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Third Ventricular Colloid Cysts in Children-A Series of Eight Cases and Review of the Literature

Çocuklarda Üçüncü Ventrikül Kolloid Kistleri - Sekiz Olguluk Bir Seri ve Literatürün Gözden Geçirilmesi

Nishant GOYAL, Bhawani Shankar SHARMA, Ashok Kumar MAHAPATRA

All India Institute of Medical Sciences, Department of Neurosurgery, New Delhi, India

Corresponding Author: Ashok Kumar MAHAPATRA / E-mail: akmahapatra22000@gmail.com

ABSTRACT

AIM: Colloid cysts are uncommon lesions, which most commonly occur in the fourth through seventh decade. The authors hereby report a series of colloid cysts in the pediatric age group.

MATERIAL and METHODS: A retrospective study was conducted on all patients of colloid cyst that underwent surgery at our institute over a period of seven years (2005 to 2011). Patients above the age of 20 were excluded from the study.

RESULTS: All eight patients presented with the features of raised intracranial pressure. All these patients had the characteristic radiological features of a colloid cyst. Of these eight pediatric patients, endoscopic removal was attempted in four. In one of these four, the colloid cyst could not be removed endoscopically and had to be converted into transcortical transventricular excision. In one more patient, transcortical transventricular excision was used, while transcallosal approach was performed in three patients. Of the three patients who underwent endoscopy, one patient additionally underwent septostomy and one patient additionally underwent septostomy along with third ventriculostomy. One of the patients succumbed to ventriculitis.

CONCLUSION: Colloid cysts in the young are thought to be more aggressive clinically and radiologically and therefore, early surgical intervention is indicated.

KEYWORDS: Third ventricular colloid cysts, Child, Pediatric, Endoscopy, External ventricular drainage

ÖZ

AMAÇ: Kolloid kistler en sık olarak dördüncü ila yedinci on yılda görülen nadir lezyonlardır. Yazarlar burada pediatrik yaş grubunda bir kolloid kist serisi bildirmektedir.

YÖNTEM ve GEREÇLER: Enstitümüzde yedi yıllık bir dönemde (2005 - 2011) ameliyat geçiren tüm kolloid kist hastalarıyla retrospektif bir çalışma yapılmıştır. Çalışmaya 20 yaşın üzerindeki hastalar alınmamıştır.

BULGULAR: Sekiz hastanın tümü artmış intrakraniyal basınç bulgularıyla gelmişlerdir. Tüm hastalarda kolloid kistin karakteristik radyolojik özellikleri saptanmıştır. Bu sekiz pediatrik hastanın dördünde kist endoskopik olarak çıkarılmaya çalışılmıştır. Bu dört hastanın birinde kolloid kist endoskopik olarak çıkarılamamış ve transkortikal transventriküler eksizyona dönülmek zorunda kalınmıştır.Bir hastada transkortikal transventriküler eksizyon, üç hastada transkallosal yaklaşım kullanılmıştır. Endoskopi yapılan üç hasta içinde bir hastaya ayrıca septostomi yapılmış ve bir hastaya ayrıca septostomi ve üçüncü ventrikülostomi yapılmıştır. Bir hasta ventrikülit nedeniyle kaybedilmiştir.

SONUÇ: Çocuklarda kolloid kistlerin klinik ve radyolojik olarak daha agresif olduğu düşünülür ve bu nedenle erken cerrahi girişim gereklidir.

ANAHTAR SÖZCÜKLER: Üçüncü ventriküler kolloid kistler, Çocuk, Pediatrik, Endoskopi, Eksternal ventriküler drenaj

INTRODUCTION

Colloid cysts are endodermally derived cystic lesions, commonly located in the anterior roof of the third ventricle at the foramen of Monro (8). They are relatively uncommon lesions representing only about 1 % of all intracranial tumors (12). In a population based study, the reported incidence is 3.2 per million per year. These lesions most commonly occur in the fourth through seventh decade (22). Till date, only about 96 cases of pediatric colloid cysts have been reported in the English literature (9).

The authors report a series of eight patients with colloid cyst in the pediatric age group and study the clinico-radiological features, management and outcome of these patients.

MATERIAL and METHODS

This retrospective study was conducted on all patients of colloid cyst that underwent surgery at our institute over a period of seven years (2005 to 2011). Patients above the age of 20 were excluded from the study. Medical records and radiological studies of the remaining patients were reviewed to study the clinico-radiological features, surgical technique used and the outcome.

RESULTS

Over all, 37 patients with colloid cysts underwent surgery at our institute between 2005 and 2011. Of these, eight pediatric patients (<20 years) were identified (21.6 % of all patients), of which six were males and two were females. The age range was between 10 and 19 years (Table I).

Headache, nausea and vomiting were the most prominent clinical symptoms in all the patients. In addition, two patients presented with visual disturbances and two had history of loss of consciousness. The symptoms were episodic in three patients. The duration of symptoms ranged from 15 days to 3 years (Table I).

All these patients had the characteristic radiological features of a colloid cyst (Figure 1A-E, 2A-D). Of these eight pediatric patients, endoscopic removal was attempted in four. In one of these four, the colloid cyst could not be removed endoscopically and had to be converted into transcortical transventricular excision. In one more patient, transcortical transventricular excision was used, while transcallosal approach was performed in three patients. Of the three patients who underwent endoscopy, one patient additionally underwent septostomy and one patient additionally underwent septostomy along with third ventriculostomy. Over all, external ventricular drain was placed at the time of surgery in five patients and was removed at 48-72 hours (Table I).

OUTCOME

One patient developed ventriculomegaly and meningitis in the post-operative period following interhemispheric transcallosal apprarach. For her, frontal Ommaya reservoir was placed, which was tapped twice daily. The CSF cultures were positive for growth of micro-organisms. This patient succumbed to ventriculitis on post-operative day 37, in spite of appropriate antibiotics. All the remaining seven patients had an uneventful post-operative course.

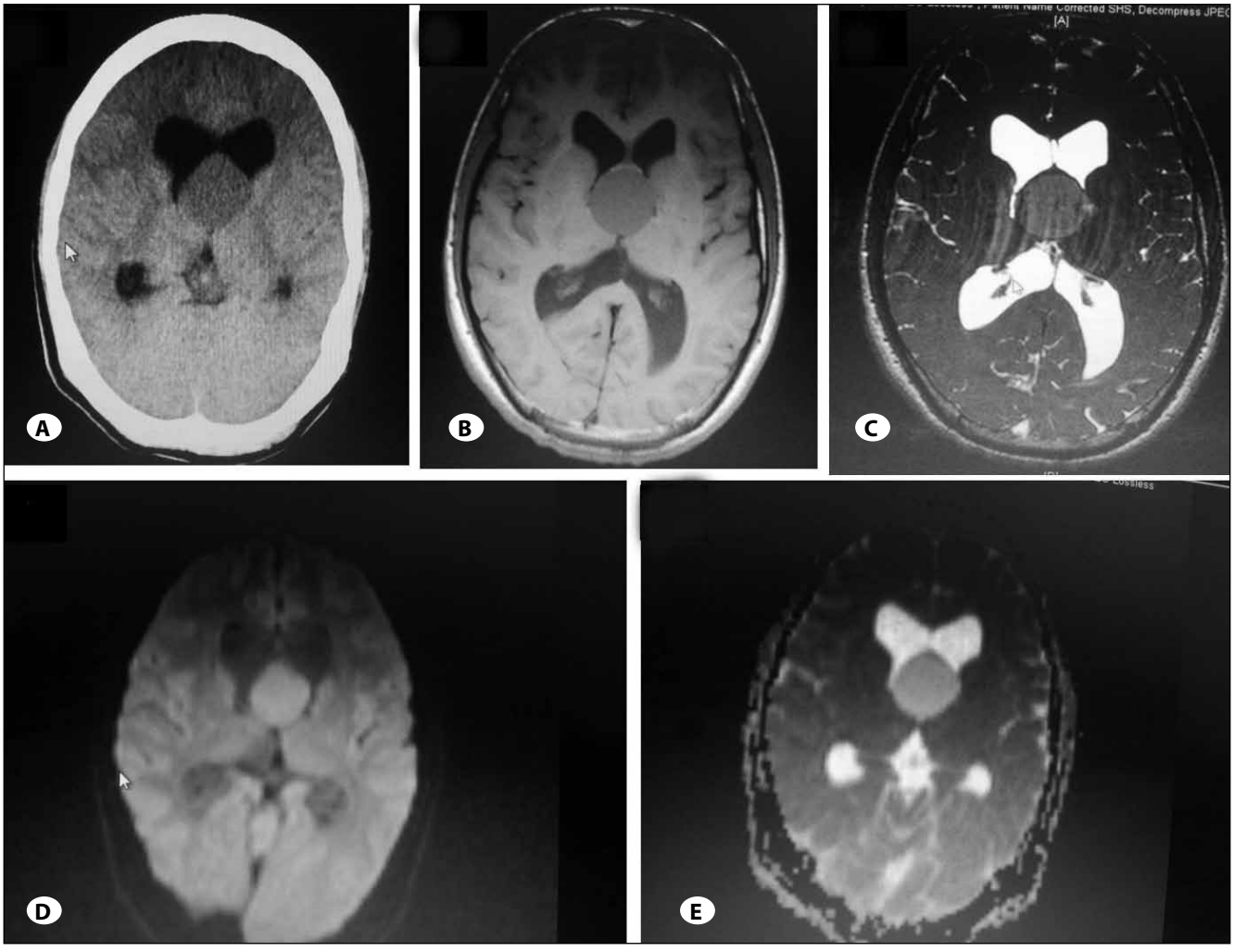

Figure 1: Colloid cyst is a well defined round mass lesion in the third ventricle which is iso-dense to the gray matter on NCCT scan **(A)**, iso-intense to the gray matter on T1-weighted MR images, slightly hyper-intense on T2-weighted MR images **(C)**. The cyst shows moderate restriction on diffusion-weighted images when compared to ventricle **(D)** and low ADC scores **(E)**.

One patient underwent endoscopic removal of the cyst along with septostomy. An external ventricular drainage was kept in situ for 48 hours following surgery and removed after 48 hours when CSF became clear. However, the follow up scan revealed a residual lesion. The patient improved symptomatically and therefore, it was decided to follow him up. He started complaining of headache of similar nature after 16 months of follow up and a follow up scan revealed increase in the size of the residual mass. He was reoperated by transcallosal approach (Figure 3A-D).

One patient was lost to follow up. The remaining five patients had no recurrence at a mean follow up period of 31 months (range- 5 to 90 months) (Table I).

Table I: Details of the Patients

Patient	Age/ Sex	Clinical features	Duration of symptoms	Management	Outcome
1	19/ F	Headache, vomiting, diplopia, blurring of vision	1 month	Endoscopic excision of colloid cyst, third ventriculostomy and septostomy. EVD kept for 48 hours.	Fever in post-operative period. Discharged on POD 10. Well till 7 ½ years' follow up.
2	17/ M	Headache, one episode of loss of consciousness	2 years	Endoscopy converted to trascortical transventricular approach. Total excision of colloid cyst achieved. EVD kept for 48 hours.	One episode of seizure. Afebrile. Discharged on POD 6. Well till 5 months' follow up.
3	18/ M	Headache, vomiting, visual diminution	5 years	Excision of colloid cyst by transcortical- transventricular approach. EVD left for 48 hours	Uneventful recovery. Had one episode of seizure in the post-operative period. Well till 2 years' follow up.
4	13/ M	Multiple episodes of sudden onset headache, vomiting, altered sensorium and redness of eyes	5 months	Endoscopic excision of colloid cyst. Minimal bleeding +, EVD placed for three days, until CSF became clear.	Fever and chemical meningitis, responded to antibiotics and steroids. Discharged on POD 6. One episode of seizure after 10 months. Well till 20 months' follow up
5	13/ M	Headache, vomiting	1 month	Endoscopic excision of colloid cyst, septostomy, EVD placed for two days, until CSF became clear.	Uneventful recovery. Dicharged on POD 5. Residual remained post operatively. Operated 16 months later by transcallosal approach.
6	19/ F	Headache, vomiting, psychotic behavior	2 years	Excision of colloid cyst by interhemispheric transcallosal approach	Meningitis and ventriculomegaly in the post operative period, managed by placing frontal Ommaya and tapping it twice daily. However, ventriculomegaly became loculated. *Expired on* POD 37
7	19/ M	Multiple episodes of headache, vomiting followed by loss of consciousness	3 years	Gross total excision of colloid cyst by transcallosal approach	Uneventful recovery. Dicharged on POD 5. Well till 8 months' follow up period. Well till 16 months' follow up.
8	10/M	Multiple episodes of headache and vomiting	1 year	Anterior transcallosal approach	Uneventful recovery.

***EVD-** External ventricular drain, **POD-** post operative day.*

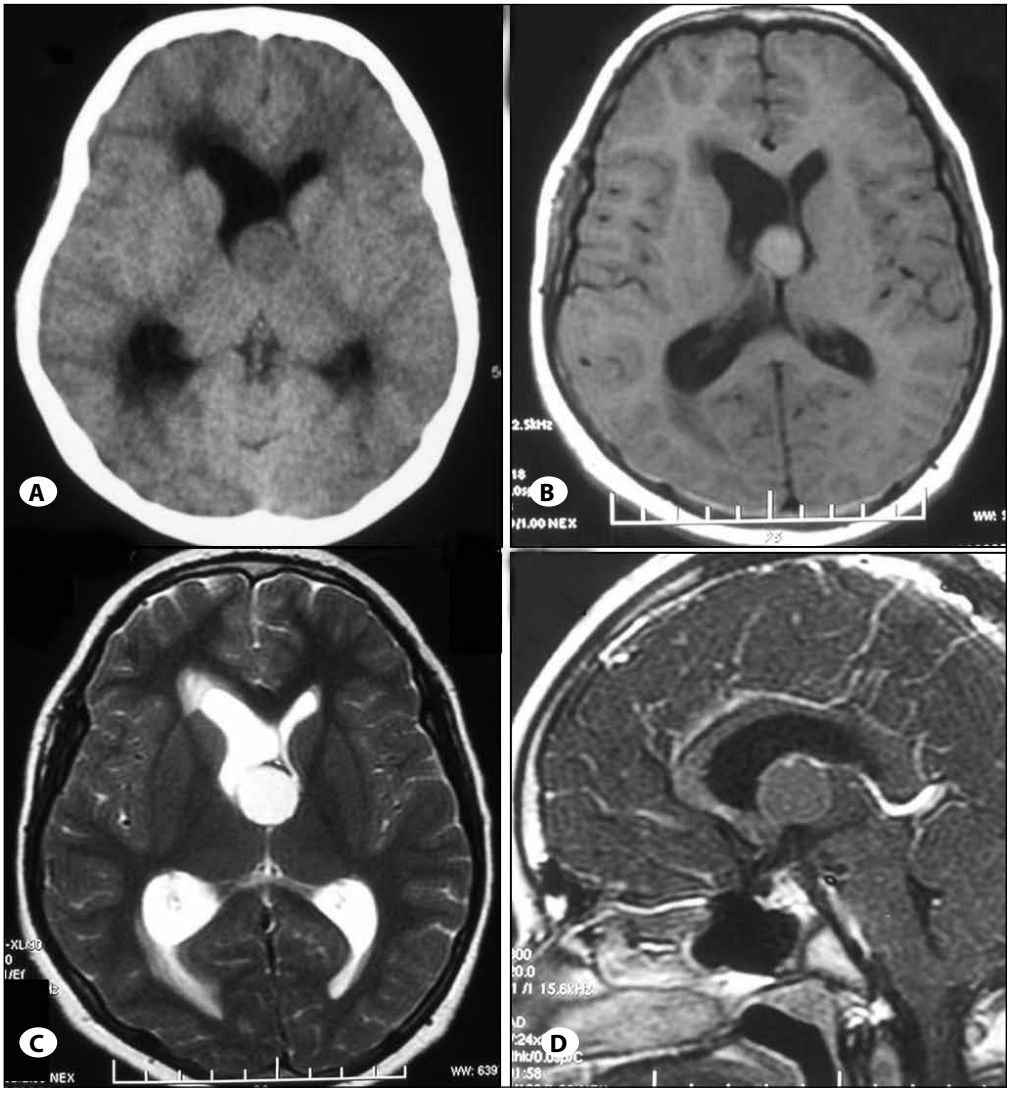

Figure 2: Preoperative images of patient no. 5 shows a well defined, rounded homogenous mass lesion in the roof of the third ventricle which is iso-dense to the gray matter on NCCT scan **(A)**, iso-intense to the gray matter on T1-weighted MR images **(B)**, hyper-intense on T2 weighted MR images **(C)**. Sagittal images of contrast enhanced MRI reveals no contrast uptake by the lesion **(D)**.

DISCUSSION

Colloid cysts generate a special interest among neurosurgeons, primarily due to their controversial origin, benign histology, variable and often dramatic clinical presentation and the various treatment options available. In spite of being congenital lesions, these cysts most commonly present in the fourth through seventh decade.

Till date, only about 96 cases of colloid cyst have been reported in the pediatric age group (9). In a series reported by Methiesen et al, out of a total of 37 cases of colloid cyst, five were found to occur in children (13.5%) (19). Alnaghmoosh and Alkhani reported a series of 43 cases of colloid cysts, of which seven were in the pediatric age group (16.3%) (2). In a series of 105 colloid cysts of all age groups, Desai et al. found 14 of them to occur in the pediatric age group (13.3%) (7). In our series, we found a higher incidence of pediatric colloid cysts (i.e. 21.6% of all age groups), which can be explained by a different age distribution in our country, as more than 30% of the population in our country is under 18 years of age.

A male predilection was recorded, as 75% of the cases in our series were males. This finding is similar to the previously published literature (19,23).

Colloid cysts are benign lesions with generally good prognosis, and most cases remain asymptomatic (8). They primarily present with non-localizing symptoms, caused mainly due to increased intracranial pressure (2). In our study, headache and vomiting were *the most common presenting complaints*. In addition, two patients in our series presented with visual disturbances and two had history of loss of consciousness (Table I). In our study, the symptoms were paroxysmal in three out of eight pediatric patients (Table I). Classically, episodic positional headaches have been described to occur in colloid cysts. Occasional cases of sudden death have been reported (13,21). The proposed mechanism of sudden death has been ventricular obstruction at the foramen of Monro, leading to acute hydrocephalus (ball valve- like mechanism) (8). Buttner et al. reviewed 21 cases of colloid cysts associated with sudden death of which *seven were pediatric (33%)* (5).

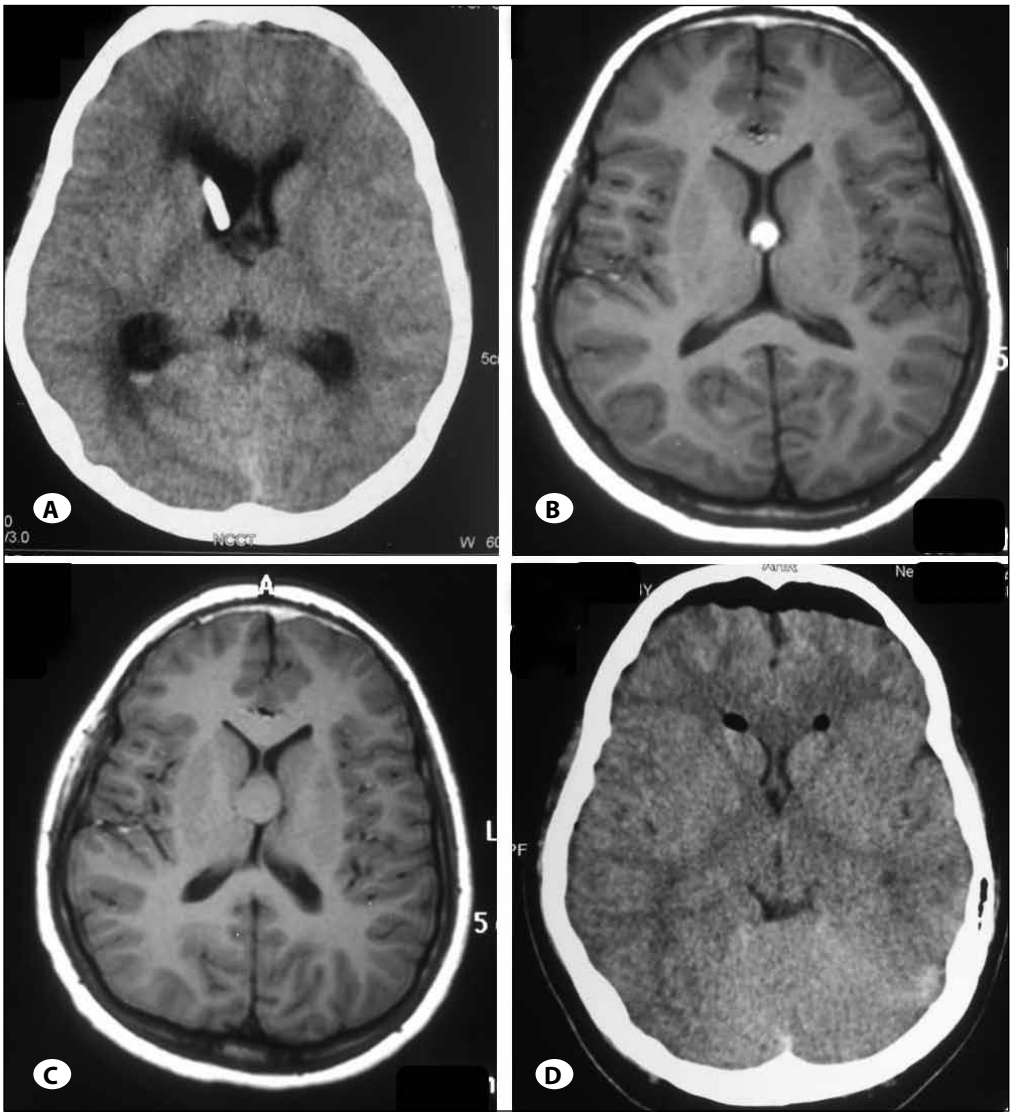

Figure 3: Patient no. 5 underwent endoscopic excision of the colloid cyst alongwith septostomy. Immediate post-operative CT scan reveals a residual mass lesion with an external ventricular drain in situ **(A).** Follow up MRI at 3 month showing the residual mass lesion **(B)**. However, as the patient was asymptomatic, he was followed up. MRI done after 16 months revealed increase in the size of the mass lesion **(C)** and the patient started complaining of headache. Therefore, he underwent excision of the residual colloid cyst by trans-callosal route. Post-operative CT scan of the patient showing complete exicision of the colloid cyst **(D)**.

This figure indicates that pediatric colloid cysts have a higher incidence of sudden worsening and a worse clinical profile as compared to adult colloid cysts.

Natural History- A study on the natural history of asymptomatic colloid cysts, conducted by Pollock et al. revealed that 8% of the subjects with asymptomatic colloid cysts go on to develop symptoms after a period of 10 years (24). The rate of growth of the colloid cyst is uncertain and it is not possible to predict which colloid cysts will become symptomatic. MacDonald et al. stressed that younger patients are more likely to become symptomatic during their lifetime and require surgery (18).

On radiology, colloid cyst is seen as a round homogenous mass in the anterosuperior third ventricle in the region of the foramen of Monro. Colloid cysts content may have variable appearance on CT and MRI (12). Kondziolka and Lundford reviewed 122 cases in the literature and related the density on CT scan directly to the viscosity of the cystic contents. They noticed that hyperdense cysts were likely to be aspirated successfully (15,16).

The signal intensity of colloid cysts content on T2-weighted images may correlate with its state of hydration. Colloid cysts with hyperintense signals on T2-weighted images were suggested to have higher water content and would be more capable of further cyst expansion. On the other hand, hypointense cysts on T2-weighted images would be more viscous and difficult to aspirate during endoscopic procedures (2). Pollock et al. reported a trend to have hyperintense signal of the colloid cysts contents on T2 weighted images in younger patients, indicating more watery contents of cysts and a higher likelihood of further cyst expansion and symptoms progression (25). This probably explains a worse clinical profile of the colloid cysts in the pediatric age group.

MANAGEMENT

The treatment of colloid cysts has greatly evolved over time. Open microsurgical excision was traditionally considered the 'gold standard' treatment. However, the quest for less invasive approaches to deal with these lesions led to the introduction of aspiration techniques for decompression of the cyst. In 1975, Gutierrez- Lara et al. attempted free hand aspiration of colloid cysts (10). In order to increase the accuracy of the procedure, stereotactic guidance was first employed by Bosch et al. (4). The procedure became popular, as it was associated with much fewer complications. However, it was soon realized that all colloid cysts were not suitable for aspiration and cysts with higher viscosity could not be treated well by this technique (16,17,20). Moreover, leaving the cyst wall behind after aspiration increased the possible risk of recurrence (20).

Endoscopic transventricular resection strikes a fine balance between the morbidity of open surgery and the low efficacy of needle aspiration. Powell et al. are credited with the first successful endoscopic aspiration of colloid cysts (26). The efficacy of neuroendoscopic techniques for resection of colloid cysts has been well established by various authors (1,3,6,11,14,27). Angled endoscope aids in visualizing the point of attachment of the colloid cyst on the third ventricular roof and thus allows radical excision of the cyst (22). Although some authors advocate complete cyst wall excision to prevent cyst recurrence, it actually appears that cure may be achieved even if a small residue is left behind, provided the cyst wall is adequately opened up so as to not allow entrapment of colloid material (22).

In our study, the procedure used was decided according to the comfort of the operating surgeon. Of the eight pediatric patients in our series, endoscopic removal was attempted in four. In one of these four, the colloid cyst could not be removed endoscopically and had to be converted into transcortical transventricular excision. In one more patient, transcortical transventricular excision was used, while transcallosal approach was performed in three patients. External ventricular drain was placed at the time of surgery in five patients and was removed at 48-72 hours. The authors believe that placing an EVD in the post-operative period helps in draining the intraventricular blood that might accumulate during surgery, thereby preventing hydrocephalus.

CONCLUSIONS

Colloid cysts in the young are thought to be more aggressive, both clinically and radiologically, and therefore, early surgical intervention is suggested, even in incidentally detected colloid cysts. Endoscopic excision is safe and effective minimally invasive approach for this cyst. Placement of external ventricular drain might be helpful in draining intraventricular blood, which can be removed once the CSF becomes clear.

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