

## ORIGINAL

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# COLLOID CYST OF THE THIRD VENTRICLE; ENDOSCOPIC EXCISION

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**ABSTRACT... Objectives:** Cerebrospinal fluid shunting or microsurgical resection of the colloid cysts of the third ventricle have long been a standard treatment. The emergence of neuroendoscopy has led to its application in various neurosurgical problems. Colloid cyst of the third ventricle is one such pathology where endoscopic treatment has been performed with great clinical success during the past decade. We now Although considered less efficacious than microsurgical excision endoscopic excision is less invasive and much simpler.

**Objectives:** (1) to assess the extent of excision (2) to assess the morbid anatomy of the colloid cyst (3) to assess the risk of complications (4) to assess the functional outcome. **Period:** Eight years (Jul 2001-June 2009) **Materials and Methods:** Endoscopic resections of 15 colloid cysts of the third ventricle with obstruction of Foramina of Monroe in all cases. **Results:** Total removal was achieved in 10 (66.7%) cases. In 5 (33.3%) patients the colloid material was evacuated completely while the remnant of the capsule adherent to its origin was left behind. Two (13.3%) patients developed meningitis one week postoperatively and one died subsequently. Nine (60%) patients had excellent recovery as the symptoms were relieved during a period of 3 to 24 months. Five (33.3%) of the total patients required ventriculoperitoneal shunt for obstructive hydrocephalus which developed within 2 weeks after surgery. One out of the total number of patients deteriorated postoperatively on the existing neurological deficit. There has not been any recurrence until now with subtotal excision of the capsule. **Conclusions:** Keyhole surgery under endoscopic visual control offers an alternative, very effective minimally invasive approach for the excision of colloid cyst of the third ventricle and is likely to replace microsurgical resection as a standard procedure.

**Key words:** Colloid cyst, endoscopic excision, third ventricle.

**INTRODUCTION**

Colloid cysts of the third ventricle are rare intracranial tumors and account for 1% of them. Colloid cysts are benign in nature and occur in the third ventricle attached to its anterior roof posterior to the Foramen of Monroe<sup>11</sup>. Rarely they may be located in the lateral ventricle, cerebellum, or brainstem<sup>13,25</sup>. As these cysts arise from

velum interpositum or choroid plexuses of the third

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ventricle they lead to obstruction of the Foramina of Monroe with resultant hydrocephalus and elevation of intracranial pressure which can wax and wane with postural changes<sup>5,21,22</sup>.

The treatment of colloid cyst was first done by Dandy in 1921 who reported its excision through posterior transcallosal approach<sup>29</sup>. Currently various treatment modalities used to treat these lesions are shunting procedures, microsurgical resection (anterior or posterior transcallosal route, transcortical transventricle), stereotactic aspiration, endoscopic excision or a combination of these techniques<sup>1,4,6,7,8,9,10,15,26</sup>. Present day imaging modalities precisely and accurately delineate the lesion thus allowing the surgeon to choose a correct trajectory. The concept of minimally invasive neurosurgery can thus be materialized. The invasiveness of miniaturized endoscopes is beyond doubt most minimal amongst the present day techniques and technologies. Their application thus brings in the concept of safety and a shorter post operative stay in the hospital. The application of endoscope not only obviates the need for brain retraction and its consequent damage but also provides a brightly illuminated field at higher magnification<sup>16,20,24</sup>. With open procedures the advantage of freedom of movement and maneuver is categorically outclassed by the intraoperative trauma and adverse effects resulting in occasional permanent neurological deficits<sup>12,17,26</sup>. Endoscopic surgery is hence performed in our department as a routine in cases of colloid cysts of the third ventricle as it is simpler and provides a far better clarity of the surrounding structures in close up positions with varying angles. It is minimally invasive and provides maximum safety to the surrounding structures.

## MATERIALS AND METHODS

### Patient Population

Twenty operations were performed in 15 patients (11 male and 4 female) with symptomatic colloid cysts. They were treated with neuroendoscopic excision and ventriculoperitoneal shunt in five cases between Jul 2001 and June 2009. The mean age at the time of surgery was 29 years ranging from 20 to 50 years. Patient selection was based on computed tomography (CT) or magnetic

resonance imaging (MRI). The goal of treatment was removal of colloid cyst and restoration of the patency of the third ventricle. It was done by a pure endoscopic approach initially except in five cases where a ventriculoperitoneal shunt had to be installed. The clinical presentation of these patients comprised of increased intracranial pressure, gait and mentation disturbances, and seizures. The follow-up has been an ongoing process during the last 8 years time. Clinical outcome has been recorded as excellent, improved, poor and death. Improvement meant partial or complete resolution of symptoms. CT or MRI was performed before patient discharge. Follow-up examination was done at 3, 6 and 12 months and then yearly.

### Surgical equipment

Miniaturization of endoscopic equipment and instrumentation has led to the increase in ability and capability of the neurosurgeon to venture into the depths of brain and its cavities. It has thus resulted in minimally invasive procedures and the simultaneous ability to treat effectively. A rigid rod lens endoscope containing therapeutic and diagnostic telescopes of 6.5mm size is utilized to carry out the entire procedure. All cases were done under general anesthesia. The operation was planned as an endoscopic procedure with provision to convert to microsurgical procedure if required.

### Surgical procedure

Coronal burr hole frontal approach is made. The patient is positioned supine without head rotation. The neck is extended about 15 degrees. Right sided approach is performed except when the Foramen of Monroe is small on that side. Skin incision is given parallel to the coronal suture and a burr hole is placed 3 to 3.5 cm lateral to the midline just in front of the coronal suture. Dura is opened and ventripuncture is performed to assess the depth of the ventricular entry and CSF pressure. Next the trocar cannula is inserted along the predefined trajectory up to the predetermined depth. The depth of insertion should not exceed the one determined by ventripuncture needle. It is important not to cannulate too deep as it may damage the neurovascular structures at the outset. The obturator is withdrawn and 0° diagnostic telescope is passed through the cannula to navigate the ventricle and

ascertain the right trajectory to the Foramen of Monroe. This is then replaced with a 6<sup>0</sup> straight forward therapeutic rigid endoscope and the preliminaries to the process of excision commence. This means observing the presentation of the colloid cyst at the Foramen Monroe whether the capsule is bulging out of the foramen or is covered with the body or column of the fornix or is placed too posteriorly to be covered entirely by the white mater. Commonly the cyst is bulging through the Foramen Monroe and is laced with the choroid plexuses. It is coagulated and divided and the capsule is then slit open. Viscosity of the colloid material is then the most important determinant of excision. Thin colloid material can be readily removed and the cyst wall depending upon its attachment site and adherence can be removed completely, sub-totally or partially. When the cyst contents are viscid and sticky it becomes rather difficult to empty it and then calls for tactical maneuvers which involves suction decompression in various directions inside the cyst cavity. Endoscope steering and suction tip placement with controlled suction pressure application is the key to success.

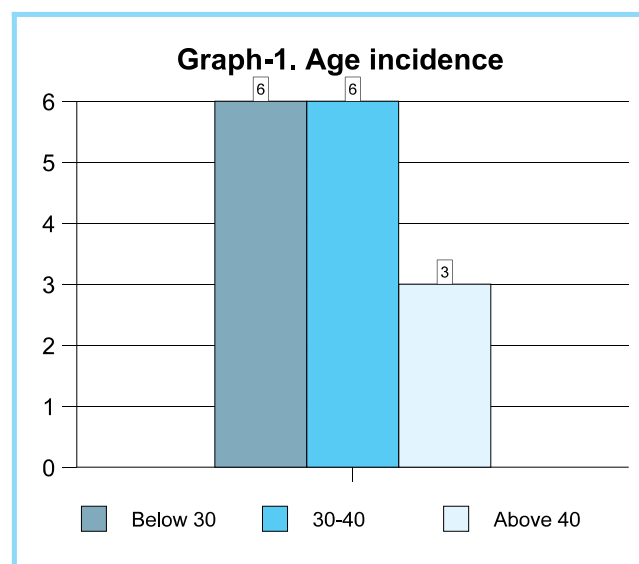
When the cyst is hidden behind the white mater or is barely visible due to overhanging forniceal parts the choice for entry corridor really becomes a critical factor. The lateral aspect of the forniceal body is then carefully opened to bare the cyst capsule if it is not accessible otherwise. The opening is restricted to a few millimeters. Like a picture in picture video display this is a further key hole in a keyhole surgery. The caveat here is that one should not make an incision in the subchoroidal area. The cyst wall is invariably attached to the roof of the third ventricle. It should be tugged to assess the extent of attachment and the vascularity. If deemed fit it can be excised completely, partially or left as such dictated by the circumstances. Ventricular cavity is washed thoroughly during and at the end of the procedure to avoid the danger of chemical meningitis. The scope is then gently withdrawn and the burr hole incision is closed after placing a piece of gelfoam on the durotomy site.

## RESULTS

### AGE INCIDENCE

All our patients of colloid cysts were adults. Out of fifteen patients 6 (40%) were between thirty to forty years. Six patients (40%) were below thirty years and three patients (20%) were above forty years, (table-I), (graph 1). However the mean age was 29 years.

Age (years)	No. of patients n(%)
Below 30	6 (40)
30-40	6 (40)
Above 40	3 (20)

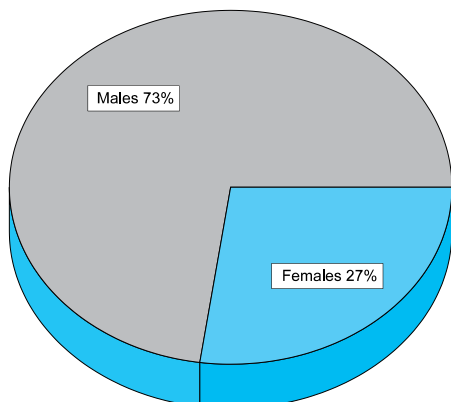


### SEX INCIDENCE

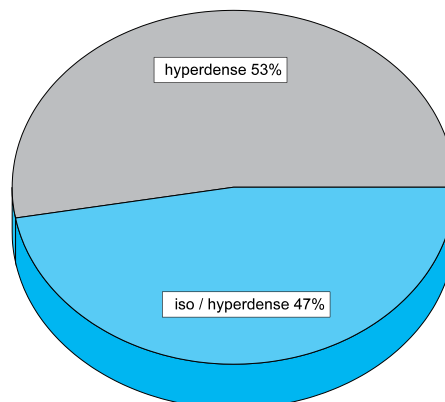
We encountered more males (73.3%) having colloid cysts than females (26.7%), in our study (table-II), (graph-II).

Sex	No. of patients
Males	11
Females	04

**Graph-2. Sex incidence**



**Graph-3. Radiological features**



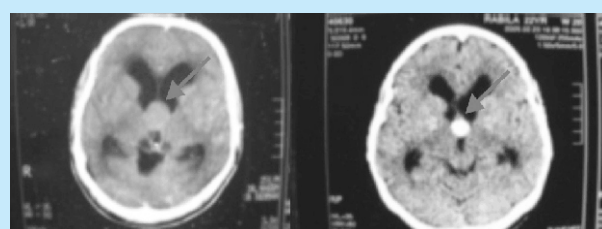
**CLINICAL PRESENTATION**

In our study patients were with drop attacks mostly, nine patients (60%) presented with sudden loss of consciousness. Headache was the commonest symptom in thirteen patients (86%), memory disturbance was documented in nine patients (60%), gait ataxia in three patients (20%) and visual impairment and seizure in one patient (6.67%), (table III).

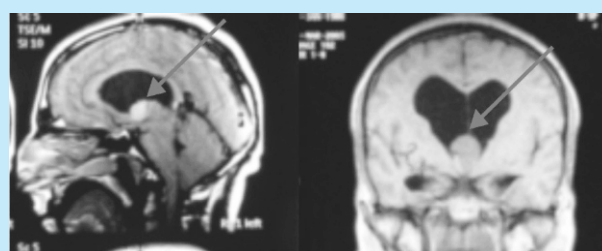
Table-III. Clinical presentation	
Clinical features	No. of patients
Headache	13
Drop attacks	09
Memory disturbance	09
Ataxia	03
Visual impairment	01

**RADIOLOGICAL EVALUATION**

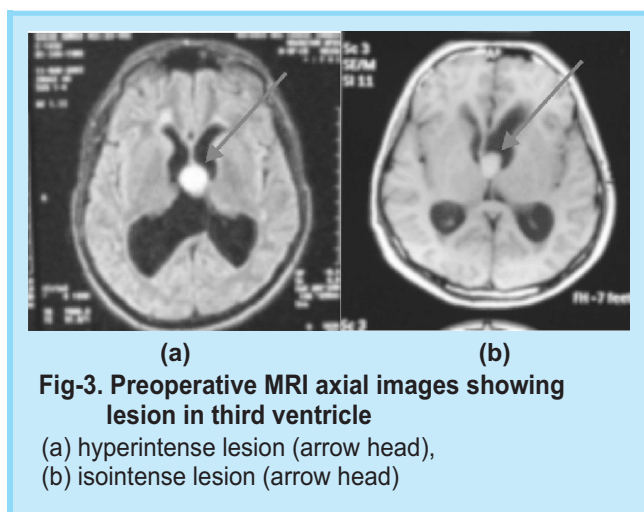
Colloid cyst was iso to slightly hyper dense on CT scan in seven patients (46.7%), while it was markedly hyper dense in eight patients (53.3%), (graph 3).



**Fig-1. Preoperative CT scan showing lesion in third ventricle**  
 (a) isodense (arrow head) (b) hyperdense (arrow head)



**Fig-2. Preoperative MRI showing lesion third ventricle**  
 (a) sagittal image showing hyperintense lesion (arrow head),  
 (b) Coronal image showing isointense lesion (arrow head)



### SIZE OF COLLOID CYST

Size of cyst was below 2cm in four patients (26.66%), between 2 to 3 cm in seven patients (46.66%), and above 3 cm in four patients (26.66%), (table IV).

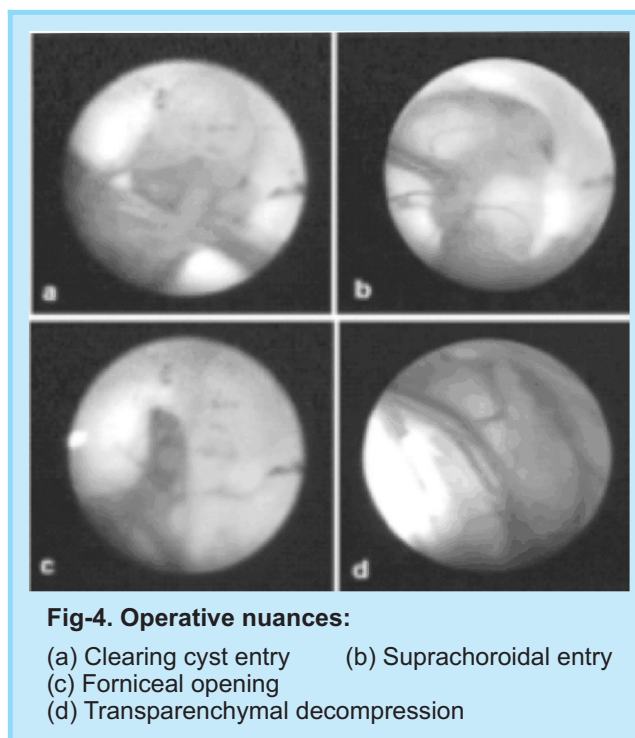
Table-IV. Size of colloid cyst	
Size of cyst	No. of patients
1-2 cm	04
2-3 cm	07
3-4 cm	04

### MORBID ANATOMY

Following two aspects were noted regarding the cyst anatomy.

Location and relation to the surrounding structures: Almost all the cysts were occupying the anterior third ventricle except one, consequently plugging the Foramen of Monroe pushing the anterior column of the fornix and fibers of its body. The choroid plexuses laced the exposed surface of the cysts peeping through the Foramen of Monroe. One of the cysts alluded to above was placed at the junction of anterior and posterior third ventricle consequently being draped by fibers of the forniceal body and also plugging the Foramen of Monroe.

Consistency of colloid material: It was of three types i) viscid fluid which was sticky and either thick or thin ii) soft flakes like a shredded soap iii) thick cheesy material clumped together. The first type was difficult to remove although neither of the three had any impact on complete excision. It was related to the adhesiveness and visibility at the site of origin and the intimacy to vascular structures.

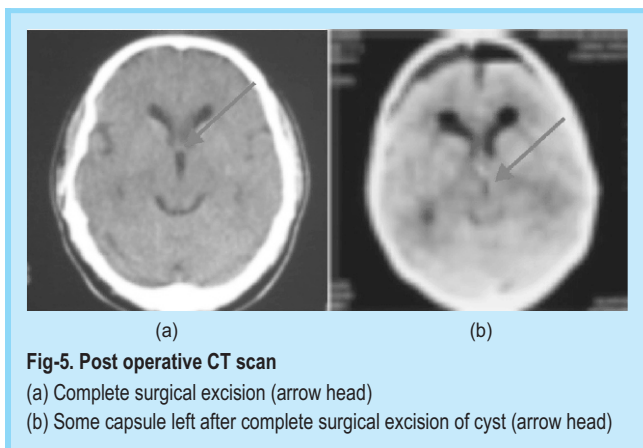


### SURGICAL EXCISION

Complete surgical excision was possible in ten (66.7%) out of fifteen patients. We were able to evacuate the cyst contents without complete excision of the capsule in five patients (33.3%) (Table V).

### POST OPERATIVE COMPLICATIONS

Two patient (13.33%) unfortunately, developed meningitis after cyst excision. Five patients (33.33%) developed hydrocephalus post operatively and required ventriculo peritoneal shunt, (graph 4).

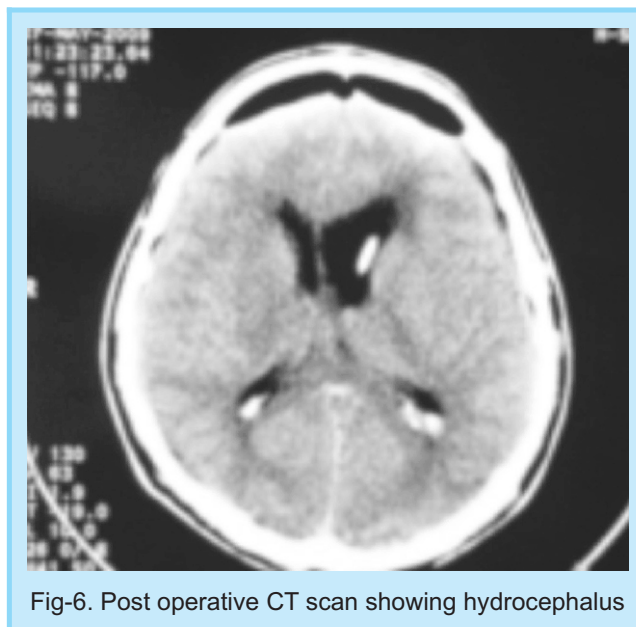


**Fig-5. Post operative CT scan**

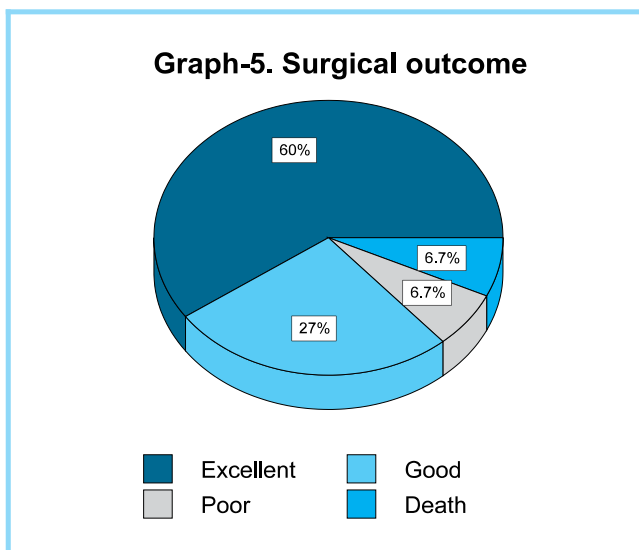
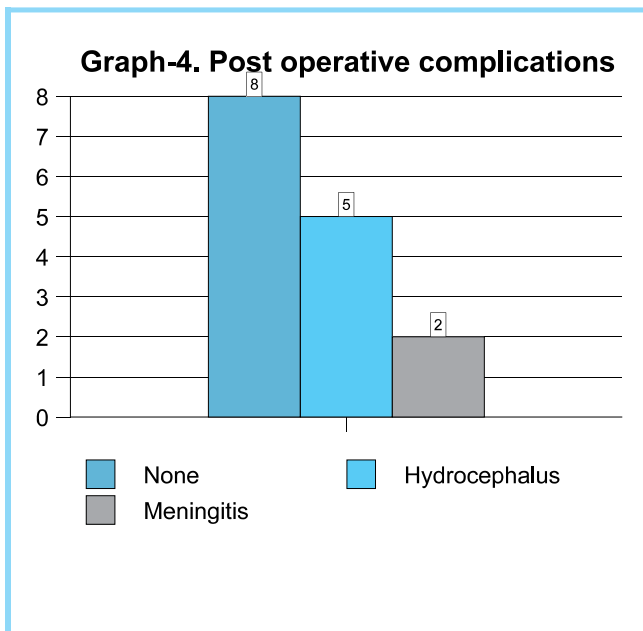
(a) Complete surgical excision (arrow head)  
 (b) Some capsule left after complete surgical excision of cyst (arrow head)

Table-V. Surgical excision	
Surgical excision	No. of patients
Complete	10
Partial	05

seen in two patient (13.33%). One of them died later (graph 5).



**Fig-6. Post operative CT scan showing hydrocephalus**



**SURGICAL OUTCOME**

Surgical outcome was excellent in 9 patients (60%) and good in four patients (26.6%) who became shunt dependent post operatively. However improved outcome was in thirteen patients (86.66%) and poor outcome was

**DISCUSSION**

Colloid cyst of the third ventricle is a relatively rare intracranial tumor. Its benign nature, deep location in the brain and excellent prognosis when diagnosed and excised earlier make it the most favorable and

challenging space occupying lesion of brain for successful surgical removal. Stereotactic aspiration or microsurgical excision by transcallosal and transcortical routes was the traditional approaches to attack this lesion<sup>1,7</sup>. With the advancement of endoscopic neurosurgery, now neurosurgeons are able to manage this avascular lesion through endoscopy. Endoscopic removal of colloid cyst is well established and safe now, although the ability of surgeon to perform complete endoscopic resection depends on tumor size, viscosity of the colloid material or nature of its contents, use of refined endoscopic instrumentation and disciplined surgical skill<sup>3,28</sup>. Rigid endoscope with good optical resolution, high magnification and excellent illumination make possible the total or near total resection of colloid cyst<sup>2,12,13</sup>. Goals of treatment of colloid cyst of third ventricle are the relief of foraminal obstruction and prevention of recurrence. We were successful in complete surgical excision of colloid cyst in ten patients (66.7%), while in five patients (33.3%) only evacuation of cyst contents along with partial excision of the capsule. Our success rate was slightly lower than that of King and Ulman<sup>14</sup>. They documented complete endoscopic excision in 93% patients, likewise Rodziewicz and Smith<sup>23</sup> demonstrated 100% success in complete surgical excision of colloid cysts. However Longatti, Godano Gangemi<sup>18</sup> from Italy in their cooperative study on treatment of 61 cases of colloid cyst described that cyst fenestration, colloid aspiration and coagulation of internal cyst wall was the main technique and excision of capsule was possible in only occasional cases. 18 We think that excision of cyst capsule is a big possibility and the skill required is to exercise the technique of push, pull and tug with the biopsy or grasping forceps and suction catheter. The diameter of cyst in our study was quite comparable with the work of Longatti & Godano<sup>18</sup> and Mark & Neal<sup>19</sup>. Although even the minimum size of colloid cyst was above 1 cm. Post operative complications seen in six patients (40%) in our study, is higher than work of Tirakotai & Schulte<sup>27</sup> who demonstrated 18.2% complications however the spectrum of complications was different, as memory disturbance, hemiparesis, meningitis and subdural fluid collection seen in 4.55% cases each, while in our study hydrocephalus seen in 33.33% cases and meningitis in 13.33% cases<sup>17</sup>. Like

wise Helwing & Bauer demonstrated 10% complications post operatively, in the form of meningitis, and intraoperative haemorrhage in 5% cases each<sup>11</sup>. Zohdi documented higher complications, memory disturbance in 16.7%, chemical meningitis in 27.7%, and CSF leak again in 16.7% patients<sup>30</sup>. No doubt the complication rate decreases markedly with surgical experience<sup>21</sup>. Our Post operative results were excellent in thirteen patients (86.66%) in our work, that are slightly lower than Halwing Bauer neuroendoscopic treatment of colloid cyst of 3rd ventricle, who documented 90% excellent outcome<sup>11</sup>. There was no recurrence documented so far in our study that is comparable with work of Mark & Neal, Zohadi & Kheshin and Charalampaki & Filippi<sup>5,19,30</sup>.

## CONCLUSIONS

Neuroendoscopic excision of the colloid cyst is a simpler, safer and minimally invasive procedure in the hands of an expert endoscopist. It now stands as an alternate to microsurgical excision in the treatment paradigm.

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