Cystplastic Cyst-Subarachnoid Shunt Procedure for Arachnoid Cyst of the Middle Cranial Fossa

—Technical Note—

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Abstract

A cystplastic cyst-subarachnoid shunt procedure using a ventricular catheter of Denver type shunt system was performed in seven patients with non-communicating middle cranial fossa arachnoid cyst. The operation technique consists of: linear incision of the outer membrane of arachnoid cyst and intrusion into the cyst; followed by a 5 mm incision of both the inner membrane of the arachnoid cyst and the arachnoid membrane; insertion of a 2–3 cm length of the ventricular catheter, cut as required with silk thread bound around the midpoint of the tube, into the subarachnoid space; fixation of the tube to the arachnoid membrane by a silk thread with Weck clips; and finally suturing of the outer membrane of arachnoid cyst by a nylon thread. During the follow-up period of 3 months to 3 years after the operation, the symptoms were relieved in all patients, and no recurrence or complication was observed.

Key words: arachnoid cyst, middle cranial fossa, cystplastic cyst-subarachnoid shunt

Introduction

Therapeutic methods for non-communicating middle cranial fossa arachnoid cyst can be classified as: cyst irrigation-cyst outer membrane excision, opening of the cyst-subarachnoid cavity, and cyst-peritoneal shunt. The cyst irrigation-cyst outer membrane excision method is associated with high incidences of recurrence and complication by postoperative subdural effusion, and therefore is seldom carried out now. Opening of cyst-subarachnoid cavity allows treatment of the bridging vein on the brain surface, no requirement for foreign bodies, and a low incidence of postoperative complication, but recurrence due to adhesions frequently occurs. The cyst-peritoneal shunt has a low incidence of recurrence, but postoperative complications are common, including hematoma occurring mainly as subdural hematoma and low cerebrospinal fluid pressure syndrome resulting from sudden reduction of pressure. The pressure variable type shunt tube has been used recently to solve these problems. Furthermore, other complications such as shunt dysfunction, evulsion distress due to shunt dependence, and infection have been reported.

We propose a cystplastic cyst-subarachnoid (C-S) shunt procedure using a ventricular catheter of Denver type shunt system for the treatment for non-communicating middle cranial fossa arachnoid cyst to solve the problems of recurrence and complications due to sudden reduction of pressure.

Materials and Methods

Seven patients were selected among those presenting at our department with middle cranial fossa arachnoid cyst during the period from January 1990 to December 1994. All seven patients had symptoms caused by the cyst, metrizamide computed tomography (CT) confirmation of no filling or slow filling and delayed clearance (non-communicating), and an epidural pressure of more than 12 mmHg measured immediately above the cyst. The five males and two females were aged 7–62 years old, with the cyst on the left side in five patients and the right side in two (Table 1).

The C-S shunt was implanted via a craniotomy per-
formed immediately above the cyst. Linear incision of the outer membrane provided access to the inside of the cyst. The cyst cavity and the subarachnoid cavity were opened by making a 5 mm incision of both the arachnoid membrane and the inner membrane of the cyst adjacent to the internal carotid cistern under the microscope. A ventricular catheter of the Denver type shunt system was cut obliquely into a length of 2-3 cm from the tip as required for the individual patient and silk thread bound at the midpoint of the tube (Fig. 1). The catheter was then inserted from the cyst cavity to the subarachnoid cavity. The silk thread suture was fixed to the arachnoid membrane with Weck clips. Finally, the linear incision of the outer membrane of the cyst was sutured with 7.0 nylon thread (Fig. 2).

Results

The follow-up period was from 3 months to 3 years.

Table 1 Patients with middle cranial fossa arachnoid cyst receiving the C-S shunt

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age/Sex</th>
<th>Side</th>
<th>Symptom</th>
<th>EDP (mmHg)</th>
<th>Reduction rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>46/M</td>
<td>lt</td>
<td>headache</td>
<td>21 B-wave</td>
<td>100 (7 wks)</td>
</tr>
<tr>
<td>2</td>
<td>62/M</td>
<td>rt</td>
<td>headache</td>
<td>29 A-wave</td>
<td>100 (3 wks)</td>
</tr>
<tr>
<td>3</td>
<td>12/F</td>
<td>lt</td>
<td>headache</td>
<td>20</td>
<td>100 (5 wks)</td>
</tr>
<tr>
<td>4</td>
<td>7/M</td>
<td>lt</td>
<td>headache, seizure</td>
<td>17 A, B-wave</td>
<td>80 (12 wks)</td>
</tr>
<tr>
<td>5</td>
<td>20/M</td>
<td>lt</td>
<td>headache, seizure</td>
<td>15</td>
<td>100 (11 wks)</td>
</tr>
<tr>
<td>6</td>
<td>14/F</td>
<td>lt</td>
<td>headache</td>
<td>19</td>
<td>100 (10 wks)</td>
</tr>
<tr>
<td>7</td>
<td>45/M</td>
<td>rt</td>
<td>headache, seizure</td>
<td>22</td>
<td>90 (15 wks)</td>
</tr>
</tbody>
</table>

EDP: epidural pressure.

Fig. 1 A ventricular catheter of the Denver type shunt system.

Fig. 2 Operative technique of C-S shunt. A 5 mm incision is made in both the inner membrane of the arachnoid cyst and arachnoid membrane of the carotid cistern (upper), and the shunt tube inserted into the subarachnoid space and fixed to the arachnoid membrane with Weck clips (middle), followed by suturing of the outer membrane of the arachnoid cyst with 7.0 nylon thread (lower, arrowheads).
No recurrence or complication after the operation was observed, and the symptoms in all patients were improved. The cyst was reduced by 100% in five patients, and by 80% and 90% in one patient each. The midline shift disappeared in all patients.

A 7-year-old boy is a representative case (Case 4). The inner membrane of the cyst wall was clearly shown by T1-weighted magnetic resonance (MR) imaging before the operation, but CT 3 months after the operation revealed that the cyst was reduced by about 80% and the midline shift had also disappeared (Fig. 3).

**Discussion**

The C-S shunt procedure uses the same operation technique as the ventricular-cisternal shunt (Torkildsen operation) for hydrocephalus. However, the pathogenesis of non-communicating arachnoid cyst is basically different from hydrocephalus in which a quantity of cerebrospinal fluid is always produced in the ventricle. We consider that occlusion of the outer membrane followed by clear communication with the normal subarachnoid cavity will be adequate for treatment. The therapeutic results in our series showed no recurrence or postoperative complication, the cyst in five of seven patients had completely disappeared, and the midline shift in the other two patients also disappeared.

We propose the C-S shunt as an extremely effective method for the treatment of non-communicating middle cranial fossa arachnoid cyst.
References


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Neurol Med Chir (Tokyo) 36, June, 1996