

Original Research

## Endoscopic Excision of 3rd Ventricular Colloid Cyst

Muhammad Irshad, Choudhary Ali Manzoor, Malik Liaqat Ali Jalal, Muhammad Tariq Naeem,  
Alishba Ijaz

Department of Neurosurgery, Nishtar Medical University, Multan, Pakistan

### ABSTRACT

**Objective:** To evaluate the surgical outcomes of endoscopic resection of colloid cysts, focusing on assessing the extent of resection achieved and determining the rate of complications associated with the procedure.

**Materials & Methods:** This prospective cohort study was conducted on symptomatic patients who underwent endoscopic removal of colloid cysts Neurosurgery department of Nishtar Medical University, Multan for 2 years. Demographic data, radiological data, clinical data, co-morbidities, length of hospital stay, duration of surgery, and complications that occurred in post-operative time were recorded. Preoperative radiological evaluations through CT scan and MRI were made for the determination of cyst size, location, presence of hydrocephalus, and enhancement.

**Results:** The mean size of cysts of the patients was  $17.54 \pm 1.17$  mm. The mean operative time and length of stay in the hospital of the patients was  $115.26 \pm 12.63$  minutes and  $5.38 \pm 1.72$  days, respectively. It was seen that content suction was easy in 76.5% of patients and difficult in 23.5% of patients. EVD insertion was observed in 14.7% of patients. According to extent resection, there was complete resection in 73.5% of patients and subtotal resection along with coagulation of residual contents in 26.5% of patients. Wound infection was found in only one patient 2.9% and 2.9% of the patient died.

**Conclusion:** Endoscopic resection of colloid cysts is an effective and reliable method, achieving complete removal in most cases while carrying a low risk of recurrence and exhibiting low morbidity and mortality rates.

**Keywords:** Endoscopic Resection, Colloid Cyst, CT Scan Density, Complications, Wound Infection.

**Corresponding Author:** Muhammad Irshad  
Department of Neurosurgery, Nishtar Medical University,  
Multan, Pakistan  
Email: iro\_dr@yahoo.com

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### INTRODUCTION

Colloid cysts are rare benign tumors that can occur in the brain, particularly in the third ventricle.<sup>1</sup> Their global incidence is estimated to be around 1% of all brain tumors.<sup>2</sup> While they can occur at any age, they are most commonly diagnosed in adults between the ages of 20 and 50 years old. The etiology of colloid cysts is not understood exactly.<sup>3</sup> However, it is believed that they develop from remnants of the primitive neuroepithelium during

embryonic development.<sup>4</sup> The persistence of these remnants is the main cause of cyst development within the brain.<sup>5</sup> Authors of some previous studies reported that there may be a familial component or genetic predisposition to develop colloid cyst, but it is not a fact.<sup>6</sup>

Management of colloid cysts is a challenge, as a fully effective, reliable approach for surgery is not established yet, some options include endoscopic or non-endoscopic microscopic resection,<sup>6</sup> aspiration with stereoscopy, ventriculoperitoneal shunt and resection with minimally invasive or microscopic technique.<sup>7</sup> Various techniques for accessing and removing CCs are discussed in the literature. Some surgeons prefer using a tubular retractor with endoscopic assistance over a full-microscopic or full-endoscopic approach.<sup>8</sup> Others opt for the full-endoscopic technique, performing the entire operation through the endoscope's working channel.

Dorsch et al,<sup>9</sup> introduced the swiveling technique for endoscopic CC removal, but their study was a technical note involving only one patient. These days endoscopic resection gained fame as many studies assessed its efficacy in comparison with open surgery as the best treatment choice.<sup>10,11</sup> Endoscopic resections have the advantages of shorter hospital stay, shorter operative time, minimal invasion, and low risk of infection.<sup>12</sup> Disadvantages of this technique include recurrence and re-do surgery.<sup>13</sup>

The study's outcomes may inspire further research and clinical trials to explore different aspects of endoscopic resection, such as long-term outcomes, comparative effectiveness with other treatment modalities, and refinements in surgical techniques.

## MATERIALS & METHODS

### Study Design, Duration, and Setting

This prospective cohort study was conducted on symptomatic patients who were planned for removal of colloid cysts with an endoscopic

technique. The study was conducted at the Neurosurgery department of Nishtar Medical University, Multan from June 2022 to May 2024.

### Inclusion Criteria

Only patients who met the criteria for pure endoscopic resection, demonstrated hydrocephalus at initial presentation, and were radiologically confirmed to have colloid cysts were included.

### Exclusion Criteria

Those patients who operated through microsurgical resection with the assistance of endoscopic technique, asymptomatic patients, Patients having residual cysts, small size cysts without hydrocephalus, or refused to participate in the study were excluded.

### Ethical Approval

The study started after approval from the institutional review board under [Ref no. 116/3/2022] after a complete evaluation of the study protocol.

### Study Variables and Clinical Management

Demographic data, radiological data, clinical data, co-morbidities, length of hospital stay, duration of surgery, and complications that occurred in post-operative time were recorded. Preoperative radiological evaluations through CT scan and MRI were made for the determination of cyst size, location, presence of hydrocephalus, and enhancement.

Immediate postoperative CT scans were performed for all patients. Follow-up assessments were conducted clinically every month for at least six months and subsequently 6 monthly. Postoperative MRI scans were scheduled at the 3rd month to evaluate the extent of resection, then at the 6th and 12th months, followed by annual MRI scans for patients with sub-totally resected cysts.

Patients were under general anesthesia, lying supine with a 30-degree head flex. Burr hole placement was based on MRI scans. It was typically an incision 5 cm anterior to the coronal suture and 4cm lateral to midline. A Cushing ventricular needle created a track, followed by the endoscopic tracker, sheath, and rigid lens scope. Landmarks were identified, including the foramen of Monro and colloid cysts, with suction of cyst contents for evacuation using a 6F Neleton catheter.

Irrigation with Ringer's lactate or grasping forceps was utilized to aid in evacuating thick contents during the procedure. After completely aspirating the colloid matter, the entire capsule of the cyst was collected using a suction tube, grasped, and gently peeled with a grasper. Bimanual dissection, involving a grasper and microscissors, was employed for adherent cyst walls, with any remaining adherent parts coagulated to reduce recurrence. Venous bleeding post-capsule removal was effectively controlled with generous irrigation alone or with the use of a Fogarty balloon tamponade at the bleeding source's edge. A dry field technique was employed, and suctioning all bloody CSF was done for improved visualization of bleeding sites. Before endoscope removal, a thorough inspection of the foramen of Monro and the aqueduct was performed for tumor residue and patency, respectively. External ventricular drain placement was carried out in bleeding cases, followed by admission to the intensive care unit and early postoperative CT brain imaging.

## Data Analysis

Data analysis was completed on SPSS version 23. Frequency and percentage were calculated for categorical variables like gender, clinical outcomes, density of CT scan, MRI scan intensity, and outcomes. Mean and standard deviations like age and cyst size were calculated for numerical variables.

## RESULTS

### Demographic and Baseline Characteristics

Out of 34 patients, 16 (47.1%) were males, and 18 (52.9%) were females with a mean age of  $37.55 \pm 5.61$  years. Headache was the most common clinical outcome found in 22 (64.7%) of the patients, followed by visual complaints and vomiting, in 17 (50.0%) and (52.7%), respectively. The mean size of the cyst of the patients was  $17.54 \pm 1.17$  mm. Hyperdense area was observed in 34 (61.8%), CT scan density among the patients. According to MRI scan intensity, T1 hypointense / T2 hyperintense was the most observed 23 (41.8%) intensity (Table 1).

### Study Findings

The mean operative time and length of stay in the hospital of the patients was  $115.26 \pm 12.63$  minutes and  $5.38 \pm 1.72$  days, respectively. It was seen that contents suction was easy in 26 (76.5%) patients and difficult in 8 (23.5%) patients. EVD insertion was observed in 5 (14.7%) patients. According to extent resection, there was complete resection in 25 (73.5%) patients and subtotal resection along with coagulation of residual contents in 9 (26.5%) patients. (Table 2). Wound infection was found in only one patient (2.9%) and 1 (2.9%) patient died. (Figure 1).

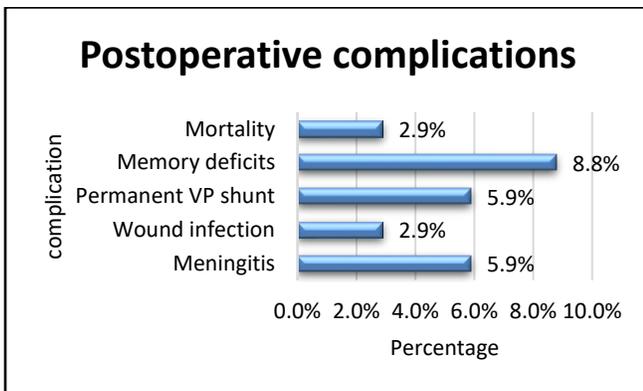
**Table 1:** Demographic, clinical outcomes, and imaging characteristics of the patients (n=34).

Variable	N (%)
<b>Gender</b>	
Male	16 (47.1%)
Female	18 (52.9%)
<b>Clinical outcome</b>	
Headache	22 (64.7%)
Visual complaints	17 (50.0%)
Gait disturbance	11 (32.4%)
Vomiting	16 (47.1%)
Memory deficits	8 (23.5%)
Disturbed conscious level	4 (11.8%)

<b>Density of CT scan</b>	
Hyperdense area	34 (61.8%)
Isodense area	15 (27.3%)
Hypodense area	6 (10.9%)
<b>Imaging findings</b>	
T1 hypointense / T2 hyperintense	23 (41.8%)
T1 hyperintense / T2 isointense	14 (25.5%)
T1 hyperintense / T2 hypointense	7 (12.7%)
T1 isointense / T2 isointense	11 (20.0%)
Variable	Mean±S.D
Age (years)	37.55±5.61
Cyst size (mm)	17.54±1.17

**Table 2:** Outcome variables of the patients.

Variable	Mean±S.D
Operative time (minutes)	115.26±12.63
Length of hospital stay (days)	5.62±1.81
Contents Suction	N (%)
Easy	26 (76.5%)
Difficult	8 (23.5%)
EVD insertion	5 (14.7%)
Total resection	25 (73.5%)
Subtotal resection and anticoagulation	9 (26.5%)



**Figure 1:** Postoperative complications.

## DISCUSSION

Colloid cysts, rare tumors found in the 3rd ventricle, were initially described by Wallman in 1858,<sup>14</sup> with Dandy diagnosing them via ventriculography pneumoencephalography in 1922.<sup>15</sup> Micro-resection surgery using transcortical approaches has been the traditional method of treatment.

Samir et al,<sup>16</sup> studies on patients with colloid cysts found that 63% of the patients were males, with a mean age of 32.7 years and a standard deviation of 10.9 years. This trend of a higher prevalence among males was supported by a related study by Sheikh et al,<sup>17</sup> indicating a potential gender-related pattern in the occurrence of colloid cysts. However, in our study, we did not observe a marked difference in gender distribution among patients, with 52.9% being female and 47.1% male.

Samadian et al,<sup>18</sup> found that colloid cysts displaying a hypodense appearance on CT scans had a significantly higher likelihood of complete evacuation compared to hyperdense cysts, as noted by El Khoury et al,<sup>19</sup> in their study, they observed that about 89% of hyperdense cysts on CT scans were difficult to aspirate completely. However, in contrast, all hypodense cases in their study were successfully removed or suctioned. This suggests that the density of the colloid cyst on CT imaging plays an important role in determining the ease and success of evacuation procedures. In this study, Hyperdense area was observed in 67.6% of CT scan density among the patients.

In their study, Sayehmiri et al,<sup>20</sup> found that the mean operative time for patients undergoing microscopic resection was significantly longer at 194.18 minutes compared to 113.04 minutes for those undergoing endoscopic resection. Similarly, the duration of hospitalization was notably longer for microscopic resection patients at 7.85 days, whereas patients who had endoscopic resection stayed for an average of 4.69 days. Similarly, Yadav et al,<sup>21</sup> suggest that microscopic resection procedures generally require more time in the operating room and lead to extended hospital stays compared to endoscopic resection techniques. The mean operative time and length of stay in the hospital of the patients was 115.26±12.63 minutes and 5.38±1.72 days.

According to extent resection, there was complete resection in 73.5% of patients and subtotal resection along with coagulation of

residual contents in 26.5% of patients. Mishra et al,<sup>22</sup> found that 78% of patients achieved gross total resection of the cyst, while Boogaarts et al,<sup>23</sup> reported a higher rate of about 90% for complete excision of colloid cysts. The quality of endoscopic resection varied across studies, with noticeable improvements in recent years attributed to enhanced training, experience, and advancements in endoscopic tools and technology.

In this study Wound infection was found in only one patient 2.9% and 2.9% of the patients died. Samir et al,<sup>16</sup> studies noted three cases of wound infection, all managed conservatively, and two cases of memory deficits that showed improvement during follow-up. Another study conducted by Unal et al,<sup>24</sup> reported 81% successful total resection and 14% subtotal resection. Meningitis and permanent hemiplegia occurred in 1 case only. Similar findings of 98.6% full resection, 8.1% recurrence, and no post-operative complications and mortality were reported by Isaacs et al.<sup>25</sup>

## CONCLUSION

Endoscopic resection of colloid cysts is an effective and reliable method, achieving complete removal in most cases while carrying a low risk of recurrence and exhibiting low morbidity and mortality rates.

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### Additional Information

**Disclosures:** Authors report no conflict of interest.

**Ethical Review Board Approval:** A prior ethical approval was taken before the study commenced.

**Human Subjects:** Consent was obtained by all patients/participants in this study.

**Conflicts of Interest:**

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

**Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.

**Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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### AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Muhammad Irshad	1. Study design and methodology.
2.	Choudhary Ali Manzoor	2. Paper writing.
3.	Malik Liaqat Ali Jalal	3. Data collection and calculations.
4.	Muhammad Tariq Naeem	4. Analysis of data and interpretation of results.
5.	Alishba Ijaz	5. Literature review and referencing.
6.	Muhammad Irshad	6. Editing and quality insurer.