



Efficacy of cyst-cisternal shunt for refractory cyst regrowth of cystic vestibular schwannomas

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Abstract

Vestibular schwannomas (VSs) are generally benign and slow-growing tumors, and microsurgical resection is the commonly recommended treatment. Some reports suggested that inserting a cystoperitoneal shunt was effective for treatment of cystic VSs; however, there was no report of a cyst-cisternal shunt which diverts cyst fluid into cistern. We report a case of cystic VS with repeated cyst regrowth within weeks after repeated surgeries. We prevented further recurrence using cyst-cisternal shunt. This technique may be a new treatment option for refractory cyst regrowth of cystic VSs.

Keywords Cystic vestibular schwannoma · Refractory cyst regrowth · Cyst fluid diversion · Cyst-cisternal shunt

Introduction

Vestibular schwannomas (VSs) are benign primary intracranial tumors that arise from the Schwann cells of the vestibulocochlear nerve [1, 3]. The incidence of the cystic variant of VSs ranges from 5 to 48%, with recent reports citing an incidence of approximately 10% [4]. Many reports have demonstrated that radiosurgery is the accepted treatment for small- to medium-sized VSs, whereas surgical resection is still the most commonly used treatment modality for large-sized VSs [1, 3]. Whereas some reports have shown no significant differences between cystic and solid VSs in surgical outcomes [2], it has been generally stated that cystic VSs are more aggressive and have less favorable surgical outcomes than solid VSs [7]. In elderly patients with cystic VSs, some reports suggest that cyst puncture or insertion of

cystoperitoneal shunt is effective and safer than resection [6]. However, there is no report of a cyst-cisternal shunt, which diverts cyst fluid to cistern. We present the first case of cyst-cisternal shunt placement for cystic VS with repeating, early cyst regrowth.

Case report

A 70-year-old male patient presented with indolent dizziness and headache. MRI showed enhanced tumor containing a large cyst (maximum diameter of 50 mm) in the left cerebellopontine angle (CPA) (Fig. 1a). The patient underwent surgical removal of the tumor; a tumor capsule was left to prevent facial nerve injury (Fig. 1b). Pathological diagnosis confirmed schwannoma. His post-operative course was uneventful, and his chief complaints were resolved.

Two years later, he presented with progressive left facial and abducens nerve palsies. MRI demonstrated recurrence of cystic schwannoma (maximum diameter of 28 mm) in the left CPA (Fig. 1c). He underwent partial tumor resection and opening of the cyst. Gamma knife surgery (GKS) was planned 1 month after surgery. One week postsurgery, however, MRI showed cyst regrowth (Fig. 1d), and 2 weeks after surgery, he complained of diplopia and progressive left facial nerve palsy. MRI

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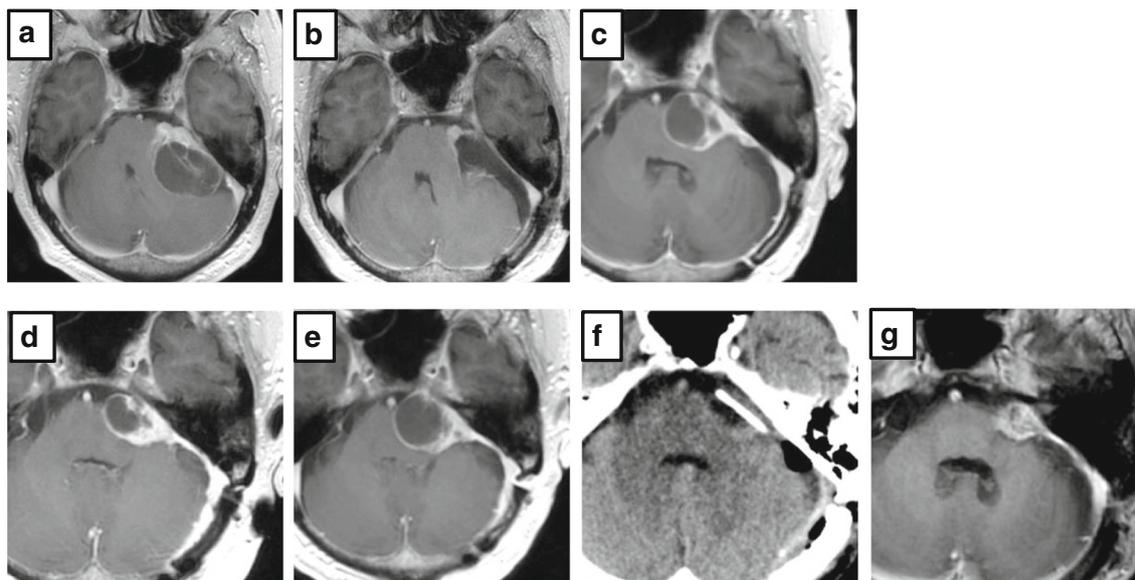


Fig. 1 The clinical course in this case. **a** Preoperative axial T1-weighted MR image after gadolinium contrast demonstrating a large cyst in the left cerebellopontine angle (maximum cyst diameter 50 mm). **b** Postoperative T1-weighted MR image after gadolinium contrast demonstrating subtotal resection and residual tumor capsule. **c** Axial T1-weighted MR image after gadolinium contrast prior to the second surgery demonstrating cyst regrowth. **d, e** Axial T1-weighted MR image after gadolinium contrast

1 week (**d**) and 1 month (**e**) after the second surgery demonstrating the progressive cyst regrowth. **f** Axial CT scan immediately after insertion of the cyst-cisternal shunt demonstrating opening of the cyst and insertion of the shunt tube into the cyst cavity. **g** Axial T1-weighted MR image after gadolinium contrast 2 years post cyst-cisternal shunt demonstrating absence of cyst regrowth

performed 1 month after the second surgery showed progressive cyst regrowth (Fig. 1e). He underwent a third operation. Although his symptoms were temporarily resolved after surgery, the cyst and his symptoms recurred 2 weeks after the third surgery.

To prevent cyst regrowth, we opted to place a syringosubarachnoid shunt (Create Medic, Kanagawa, Japan) as a “cyst-cisternal shunt” (CC shunt) to divert cyst fluid into cistern. We inserted one end of shunt tube into the cyst, attached the tube to a petrous bone and placed the opposite tube end in the cisterna magna (Figs. 1f and 2). After surgery, symptoms were resolved and gamma knife (12 Gy) surgery was performed 1 week later. There was no tumor recurrence or cyst regrowth in the 2 years following surgery (Fig. 1g).

Discussion

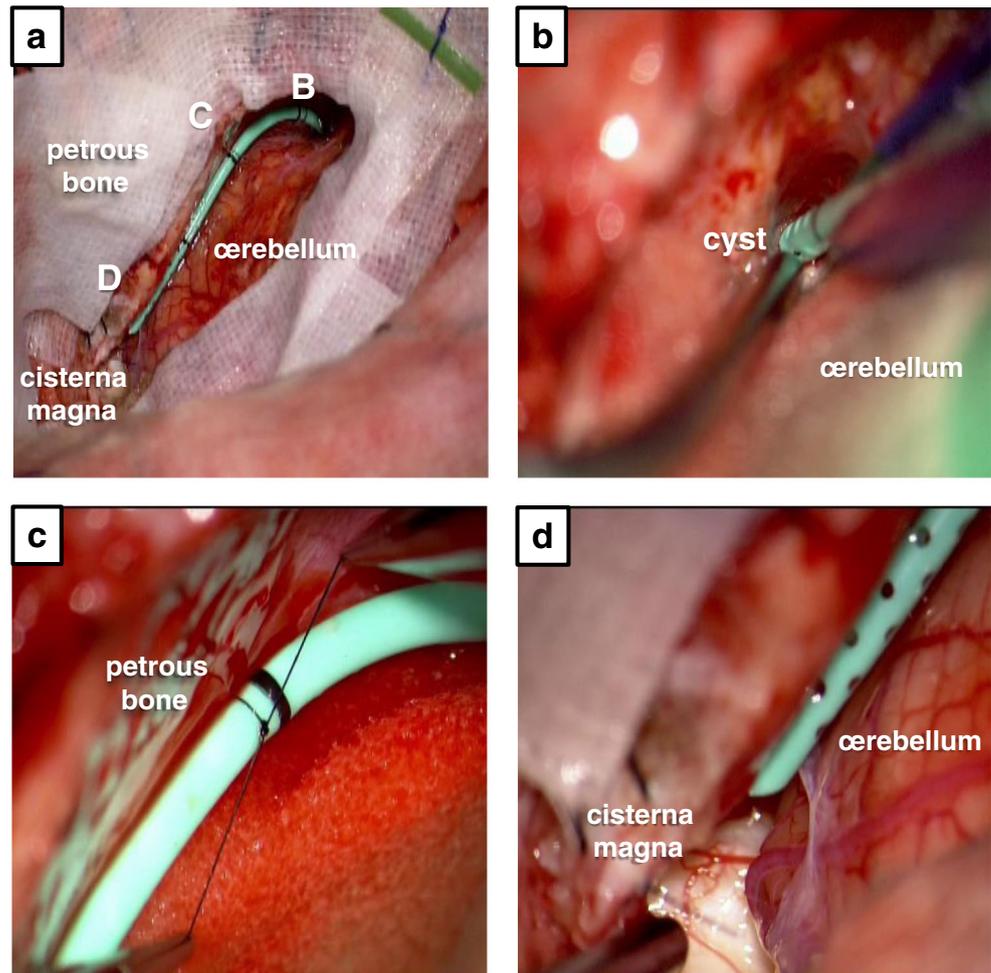
Among patients treated with subtotal resection (STR) and no stereotactic radiosurgery (SRS), median period of recurrence for VS is 2.7 years [5]. It is therefore unsurprising in this case that VS recurred in 2 years. It is rare, however, that cyst regrowth recurred very early after the second and third surgeries, despite unchanged pathological findings. We hypothesized that the reason for early regrowth was strong adhesion

around the tumor that patched the window of cyst wall. We accordingly explored procedures to continuously divert cyst fluid even if strong adhesion repaired the cyst wall.

Some studies have reported that a cyst-peritoneal shunt, which diverts cyst fluid into peritoneal cavity, is a valid palliative surgical solution to cystic VSs [6]. This strategy preserves the facial nerve and shrinks the cyst to resolve symptoms. There is no report of a cyst-cisternal shunt, which diverts cyst fluid to cistern (in this case, the cisterna magna). It is a simpler, more physiological, and less invasive approach than cyst-peritoneal shunt. Although there are currently no cyst-cisternal shunt tubes available, we substituted a syringosubarachnoid shunt tube; it provided appropriate length with flexibility and proven safety for long-time placement in an intracranial cavity.

In this case, symptoms were resolved and no complications aroused after inserting the cyst-cisternal shunt. However, SRS was performed 1 week after surgery. It is unclear how much this shunt contributed to prevent recurrence because both techniques were performed. It is certain that the shunt prevented accumulation of cyst fluid during the period from surgery to SRS. This outcome is in stark contrast to results from the second and third surgeries in which cyst fluid recurred within 1 week.

Fig. 2 An intraoperative photograph of the inserting cyst-cisternal shunt. **a** Overview image of the cyst-cisternal shunt. **b** One end of a syringosubarachnoid shunt tube was inserted into the cyst cavity. **c** The tube was affixed by binding to dura of the petrous bone. **d** The opposite end of the shunt was inserted into cisterna magna



Conclusion

We present the first case of cyst-cisternal shunt placement for refractory cystic VS. More cases are needed to establish the efficacy and safety of the procedure. It is a potential new choice for simple and safe surgery to resolve symptoms of cystic VSs.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Informed consent was obtained from all individual participants included in the study.

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