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Case Report

Sylvian arachnoid cyst typing and neuroendoscopic fistula surgery treatment

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Abstract: Objective: To propose a new typing method for sylvian arachnoid cysts (SACs) and to provide a basis for the choice of surgical approaches of SACs. Methods: 34 cases of SACs were divided into 3 types: I type. SACs medial cyst wall was located in the outer 1/3 of sylvian fissure; type II. SACs medial cyst wall was located in median 1/3 of sylvian fissure; III type. Type I and Type II accepted neuroendoscope cyst-sylvian fissure fistula; type III accepted neuroendoscope cyst-fistulization cistern. Results: The mean follow-up time was 20.2 months; SACs volume reduction rate, remission rate and the incidence of subdural effusion or hematoma were respectively 68%, 38% and 12% (Table 1). The surgery efficacy for type III SACs (postoperative volume reduction rate and remission rate) was superior to type I and type II ($P < 0.05$); and the subdural effusion or hematoma incidence rate of type III was lower than Type I and type II ($P < 0.05$); Conclusion: Neuroendoscope cyst-fistulization cistern should be the first choice of Type III SACs; the best surgical approach for Type I and Type II SACs needs further study; the poor effect of cyst-fistulization may be related to the poor development of ipsilateral sylvian fissure.

Keywords: SACs, Neuroendoscope technology, typing

Introduction

Sylvian arachnoid cysts (SACs) accounted for 49%-65.2% in intracranial arachnoid cysts (IACs) [1]; Galassi et al [2] in 1980 firstly proposed SACs typing methods from the perspective of radiography and clinical symptoms. Neuroendoscopyfistulization is the main treatment of SACs; based on the in-depth understanding on it and treatment improvement, we proposed a new typing method and corresponding surgical methods, and compared their therapeutic effect and major complications to provide evidence for clinical selection of surgical approaches.

Material and methods

General information

Our department had treated a total of 34 cases of patients clearly diagnosed of SACs (both single IACs) between March 2009 and March 2013, including 31 males and 3 females, 18 cases of left side and 16 cases of right side, with an average age of 9.3 years (1 year old -57 years old). 17 cases had symptoms, including 4 cases of seizures, 11 cases of headaches and other symptoms of intracranial hypertension, one case of abduction nerve palsy, 1 case of mental retardation. 17 cases were asymptomatic; five cases were found by local skull exogenous uplift; 12 cases were causally found by cranial CT examination. At admission three cases were complicated by subdural effusion.

SACs typing principle

I type. SACs medial cyst wall was located in the outer 1/3 of sylvian fissure; type II. SACs medial cyst wall was located in median 1/3 of sylvian fissure; III type. SACs medial cyst wall was located in internal 1/3 of sylvian fissure or arrived at cistern. Double-blind typing of 34 cases SACs was performed by a neurosurgical and an imaging physician, respectively: 4 cases of I type, 9 cases of type II, 21 cases of type III.

Endoscopic instrument

STORZ rigid Children 30 observation mirror and work mirror (outer diameter was 4.5 mm);

Table 1. Postoperative volume reduction rate, remission rate and incidence of subdural effusion or hematoma of different types of SACs

SACs	I	II	III	Total
Volume reduction rate	25% (1/4)	22% (2/9)	95% (20/21)*,&	68% (23/34)
Remission rate	25% (1/4)&	11% (1/9)*	52% (11/21)*,&	38% (13/34)
Postoperative incidence of subdural effusion or hematoma	25% (1/4)	33% (3/9)	0% (0/21)*,&	12% (4/34)

Note: *compared with type I, $P < 0.05$; &compared with type II, $P < 0.05$; The concurrent subdural effusion or hematoma in follow-up, cannot be included in the "Volume reduction". Preoperative asymptomatic cases were not included in "remission".

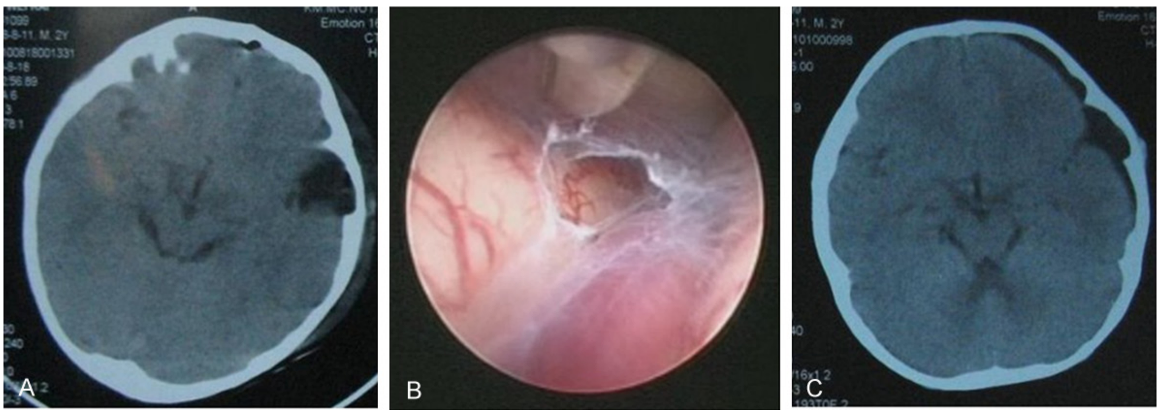

Figure 1. Preoperative, postoperative imaging and intraoperative endoscopy diagram of one case of type I SACs. A: Cranial CT scan showed left SACs; B: Intraoperative cyst-sylvian fissure fistula; C: On the 16th month after surgery, cranial CT scan showed left SACs with subdural effusion, follow-up was continued.

STORZ rigid adult 6 observation mirror and working mirror (outer mirror 6 mm); and dedicated endoscopic bipolar coagulation, micro-scissors and expansion balloons, etc., STORZ endoscopic surveillance video system.

Surgical methods 34 patients accepted Neuro-endoscopy fistula treatment. After general anesthesia, the thickest site in SACs which can reach the suprasellar cistern straightly was selected to form a skull hole; after cutting cyst wall sheathed endoscope was inserted and flushed with Ringer solution at low flow; intracavitary and adjacent structures were observed. Type I and II SACs were treated with cyst-sylvian fissure fistula (**Figure 1**) [3]. Location was the inner cyst wall near the sylvian fissure; vessel within the sylvian fissure was taken as anatomical landmarks in surgery. III-type SACs were treated with cyst-cistern fistula (**Figure 2**) [4, 5]. The ipsilateral posterior communicating artery, posterior cerebral artery, oculomotor nerve and anterior petroclinoid ligament can be observed through the cyst wall; fistula location was the cyst wall between these structures; fistula can be one or plural. Firstly sharply cut cyst sidewalls and the below arachnoid, and widen the fistula with a balloon in parallel to the blood vessels and nerves (diameter > 5 mm). Must pay attention not to damage ipsilateral posterior communicating arteries and posterior cerebral artery in fistula. A small amount of wall tissue of some case was collected with forceps in surgery for pathological examination. After confirming no bleeding in operative field, slowly exit endoscopic and suture the incision.

Statistical analysis

SPSS13.0 software was used to perform the multiple-group chi-square test of volume reduction rate, remission rate and lower incidence of effusion or hematoma for all types of SACs; $P < 0.05$ was considered significant.

Results

All the operations went smoothly; nine cases of intraoperative bleeding caused by the rupture of cyst wall and its surrounding blood vessel achieved successful hemostasis. The mean follow-up time was 20.2 months (14 months-38 months); SACs volume reduction rate, remission rate and the incidence of subdural effu-

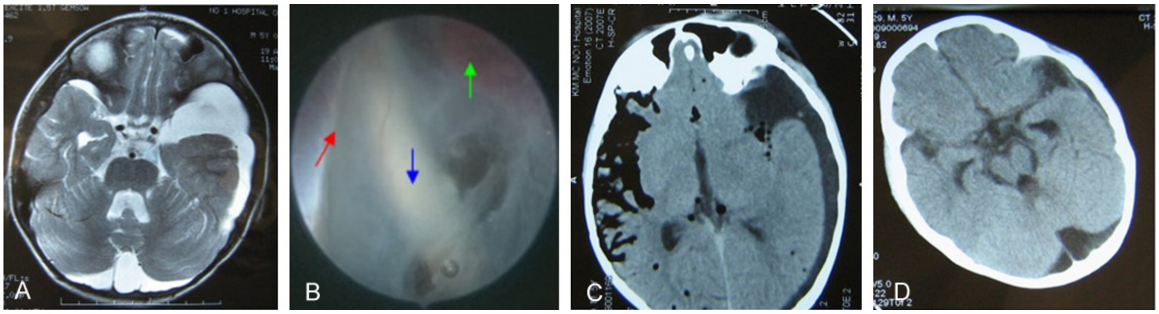

Figure 2. Preoperative, postoperative imaging and intraoperative endoscopy diagram of one case of type III SACs. A: Cranial CT scan showed left SACs; B: Real neuroendoscopy cyst-cistern fistulization (the red arrow shows The anterior petroclinoid ligament, the blue arrow shows the oculomotor nerve, the green arrow showsposterior communicating artery); C: On the day of surgery, review of cranial CT showed extensive intracranialpneumatosis, indicating that SACs had a good communication with subarachnoid; D: At 23th month after surgery, review of head CT showed nearly disappeared right SACs and no subdural effusion.

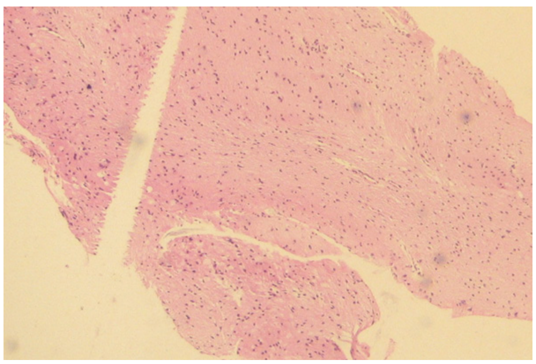

Figure 3. SACs cyst wall H-E staining (×40). It shows that cyst wall contains fibrous connective tissue and arachnoid cells, consistent with the pathological diagnosis of IACs.

sion or hematoma were respectively 68%, 38% and 12% (**Table 1**). The surgery efficacy of type III SACs (postoperative volume reduction rate and remission rate) was superior to type I and type II ($P < 0.05$); in follow-up subdural effusion or hematoma incidence rate of type III was lower than Type I and type II ($P < 0.05$); type III had no subdural effusion or hematoma (**Figure 2**); type I and Type II totally had 3 cases of subdural effusion, which were continued to observe (**Figure 1**); 1 case was complicated with chronic subdural hematoma and treated with drilling drainage. Pathological examination of cyst wall confirmed that it only contained fibrous connective tissue and arachnoid cells, consistent with IACs histological diagnosis (**Figure 3**) [6].

Discussion

Galassi et al [2] divided SACs into three types: type I, the cyst was double-convex lens-shaped without mass effect or clinical symptoms; the capsule cavity was well communicated with subarachnoid space subarachnoid cysts and good communication; type II, cyst was quadrilateral and had some mass effect and clinical symptoms; capsule cavity had a poor communication with subarachnoid space; type III, cyst was quasi-circular with significant mass effect and clinical symptoms; capsule cavity had no communication with subarachnoid space. Wherein the type I do not need surgery, type II and III require surgery. This typing can only be used as the basis to judge surgical indications, which cannot guide the choice of surgical methods. Currently, surgical treatment methods for SARs have been more than twenty years ago, including Neuroendoscopy fistula or cyst wall stripping, and craniotomy fistula or cavity-peritoneal shunt, etc., but how to choose thsese surgical methods has no clear basis. By comparison of different IACs surgical procedures, we believe that success rate pf wall stripping is not higher than fistula and wall stripping has more complications; meanwhile neuroendoscopy has more advantages compared with cranial or bypass surgery, so neuroendoscope fistula should be recommend as the preferred surgical technique for IACs [7, 8]. Although Galassi et al [2] considered that the SACs without obvious mass effect or clinical symptoms did not require surgery, many scholars support surgery for all SACs; the main reasons are: Through cerebral blood perfusion and metabolism testing of SACs cases without mass effect or clinical symptoms, the temporal lobe was found in the state of hypoperfusion and low energy metabolism; after surgery the abovementioned conditions were improved significantly; SACs natural rupture rate was about 8-17%; aggressive surgical treatment should be performed to reduce the occurrence of acute intracranial hypertension; the development of nerve endoscopy, stereospecific and other minimally-invasive techniques improves the safety of surgical procedures and significantly reduces the incidence of postoperative complications [3, 9, 10].

Different SACs have different anatomical relationship with neighboring cistern, thus ostomy position is not completely unified, mainly including cyst-cistern fistula and cyst-lateral fissure fistula [3, 6]. No document has clearly reported the indications of the two colostomy methods and compared the two methods. The cyst volume of 95% type III patients in this study was reduced or even disappeared, and the clinical symptoms were significantly improved, so the cyst-interpeduncular cistern fistula was an effective treatment. In the surgical process of Type I and Type II patients, no obvious subarachnoid or cistern structure was found around the cyst cavity, so selecting sylvian fissure as fistula position had a certain blindness. Higher incidence of subdural effusion and hematoma after fistulization indicated that sylvian fissure fistulization does not make cyst well communicate with CSF circulation; cystic fluid accumulated in local subdural space, resulting in effusion or chronic hematoma; the hematoma with obvious mass effect and recurrent effusion still need separate bypass surgery [3, 9]. The formation of SACs is related to sylvian fissure formation; during the development of the embryo the frontal and temporal lobe curled inward to form the sylvian fissure; an exception to this procedure may result in the formation of SACs and abnormal sylvian fissure structure; whether the ipsilateral sylvian fissure of SACs can communicate with subarachnoid is likely to be the key factor for the success of cyst-sylvian fissure fistula [10, 11]. Currently no reports have evaluated the postoperative communication between SACs sylvian fissure and subarachnoid; MRI or CT cisternography may help solve this problem [12]. We also found that in follow-up imaging and clinical symptom improvement of type I and type II cases is not a patch on the type III cases, and some cases were complicated by subdural effusion or hematoma. Therefore, we believe that in the absence of basis for normal communication between ipsilateral sylvian fissures and subarachnoid, Type I and II SACs should at the same time consider cyst-peritoneal shunt and other surgical methods as an alternative or alternative surgery when fistulization is selected; type III SACs should prefer neuroendoscope cyst-cistern fistulization. This article intended to propose a new SACs-typing method to provide a basis for the selection of SACs surgical methods, and with the accumulation of cases and continuous exploration we will further improve the relevant work.

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Disclosure of conflict of interest

None.

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