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Original Article

Utilizing tubular retractors in colloid cyst resection: A single surgeon experience

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ABSTRACT

Background: Colloid cysts are intracranial lesions originating from abnormalities in the primitive neuroepithelium folding of the third ventricle. Various surgical approaches have been explored for the management of colloid cysts, each carrying its own set of advantages and limitations. Tubular retractors developed recently alleviate retraction pressure through radial distribution, potentially offering benefits for colloid cyst resection. This study aims to introduce and assess a modified microsurgical method utilizing the tubular retractor for addressing colloid cysts.

Methods: The study included a retrospective assessment of patients who had colloid cysts and who were treated between 2015 and 2023 by one experienced surgeon. The demographic, clinical, radiological, histological, and surgical data regarding these patients were evaluated. The patients were assessed using the colloid cyst risk score, indicating a risk for obstructive hydrocephalus.

Results: The minimally invasive microsurgical approach was successfully applied to all 22 identified patients. No postoperative surgical complications were reported. Gross total resection was achieved in 21 (95.5%) patients. The early complication rate was 22.7% ($n = 5$). There were no postoperative seizures, permanent neurological deficits, or venous injuries. The average hospital stay was 3 days. There was no evidence of recurrence at an average follow-up length of 25.9 months.

Conclusion: The transtubular approach is an effective, safe method for treating colloid cysts. It achieves complete cyst removal with minimal complications, offering the benefits of less invasiveness, improved visualization, and reduced tissue disruption, strengthening its role in colloid cyst surgery.

Keywords: Colloid cyst, Microsurgical approach, Minimally invasive surgery, Outcomes, Tubular retractor

INTRODUCTION

Colloid cysts in the third ventricle are rare, making up only about 1% of all intracranial tumors.[1,14,15] The reported estimated incidence of colloid cysts is approximately 3.2 cases per 1 million individuals per year.[6] These cysts are typically found in the anterolateral part of the third ventricle, close to the foramen of Monro. This location is significant because when these cysts block the foramen of Monro, they can disrupt the normal flow of cerebrospinal fluid (CSF) in the brain, leading to obstructive hydrocephalus.[3] An abnormal build-up of CSF characterizes

Hydrocephalus and can cause various neurological symptoms and increased pressure within the skull.[33] Due to their potential to cause severe, possibly sudden, hydrocephalus, surgical intervention is often necessary to remove the cyst and manage the associated symptoms when lesions reach a size threshold.[7] More than half of patients diagnosed with colloid cysts in the third ventricle experience symptoms and eventually require neurosurgical treatment.[2,5,17,24,27]

There are several standard surgical options for removing colloid cysts in the third ventricle. These include transcortical trans ventricular, interhemispheric transcallosal, and endoscopic approaches.[1,7-9,28,31-33] At present, there is no consensus on which surgical procedure provides the most effective outcomes. The primary objectives of surgery are to achieve complete removal of the cyst with no remnants, address hydrocephalus if it is present, prevent complications, and minimize manipulation of brain tissue and blood vessels. The choice of surgical approach may vary depending on the individual patient's condition and the surgeon's expertise.

Traditional systems such as the Greenberg or Leyla retractors, though effective, often present issues due to their bulky nature and the potential for causing significant cortical and vascular damage during aggressive retraction, as demonstrated in animal studies.[29,30,35] To mitigate these concerns, tubular retractors have emerged, aiming to minimize retraction injury.[10,20,21] Kelly initially detailed the use of a tubular system for stereotactic resection of intracranial tumors.[20,21] The use of tubular retractors in neurosurgical procedures has increased markedly in recent years. Different tubular retractor systems have been described, employing materials that range in strength and flexibility, such as red rubber latex, silicone, and polyester film.[4,18,20] Tubular retractors distribute pressure evenly in all directions, reducing the pressure on the brain tissue being retracted and potentially lowering the chance of local trauma.[12,20] Yet, to date, its surgical utility continues to be defined. As such, the primary objective of our study was to evaluate the efficacy and safety of this particular technique in a single-surgeon case series of surgical resections of colloid cysts using a transcortical-trans tubular approach.

MATERIALS AND METHODS

Patient selection

This retrospective study received approval from the Institutional Review Board, with the consent process waived. All patients who underwent colloid cyst resection with the use of tubular retractors by the senior neurosurgeon (R.J.K.) at our institution between 2015 and 2023 were included in the study. To identify relevant patients, we reviewed the senior neurosurgeon's clinical database. We collected clinical data from electronic medical records, including demographic information, initial symptoms, surgical data, and postoperative neurological status of the patients. The BrainPath system (NICO Corp, Indianapolis, Indiana) and the ViewSite Brain Access System (VBAS; Vycor Medical Inc, Boca Raton, Florida) were utilized in these procedures. The BrainPath tubular retractor system has a smaller working diameter (13.5 mm) compared to the VBAS system by Vycor Medical (17 mm). Despite this disparity in size, both tubular retractors share a similar technique and approach. The advantage of the BrainPath retractor lies in its narrower working diameter, potentially resulting in less disruption of normal brain tissue during the procedure. On the other hand, the VBAS system's larger working area presents an advantage in tackling larger lesions, potentially facilitating their resection more effectively.

We assessed the patients using the colloid cyst risk score (CCRS). T1 contrast-enhanced, T2, and fluid-attenuated inversion recovery (FLAIR) magnetic resonance imaging (MRI) images were evaluated. Preoperative cyst volume was determined using the formula $4/3\pi r^1 r^2 r^3$. Early complications were defined as complications occurring within the 1st week of post-surgery.

Operative technique

All patients underwent preoperative MRI, encompassing gadolinium-enhanced and fluid-attenuated inversion recovery sequences, with fiducial markers placed for utilization alongside navigation and preoperative trajectory planning. Following intubation and anesthesia induction, patients were immobilized in a Mayfield head holder and registered within the navigation system. The incision and craniotomy were strategically planned according to the lesion's location, utilizing navigation for precise trajectory and guidance. All surgeries were performed with patients in a supine position. Typically, the entry point is situated approximately at Kocher's point [Figure 1]. This frontal approach allows for an angle of entry into the ipsilateral lateral ventricle, offering better intraoperative visibility of the foramen of Monro, the roof of the third ventricle, and the colloid cyst [Figure 2]. We opt for a right-sided approach to minimize the risk of injury to the dominant hemisphere. However, in cases where the left frontal horn is significantly larger due to asymmetric hydrocephalus from the colloid cyst, we may choose a left-sided approach for easier access. To accommodate this entry point, a curved incision is made just behind the hairline, and the skin flap is pulled outwards using fish hooks. With guidance from neuronavigation, a focused craniotomy, approximately 3–4 cm in diameter, is made at the superior frontal sulcus's entry point along the trajectory. This trans-sulcal approach reduces the risk of cortical injury and minimizes damage to the underlying association fibers of the superior longitudinal fasciculus compared to posterior

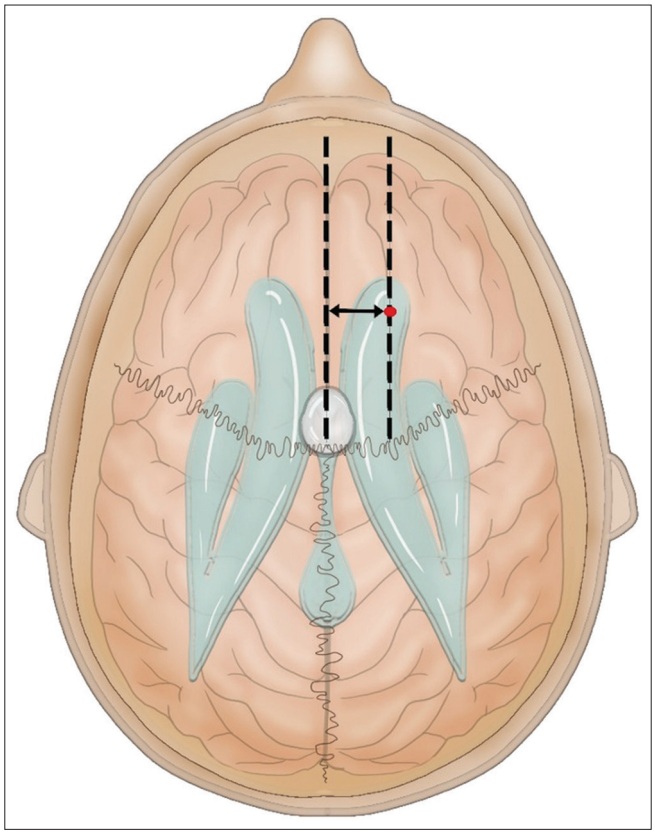

Figure 1: Entry point of the tubular cannula. Red dot: Entry point, Arrow: Distance from midline.

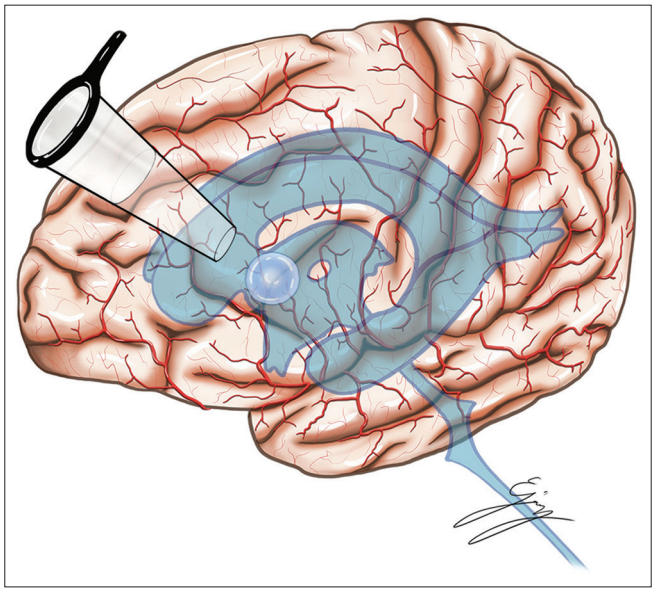

Figure 2: Trajectory of tubular cannula.

approaches. Microsurgical dissection of the superior frontal sulcus facilitates a gentle trans-sulcal advancement of the tubular retractor. If prominent cortical veins hinder this approach, a small corticotomy is made in the non-eloquent cortex for retractor insertion. The strategy aimed to preserve major veins/arterial structures, access a non-eloquent gyrus, and ensure avoidance of major white fiber tracts at the depths of the trajectory. The corticectomy is facilitated by making a small pial incision roughly equivalent to the intended final diameter of the retractor tube. Subsequently, to establish the surgical trajectory, the navigation probe loaded within the tubular introducer and advanced into the brain along the desired path following the corticectomy. The length of the retractor was determined through preoperative analysis of the surgical trajectory on MRI. We use a 7 cm long and 17 mm wide retractor. Utilizing neuronavigation, the retractor is directed toward the ipsilateral foramen of Monro and carefully advanced to the ependyma, and the clear introducer sheath is removed. Standard microsurgical techniques are employed to dissect the ependymal lining and access the ventricle for lesion resection. To enhance the visible area, the retractor can be safely maneuvered. Finally, the tube is gradually removed in steps while ensuring hemostasis along the entire surgical path.

Case example: Patient 14

A 59-year-old male with a past medical history of hypertension, hyperlipidemia, and gout presented in July 2020 with a chief complaint of progressively worsening altered mental status and headaches over the past several weeks. A computed tomography (CT) scan revealed obstructive hydrocephalus, with a notable large lesion identified in the foramen of Monro. Urgent admission was necessitated, and subsequent MRI substantiated the presence of a spherical 2.6 cm × 2.6 cm × 2.3 cm cystic-appearing mass centered at the foramen of Monro in Zone I [Figure 3]. The volume of the cyst was 70.92 cm^3. The lesion exhibited a homogeneously high T2/FLAIR signal with a thin, smooth peripheral enhancement indicative of a colloid cyst. A right frontal craniotomy was performed for the removal of the lesion using the minimally invasive tubular cannula system [Figure 4]. A gross total resection of the cyst was accomplished. Following the surgery, the patient experienced slight dizziness, which completely resolved within 24 hours. Their postoperative progress was positive, marked by substantial improvement in symptoms. Subsequent MRI conducted on the 1st postoperative day demonstrated a gross total resection of the midline cystic mass and resolution of hydrocephalus. Over a 2-year follow-up period involving annual MRI assessments, the patient remained asymptomatic, exhibiting no evidence of recurrence or residual colloid cyst with no indication of hydrocephalus, underscoring the sustained success of the intervention.

Case example: Patient 22

A 69-year-old male with a past medical history of hypertension and thrombosis presented to the clinic in August 2023 with

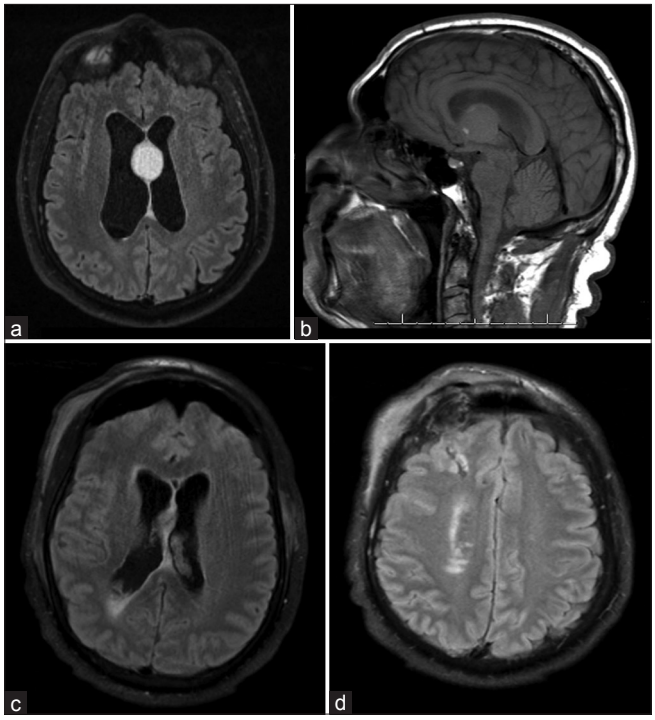

Figure 3: Patient 14. Preoperative and postoperative magnetic resonance imaging (MRI) of a patient with a colloid cyst with a volume of 70.92 cm^3. (a) Preoperative T2-weighted axial fluid-attenuated inversion recovery (FLAIR) MRI. (b) Preoperative T1-weighted sagittal MRI. (c) Postoperative T2-weighted axial FLAIR MRI. (d) Postoperative T2-weighted axial FLAIR MRI showing tubular retractor trajectory.

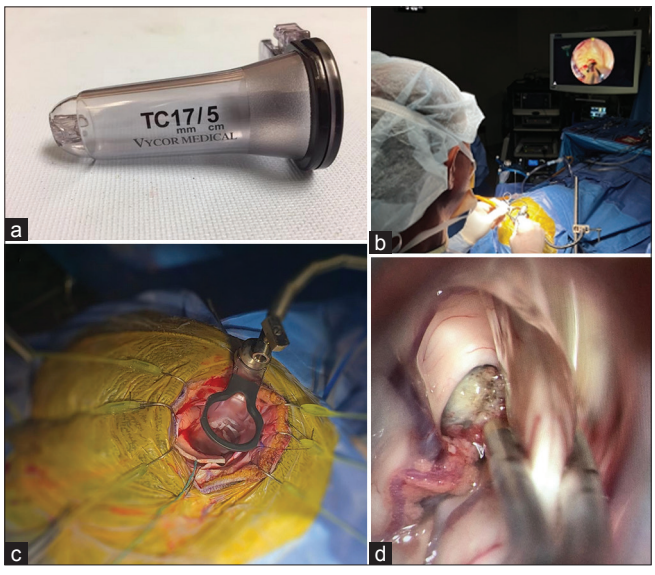

Figure 4: Minimally-invasive portal-based surgery. (a) Tubular retractor from ViewSite Brain Access System. (b) Placement of the tubular system. (c) Surgeon's view. (d) Intraoperative view.

complaints of headache and a syncope event. A CT scan revealed a third ventricular colloid cyst with no acute hydrocephalus. MRI substantiated a stable spherical 1.15 cm × 1.19 cm × 1.15 cm homogenously high T2 lesion in the anterosuperior aspect of the third ventricle centered at the foramen of Monroe in Zone II suggestive of a colloid cyst [Figure 5]. The volume of the cyst was 6.59 cm^3. Due to the significant size of the cyst and the risk of sudden obstruction, the patient was recommended to undergo surgery as soon as possible. A right frontal craniotomy was performed for the removal of the lesion using the minimally invasive tubular cannula system. A gross total resection of the cyst was accomplished without any intraoperative complications. Subsequent MRI conducted on the 1st postoperative day demonstrated a gross total resection of the colloid cyst. No hydrocephalus was seen. After the surgery, the patient experienced a local infection at the surgical site, which was successfully resolved with antibiotics. The patient was discharged neurologically intact with no evidence of residual cyst and will continue routine follow-up.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences 23.0 software (IBM, New York). Categorical variables were presented as numbers and percentages, and continuous variables were presented as means ± Standard deviation. Two-group comparisons for categorical variables were performed using Chi-square and Fisher's exact tests, while comparisons for continuous variables were conducted using the independent samples *t*-test. Receiver operating characteristic analysis was performed to evaluate the accuracy of the CCRS score in predicting the risk of obstructive hydrocephalus.

RESULTS

Twenty-two colloid cyst resections were performed at our institution. Patient demographics are shown in Table 1. The mean age of patients was 55.64 ± 13.78 years. Thirteen (59.1%) patients were female. All patients were right-handed. Twelve (54.5%) patients had preoperative imaging studies that demonstrated preoperative hydrocephalus. The mean Evans ratio was 0.31 ± 0.05. Twenty-one (95.5%) patients had symptoms preoperatively [Table 1]. All of the patients were evaluated using CCRSs, a 5-point tool to identify symptomatic lesions and assess the risk of obstructive hydrocephalus, as described by Beaumont *et al.*[2] One (4.5%) patient received a CCRS of 2, 5 (22.7%) patients received a CCRS of 3, 10 (45.5%) patients received a score of 4, and 6 (27.3%) patients received a score of 5.

Gross total resection was achieved in 95.5% (n = 21) of cases [Table 2]. A left-sided approach was used in 7 (31.8%) patients because the colloid cyst caused asymmetric hydrocephalus with the left lateral ventricle larger than the right. VBAS (Vycor Medical, Boca Raton, Florida) tubular retractors were used in 18 (81.8%) patients, and BrainPath

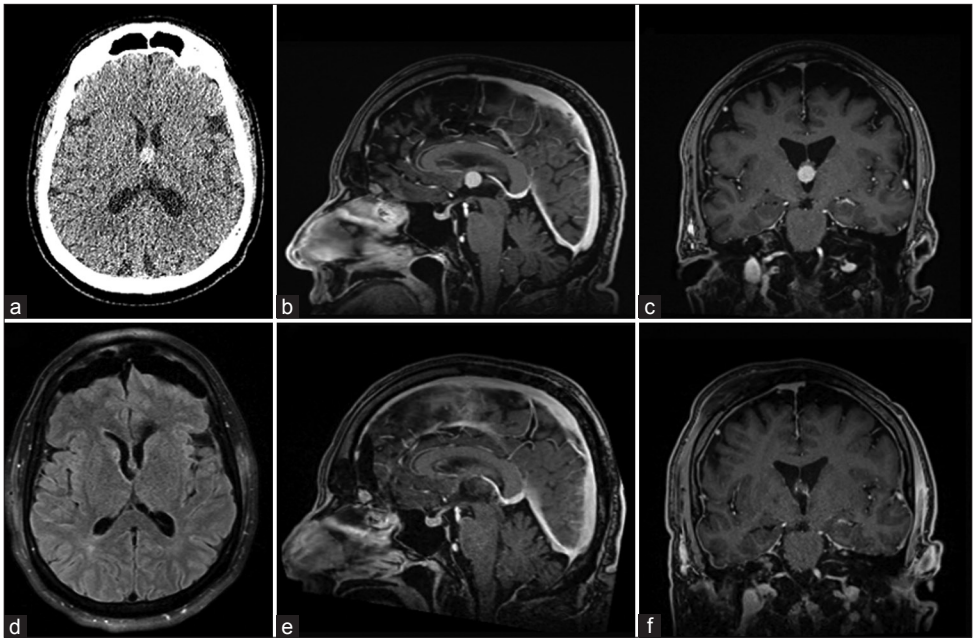

Figure 5: Patient 22. Preoperative and postoperative magnetic resonance imaging (MRI) of a patient with a colloid cyst with a volume of 6.59 cm^3. (a) Preoperative computed tomography. (b) Preoperative T1-weighted contrast-enhanced sagittal MRI. (c) Preoperative T1-weighted contrast-enhanced coronal MRI. (d) Postoperative T2-weighted axial fluid-attenuated inversion recovery MRI. (e) Postoperative T1-weighted contrast-enhanced sagittal MRI. (f) Postoperative T1-weighted contrast-enhanced coronal MRI.

(NICO, Indianapolis, Indiana) tubular retractors were used in 4 (18.2%) patients. There was no significant difference in complications and achieving gross total resection among the two tubular retractors. External ventricle drainage (EVD) was placed in 4 (18.2%) patients intraoperatively. No patients developed postoperative hydrocephalus.

Every patient was discharged to home in good condition with an average hospital stay of 3 ± 1.34 days, with a range of discharge on postoperative day 2–day 7. Five (22.7%) patients had early complications: two with confusion, one with short-term memory difficulties, and one with mild dizziness. One patient had urinary retention post-operatively. All of the early complications resolved within 5 days of surgery. No patients experienced permanent complications. There was no evidence of recurrence or progression during an average follow-up of 25.9 ± 25.02 months.

Our analysis did not reveal a significant association between the size of the colloid cyst, axial and greatest diameter of the cyst, and CCRS of greater or equal to 4 [Table 3]. The area under the curve (AUC) of CCRS for preoperative hydrocephalus was 0.638.

DISCUSSION

This is the largest single-surgeon experience in the literature to date using tubular retractors for colloid cyst resection. The channel-based transcortical-transtubular approach appears to be an effective and safe method for treating colloid cysts based on our institutional experience. The procedure demonstrated favorable surgical outcomes, with complete cyst removal and no permanent postoperative complications. Further, prospective data are needed to establish the learning curve to make this an appropriate tool in the surgeon's armamentarium when presented with a colloid cyst for surgical evaluation.

The utilization of endoscopy in the extraction of third ventricular colloid cysts has garnered favor in various medical institutions. Neuroendoscopy demonstrates efficacy in evacuating cyst contents and coagulating the cyst wall. Nevertheless, the endoscopic approach, mainly due to the significant prevalence of incomplete removal, was documented in previous reports within the medical literature.[13,16] Initially, the endoscopic approach was limited to cyst aspiration due to technical and technological constraints, resulting in higher recurrence rates.[25] In recent times, as surgeons have gained greater expertise in the procedure and technology has improved, they can now more frequently achieve gross total resection, which involves removing both the cyst content and the capsule.[34] However, in 2014, a meta-analysis of 1278 patients demonstrated the advantages of the transcortical-tubular approach compared to endoscopy, specifically in the rates of gross total resection

Table 1: Baseline characteristics.

Patient No	Age	Gender	Symptoms	Preoperative KPS	Preoperative hydrocephalus	Preoperative lesion volume (cm^3)	Headache Y/N	Age <65 Y/N	Axial diameter ≥7 mm Y/N	FLAIR hyperintensity Y/N	Risk zone Y/N	CCRS*
1	53	F	HA	90	Yes	1.61	Yes	Yes	No	Yes	Yes	4
2	53	M	HA	90	Yes	4.49	Yes	Yes	Yes	Yes	Yes	5
3	39	F	HA, visual disturbances	90	Yes	3.4	Yes	Yes	Yes	Yes	Yes	5
4	68	F	HA, memory loss	90	No	3.67	Yes	No	Yes	Yes	No	3
5	73	F	HA, N/V, diarrhea	80	Yes	2.66	Yes	No	Yes	Yes	Yes	4
6	46	M	HA, nausea, dizziness	90	No	4.05	Yes	Yes	Yes	No	Yes	4
7	42	F	HA	90	Yes	1.74	Yes	Yes	Yes	Yes	Yes	5
8	47	M	HA, hearing loss	90	Yes	10.3	Yes	Yes	Yes	N	Yes	4
9	59	F	HA, blurry vision, gait imbalance, dizziness, trouble concentrating	90	No	0.76	Yes	Yes	No	N	Yes	3
10	66	F	HA	90	Yes	30.94	Yes	No	Yes	Yes	No	3
11	54	F	HA, pressure behind eyes, dizziness	90	No	2.04	Yes	Yes	Yes	Yes	Yes	5
12	56	F	Memory complaints, pressure in head	90	Yes	10.84	No	Yes	Yes	Yes	Yes	4
13	42	M	Presyncopal type episodes	90	Yes	19.82	No	Yes	Yes	Yes	Yes	4
14	59	M	HA, confusion	90	Yes	70.92	Yes	Yes	Yes	Yes	No	4
15	74	F	None	100	No	14.97	No	No	Yes	Yes	Yes	3
16	61	F	Memory complaints	90	Yes	12.98	No	Yes	Yes	Yes	Yes	4
17	77	M	Fatigue, somnolence	90	No	4.44	Yes	No	Yes	Yes	No	3
18	69	F	HA, seizure	80	No	4.32	Yes	No	Yes	Yes	Yes	4
19	52	F	HA, blurry vision	90	No	7.37	Yes	Yes	Yes	Yes	Yes	5
20	45	M	HA, gait imbalance, memory complaints	90	Yes	3.05	Yes	Yes	Yes	No	Yes	4
21	20	M	HA, memory complaints, syncopal episodes	90	No	3.25	Yes	Yes	Yes	Yes	Yes	5
22	69	M	HA, syncope	90	No	6.59	Yes	No	Yes	No	No	2

*Colloid cyst risk score, as described in Beaumont *et al.*, 2016. F: Female, M: Male, HA; Headache, N/V: Nausea and vomiting, KPS: Karnofsky performance scale, FLAIR: Fluid-attenuated inversion recovery, CCRS: Colloid cyst risk score

Table 2: Surgical characteristics.

Patient No	Tubular system	Surgical approach laterality	Intraoperative EVD	Extent of resection	Early complications	Postoperative KPS
1	Vycor	Left	Yes	GTR	N/A	100
2	Vycor	Left	No	GTR	N/A	100
3	Vycor	Right	No	GTR	N/A	100
4	Vycor	Right	No	GTR	N/A	100
5	Vycor	Right	No	GTR	N/A	100
6	Vycor	Right	No	GTR	N/A	100
7	Vycor	Right	No	GTR	N/A	100
8	Vycor	Right	No	GTR	N/A	100
9	Vycor	Left	No	GTR	Postoperative day #1 confusion	100
10	Vycor	Right	No	GTR	N/A	100
11	Vycor	Right	No	GTR	N/A	100
12	Vycor	Right	No	GTR	Postoperative day #1 short term memory difficulties	100
13	Vycor	Right	No	STR	N/A	100
14	Vycor	Right	No	GTR	Postoperative day #1 confusion	100
15	Vycor	Left	No	GTR	N/A	100
16	Vycor	Left	No	GTR	N/A	90
17	Vycor	Right	No	GTR	N/A	100
18	Vycor	Left	No	GTR	Postoperative day #1 mild dizziness	100
19	BrainPath	Left	Yes	GTR	N/A	100
20	BrainPath	Right	Yes	GTR	N/A	100
21	BrainPath	Right	Yes	GTR	Urinary retention, resolved postoperative day #5	100
22	BrainPath	Right	No	GTR	N/A	90

GTR: Gross-total resection, STR: Subtotal resection, KPS: Karnofsky performance scale, N/A: Not applicable, EVD: External ventricle drainage

Table 3: Comparison of patients with and without preoperative hydrocephalus.

Variable	Preoperative hydrocephalus present	Preoperative hydrocephalus absent	*P*-value	RR (95% CI)
Preoperative volume (cm^3)	14.4±19.85	5.15±3.95	0.141	-
Greatest diameter (mm)	15.26±5.23	11.64±2.55	0.06	-
Axial diameter (mm)	13.45±4.83	10.67±3.06	0.132	-
Axial diameter ≥7 mm	11 (55)	9 (45)	0.892	0.9 (0.21–3.84)
Headache	9 (50)	9 (50)	0.594	1.5 (0.72–3.11)
Evans ratio	0.34±0.03	0.27±0.03	<0.001	-
FLAIR hyperintensity	10 (58.8)	7 (41.2)	0.749	0.85 (0.29–2.44)
Risk zone	10 (58.8)	7 (41.2)	0.624	0.68 (0.21–2.13)
CCRS ≥4	11 (68.8)	5 (31.3)	0.056	0.24 (0.03–1.49)

Values are shown as number (%) or mean±SD unless otherwise indicated. FLAIR: Fluid-attenuated inversion recovery, CCRS: Colloid cyst risk score, CI: Confidence interval

(95.2% vs. 58.2%) rate of recurrence (1.48% vs. 3.91%), and rate of reoperation (0.38% vs. 3.0%).[33]

Tubular systems for deep-seated lesions are known for causing less tissue trauma, reducing intrusion into normal tissue, and enabling traditional microsurgical techniques.[11,19,22,26] However, given the relatively recent emergence of tubular retractor systems tailored for cranial surgery, there remains a scarcity of comprehensive data addressing their effectiveness and safety.

We believe that the results of our study demonstrate the effectiveness and a reasonably safe profile for the use of tubular retractors in colloid cyst resections. We achieved a gross total resection rate of 95.5%, which is consistent with reported rates using this modality and surpasses those of endoscopic approaches.[33] Our experience shows a favorable safety profile with only 5 patients (22.7%) experiencing early transient complications using tubular retractor systems. Similarly, in a multicenter retrospective analysis of 16 patients with colloid cysts who underwent surgery with transtubular approach, only three patients (18.8%) experienced transient complications.[23] While we initially used intraoperative EVD with tubular retractors in some early cases, we discovered

that their placement is not required unless there is significant bleeding during colloid cyst resection.

We employed the CCRS to assess our patients preoperatively, as outlined by Beaumont *et al*., which proved instrumental in evaluating preoperative risk.[2] In addition, in that study, a CCRS of 4 or more demonstrated a statistically significant correlation with an increased likelihood of obstructive hydrocephalus, and patients with lesser scores were unlikely to progress to needing surgery.[2] The CCRS adopts a 5-point scale, attributing one point each for lesion diameter exceeding or equal to 7 mm, age below 65 years, presence of headaches, MRI FLAIR hyperintensity, and a colloid cyst situated within a specific "risk zone." These zones encompass areas from the lamina terminalis to defined regions in the brain's anatomical structure.

Notably, in our study cohort, 21 (95.5%) patients exhibited a CCRS score of 3 or higher [Table 1]. Twenty-one (95.5%) patients had preoperative symptoms, while 12 (54.5%) had preoperative hydrocephalus. Furthermore, every patient except for two had a colloid cyst with an axial diameter exceeding 7 mm. While we typically monitor patients with smaller cysts for growth or signs of hydrocephalus, one of these patients required surgery due to hydrocephalus, and the other underwent surgery for various symptoms, including blurry vision, gait imbalance, dizziness, and trouble concentrating. Although Beaumont *et al*.'s findings suggest that colloid cysts with an axial diameter of 7 mm or larger and a CCRS of 4 or more pose an escalated risk for symptomatic hydrocephalus, we failed to demonstrate a significant relationship between these variables and hydrocephalus.[2] This observation may be explained by the fact that six patients in our study who had a CCRS <4 underwent surgery due to recurrence. In addition, while Beaumont *et al*. achieved an AUC of 0.845, our study yielded a lower AUC of 0.638 of CCRS for cysts presenting with hydrocephalus. Our cohort characteristics may explain this marked difference in predictive performance. Our cohort included only 22 patients, while Beaumont *et al*.'s study included 163 patients. Larger case series are required to validate the accuracy of CCRS.[2]

In our institution, we have observed that employing the transcortical-trans tubular approach for colloid cyst removal proves effective and maintains a reasonably safe profile. However, there is a scarcity of comprehensive comparative data between this approach and established microsurgical and endoscopic methods. Further, extensive studies involving larger series and comparative analyses between various surgical approaches are necessary. Nonetheless, the field of neurosurgical technology is progressing, paving the way for continuous evolution in the treatment of deeply located brain lesions. Anticipated advancements in neuronavigation and surgical robotics are likely to surpass current methodologies. Notably, transcortical-trans tubular approaches to the third ventricle have exhibited both safety and effectiveness, warranting consideration, especially when confronted with challenging deep-seated lesions.

Limitations

A significant limitation of our study is its retrospective nature. Retrospective studies inherently carry the risk of selection bias, incomplete data, and the inability to control or standardize data collection methods. In addition, neuropsychological assessment for long-term memory complaints was not performed. These limitations could impact the overall robustness of our findings and the validity of the conclusions drawn. Our analysis was based on a relatively small number of patients, which may restrict the generalizability of our results. Larger and more diverse datasets would provide a more comprehensive and reliable assessment of the predictive capabilities of this technique.

CONCLUSION

The channel-based transcortical-trans tubular approach is an effective and safe method for treating colloid cysts. The procedure demonstrated favorable surgical outcomes, with complete cyst removal and no permanent postoperative complications. This approach offers the advantages of minimal invasiveness, optimal visualization, and reduced glial tissue incision, further establishing its viability in the management of colloid cysts in the third ventricle.

Ethical approval

The research/study approved by the Institutional Review Board at University of Miami, number 221078, dated October 13, 2023.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the

writing or editing of the manuscript and no images were manipulated using AI.

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