CASE REPORT

A suprasellar arachnoid cyst resulting from an intraventricular haemorrhage and showing complete resolution following endoscopic fenestration

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SUMMARY

We present the case of a premature neonate who developed a large, acquired arachnoid cyst as a consequence of intraventricular haemorrhage. The child was managed with endoscopic fenestration and made an excellent recovery.

BACKGROUND

Arachnoid cysts are rare non-tumorous intra-arachnoid collections of cerebrospinal fluid (CSF). They have a prevalence of 0.16% in neonates and account for 1% of all paediatric intracranial space-occupying lesions.^{1 2} Their aetiology is thought to arise from an abnormality during embryology development, although other mechanisms have been reported.³ Treatment options include endoscopic fenestration, surgical drainage via craniotomy and treatment with shunt insertion.

This case is extremely unusual insofar as the arachnoid cyst was proved to be an acquired lesion; it arose secondary to an intraventricular haemorrhage (IVH). This cyst was endoscopically treated and subsequently resolved completely.

CASE PRESENTATION

A male neonate, born at 29⁺6 weeks by a 'difficult forceps delivery', was initially managed in an intensive care environment requiring ventilation and inotropic cardiovascular support. His routine laboratory tests revealed abnormal clotting function.

On account of his prematurity, a cranial ultrasound was performed on the day of birth and showed evidence of a grade II IVH, without hydrocephalus. A CT of the head, performed on day 1 of life, showed no evidence of an arachnoid cyst at that stage (figure 1). At the time there was no

radiological evidence of any arachnoid cyst being present; this has been confirmed by a secondary review by a consultant neuroradiologist.

A follow-up CT scan was performed at 2 months of age. This demonstrated a small suprasellar arachnoid cyst but no hydrocephalus at that stage. The head circumference (occipital frontal circumference, OFC) at the time remained on the 50th centile.

About 4 weeks later the infant deteriorated acutely, presenting with a history of vomiting, bradycardia and a rapid increase in head circumference from 50th centile to 99.6th centile. Examination revealed a tense, bulging fontanelle, together with upgaze palsy and disconjugate gaze. He was transferred immediately from the referring centre to the local paediatric neurosurgical unit. MRI (figure 2) demonstrated a 33×34 mm suprasellar cyst elevating the third ventricle, and causing significant displacement of the pons and midbrain, further causing obstructive hydrocephalus. Evidence of previous IVH was suggested on T2-weighted imaging with signal drop-out around the ventricular margins.

TREATMENT

The patient was taken to theatre urgently for surgery to fenestrate the arachnoid cyst via an endoscopic approach. The left lateral ventricle was entered and the arachnoid cyst was visualised in the foramen of Monro. The septum pellucidum was noted to be absent and haemosiderin deposits were noted on the ventricular walls. The cyst wall was thick and leathery requiring monopolar diathermy for the initial fenestration, which was subsequently enlarged. A further fenestration was performed in the base of the cyst, to the left of the basilar artery, through several layers of thickened arachnoid membrane. Once this was achieved, good pulsatility was

Figure 1 (Left to right) Axial, sagittal and coronal CT scan day 1 of life demonstrating a normal suprasellar cistern with no evidence of an arachnoid cyst at the time.

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Figure 2 Standard 4 mm axial (left) and high-resolution (constructive interference in steady state) sagittal (right) T2-weighted MRI showing a large suprasellar arachnoid cyst causing obstructive hydrocephalus.

observed in the membrane and the endoscope was used to view further down the anterior surface of the pons, confirming distal patency.

OUTCOME AND FOLLOW-UP

Following surgery, the patient's condition stabilised and the upgaze palsy gradually recovered, although full recovery of this took approximately 6 months. The head circumference improved to lying between the 91st and 98th centiles, and feeding and weight gain were also noted to be better.

Developmentally, there were improvements and milestones were reached in line with expectations based on the degree of prematurity. Repeat MRIs have been performed postoperatively (figure 3). These have shown complete resolution of the suprasellar arachnoid cyst with no evidence of hydrocephalus. The lateral ventricles have reduced in size and the brainstem has returned to its normal position. The scans confirm that the cerebral aqueduct remains patent.

DISCUSSION

Suprasellar arachnoid cysts are an important cause of hydrocephalus in neonates, especially in the context of lower cranial nerve impairment.

Arachnoid cysts are frequently asymptomatic, but neurological symptoms can arise from compression of adjacent structures or from raised intracranial pressure secondary to obstructing CSF flow.^{1 3} Suprasellar arachnoid cysts occur in 9–15% of arachnoid cysts.¹ They generally expand from the prepontine space, causing elevation of the third ventricle, with an upward and forward displacement of the pituitary stalk and optic chiasm.

They can also cause superior and posterior distortion of the mammillary bodies. As the cyst size increases, occlusion of the third ventricle and blockage of the cerebral aqueduct may occur, and lead to obstructive hydrocephalus.⁴ Posterior displacement of the brainstem with subsequent dysfunction may also occur. The diagnosis is best made by MRI.

Numerous treatments have been described, such as cystoperitoneal shunt insertion and open fenestration via a craniotomy. With the advent of endoscopic techniques, these open neurosurgical treatments are now becoming less common.⁴ The aim of surgery is to normalise CSF flow by establishing and maintaining communication between cyst cavity and the intraventricular or subarachnoid space, including the basal cisterns.^{1 5} When performing endoscopic fenestration of a suprasellar arachnoid cyst, it is important that two fenestrations are performed—one in the superior cyst wall and a second in the inferior wall—to enable communication into the basal cisterns.⁵ The endoscope can be passed through these fenestrations to confirm patency. These two manoeuvres can avoid the need to insert a ventriculo-peritoneal shunt.

The aetiology and pathophysiology of arachnoid cysts remain debatable and many theories have been suggested as to their formation.⁶ In general, arachnoid cysts are seen as developmental abnormalities, occurring during embryonic development where splitting or duplication of the primary arachnoid membrane leads to intra-arachnoid fluid collections.³ In addition, acquired cysts can occur secondary to trauma, haemorrhage and inflammation. However, there are few instances where their development can be demonstrated on serial imaging. Our case clearly shows the absence of any cyst on the initial CT scan, with the

Figure 3 Axial (left) and sagittal (right) T2-weighted and coronal constructive interference in steady state (middle) MRI sequences taken 6 weeks postoperatively demonstrating complete resolution of the suprasellar arachnoid cyst.

cyst subsequently developing over 2–3 months. The presence of haemorrhage was confirmed with imaging and through surgery. Owing to the absence of the cyst on the initial scan, we surmise the cyst formation was likely causally related to the episode of IVH. This has not been demonstrated in such a clear pattern in previous descriptions of this entity.

Neuroendoscopy is emerging as a safe and effective treatment for arachnoid cysts, and appears to offer less morbidity when compared with open surgical drainage.⁶ Endoscopic treatment is at least as effective as open surgery.⁶ Although this is a case of an arachnoid cyst that developed secondary to an IVH, the treatment is much the same. This case showed complete resolution of the previously demonstrated large suprasellar cyst

following endoscopic fenestration. With experience in endoscopic procedures becoming more established, endoscopic fenestration is becoming the first-line option for the management of symptomatic arachnoid cysts in neonates.²

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Competing interests None declared.

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Learning points

- ▶ It can be difficult to determine the true cause of arachnoid cyst formation.
- ▶ This case highlights that intraventricular haemorrhage is indeed one of the mechanisms by which arachnoid cysts may form.
- ▶ Endoscopic fenestration of arachnoid cysts is a quick, safe and effective first-line surgical treatment for the treatment of symptomatic neonatal arachnoid cysts.

REFERENCES

- 1 Tamburrini G, D'Angelo L, Paternoster G, *et al.* Endoscopic management of intra and paraventricular CSF cysts—case report. *Childs Nerv Syst* 2007;23:645–51.
- 2 Tsutsumi S, Kondo A, Yasumoto Y, *et al.* Asymptomatic huge congenital arachnoid cyst successfully treated by endoscopic surgery—case report. *Neurol Med Chir (Tokyo)* 2008;48:405–8.
- 3 Jamjoom ZA. Intracranial arachnoid cysts: treatment alternatives and outcome in a series of 25 patients. *Ann Saudi Med* 1997;17:288–92.
- 4 Gul SB, Wang XS, Zong XY, *et al.* Suprasellar cysts: clinical presentation, surgical indications, and optimal surgical treatment. *BMC Neurol* 2011;11:52.
- 5 Yadav YR, Parihar V, Sinha M, *et al.* Endoscopic treatment of the suprasellar arachnoid cyst. *Neurol India* 2010;58:280–3.
- 6 Guzel A, Trippel M, Ostertage CB. Suprasellar arachnoid cyst: a 20-year follow-up after stereotactic internal drainage—case report and review of literature. *Turk Neurosurg* 2007;17:211–18.

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