

## Endoscopic treatment of cystic craniopharyngiomas in elderly patients. Report of three cases with a review

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**Abstract:** Craniopharyngiomas are rare tumors with peak incidence between 5–14 and between 65–74 years of age. Treatment of choice is surgical resection, sometimes associated with radiation therapy. Complete tumor resection may be challenging. Radical surgery is particularly risky in older patients.

Authors evaluate three cases of large cystic craniopharyngioma in patients in their 7th and 8th decade of life operated with the use of endoscopic technique. The postoperative follow-up period in which outpatient controls with imaging examinations were performed was up to 6 years. Symptoms of intracranial hypertension resolved in all patients in the immediate postoperative period. Visual acuity improved in two patients. No cases of aseptic meningitis have been reported. One patient underwent subsequent radiotherapy. The well-being of the operated patients continued.

Endoscopic transventricular approach to cystic craniopharyngiomas may be a safe and effective approach in older patients, being an alternative to microsurgical procedures.

**Keywords:** cystic craniopharyngioma, neuroendoscopy, transcortical transventricular approach, elderly.

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### Introduction

Craniopharyngioma is a benign tumor, which accounts for approximately 3% of intracranial neoplasms, with peak incidence between 5–14 and between 65–74 years of age. In adults, the annual incidence is estimated at 1.3 cases per million [1, 2]. Most (60–90%) of craniopharyngiomas are cystic. The cystic part may propagate towards the anterior part of the third ventricle, the interpeduncular cistern and the parasellar



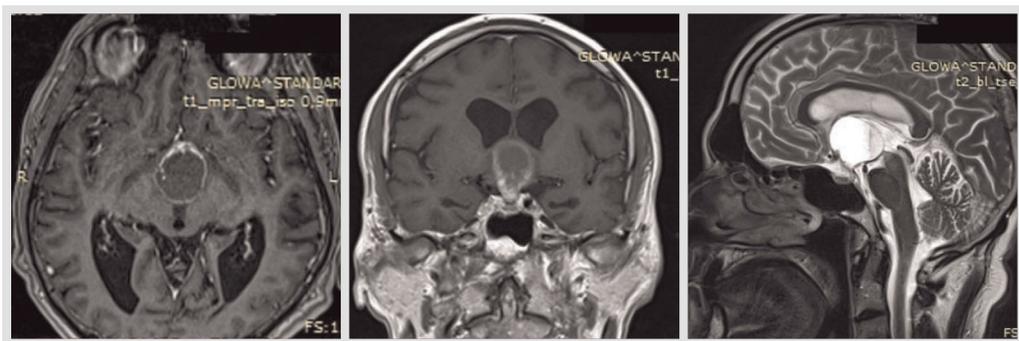
region [1, 3]. The treatment of choice is surgical resection, sometimes associated with radiation therapy [2, 4–6]. The most frequently used surgical approach is transcranial and transsphenoidal [2, 5, 7, 8]. Sometimes, radical tumor resection may be technically challenging and may entail undesirable endocrine, neurological and visual outcomes [2, 5]. In elderly, radical surgery is associated with particular risks. Authors present 3 cases with long-term follow-up of cystic craniopharyngiomas treated with the transcortical transventricular approach with use of the endoscopic technique.

## Clinical cases

### *Patients*

Case series included three patients, one woman and two men aged 65–78 years treated at the Department of Neurosurgery and Neurotraumatology (Faculty of Medicine, Jagiellonian University Medical College in Cracow, Poland) in the last decade. In all patients, the first symptoms of the disease were headaches and apathy, in two of them it was combined with impaired visual acuity and a deficit in the visual field. No endocrine abnormalities were noted. The symptomatic preclinical period ranged from 6 weeks to 8 months. Each of the patients suffered from other comorbidities.

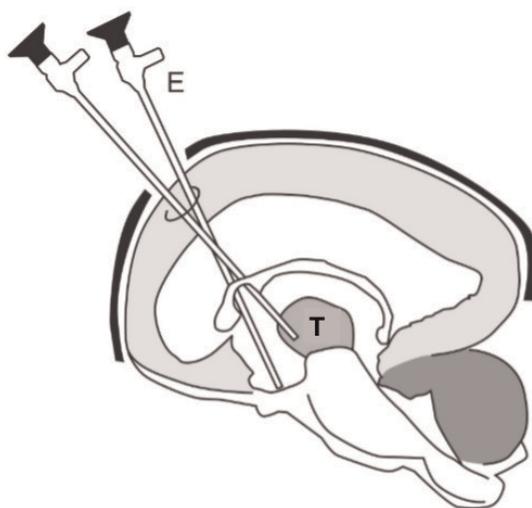
Analyzed imaging included head computed tomography (CT) and/or magnetic resonance imaging (MRI) with contrast enhancement. The diagnosed tumors resulted in subsequent enlargement of the ventricular system. The diameter of the cystic part measured from 4 to 5 cm (Fig. 1). In one case, colloid cyst was an initial diagnosis based on preoperative head CT scan. Before the surgery, endocrinological and ophthalmological consultations were performed routinely, and they were repeated as needed postoperatively. All three patients received hydrocortisone perioperatively.



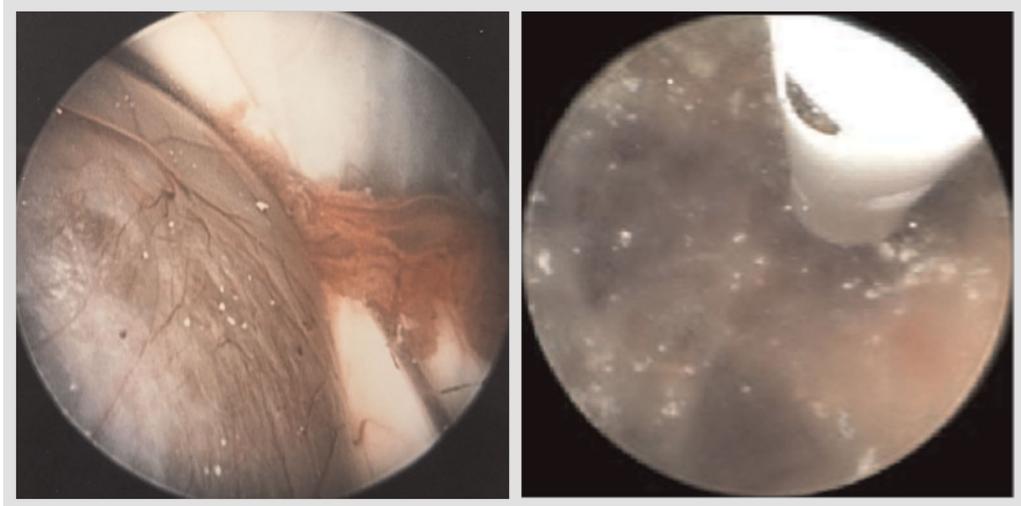
**Fig. 1.** Magnetic resonance imaging — axial, coronal and sagittal images: Preoperative image of cystic craniopharyngioma protruding into the anterior part of the third ventricle.

### *Surgical procedure*

Rigid Karl Storz, Frazier and Lotta neuroendoscopic systems were utilized for the procedures. Endoscopic approach to the third ventricle was obtained through about 10 mm in diameter burr hole located in the right lateral precoronal area. Its location was modified by the configuration of the ventricular system and the location of the cystic part of the tumor (Fig. 2). In one case, the Medtronic StealthStation stereotactic framework system was applied to determine the optimal trajectory. After incision of the dura and coagulation of the arachnoid, the surface of the brain was punctured according to the planned trajectory and the lateral ventricle was cannulated. The endoscope was inserted and the positions of the interventricular foramen and septum pellucidum were identified. The anatomical orientation was facilitated by the choroid plexus passing through the interventricular foramen from the lateral ventricle to the third ventricle and the fusion of the thalamic striatal vein with the septum pellucidum vein visible in the interventricular foramen lower edge. The endoscope was positioned over the cystic part of the tumor occupying the interventricular foramen and the third ventricle. The cyst was punctured with use of polyethylene drain with central and lateral openings, its content was aspirated, and the cyst was rinsed with Ringer's solution. The solid part of the tumor was reduced within the safe extent with use of the biopsy forceps and material for histopathological examination was secured. In one case where excessive bleeding occurred, the fragment of the tumor remaining in the field of view of the endoscope was devascularized by coagulation (Fig. 3). After the



**Fig. 2.** Transcortical transventricular endoscopic access to cystic craniopharyngiomas: E — endoscope, T — tumor.



**Fig. 3.** Endoscopic images: Left image — view from the frontal horn of the right lateral ventricle — cystic craniopharyngioma blocking the interventricular foramen, Right image — view of the inside of the cystic part of the tumor with inserted polyethylene drain after aspiration of the contents.

endoscope was withdrawn from the ventricular system, a drain was left in the lateral ventricle for rinsing the ventricles with saline. It was removed on the first or second postoperative day.

### *Postoperative evaluation*

Outcome was assessed based on clinical and radiologic criteria. The neurological examination was carried out in accordance with generally accepted rules, referring to the preoperative patient's neurological status. The radiological evaluation included CT and/or MRI of the head. The radiological criteria included lack of recurrence of the cystic part of the tumor and the lack of significant growth in the remaining solid part. The first follow-up examinations were performed after surgery (before the planned discharge), and the next ones: 6 months and 1 year after discharge. Subsequent long-term follow-up examinations were carried out in annual intervals, depending on indications. Follow-up ranged from 45 months to almost 6 years.

### *Follow-up*

In the immediate postoperative period, the symptoms of intracranial hypertension subsided, and the mental state improved in all patients. In two patients with pre-existing visual impairment, visual acuities had improved. Another one had also an improvement of visual field. One patient post-operatively had symptoms of diabetes

insipidus and required hormonal substitution. In all cases, the histopathological examination confirmed the diagnosis of craniopharyngioma. One patient underwent postoperative radiotherapy. Although, two were disqualified from irradiation due to the critical proximity of the solid part of the tumor and the optic chiasm. In the further postoperative period, the well-being of the operated patients was maintained as they returned to their previously performed activities. Four years after surgery, one patient required ventriculoperitoneal (VP) shunt placement due to hydrocephalus, not caused by the tumor regrowth.

## Discussion

Craniopharyngiomas most often develop from the squamous cells of the primary Rathke's pouch located in the pituitary stalk and in the tuber cinereum. Tumor may be adjacent to the optic nerves, optic chiasm, vessels of the circle of Willis, pituitary gland, pituitary stalk and hypothalamus. Radical removal of the tumor, although considered the gold standard of treatment, may result in damage to these structures [2]. Despite latest advances in the field, the choice of an adequate treatment strategy remains difficult. In addition to the patient's age and history of the disease, surgeon should consider the features of the tumor displayed such as: appearance, location, size, presence of solid cystic parts, presence of calcifications, and adjacent neuronal structures. In one of described patients, despite a thorough analysis of the neuroimaging studies, the initial diagnosis of colloid cyst turned out to be a craniopharyngioma.

Radical removal of the tumor is possible in 70–90% of patients, and 60–80% of them remain free of tumor regrowth after this treatment. In the case of partial resection, regrowth occurs in nearly 70% of patients [2, 5, 9]. The risk of iatrogenic damage should be considered, also weighing in the occurrence of complications from the natural course of the disease [2, 10–12]. Therefore, less invasive fenestration and drainage of the cystic part of the craniopharyngioma seems to be a better solution in the presence in case of cystic lesions. This management is mostly justified in elderly patients with comorbidities. Fenestration can be performed stereotactically or endoscopically. Rachinger *et al.* [13]. have proven that fenestration of the cyst is as effective as the microsurgical procedure with less damage to the hypothalamus. Presence of a cystic part of the tumor located intraventricularly with concomitant enlargement of the ventricular system is a particular indication for endoscopic procedure with a transventricular approach. It allows for targeted positioning of the drain and direct visualization inside of the cyst (tumor). Fenestration and aspiration of the cyst content prevents its leakage into the ventricular system, minimizing the risk of „chemical meningitis” [1]. Treatment results are better compared to microsurgical techniques. There is an immediate remission of the symptoms resulting from intracranial hypertension and a smaller number of possible long-term complications, such as: hypona-

tremia or hyperosmolarity, ischemic infarction in the basal ganglia, impaired blood supply to the optic chiasm [1, 5, 14]. Lauretti *et al.* [12] have advocated the superiority of the endoscopic procedure over the stereotactic aspiration of the cyst and presented a suggestion that through communicating of the cyst with the subarachnoid space surgeons can lower risk of its reconstruction. The main limitations of transventricular access are related to the radicality of the procedure. Radical resection should not be forced due to the possibility of potential damage to the hypothalamus. Cinalli *et al.* [3] points out that the endoscopic procedure enables long-term postoperative control and the preparation of the patient for microsurgical treatment.

The role of radiotherapy in the treatment of craniopharyngiomas remains controversial. It may take the form of fractionated conformal radiotherapy, stereotactic radiosurgery, proton therapy or intracavitary radiotherapy [4, 15]. The long-term results of combined treatment revealed that the survival rate of patients after partial resection of the tumor and radiotherapy is higher than that of those with partial resection [4]. Jaiswal *et al.* [1] and Nakahara *et al.* [4] studies suggest radiotherapy as adjuvant treatment after endoscopic surgery in cystic craniopharyngiomas. Although, Rachinger *et al.* [13] suggested withholding or postponing radiotherapy in such cases. Of the three presented patients, all were initially qualified for radiotherapy, but ultimately only one underwent it. Despite that good outcomes were achieved in all 3 patients.

## Conclusions

Endoscopic transcortical transventricular access to cystic craniopharyngiomas can be a safe and effective method of surgical treatment in elderly patients, constituting an alternative to microsurgical procedures.

## Funding

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## Conflict of interest

None declared.

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