%), which were controlled completely with anticonvulsants. Gokalp et al. and Desai et al. reported the incidence of seizures after the transcortical-transventricular approach to be 3.5% and 26.6%, respectively [12, 16]. Seizures may occur following any approaches requiring cortical incision, even after stereotactic procedures or a transcallosal approach. Jeffree and Besser reported a seizure rate of 11% after transcallosal surgery [2]. In our series, the follow-up periods varied between 8 months and 6.5 years, with a mean of 3.8. The results were good and no recurrence was detected in this period.

In summary, symptomatic colloid cysts of the third ventricle should be treated surgically. These are benign lesions and have excellent prognosis when treated with the appropriate procedure. The transcortical-transventricular approach can be used safely to excise third ventricle colloid cysts with low risk of mortality and morbidity.

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