

Colloid Cysts of the Third Ventricle

Open Operative Approach or Stereotactic Aspiration?*

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Summary

Colloid cysts of the third ventricle can cause hydrocephalus if they grow to the point where they occlude the foramina interventricularia. The operative approach via a craniotomy used to be the common method of treating these lesions. Now, in the era of CT- and MR-scanning, stereotactic aspiration should be preferred as an ideal method of simultaneously diagnosing and treating colloid cysts. Unlike open surgery, aspiration of colloid masses poses hardly any risk for the patient. Ten cases successfully treated by this technique are presented.

Keywords: Colloid cysts; hydrocephalus; stereotactic puncture; third ventricle.

Introduction

Colloid cysts are rare lesions of the third ventricle which often produce a partial occlusion of the foramina interventricularia, which leads to a hydrocephalus. Their incidence is reported as being less than 1% of all intracranial tumours (Rubinstein 1972).

Male adults are affected twice as often as female adults. Colloid cysts and neuroepithelial cysts of the third ventricle were described at the beginning of the century exclusively as findings in pathological studies (Wallmann 1858). With the introduction of pneumencephalography and ventriculography colloid cysts could be identified as a cause of hydrocephalus of the lateral ventricles with increased intracranial pressure and neurological deficit.

In 1921, Dandy performed the first removal of colloid cysts by a transpineal approach. In 1933 he gave a comprehensive review of the literature and presented 5 cases of his own. Dandy recommended the transcortical approach for the operative treatment of midline cysts. Subsequently approaches other also were developed by several authors. Transcortical block-resection was discontinued in favor of transcortical longitudinal incision. Nevertheless, the postoperative mortality ranged between 10–20% in older series, and serious neurological deficit and postoperative seizures frequently occurred. Now in the microscopic era good results without great deficits are achieved (Symon 1985).

Because of the danger of bleeding from ventricular wall vessels, McKissock (1951) preferred a cautious enucleation technique and recommended the coagulation of the remaining cyst wall. However the good results of Symon et al. (1985) prove that with modern microsurgical technique complete removal is possible and the cautious enucleation technique of McKissock is no longer advisable. Also a frontal transcallosal approach has been used for the enucleation of cysts and tumours of the third ventricle. Complications of this approach include the disconnection-syndrome and postoperative psychological effects (Shucart 1978, Jeeves 1979).

Guiterrez-Lara (1975) was the first to propose a puncture evacuation of colloid cysts of the third ventricle and published good results in 5 cases. Bosch (1978) achieved good results with stereotactic evacuation in 4 cases. We present a survey of the literature and the experiences with 10 of our own cases, which were successfully treated by stereotactic aspiration.

* Dedicated to Prof. Dr. Friedrich Loew on the occasion of his 65th birthday and the 25th anniversary of the Homburg Neurosurgical University Clinic, which has been founded and built up by him.

Patients and Method

Our material consists of 10 cases, 7 male and 3 female, aged between 14 and 64 years, mean 43 years. In all cases signs and symptoms of intermittent increased intracranial pressure, such as headache, memory disturbance, gait instability and dizziness lead to hospital admission. 2 patients showed an intermittent hemihypaesthesia. The interval between the first symptoms and admission to our department ranged from few a days to 2 years.

In 9 cases, a tentative diagnosis of a colloid cyst in the third ventricle was made on the basis of CT-examinations which all showed a round hyperdense mass in the region of the foramen of Monro (see Table 2). Only in one case, CT-findings of an isodense lesion were not conclusive with regard to its nature although its location was clear. In this case MR-sections clearly demonstrated an area of abnormal signal intensity in the third ventricle (Figs. 3 c and d). The histological diagnosis was colloid cyst (Fig. 4).

In 6 cases, the hydrocephalus had been treated in other hospitals by the insertion of a shunt.

To exclude a vascular pathology angiography has been performed in all of our patients. CT-findings were transferred to a true-to-scale X-ray picture for stereotactic evacuation. With gentle aspiration and irrigation stereotactic evacuation of the cysts was possible in every case. The mucous contents can be very viscous. The cannula used for aspirator therefore should be no less than 1.4 mm in inner diameter. After aspiration the cysts were filled with air and contrast medium to radiographically demonstrate the complete removal of the cyst contents. For histological determination a biopsy of the cyst-wall was performed.

The cysts could be evacuated in all cases without any complications. We did not observe any recurrences of the cysts during the follow up-period (1, 1, 3 months, 1, 2, 2, 2, 2, 4, 4 years) (see Table 2).

Discussion

Microscopically, the wall of a colloid cyst consists of a thin layer of collagenous tissue lined inside by a cubic or low columnar epithelium. Mucus goblet cells are commonly present with a mucin-positive reaction using with mucicarmine and PAS staining. The contents of the cyst are formed by amorphous PAS positive debris (Rubinstein 1972) and degenerating secretory products.

The embryological origin remains a matter of controversy: Kappers (1955) regards these cysts as arising from neural epithelium, while Shuangshoti (1966), Ciric and Zivin (1975) consider them to be malformations of the diencephalic neuro-epithelium of the choroidal tissue.

Colloid cysts are often manifested by intermittent symptoms of raised intracranial pressure. Kelly (1951) divided the clinical symptoms into three groups:

1. headache, papilloedema, without neurological signs;
2. fluctuating or progressive dementia;
3. classical features are episodic headaches and drop attacks.

These symptoms are caused by increased intracranial pressure due to the intermittent or permanent occlusion of the foramina of Monro by the cysts. Very rarely local masses near the fornices or the floor of the third ventricle may produce neurological deficits.

The ball-valve effect of the cyst with sudden occlusion of the outlets of the lateral ventricles explains the observations of sudden pressure-death (Ryder *et al.* 1986). Sjovall (1910) and Bush (1917) were the first to refer to a causal relationship between colloid cysts and the so called sudden death syndrome in young people.

CT scanning makes it possible to achieve the diagnosis relatively early and safely. But in spite of the fact that CT and MR-scanning give an exact demonstration of the anatomic lesion, its size and the grade of hydrocephalus, it does not allow of a definitive pathological diagnosis from gliomas, meningiomas, dermoid cysts, cysticercosis, ependymomas, papillomas or arachnoid cysts. This can only be done histologically after puncture or extirpation. However the typical finding on CT of a round hyperdense mass strongly suggests the likelihood of a colloid cyst.

With regard to treatment, major improvements have been made since Dandy's open surgical method. Cortical block resection is being replaced by the less damaging frontal transventricular approach to the third ventricle using a 2 cm longitudinal cortical incision. The cyst can be seen well under the operating microscope (Antunes *et al.* 1980, Nitta and Symon 1985) and extirpation can be carried out safely and completely.

Nevertheless open surgical treatment, in spite of every painstaking precaution, has been known to produce temporary disability as well as epilepsy (Jeeves 1979). The transcallosal approach taken by Shucart (1978) and Antunes (1980) reduced the risk of epilepsy but not the danger of injury to association fibres, which may bring about the so-called disconnection syndrome.

Stereotactic aspiration is a safe method of treating colloid cysts which puts almost no strain on the patient. The cysts can be evacuated via the smallest possible approach involving minimal injury to the cerebral matter. In none of our cases did we observe regrowth of the cyst after aspiration during a follow-up of 4 years.

Only two recurrences have been reported in the literature, and these could be evacuated again by repeated puncture (Powell 1983, Rivas 1985). Up till now no mortality, no serious complications and no neurological or psychiatric side effects after stereotactic evacuation have been reported.

According to the literature and to our own experience, the danger of a stereotactically aspirated

Table 1

Authors	Number of patients	Surgical procedure	Results and complications
Dandy 1933	5	transcallosal-transventricular approach	4 recovered 1 died
Zimmermann 1933	2	transfrontal transventricular approach	1 good result 1 died
McLean 1935	1	transcortical approach	1 motor. aphasia for several days
Gardner 1937	1	transfrontal transventricular approach	1 died
Shaw 1940	2	transfrontal —ventricular approach	2 successful
Grossiord 1941	72	27 transfrontal transventricular approach	14 dead acutely, 4 died post-operatively the paper does not provide any details
Greenwood 1949	8	5 transcallosal approach 3 additional autopsy cases without treatment	4 successful 1 died post-operatively
McKissock 1951	21	transfrontal —ventricular approach	11 good results 1 single epileptic attack 1 amaurosis r. eye 1 dementia 1 recurrence 6 died
Kelly 1951	29	transfrontal approach	20 relieved by operation, 9 died the paper does not provide any details
Penzholz 1953	2	transfrontal resection	1 disability 1 recurrence after 1 year, second successful attempt
Yenermen 1958	54	27 removal	7 good, 4 poor results 16 died post-operatively
Coxe 1964	1	transfrontal transventricular	1 good result
McKissock 1965	21	transfrontal-transventricular approach	12 good results 1 recurrence after 15 months, died post-operatively 5 died
Brun 1973	7	a raised ventricular fluid pressure was recorded, no cyst removal	7 autopsy cases
Little 1974	38	21 transventricular approach	12 good results 4 poor results 5 died
Ciric 1975	2	transventricular-, —septal approach	1 post-operatively epilepsy 1 fluctuating dementia

Authors	Number of patients	Surgical procedure	Results and complications
Sackett 1975	3	diagnosed by CT, 2 operative removals	2 operatively good results 1 died of carcinoma without cyst-evacuation
Gutierrez-Lara 1975	5	"freehand" (blind) aspiration	5 good results no complications
Guner 1976	3	right transventricular- approach	2 epilepsy post-operatively over months, 1 intermittent mental confusion
Shucart 1978	6	transcallosal approach	5 good results 1 hemiparesis
Bosch 1978	4	stereotactic aspiration	4 good results in one case shunt-treatment after a half year
Malik 1980	1	shunt, without removal	progressive impairment of memory, after ten years died of thromboembolism, pneumonia
Antunes 1980	33	23 transcortical approach	12 good results 5 poor results 6 died
		8 microsurgical transcallosal approach	6 good results 1 died after weeks, the cause of death was unknown, 1 died of an intracerebral haematoma after months, subsequently 3 shunts,
		2 only shunt-treatment	2 good results
Bullard 1982	1	transfrontal- ventricular approach	1 good result no complication
Chan 1983	4	right frontal ventriculostomy, in one case trans- frontal approach	1 good result 2 died 1 after removal of the cyst left hemiparesis
Powell 1983	18	6 ventriculostomy with cyst-aspiration	1 aspiration impossible 2 after vs. copy a craniotomy—cyst wall removal
		14 transcortical microsurgical approach	1 short term memory deficit All cases were improved after cyst ablation
Nitta and Symon 1985	36	transfrontal- transventricular approach, 18 with microscope	10 excellent, 6 good and 2 poor results, 15 excellent and 3 good results, 1 recurrence after 4 years, successful endoscopic evacuation
Rivas and Lobato 1985	3	CT guided stereotactic evacuation	good result in all cases, in 1 case incomplete evacuation of cyst, a second successful attempt was performed after 4 years

Table 2. *Stereotactic Treatment of Colloid Cysts 10 Own Results*

No.	Age	Sex	CT findings	Follow up	Clinical results	Remarks
1.	56	m	hyperdense mass	4 years	asymptomatic	hydrocephalus preceding shunt treatment
2.	14	m	hyperdense	4 years	asymptomatic	hydrocephalus preceding shunt treatment
3.	50	m	hyperdense	3 years	asymptomatic	hydrocephalus preceding shunt treatment
4.	48	f	hyperdense	2 years	asymptomatic	hydrocephalus preceding shunt treatment
5.	21	f	hyperdense	2 years	asymptomatic	hydrocephalus without shunt treatment
6.	63	m	hyperdense	1 year	asymptomatic	hydrocephalus preceding shunt treatment
7.	64	m	hyperdense	1 year	asymptomatic	hydrocephalus preceding shunt treatment
8.	25	m	isodense MR signalpositive	3 months	asymptomatic	hydrocephalus without shunt treatment
9.	54	m	hyperdense	1 month	asymptomatic	without hydrocephalus
10.	36	f	hyperdense MR signalpositive	1 month	asymptomatic	hydrocephalus preceding shunt treatment

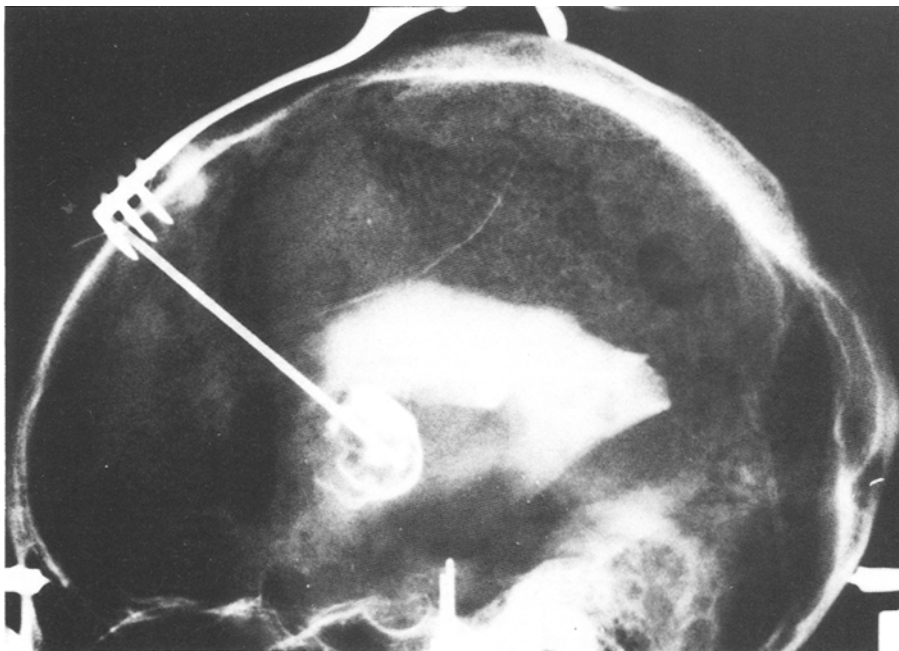


Fig. 1. Lateral view of the ventriculogram shows the cannula in the partially aspirated colloid cyst

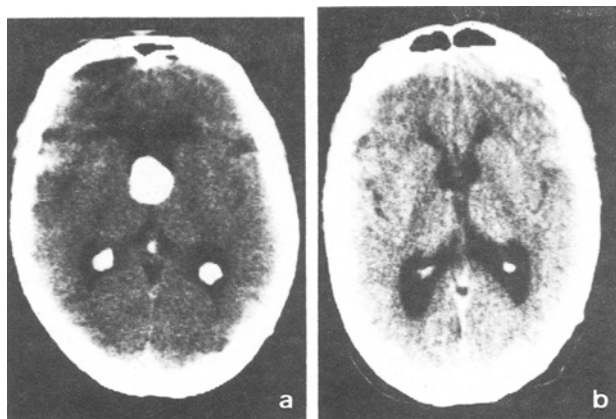


Fig. 2. a) Typical CT-scan. The lateral ventricles are dilated. A hyperdense, round mass arises behind the foramina of Monro and reaches into the third ventricle. b) By stereotactic aspiration a colloid cyst has been verified and at the same time evacuated

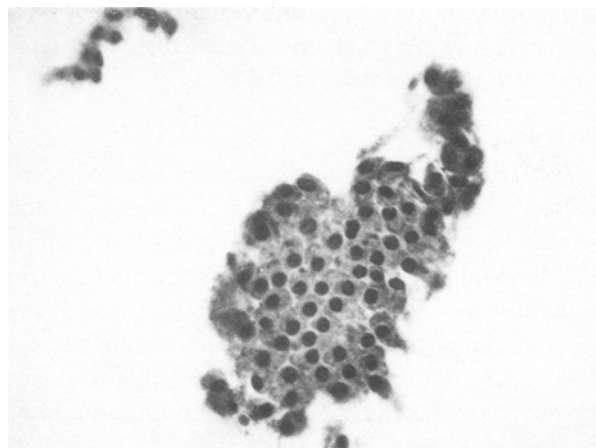


Fig. 4. A smear preparation of the cyst-wall shows the typical cuboidal epithelium of the colloid cysts

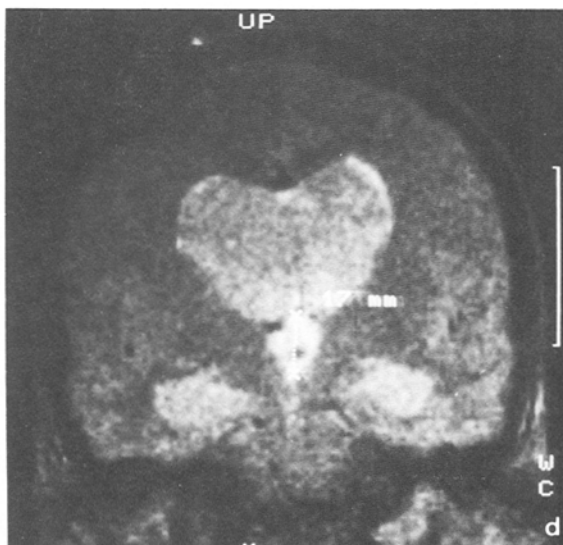
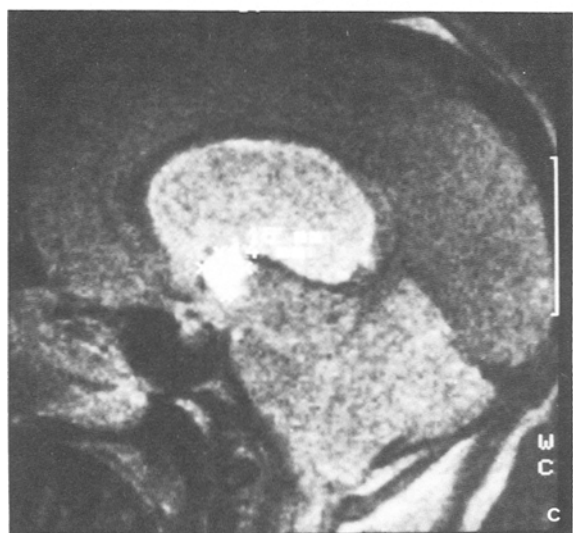
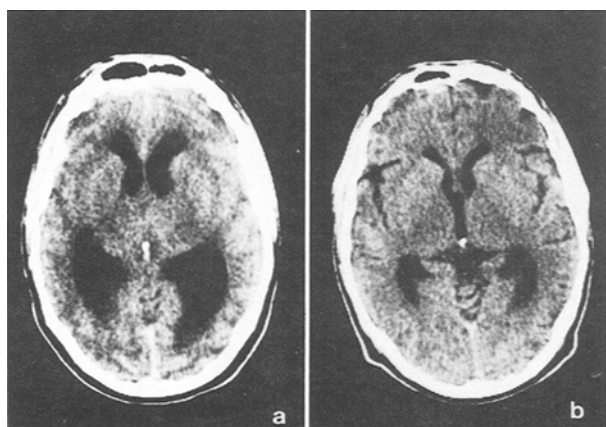


Fig. 3. Case 8: 25-years-old male with the unusual finding of an CT-isodense colloid cyst. a) An isodense mass near the foramina of Monro cause an enlargement of the lateral ventricles. The third ventricle is thin. b) After cyst-evacuation the hydrocephalic lateral ventricles became smaller. c) and d) MR-sections demonstrate a resonance positive mass behind the foramina of Monro, a small third ventricle and marked dilation of the lateral ventricles

cyst recurring is very low. In the unlikely event of a recurrence, however, stereotactic puncture can be repeated with minimal risk for the patient.

Conclusion

With regard to its safety and the lack of complications and approach-related side-effects the stereotactic evacuation of colloid cysts of the third ventricle should be regarded as the treatment of choice. The definite histological diagnosis is established at the same time. An open operative approach should be used only as a last resort when repeated stereotactic punctures have not been effective. Such a situation has not been encountered so far.

In patients in which hydrocephalus and increased intracranial pressure persist despite the cyst evacuation an internal CSF shunting system has to be implanted. This may also be necessary as an emergency measure prior to the stereotactic puncture in cases with acute hydrocephalus.

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