



Manuscript ID ZUMJ-2205-2570
DOI 10.21608/zumj.2022.139780.2570

ORIGINAL ARTICLE

Endoscopic resection of colloid cysts: Technical aspects and Surgical outcomes

¹Ahmed A. Morsy, MD *, ¹Hassan A. Abaza, MD, ¹Mohamed A. Samir, MD, ²Nabil A. Nasef, MD

¹Department of Neurosurgery Faculty of Medicine, Zagazig University, Egypt

²Department of neurosurgery Faculty of Medicine, Kafr El-sheikh University, Egypt

Corresponding author:

Ahmed Ali Morsy, M.D, PhD

Lecturer and Consultant,

Neurosurgery Department

Zagazig University, Zagazig ,

Egypt

Address: Zagazig University

Hospitals, Neurosurgery

Department, Zagazig , Alsharkia,

Egypt, Postal code 44519

Mobile: +201006714565

Email:

dr.ahmed.ali.morsy@gmail.com

ahmedmorsy@zu.edu.eg

Submit Date 2022-05-30

Accept Date 2022-06-09

ABSTRACT

Background: Colloid cysts are considered rare benign tumors at the 3rd ventricle. Best surgical option for such tumors has not been established, however endoscopic approaches have been gaining popularity and have been proved to be an effective modality. We aimed to assess surgical outcomes of endoscopic resection of colloid cysts with evaluation of extent of resection and rate of complications.

Materials and methods: A retrospective cohort study was conducted to investigate surgical outcomes of patients who had undergone endoscopic resection of colloid cyst. Pre-operative clinical and radiological data were collected. Operative details, extent of resection and postoperative complications were estimated.

Results: In this study 27 cases had undergone endoscopic resection of colloid cyst in the period from January 2016 to January 2021. Patients were of mean age 32.7±10.9 years (17 patients were males). Headache was the most common presentation in (81.5%) of our patients. Complete resection was reported in 22 cases (81.5%), while subtotal resection with coagulation of residual adherent parts was done in 5 cases (18.5%). 3 patients (11.1%) had postoperative wound infection, 2 patients (7.4%) experienced postoperative transient memory deficits, and only one patient (3.7%) had postoperative fulminant meningitis, and this was our mortality case. EVD was inserted in 9 patients (33.3%), but only 2 patients (7.4%) who further had a permanent VP shunt.

Conclusion: Endoscopic resection of 3rd ventricle colloid cysts is an effective procedure that provides gross total resection in most patients and has lower morbidity and mortality rates.

Keywords: Colloid cysts – Endoscopic resection – Third ventricle tumors

INTRODUCTION

Colloid cysts are rare benign brain tumors representing less than 2% of all brain tumors, that are mostly located at the anterior 3rd ventricle near foramen of Monro ^(1,2). Clinically, it could be asymptomatic, or presented with symptoms of obstructive hydrocephalus as progressive paroxysmal headache, which are common presentation of colloid cysts ⁽²⁾. However sudden death may occur as a rare presentation due to severe obstructive hydrocephalus ⁽³⁾.

Treatment of this tumor remains arguable and the best surgical approach has not been established. Microsurgical resection, endoscopic resection, endoscopically assisted microscopic resection, stereotactic aspiration and ventriculo-peritoneal (VP) shunt insertion are considered treatment choices for colloid cysts ^(4,5,6). Recently, endoscopic surgery has gained popularity and many studies have proved

endoscopic resection as an effective treatment modality as open surgery ^(7,8,9,10)

Endoscopic approach reduces operative time, hospital stay and lowers risk of infection with minimally invasive approach, but having the disadvantage of higher incidence of incomplete resection leading to potential cyst regrowth and the need for additional surgical intervention. ^(9,10,11).

This retrospective study aimed to assess surgical outcomes of endoscopic resection of colloid cysts as a valuable treatment modality with an evaluation of the extent of resection and rate of complications.

MATERIALS AND METHODS

Patient population:

This retrospective cohort study was performed on patients who had gone through endoscopic removal of colloid cyst at two tertiary referral centers in Egypt, between January 2016 and January 2021. The institutional review board approved this study. All our patients who had been candidates for pure endoscopic resection were symptomatic, had

hydrocephalus at initial presentation, and proved postoperative by histological examination to be colloid cyst. Patients who had been operated by endoscopic assisted microsurgical resection approach, previously operated with recurrent or residual cyst, asymptomatic patients, those with small cyst without hydrocephalus, and patients with incomplete data or follow up records were excluded.

Patients' demographics, co-morbidities, clinical and radiological data, operative duration, hospital stay, postoperative complications were recorded. Preoperative computed tomography (CT) and magnetic resonance imaging (MRI) were done in all patients to characterize cyst site, size, enhancement, and presence of hydrocephalus. Immediate postoperative CT was done in all patients. Follow up was done clinically every month for all patients for the first 6 months and then every 6 months. Postoperative MRI was done at 3rd month to assess extent of resection then at the 6th and 12th months and then every year in patients with subtotally resected cyst.

Endoscopic technique

The Storz® GAAB or LOTTA system (Tuttlingen, Germany) 0-degree rigid endoscope was used throughout our series. Single ports were used for all patients under general anesthesia, while lying supine and the head flexed 30 degrees. The exact site and laterality of the burr hole were pre-decided on sagittal and coronal MRI basis. For example, in patients whom the cyst located posterior to foramen of Monro; the burr hole was placed more anteriorly. Generally, the burr hole was determined between 3-4 cm lateral to the sagittal suture and 1-4 cm anterior to the coronal suture. After creating a track by the Cushing ventricular needle, the endoscopic tracker and sheath were introduced followed by the rigid lens scope. Anatomical landmarks and choroid plexus were visualized till reaching foramen of Monro and identifying colloid cyst. Intermittent controlled suction was carried out in order to evacuate the cyst content through a 6F Neleton catheter introduced in the cyst cavity. Ringer's lactate irrigation or using grasping forceps could facilitate evacuation thick contents. After complete aspiration of the colloid material, the whole cyst capsule was gathered by the suction tube, grasped, and then peeled gently with an endoscopic grasper. Bimanual dissection with grasper and microscissor could help in adherent cyst wall, with coagulation of any remaining adherent parts of cyst wall to decrease recurrence. Venous bleeding that may occur after capsule removal was always controlled successfully using

generous irrigation only or we also may use Fogarty balloon tamponading at the edge of the bleeding source. In some cases, dry field technique by suctioning of all bloody CSF was used, by this technique better visualization and clot formation on bleeding site could be achieved. Before we remove the endoscope, we should inspect both the foramen of Monro and the aqueduct for any tumor residue and patency respectively. Removal of the endoscope carefully, External ventricular drain was used when there was bleeding. All cases were admitted to the intensive care unit and early post operative CT brain was done.

RESULTS

Twenty-seven patients who had undergone endoscopic resection of colloid cyst between January 2016 and January 2021 were included in this study (17 males and 10 females) with mean age of (32.7±10.9). Headache was the most common presentation in (81.5%) of our patients, 15 patients (55.6%) complaint blurring of vision or impaired vision, and 13 patients (48.1%) had vomiting. Other symptoms included memory deficits (18.5%) and gait disturbance (25.9%). 3 patients (11.1%) presented at emergency department with disturbed conscious level and hydrocephalus, for whom EVD was inserted on urgent basis with subsequent endoscopic resection of colloid cyst in the following day. Table 1

Regarding CT scan findings in all patients, the cyst was hyperdense in 17 patients (63%). In 7 patients (25.9%) the cyst was isodense, and hypodense in 3 patients (11.1%). All patients in our study had pre-operative MRI scan with mean size of the cyst 16.1±3.6 mm. In (48.1%) of our patients, the cyst had a hypointense appearance on T1-weighted- and was hyperintense on T2-weighted MRI. The cyst was hyperintense on T1-weighted- and isointense on T2-weighted MRI in 6 patients (22.2%), while in 4 patients (14.8%) was hyperintense on T1-weighted- and hypointense on T2-weighted images, and it was isointense on T1-weighted- and isointense on T2-weighted images in 4 patients (14.8%). Table 1

Mean operative time in our series was 110±21.4 minutes. most of the cysts which were endoscopically removed in our study (77.8%) had soft contents and were easily suctioned, but in 22.2% of patients, the suction of cyst contents was difficult and grasping forceps was used with ringer's lactate irrigation. Complete resection was reported in 22 cases (81.5%), while subtotal resection with coagulation of residual adherent parts was done in 5 cases (18.5%). Mean hospital stay in our study was 4.7± 1.8 days. EVD was

inserted in 9 patients (33.3%), but only 2 patients (7.4%) who further had a permanent VP shunt. 3 patients (11.1%) had postoperative wound infection, and all treated conservatively. 2 patients (7.4%) experienced postoperative transient

memory deficits and improved at 3 months follow up visit. Only one patient (3.7%) had postoperative fulminant meningitis, and this was our mortality case. Table 2

Table 1: Characteristics of 27 patients who had undergone endoscopic resection of colloid cyst:

Demographic Data	
Male: No. (%)	17 (63%)
Female: No. (%)	10 (37%)
Age: Mean \pm SD	32.7 \pm 10.9
Clinical Presentation	
Headache: No. (%)	22 (81.5%)
Visual complaints: No. (%)	15 (55.6%)
Gait disturbance: No. (%)	7 (25.9%)
Vomiting: No. (%)	13 (48.1%)
Memory deficits: No. (%)	5 (18.5%)
Disturbed conscious level: No. (%)	3 (11.1%)
Imaging characteristics	
Size of cyst: Mean(mm) \pm SD	16.1 \pm 3.6
CT scan density	
Hyperdense: No. (%)	17 (63%)
Isodense: No. (%)	7 (25.9%)
Hypodense: No. (%)	3 (11.1%)
MRI scan intensity	
T1 hypointense / T2 hyperintense: No. (%)	13 (48.1%)
T1 hyperintense / T2 isointense: No. (%)	6 (22.2%)
T1 hyperintense / T2 hypointense: No. (%)	4 (14.8%)
T1 isointense / T2 isointense: No. (%)	4 (14.8%)

Table 2: Operative details, outcomes, and postoperative complications of 27 patients who had undergone endoscopic resection of colloid cyst:

Operative time: Mean (min.) \pmSD	110\pm 21.4
Hospital stay: Mean (Days) \pm SD	4.7 \pm 1.8
Contents suction:	
Easy: No. (%)	21 (77.8%)
Difficult: No. (%)	6 (22.2%)
EVD insertion: No. (%)	9 (33.3%)
Extent of resection	
Complete resection	22 (81.5%)
Subtotal resection with coagulation of residual parts: No. (%)	5 (18.5%)
Postoperative Complications	
Meningitis: No. (%)	1 (3.7%)
Wound infection: No. (%)	3 (11.1%)
Permanent VP shunt: No. (%)	2 (7.4%)
Memory deficits: No. (%)	2 (7.4%)
Mortality: No. (%)	1 (3.7%)

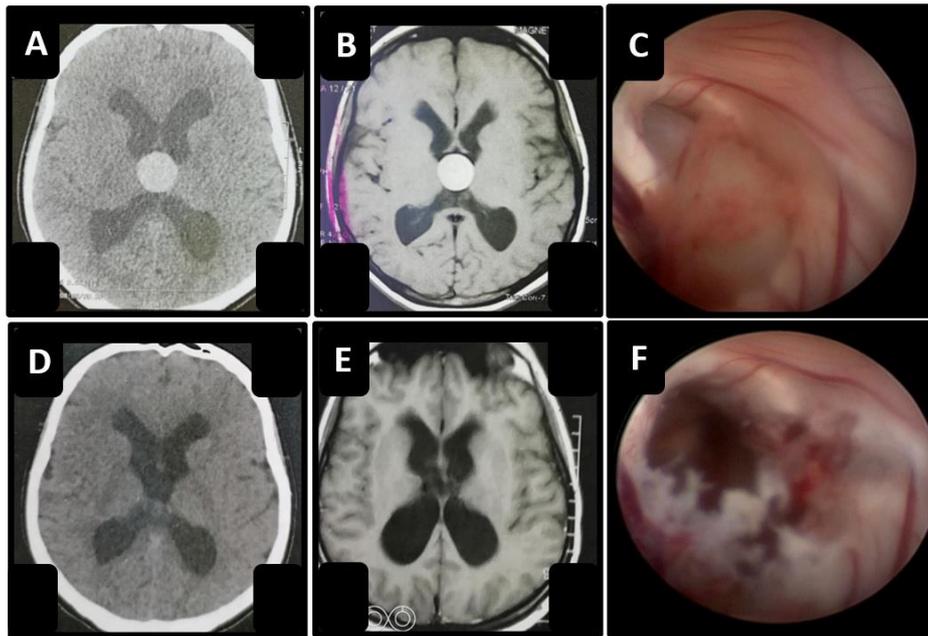


Figure 1: 28 years old female patient presented with headache and blurring of vision, her fundus examination revealed papilledema. Complete resection was done endoscopically with postoperative improvement of her symptoms with resolution of papilledema. (A) preoperative CT scan shows hyperdense colloid cyst associated with hydrocephalus, (B) the lesion is hyperintense in MR T1-weighted images. (C) Endoscopic view shows the cyst before resection. (D, E) CT and MR images shows complete excision of colloid cyst. (F) Endoscopic view after gross total resection

DISCUSSION

Colloid cysts are rare tumors which are located in the 3rd ventricle. Wallman was the first to describe them in 1858⁽¹²⁾, while Dandy diagnosed colloid cysts via ventriculography and pneumoencephalography in 1922^(13,14). Microsurgical resection through transcortical approaches either transcortical or transcallosal has traditionally been used^(15,16). However, Continuing improvements in neuro-endoscopic approaches and endoscopic instruments with good long-term results in endoscopically treated patients have settled endoscopic colloid cyst excision as an alternative to microsurgical procedures.^(17,18,19) Colloid cysts are more commonly observed in males^(20,21), 63% of our patients were males with mean age of 32.7±10.9 years. Colloid cysts can be asymptomatic and only discovered coincidentally. However, headache is the most common presentation in symptomatic cases. Also symptoms such as memory deficits, vomiting, gait disturbance, seizures, drop attacks, vertigo and disturbed conscious level are included^(9,21,22). In this study, headache was the most common symptom in 81.5% of patients. It occurs because of the variation of the obstruction in the interventricular foramina through the cyst by a valve mechanism⁽²³⁾. Most of the other symptoms

are mostly attributed to increased intracranial pressure due to CSF flow obstruction⁽²¹⁾. Acute hydrocephalus associated with disturbed conscious level can be the first presentation which prompt an emergency intervention⁽²⁴⁾, 3 patients (11.1%) in this study presented with disturbed conscious level and hydrocephalus, EVD insertion on urgent basis was done with subsequent endoscopic resection of colloid cyst in the following day. Neuroimaging studies including CT scan and MRI usually describe it as a round lesion lying in the anterior superior part of the 3rd ventricle with variable density and intensity according to viscosity of cyst contents^(25,26). The viscosity of the cyst is considered the main predictive factor for the practicability of endoscopic aspiration that can be analyzed preoperatively using proper neuroimaging^(21,25). Samadian et al⁽²¹⁾ reported that colloid cysts with a hypodense appearance on CT scan would have much better chance to be evacuated completely⁽²¹⁾. In the present study, all hypodense and isodense cysts were easily suctioned during surgery, and from 17 cases hyperdense in CT, 6 cases were difficult to aspirate by suction tube. ElKhoury et al⁽²⁵⁾ noted that about 89% of hyperdense cysts on CT had been difficult to be aspirated completely.

The mean of hospital stay in this study was 4.7 days and the mean operative duration was 110 minutes. Both could be significantly reduced if endoscopic resection was performed instead of microscopic resection^(11,20,27,28). However, some factors may prolong the endoscopic intervention operative time, especially, lack of experience, intraoperative complications such as intra ventricular bleeding requiring more irrigation with Ringer's solution, and hyperviscosity of cyst content requiring a much longer time for aspiration.

Several studies reported that endoscopic approach carries higher rate of partial resection of colloid cysts, thus higher recurrence rate in comparison with open approaches^(15,29,30,31). The extent of resection differs widely from series to series. However, in our experience, we achieved gross total resection in 22 cases (81.5%), and foramen of Monro patency was considered to be satisfactory, Immediate post operative CT brain was done and confirmed the intraoperative findings. MRI was done on follow up and no growth or residual appeared. In five cases a residual was left, three of these cases showed no interval growth in the follow up imaging. Two patients had growing residual on follow up, one reoperated with endoscopic approach and the other had microscopic approach. Similar results were observed in earlier series⁽²⁰⁾. Mishra et al⁽³²⁾ reported gross total resection of the cyst in 78% patients, and Boogaarts et al⁽¹⁹⁾ were able to do complete excision of colloid cysts in about 90% of patients. The quality of the endoscopic resection of cysts differs from one study to another. In fact, it has been improved obviously in the last years, that can be related to better training and experience, and also due to the improvement of endoscopes and instruments⁽³³⁾.

The endoscopic approach was found to be safe in our study as only one patient died (3.7%) of fulminant meningitis. This is agreeable with the surgical mortality in other series, ranging from 0% to 4%^(4,9,15,21,28). Sheikh et al⁽²⁰⁾ reported in their systematic review and meta-analysis of 1278 patients comparing endoscopic resection versus microsurgical excision of colloid cysts that there is no significant difference in mortality rates between the endoscopic and the microsurgical techniques. In concurring with previous studies analyzed the risk of postoperative complications after endoscopic resection of colloid cysts^(19,20,21,28,30,31), we reported in our study 3 patients had wound infection and treated conservatively, memory deficits occurred in 2 cases and improved in the follow up. EVD was inserted in 9 patients and permanent VP shunt was needed in 2 patients.

There was no new onset seizures or hemiparesis in our series.

Endoscopic excision of colloid cysts is associated with a steep learning curve. The rate of complications after endoscopic surgery is low, however life-threatening complications, although rare, but may occur. The complication rate could be decreased significantly with good surgical experience and continuous training⁽³⁴⁾. Careful patient selection, meticulous analysis of the preoperative investigations and proper planning of the surgery are mandatory for better results.

CONCLUSION

The endoscopic resection of colloid cysts is a reliable and effective technique that offers total removal in most of cases with low risk of recurrence and low morbidity and mortality. However, proper patient selection and continuous training are necessary and remain important factors in improving the outcome.

REFERENCES

1. Ahmed SI, Javed G, Laghari AA, Bareeqa SB, Aziz K, Khan M, Samar SS, Humera RA, Khan AR, Farooqui MO, Shahbaz A. Third Ventricular Tumors: A Comprehensive Literature Review. *Cureus*. 2018;10(10):e3417.
2. Barbagallo GM, Raudino G, Visocchi M, Maione M, Certo F. Out-of-third ventricle colloid cysts: review of the literature on pathophysiology, diagnosis and treatment of an uncommon condition, with a focus on headache. *J Neurosurg Sci*. 2019 ;63(3):330-336.
3. De Witt Hamer PC, Verstegen MJ, De Haan RJ, Vandertop WP, Thomeer RT, Mooij JJ, et al: High risk of acute deterioration in patients harboring symptomatic colloid cysts of the third ventricle. *J Neurosurg*.2002;96:1041-1045
4. Desai KI, Nadkarni TD, Muzumdar DP, Goel AH: Surgical management of colloid cyst of the third ventricle—A study of 105 cases. *SurgNeurol*.2002;57:295-304
5. Charalampaki P, Filippi R, Welschehold S, Perneckzy A. Endoscope-assisted removal of colloid cysts of the third ventricle. *Neurosurg Rev* 2006;29(1):72-79
6. Heller RS, Heilman CB. Colloid Cysts: Evolution of Surgical Approach Preference and Management of Recurrent Cysts. *Oper Neurosurg (Hagerstown)* 2020 ;18(1):19-25.
7. Abdou MS, Cohen AR. Endoscopic treatment of colloid cysts of the third ventricle. Technical note and review of the literature. *J Neurosurg* 1998;89(6):1062-1068
8. Rodziewicz GS, Smith MV, Hodge CJ Jr: Endoscopic colloid cyst surgery. *Neurosurgery*.2000;46:655-662.
9. Samadian M, Ebrahimzadeh K, Maloumeh EN, Jafari A, Sharifi G, Shiravand S, Digaleh H, Rezaei O. Colloid cyst of the third ventricle: long-term

- results of endoscopic management in a series of 112 cases. *World Neurosurgery*. 2018;111:e440-8.
10. Beaumont TL, Limbrick DD, Patel B, Chicoine MR, Rich KM, Dacey RG. Surgical management of colloid cysts of the third ventricle: a single-institution comparison of endoscopic and microsurgical resection. *Journal of Neurosurgery*. 2022;1(aop):19.
 11. Sayehmiri F, Starke RM, Eichberg DG, Ghanikolahloo M, Rahmatian A, Fathi M, Vakili K, Ebrahimzadeh K, Rezaei O, Samadian M, Mousavinejad SA. Comparison of microscopic and endoscopic resection of third-ventricular colloid cysts: A systematic review and meta-analysis. *Clinical Neurology and Neurosurgery*. 2022;215:107179.
 12. Wallman H. Eine collidec cyst im dritten hirnventrikel und eine lipom im plexus choroids. *Virchows Arch (Pathol Anat)* 1858;11:385–8 (German).
 13. Dandy WE. *Benign tumors in the third ventricle of the brain: diagnosis and treatment*. Springfield, IL: Charles C Thomas; 1933.
 14. Dandy WE. Diagnosis, localization and removal of tumors of the third ventricle. *Bull Johns Hopkins Hosp* 1922;33:188–9.
 15. Hernesniemi J, Leivo S: Management outcome in third ventricular colloid cysts in a defined population: A series of 40 patients treated mainly by transcallosal microsurgery. *SurgNeuro*.1996; 145:2–14.
 16. Mathiesen T, Grane P, Lindgren L, Lindquist C. Third ventricle colloid cysts: a consecutive 12-year series. *Journal of neurosurgery*. 1997;86(1):5-12.
 17. Hellwig D, Bauer BL, Schulte M, Gatscher S, Riegel T, Bertalanffy H. Neuroendoscopic treatment for colloid cysts of the third ventricle: the experience of a decade. *Neurosurgery* 2008;62(6, Suppl 3): 1101–1109
 18. Maqsood AA, Devi IB, Mohanty A, Chandramouli BA, Sastry KV. Third ventricular colloid cysts in children. *Pediatr Neurosurg* 2006;42(3):147–150
 19. Boogaarts HD, Decq P, Grotenhuis JA, Le GC, Nseir R, Jarraya B, et al: Longterm results of the neuroendoscopic management of colloid cysts of the third ventricle: a series of 90 cases. *Neurosurgery*.2011;68: 179-187.
 20. Sheikh AB, Mendelson ZS, Liu JK. Endoscopic versus microsurgical resection of colloid cysts: a systematic review and meta-analysis of 1278 patients. *World Neurosurg*.2014;82:1187–1197.
 21. Samadian M, Ebrahimzadeh K, Maloumeh EN, Jafari A, Sharifi G, Shiravand S, Digaleh H, Rezaei O. Colloid cyst of the third ventricle: long-term results of endoscopic management in a series of 112 cases. *World Neurosurgery*. 2018;111:e440-8.
 22. Youmans Winn HR. *Neurological surgery*. 5th ed. Philadelphia: WB Saunders; 2004.
 23. Desai KI, Nadkarni TD, Muzumdar DP, Goel AH. Surgical management of colloid cyst of the third ventricle—a study of 105 cases. *Surgical neurology*. 2002 ;57(5):295-302.
 24. Roberts A, Jackson A, Bangar S, Moussa M. Colloid cyst of the third ventricle. *Journal of the American College of Emergency Physicians Open*. 2021;2(4):e12503.
 25. El Khoury C, Brugières P, Decq P, Cosson-Stanescu R, Combes C, Ricolfi F, et al. Colloid cysts of the third ventricle: are MR imaging patterns predictive of difficulty with percutaneous treatment? *American journal of neuroradiology*. 2000;21(3):489-92.
 26. Armao D, Castillo M, Chen H, Kwock L. Colloid cyst of the third ventricle: imaging-pathologic correlation. *American journal of neuroradiology*. 2000;21(8):1470-7.
 27. Grondin RT, Hader W, MacRae ME, Hamilton MG. Endoscopic versus microsurgical resection of third ventricle colloid cysts. *Can J Neurol Sci* 2007;34(2):197–207
 28. Yadav YR, Parihar V, Pande S, Namdev H. Endoscopic management of colloid cysts. *Journal of Neurological Surgery Part A: Central European Neurosurgery*.2014;75(05):376-80.
 29. Decq P, Le GC, Brugieres P, Djindjian M, Silva D, Keravel Y, et al: Endoscopic management of colloid cysts. *Neurosurgery*.1998;42:1288-1294
 30. Greenlee JD, Teo C, Ghahreman A, Kwok B: Purely endoscopic resection of colloid cysts. *Neurosurgery*.2008;62:51-55.
 31. Engh JA, Lunsford LD, Amin DV, Ochalski PG, Fernandez-Miranda J, Prevedello DM, et al: Stereotactically guided endoscopic port surgery for intraventricular tumor and colloid cyst resection. *Neurosurgery*.2010;67:198-204
 32. Mishra S, Chandra PS, Suri A, Rajender K, Sharma BS, Mahapatra AK. Endoscopic management of third ventricular colloid cysts: eight years' institutional experience and description of a new technique. *Neurol India* 2010;58(3):412–417
 33. Ibanez-Botella G, Dominguez M, Ros B, De Miguel L, Marquez B, Arraez M. Endoscopic transchoroidal and transforaminal approaches for resection of third ventricular colloid cysts. *Neurosurgical review*. 2014;37(2):227-34.
 34. Schroeder HW, Oertel J, Gaab MR. Incidence of complications in neuroendoscopic surgery. *Childs Nerv Syst* 2004;20(11-12): 878–883

To Cite

morsy, A., Abaza, H., Samir, M., nasef, N. Endoscopic resection of colloid cysts: Technical aspects and Surgical outcomes. *Zagazig University Medical Journal*, 2022; (891-896): -. doi: 10.21608/zumj.2022.139780.2570