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ORIGINAL PAPER

Institutional experience of endoscopic suprasellar arachnoid cyst fenestration

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Abstract
Introduction Suprasellar arachnoid cysts can differ from other arachnoid cysts in several ways, making a separate analysis of these cysts worthwhile. Herein, we present the outcome and perform volumetric analysis of six children with suprasellar arachnoid cysts treated with endoscopic ventriculocystocisternostomy in order to evaluate the long-term outcomes.
Patients and methods Operative and postoperative data were retrospectively reviewed for six patients harboring suprasellar arachnoid cysts. Imaging was then used to follow success of surgical intervention.
Results Six patients with suprasellar arachnoid cysts underwent ventriculocystocisternostomy. Presenting symptoms were headaches in three patients, developmental delay in another, and an incidental finding in the remaining patients. All patients had enlarged lateral and third ventricles on initial imaging. Average age at presentation was 145.7 months (65.4–250.2). Follow-up was an average of 46.5 months (3–84). The average cyst size was 153.96 cm^3 (42.98–369.20) preoperatively and an average of 39.92 cm^3 (3.20–101.47) at follow-up.
Conclusions Based on our experience, suprasellar arachnoid cyst treatment with ventriculocystocisternostomy is an adequate surgical intervention. Suprasellar and third ventricular size does respond to the surgical intervention at long-term follow-up.

Keywords Intracranial arachnoid cysts · Pediatrics · Cystoperitoneal shunt · Fenestration

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Introduction

The management of arachnoid cysts in children continues to be a topic of discussion. Understanding the natural history of the disease and how it is altered by surgical intervention are critical for optimum patient management. The two most widely utilized interventions for arachnoid cysts are cyst fenestration and placement of a cystoperitoneal shunt. The choice of procedure and criteria for intervention differs between centers because our collective understanding on the natural history is incomplete and well-controlled trials of treatment alternatives have not been performed. Major clinical variables influencing the outcome include the age of the patient, location of the cyst, presenting symptoms, and the surgical approach.

Suprasellar cysts arachnoid cysts are relatively uncommon making up less than 2 % of all arachnoid cysts [1]. Presenting symptoms range between obstructive hydrocephalus, visual changes, endocrine abnormalities, head bobbing, or are picked up incidentally [2–5]. An earlier symptomatic presentation could explain why the more superiorly located arachnoid cysts make up between 8 and 15 % of all cysts that require surgical intervention [5–9].

Herein, we report the practice of using the size of cyst size as a predictor for successful surgical outcome following ventriculocystocisternostomy.

Patients and methods

Patient population

This study was approved by our institutional review board. Pediatric neurosurgical databases and clinic charts from Children's Hospital were retrospectively reviewed. Fifty-one patients were identified who underwent surgical treatment of arachnoid cysts between 2001 and 2012. Thirty-eight of these

arachnoid cysts were supratentorial, while the remaining 13 were infratentorial and will not be further considered in this paper. Six supratentorial cysts were identified with suprasellar arachnoid cysts. Data regarding clinical presentation, radiologic findings, surgical intervention, complications, and overall clinical course were extracted, tabulated, and analyzed.

Measurements

With imaging software measuring devices, the maximal width and length of the suprasellar cysts and third ventricles were measured twice by the same observer, and the average of the two measurements, taken and recorded. The third ventricle was measured preferentially over the lateral ventricles as it was thought to be a more meaningful measurement due to the wide variation in lateral ventricular size/landmarks.

Statistical analysis

Statistical analysis was performed using SPSS (SPSS, Inc.; Chicago, IL, USA). In the univariate analysis, contingency tables were used to analyze categorical variables, and continuous variables were compared with student *t* test. *p* values of less than 0.05 were considered significant.

Results

Patient presentation

Three patients (50 %) presented with headaches; another patient (16.7 %) was worked up for developmental delay and was found to have the above-noted pathology; and the final two patients (33.3 %) were incidentally identified on a screening trauma CT scan. The average age of the patients at the time of presentation was 145.7 months (65.4–250.2). None of the patients had focal neurological findings directly attributable to the arachnoid cyst. Local mass effect on the surrounding brain parenchyma was seen in all cases.

Surgical treatment

All patients underwent cyst fenestration procedures, with ventriculocystocisternostomy. Although ventriculomegaly was common, the degree of ventriculomegaly was generally mild. None of the patients received a ventriculoperitoneal shunt as their primary treatment.

Short-term clinical and imaging outcomes

All patients had postoperative imaging and clinical visits within 3 months of the intervention and at yearly follow-up visits. The total follow-up period was, on average, 46.5 months (3–84 months). Clinical and imaging outcomes were reviewed for the total follow-up period.

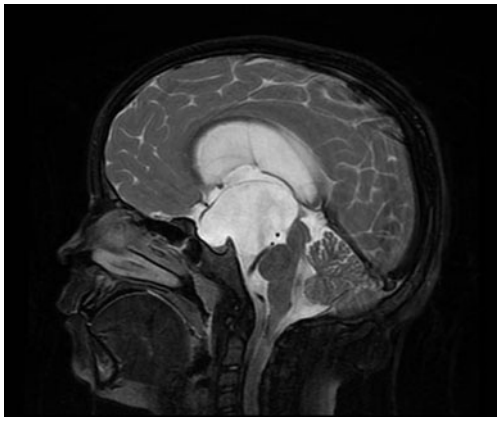

Fig. 1 A 6-year-old male presented with worsening headaches and behavioral problems. MRI T2 sagittal image shows a suprasellar arachnoid cyst projecting into the third ventricle with ventriculomegaly

Cyst size decreased in all six patients (Figs. 1 and 2). The response to treatment occurred in as little as 3 months with response in cysts and third ventricle size. Cyst size average was 153.96 cm^3 (42.98–369.20) preoperatively and 39.92 cm^3 (3.20–101.47) at follow-up. There was a statistical difference between the two groups with a t value=2.13, $p<0.05$. In a similar fashion, the third ventricle dimensions decreased from an average of 7.08 cm^2 (0.72–14.21) to 4.61 cm^2 (0.52–10.0). There was no statistical difference between the two group with a t value=0.98, $p>0.05$.

Long-term clinical outcome

All patients had long-term clinical follow-up with an average of 46.5 months (3–84). One patient developed acute ventriculitis that was successfully treated with antibiotics and temporary

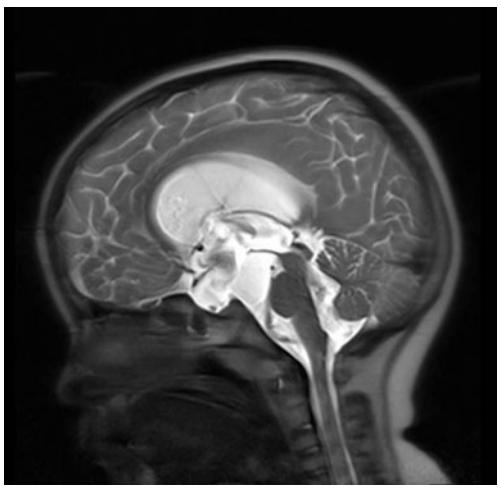

Fig. 2 A 3-month follow-up scan showing a significant reduction in the cyst size following ventriculocystocisternostomy

diversion of CSF via a ventriculostomy. None of the other patients suffered recurrence of symptoms, imaging findings, or any sequelae of the surgical intervention.

Discussion

While reports on the natural history of arachnoid cysts have begun to accumulate [2], there is not a shortage of surgical series documenting results of intervention. While this kind of reporting is limited in many ways, careful scrutiny may emphasize aspects of clinical features that deserve special attention from future researchers.

Suprasellar/lateral intraventricular cysts

Even though the main advantage of an endoscopic procedure (able to reach a deep target through a small operation corridor) was not readily realized for other types of arachnoid cysts, it is of utility in the management of suprasellar cysts. Over the past decade, more and more of these cysts were treated with endoscopic fenestration with or without a shunt; it is now rare to treat arachnoid cysts in this location with open fenestration. A recent review from Maher and Goumnerova [10] summarized 44 published cases and concluded that endoscopic ventriculocystocisternostomy is more effective than ventriculocystostomy. Our data support the role of the above intervention and the early successful response that is carried long-term [10]. Endoscopic ventriculocystostomy has been shown to have optimal CSF dynamic outcomes [8]. In the above study, long-term analysis of CSF dynamics showed that, in long-term follow-up, the perforation at the bottom of the cysts remained patent and functional. Here, we show that the response to such treatment is within months of intervention and continues to progress at long-term follow-up irrespective of the presenting age of the patient. Furthermore, the shape of the third ventricle responds to the intervention in conjunction to the decompression of the cyst, which could be a predictor of successful intervention.

Conclusions

The optimal treatment of arachnoid cysts varies between centers and physicians. With carefully selected cases, endoscopic management of suprasellar arachnoid cysts is a safe and effective modality. Our results compare favorably to a previously reported case series [10–15]. Ventriculocystocisternostomy is our preferred endoscopic treatment in such instances. In this case series, the arachnoid cyst size decreased in the short-term and continued at long-term follow-up.

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