

## Neuroendoscopic Excision of Third Ventricular Colloid Cysts

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### Abstract

**Objective:** Several surgical approaches have been proposed for the treatment of colloid cysts, which still remains controversial. Though microsurgical craniotomy is more apt to result in a gross total resection, yet subtotal resections and recurrences occur even with best possible efforts. Off late, endoscopy is emerging as an effective alternative to address various intraventricular lesions. **Methods:** The study was carried out on 23 patients (Males-14, Females-9) spanning over a period of 8 years. The age group of the patients ranged from 16years-60 years. Depending on the radiological appearance, the procedure was performed via a right or left precoronal burr hole. We aimed for complete resection of the entire cyst, including the cyst wall. Only in situations in which a part of the cyst wall could not be separated from neural or vascular structures, it was coagulated and left in situ. **Results:** The Follow-up period ranged from a period of 2 months-96 months. All patients were operated by precoronal uniportal transventricular technique without using any navigation system. Twenty two patients were operated by transforaminal approach. One patient required trans-septal approach. Complete excision was possible in 20 cases, while in three patients a small part of cyst was left to avoid venous injury. The operative time ranged between 45 to 100 minutes. Resolution of the symptoms was obtained in all our patients without any mortality. **Conclusion:** These results show that endoscopy is a safe and effective alternative to the well established approaches of microsurgical removal and stereotactic aspiration with a quicker return to active life and low or negligible direct surgical morbidity.

**Keywords:** Neuroendoscopic Excision; Craniotomy; Colloid Cysts.

### Introduction

Colloid cyst is a benign, congenital, epithelium-lined cyst. It almost always arises in the anterosuperior third ventricle, near the foramina of Monro. It accounts for approximately 0.5-2% of all intracranial tumors and it is the most common type of neuroepithelial cyst, as well as the most common tumor in the third ventricle [1,2,3]. The cysts are believed to be derived from either primitive neuroepithelium of tela choroidea or from endoderm [4]. Owing to the presence of critical neuroanatomic structures around the Third

ventricle, tumors in this region present a challenging management scenario for the neurosurgeon. Off late, endoscopy is emerging as an effective alternative to address various intraventricular lesions.

### Material and Methods:

The study was carried out on 23 patients (Males-14, Females-9) spanning over a period of 8 years. The age group of the patients ranged from 16 years-60 years. All patients underwent a thorough clinical examination followed by routine blood investigations and radiological investigations.

MR imaging was done for all the patients who underwent surgery. All the surgeries were performed by the same surgeon precoronal uniportal transventricular technique without using any navigation system. Operative time, length of hospital stay, intraoperative and post operative complications were noted.

**Surgical approach:** All patients were surgically treated under general endotracheal anesthesia, in the supine position, with the head fixed on

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Mayfield head holder in neutral position. The initial burr-hole was planned as carefully as possible, for entry into the frontal horn of the lateral ventricle with a degree of anteroposterior angulation, so that the foramen of Monro could be entered from an anterolateral aspect. The sheath of Gaab universal neuroendoscope (OD=6.7-mm) was introduced through a 14-mm burr hole made 3 to 5 cm lateral and 2 cm anterior to the coronal suture on the right side, unless any indication for left side (viz. larger left lateral ventricle). This sheath was held and supported with a table-mounted endoscope holding arm (Aesculap Germany). The holding arm was a key component that allowed easy manipulation of the endoscope, freehand when necessary but also in a fixed position when needed. Continuous, gravity-fed irrigation was used during the whole procedure (Ringer's solution warmed to 37deg.C). The stylet was withdrawn and a rigid endoscope (4 mm- 0, 30, and 70 degrees) was passed for inspection of the lateral ventricle, the foramen of Monro, and identification of the colloid cyst. The septal vein, thalamostriate vein, choroid plexus, and fornix were identified at this time. A septostomy was performed (to facilitate unilateral extraventricular drainage in event of failure of procedure). The shape and size of the foramen of Monro and the cyst dictated the use of the transforaminal approach or the transeptal interforaminal approach.

#### *A) Transforaminal approach*

Cyst is seen at foramen of Monro. Resection starts with initial bipolar coagulation of the presenting cyst capsule and the overlying choroid plexus followed by fenestration of the cyst capsule with the electrode. A catheter is inserted and suction of the contents done by a 20-mL syringe. The contents of the cyst vary from mucoid suckable to solid and even mixed contents. Solid difficult to aspirate contents are fragmented by clockwise-anticlockwise rotation of trephine edge catheter and then aspirated.<sup>7</sup> Piecemeal removal of the solid contents with the biopsy forceps was done. Following evacuation of all the cyst contents, bipolar shrinkage of the inner and outer surfaces of the cyst capsule facilitates its maximum possible resection. The residual cyst capsule is disconnected from its attachment by the electrode or cutting with scissors, if possible. Removal of the some solid contents and dissected cyst requires use of biopsy forceps.

#### *b) The transeptal-interforaminal approach*

Occasionally, colloid cyst does not present at the foramen of Monro. In these cases, the cyst usually protrudes superiorly and splits the septum

pellucidum. Such a cyst is approached through the septum pellucidum just behind the anterior septal vein. Initial coagulation and fenestration of the septum and underlying cyst capsule is performed. Using catheter, aspiration of the contents is attempted applying the same principles mentioned above. A French 3 Fogarty catheter is then inflated around the fenestration to dilate it allowing better access to the remaining cyst contents.

## **Results**

The study was carried out on 23 patients (Males-14, Females-9) spanning over a period of 8 years. The age group of the patients ranged from 16years-60 years. The presenting symptoms of our patients were headache (22 patients), vomiting (16 patients), behavioral changes (6 patients), drop attacks (5 patients), short-term memory loss (2 patients), diplopia (3 patients), blurred vision (3 patients), and symptomatology of Normal Pressure Hydrocephalus in 1 patient. (Table 1)

On Magnetic Resonance Imaging there was evidence of hyperintense lesion in 18 patients, isointense lesion in 4 patients and hypointense in 1 patient. Five of the patients had asymmetric hydrocephalus.

Twenty two patients were operated by, transforaminal approach. One patient required trans-septal approach. In four patients ipsilateral fornix was injured and cut. Complete excision was possible in 20 cases, while in three patients a small part of cyst was left to avoid venous injury. The operative time ranged between 45 to 100 minutes (Table 2). With increase in experience the operating time decreased. Two patients developed postoperative chemical meningitis that was successfully controlled with steroids. Postoperative transient memory disturbance was observed in 3 patients. One patient had a postoperative CSF leak which required shunt surgery. One patient who postoperatively had signs of raised intracranial tension responded to temporary placement of an External Ventricular Drain. The contents of the cysts showed variable degrees of resistance to aspiration. One patient had a cyst content that was totally solid. Four patients had mixed contents of thick mucoid that was difficult to aspirate and some solid contents were removed with the biopsy forceps. One patient with incomplete excision was reoperated endoscopically after three days on the basis of residual size seen on post operative scan. Total hospital stay of these patients ranged from 3days to 10 days. The period

of follow-up ranged between 2 months to 8 years. One patient showed post-operative radiological evidence of small cyst not obstructing foramina of

Monro. He remains asymptomatic on follow up.

**Table 1:** Showing patient characteristics, radiological findings, extent of surgery

CN	Age	Sex	Clinical presentation	Radiology	Extent of Surgery
1	26 yrs	M	Headache, Recc. vomiting	Hyperintense lesion, Biventriculomegaly	Complete resection
2	23 yrs	F	Paroxysmal headache, Vomting	Hyperintense lesion, Biventriculomegaly	Complete resection
3	32 yrs	M	Headache, vomiting, drop attacks	Isointense lesion, Biventriculomegaly	Complete resection
4	46 yrs	F	Headache, Recc. vomiting	Hyperintense lesion, Biventriculomegaly	Complete resection
5	33 yrs	F	headache, emesis, diplopia, dimn.of vision, drop attacks	Isointense lesion, Assym. ventriculomegaly	Incomplete resection, septostomy
6	35 yrs	F	Headache, behavioral changes.	Hyperintense lesion, Biventriculomegaly	Complete resection
7	45yrs	M	Headache, Recc. vomiting	Hyperintense lesion, Biventriculomegaly	Complete resection
8	40 yrs	F	Headache, decreased memory, and behavioral changes.	Isointense lesion, Biventriculomegaly	Incomplete resection, septostomy
9	32 yrs	F	Headache, behavioral changes.	Hyperdens lesion, Assym. ventriculomegaly	Complete resection
10	46 yrs	M	Headache, Recc. vomiting, drop attacks	Hyperintense lesion, Biventriculomegaly	Complete resection
11	40 yrs	M	headache, emesis, diplopia	Hyperintense lesion, Biventriculomegaly	Complete resection
12	32 yrs	M	Headache, vomiting	Hyperintense lesion, Assym. ventriculomegaly	Complete resection
13	28 yrs	F	Headache, vomiting, behavioral changes.	Hypointense lesion, Biventriculomegaly	Complete resection
14	32 yrs	M	Headache, Recc. vomiting, drop attacks	Hyperintense lesion, Biventriculomegaly	Complete resection
15	60 yrs	M	Symptoms of NPH	Hyperintense lesion, Biventriculomegaly	Incomplete resection, septostomy
16	55 yrs	M	Headache, behavioral changes.	Hyperintense lesion, Biventriculomegaly	Complete resection
17	33 yrs	F	Headache, Recc. vomiting	Hyperintense lesion, Assym. ventriculomegaly	Complete resection, septostomy
18	38 yrs	F	Headache, dimn.of vision Recc. vomiting	Hyperintense lesion, Biventriculomegaly	Complete resection
19	32 yrs	M	Headache, Recc. vomiting	Isointense lesion, Biventriculomegaly	Complete resection
20	29 yrs	M	Headache, diplopia	Hyperintense lesion, Assym. ventriculomegaly	Complete resection, septostomy
21	30 yrs	M	Headache, Recc. vomiting, drop attacks	Hyperintense lesion, Biventriculomegaly	Complete resection
22	36 yrs	M	Headache, Recc. Vomiting,	Hyperintense lesion, Biventriculomegaly	Complete resection
23	16 yrs	M	Headache, decrease memory,behavioral changes, Dimunition of vision	Hyperintense lesion, Biventriculomegaly	Complete resection

**Table 2:** Showing endoscopic intervention, complications, outcome and follow-up

CN	Endoscopic Intervention	Operative time	Hospital Stay	Postoperative procedure	Complication	Follow Up
1	Complete resection	50mts	3days	None	None	96mo, No recurrence
2	Complete resection	55mts	3days	None	None	82mo, No recurrence
3	Complete resection	40mts	4days	None	Transient memory deficit	56mo, recurrence
4	Complete resection	60mts	7days	None	Hemorrhage	50mo, No recurrence
5	Incomplete resection, septostomy	45mts	10days	None	Aseptic meningitis	40mo, asymptomatic
6	Complete resection	50mts	5days	None	None	35mo, No recurrence
7	Complete resection	75mts	10days	Redo-surgery after 3 days	Hemorrhage	32mo, No recurrence
8	Transfornicial incomplete resection, septostomy	90mts	8days	Rt VP Shunt	Transient memory deficit	30mo, small cyst residue, asymptomatic
9	Complete resection	50mts	4days	None	None	25mo, No recurrence
10	Complete resection	45mts	3days	None	None	25mo, No recurrence
11	Complete resection	50mts	5days	None	Hemorrhage	23 mo, No recurrence
12	Transfornicial, Complete resection	80mts	6days	None	Hemorrhage, Transient memory deficit	20mo, No recurrence
13	Complete resection	45mts	4days	None	None	20mo, No recurrence
14	Trans-septal interfornicial, Complete resection	70mts	9days	None	Aseptic meningitis	17mo, No recurrence
15	Transfornicial, Incomplete resection, septostomy	100mts	7days	None	Hemorrhage	16mo, small Cyst residue, asymptomatic
16	Complete resection	60mts	3days	None	None	12mo, No recurrence
17	Complete resection, septostomy	50mts	6days	None	None	10mo, No recurrence
18	Complete resection	75mts	6days	None	Hemorrhage	7mo, No recurrence
19	Complete resection	45mts	3days	None	None	7mo, No recurrence
20	Complete resection, septostomy	50mts	3days	None	None	6mo, No recurrence
21	Complete resection	50mts	4days	None	None	5mo, No recurrence
22	Complete resection, septostomy		9 days	EVD insertion	None	4mo, No recurrence
23	Complete resection, septostomy		7 days	None	None	2mo, No recurrence

**Fig. 1:** Histology of a colloid cyst showing the pseudostratified cuboidal epithelium

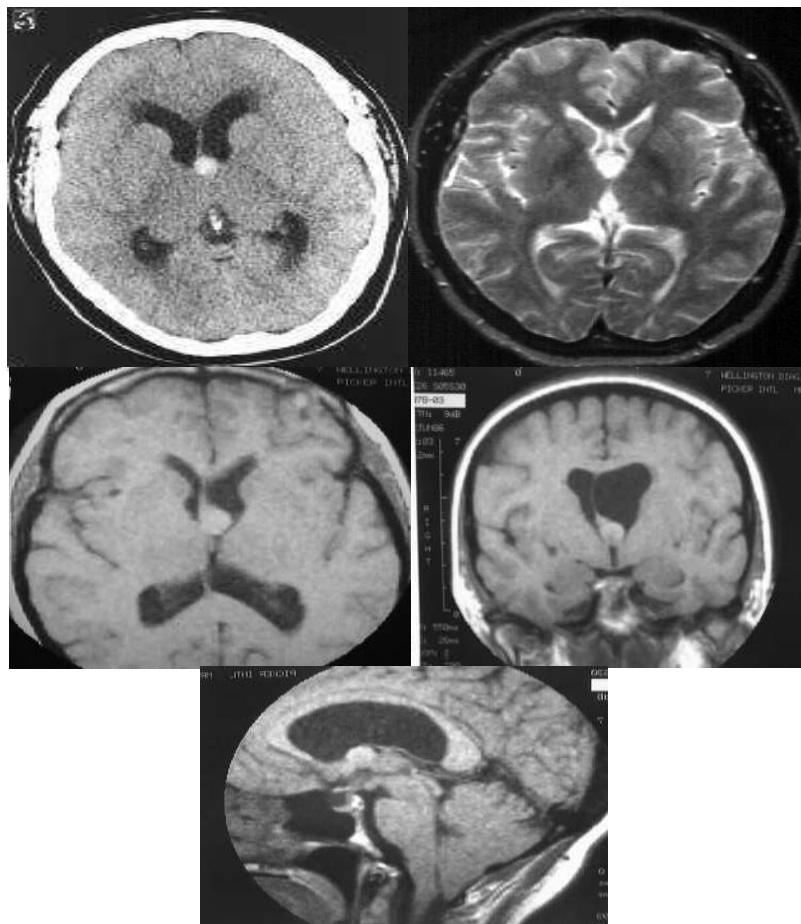


Fig. 2: CT Scan and MR Images of Third Ventricular Colloid Cysts in various sections

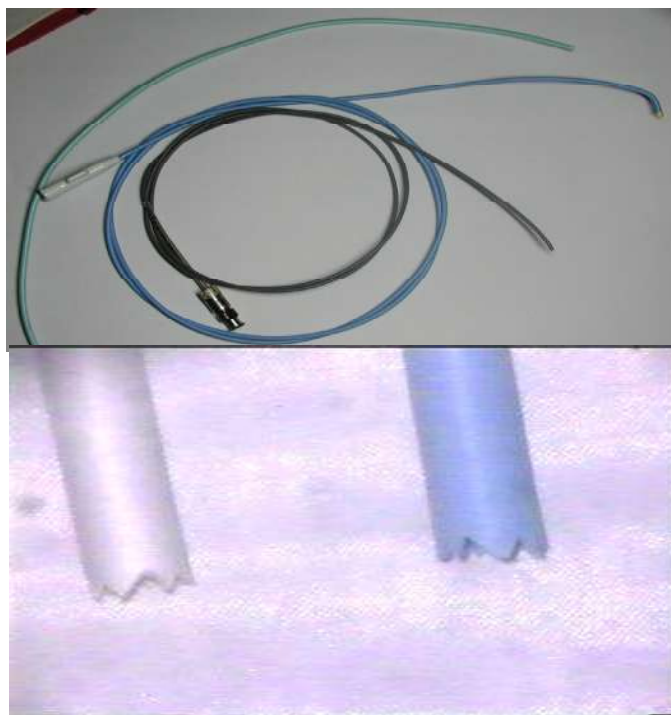
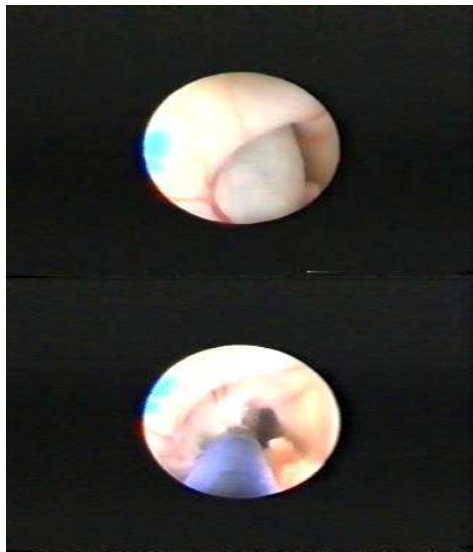
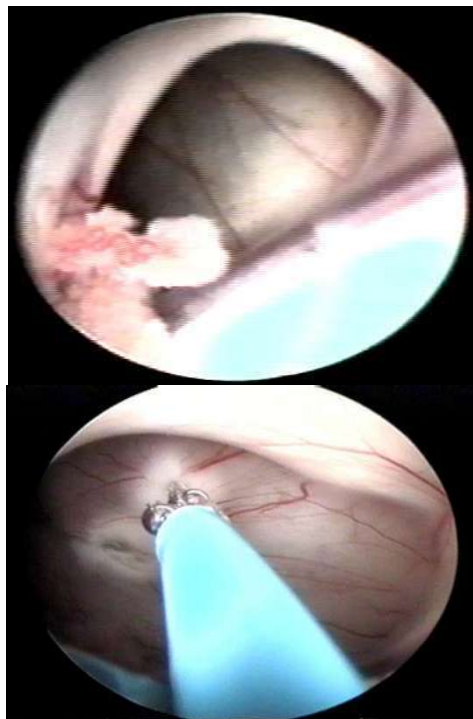


Fig. 3: Angiographic Catheters cut to length and edges having the shape as that of trephine



**Fig. 4:** Endoscopic view of the Third Ventricular Colloid Cyst and its dissection from the ventricular walls



**Fig. 5:** Endoscopic view of the Third Ventricular Colloid Cyst and its fenestration with the angiocath

## Discussion

Colloid cysts are considered to be benign, non invasive congenital lesions located at the anterior part of the third ventricle [5,6]. They are composed of an outer fibrous layer and an inner epithelium of ciliated or mucin producing cells.

Nearly 60% of these mucinous cysts are found incidentally during work up for other neurological

diseases and are asymptomatic [7]. In symptomatic patients, the symptoms may be non specific or related to the rate of hydrocephalus development [8].

In our study majority of the patients presented with symptoms of raise intracranial pressure. The presenting complaints of the patient included headache, recurrent vomiting, emesis, diplopia, diminution of vision, drop attacks, behavioural changes, decreased memory and symptoms of NPH. This is consistent with the symptoms mentioned in various studies. Additional symptoms mentioned in literature include coma, weakness of lower limbs, deterioration in consciousness and symptoms resembling korsakoffs syndrome which may develop due to impression of the cyst to the surrounding area in in cases with increased intracranial pressure [3,4,5].

Since the clinical presentation of colloid cysts is nonspecific, its presence may be confirmed only by diagnostic imaging. Depending on the quantity of cholesterol and protein, cysts may have a diverse appearance on imaging [8,9]. Cysts with higher content of cholesterol and protein are hyperintense on T1 and hypointense on T2 weighted MRI sequences. In our study, the cyst was hyperintense in 18 patients (78.2%) and in 4 patients (17.3%) on T1 weighted MRI sequences [8,9,10].

Management options for colloid cysts include observation, stereotactic aspiration, microsopic or endoscopic resection and shunt surgery [4,11].

The optimal approach for excision of colloid cyst is still controversial. there have been various studies comparing the outcome for microsurgical and endoscopic approaches. In a meta-analysis by Sheikh et al. in 2014 on endoscopic versus microsurgical resection of colloid cyst in 1278 patients, the authors conclude that microsurgical resection of colloid cysts is associated with a higher rate of complete resection, lower rate of recurrence and fever reoperations than endoscopic removal whereas the rate of morbidity is higher with microsurgery than with endoscopy [12]. However, many papers reporting endoscopic outcomes were from early studies when neuroendoscopy was still a new technique. the neuroendoscopic outcomes have improved with the advent of better endoscopes and better exposure to the procedure. In our study also, the operative time and the rate of complications decreased with increase in experience [3].

The rationale for the use of the endoscopic approach is [13,14].

1. to reach the mass rapidly with a minimally invasive path,
2. to visually inspect the anatomic situation of the lesion with respect to the surrounding structures,
3. to empty the cyst by making openings in its wall and aspirating the contents,
4. to achieve total excision with minimal manipulation and in event of failure to do so, coagulate the productive wall to prevent recurrence and relieve mass effect by shrinkage.

The complications seen our study were aseptic meningitis, CSF leak, haemorrhage, transient memory deficit and incomplete excision. The additional complications reported in literature include seizures, memory deficits, venous infarction, subdural hematoma, intracerebral hematoma, arterial infarction, hemiparesis and meningitis [12,15,16,17,18].

Another advantage of Neuroendoscopic procedure is concomitant treatment of associated hydrocephalus, although tumour resection alone may be sufficient to restore CSF flow in most cases [19]. In our study, hydrocephalus was seen in all patients and concomitant septostomy was done in 5 patients (21.7%).

### Conclusions

Endoscopic management of colloid cysts of the third ventricle is emerging as a safe and effective alternative to the well established approaches of microsurgical removal and stereotactic aspiration. The most relevant advantages of the endoscopic approach over microsurgery are shorter operation time, lesser brain retraction, decreased hospital stay and quicker return to active life and low or negligible direct surgical morbidity.

Although this approach has a lower success for complete resection, it is associated with a more favourable outcome and hence should be considered for primary treatment of third ventricular colloid cysts.

### References

1. Mathiesen T, Grane P, Lindgren L, Lindquist C. Third ventricle colloid cysts: a consecutive 12-years series. *J Neurosurg* 1997;86:5-12.
2. Rhoton AL Jr: The lateral and third ventricles. *Neurosurgery* 2002;51 [Suppl]:S207-S271.

3. Connolly ID, Johnson E, Lamsam L, Veeravagu A, Ratliff J, Li G. Microsurgical vs Endoscopic Excision of Colloid Cysts: An analysis of complications and costs using a longitudinal administrative database. *Front. Neurol* 2017;8:59.
4. Yadav YR, Yadav N, Parihar V, Kher Y, Ratre S. Management of colloid cyst of third ventricle. *Turk Neurosurg* 2015;25(3):362-71.
5. Hacıyakupoğlu E, Yılmaz DM, Kınalı B, Arpaç T, Akbaş T, Hacıyakupoğlu S. Colloid cyst of third ventricle: report of 11 cases with transcallosal transforaminal and transcolumna fornicis approach and clinical, radiological features. *Int J Clin Exp Med* 2017;10(6):8819-8828.
6. Ciurea AV, Brehar FM, Tascu A, Iliescu A, Talianu D, Rizea R. Our policy in intraventricular colloid cysts. Experience of 31 operated cases. *Romanian Neurosurgery* 2011;XVIII(1):54-59.
7. Beaumont TL, Limbrick DDJ, Rich KM, Wippold FJII, Dacey RGJ. Natural history of colloid cysts of the third ventricle. *J Neurosurg* 2016;125(6):1420-30.
8. Ravnik J, Bunc G, Grcar A, Zunic M, Velnar T. Colloid cysts of the third ventricle exhibit various clinical presentations: a review of three cases. *Bosn J Basic Med Sci* 2014 Aug;14(3):132-35.
9. Algin O, Ozmen E, Arslan H. Radiologic manifestations of colloid cyst: a pictorial essay. *Canadian Association of Radiologists Journal* 2013;64:56-60.
10. Khoury CE, Brugieres P, Decq P, Cosson-Stanescu R, Combes C, Ricolfi F, Gaston A. C. Colloid Cysts of the Third Ventricle: Are MR Imaging Patterns Predictive of Difficulty with Percutaneous Treatment? *AJNR Am J Neuroradiol* 200 March;21:489-492.
11. Thiam AB, Mezui EDO, Ndoye N, Thioub M, Code Ba M, Badiane SB. Endoscopic treatment of Colloid cysts of third ventricle: study of three cases. *Iranian journal of Neurosurgery* 2015;1(4):15-19.
12. Sheikh AB, Mendelson ZS, Liu JK. Endoscopic versus Microsurgical Resection of Colloid Cysts: a systematic review and Meta analysis of 1278 patients. *World Neurosurgery* 2014 Dec;82(6):1017-19.
13. Barber S, Rangel-Castilla L, Baskin D. Neuroendoscopic resection of intraventricular tumours: a Systematic outcomes analysis. *Minimally Invasive Surgery* 2013, Article ID 898753, 12 pages.
14. Rocque BG. Neuroendoscopy for intraventricular Tumor Resection. *World Neurosurg.* 2016 Jun;90:619-620.
15. Husain M, Jha D, Vatsal DK, Thaman D, Gupta A, Husain N, Gupta RK. Neuro-endoscopic surgery - experience and outcome analysis of 102 consecutive procedures in a busy neurosurgical centre of India. *Acta Neurochirurgica*, 2003;145(5):369-76.
16. Mathiesen T, Grane P, Lindgren L, Lindquist C, von Holst H. High recurrence rate following aspiration

- of colloid cysts in the third ventricle. J Neurosurg 1993;78:748-52.
17. Schroeder HWS, Gaab MR. Endoscopic resection of colloid cysts. Neurosurgery 2002;51:1441-45. Zohdi A, El Khashin S. Endoscopic approach to colloid cysts. Minim Invasive Neurosurg 2006 Oct; 49(5):263-8.
18. Margetis K, Souweidane. MM. Endoscopic Treatment of Intraventricular Cystic Tumours. World Neurosurgery 2013 Feb;79(2):S19.e1-S19.e11.
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