Endoscopic and Microsurgical Treatment of Sylvian Fissure Arachnoid Cysts—Clinical and Radiological Outcome

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OBJECTIVE: **A Sylvian fissure arachnoid cyst (SAC) is a well-recognized location for an intracranial arachnoid cyst in the pediatric population. For those cysts, which can rupture and be accompanied by a subdural hygroma or hematoma, several treatment modalities have been reported. We report clinical and radiological outcome of fenestration of these cysts by either endoscopy or microsurgery.**

METHODS: **A retrospective review of the database of operative procedures revealed 24 procedures (20 endoscopic and 4 microsurgical procedures) to fenestrate a SAC at university hospitals in Berlin, Germany and Tokyo, Japan.**

RESULTS: **With the applied technique, a reduction of SAC volume of more than 10% was achieved in 83.3% of all patients. The median volume of SACs (n = 24) was significantly reduced from 83.5 mL (range 21–509 mL) preoperatively to 45.5 mL (range 8.4–261 mL; $P < 0.01$) after 3.5 months and to 29.0 mL (range 0–266 mL; $P < 0.01$) after 15 months. In children (n = 8) with a ruptured SAC the combined extraaxial volume of a SAC and accompanying hygroma/hematoma was reduced from 166 mL (range 111–291 mL) before surgery to 127 mL (range 87–329 mL) after 2 months and to 77 mL (range 25–140 mL; $P < 0.05$) after 11 months. Acute clinical symptoms were generally resolved postoperatively; headaches were resolved or improved in 75%. A significant association of resolution or improvement of headaches and volume reduction was demonstrated.**

CONCLUSIONS: **The study demonstrated efficacy in a predominantly endoscopically treated patient cohort with Sylvian fissure arachnoid cysts, as indicated by improvement of clinical symptoms and diminished radiological SAC volume after treatment.**

INTRODUCTION

Arachnoid cysts are known intracranial lesions, which can be demonstrated at different sites within the cranial and spinal cerebrospinal fluid (CSF) space. One possible location is in the temporal fossa in association with the Sylvian fissure (Sylvian fissure arachnoid cysts, SACs). The variation of SAC size can be enormous and has been traditionally classified according to Galassi (7, 8). This classification is based on anatomical characteristics with type I cysts being small, spindle shaped, and limited to the anterior temporal fossa; type II cysts demonstrating mass effect on the temporal lobe but their superior extent being limited by the Sylvian fissure; and type III cysts occupying the whole middle fossa and demonstrating displacement of the frontal and parietal lobes. Although a SAC can be an incidental finding and remain asymptomatic, a variety of symptoms has been associated with its presence. Furthermore, rupture of such a cyst is known to cause subdural hygroma or hematoma along with acute or subacute signs of elevated intracranial pressure (ICP) (27). The possible treatment modalities consist of cyst fluid diversion by a shunt system or by establishing a communication of the cyst with cisterns or the ventricular system allowing establishment of a pressure equilibrium between the cyst and the regular CSF spaces (10, 23, 36).

In this study the clinical and radiological results of an approach to establish communication to the regular CSF circulation by either an endoscopic approach or microsurgical approach are reported.

Key words
- Endoscopic fenestration
- Microsurgical fenestration
- Sylvian fissure arachnoid cyst

Abbreviations and Acronyms
CSF: Cerebrospinal fluid
ICA: Internal carotid artery
ICP: Intracranial pressure
MCA: Middle carotid artery
SAC: Sylvian fissure arachnoid cyst

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PATIENTS AND METHODS

All children who underwent surgical treatment of a temporal arachnoid cyst were identified by a systematic review of the operative database of the participating pediatric neurosurgical departments. The operative and clinical records and preoperative and postoperative imaging were evaluated for this study.

Surgical Technique, Postoperative Care, and Clinical Follow-up

All children underwent magnetic resonance imaging (MRI) including thin sequences suitable for neuronavigation before an operation. Indiscation for surgery was the existence of associated symptoms and/or the radiological mass effect of Gallassi type II and III SACs. The choice of surgical technique followed the individual anatomy. If the medial wall of the arachnoid cyst had contact with the basal cisterns, fenestration by an endoscopic approach was chosen (Figure 1). If there was no interface with the basal cisterns but the medial cyst wall had contact with the Sylvian/insular cisterns, a microsurgical approach was selected (see Figure 1). Depending on the individual anatomy, a neuronavigation system (Vector Vision^2, BrainLab, Feldkirchen, Germany) was used to plan a trajectory for the endoscope toward the prepontine cistern or the temporal ventricular horn. The children were placed in a Doro pediatric headrest system (Pro Med Instruments, Breisgau, Germany). Through a burr hole opening at the preplanned entry point, access into the cyst was either achieved by a transcortical route or by opening of the cyst wall directly underneath the dura. In cases with preexisting subdural hygroma, access into the cyst was achieved through the retracted lateral cyst wall after irrigation of this subdural cavity and passing through the hygroma or hematoma. Blunt or sharp perforation of the medial cyst wall was performed into the prepontine cistern and into the carotid cistern through the optico-carotid window. The fenestration was widened with repeated opening of a grasping forceps or with a Fogarty balloon. If possible, an opening of the cyst into a segment of the temporal horn was performed as well. After retraction of the endoscope, the cortical tract, if existing, was plugged with a gelatin sponge. The dura was sealed with TachoSil (Takeda Nycomed AS, New York, New York, USA), which was followed by multilayer closure of the temporal muscle, subcutaneous tissue, and skin.

For a microsurgical cyst fenestration a temporal craniotomy (about 2.5 cm in diameter) was performed. The dura was opened as a flap followed by incision of the outer cyst wall, which was circumferentially seamed to the dural edges to prevent its retraction and subdural hygroma formation. Within the cyst cavity the medial cyst wall was extensively opened along the middle carotid artery (MCA) branches. Opening of the cyst toward the dura of the basal temporal fossa wall and the sphenoid wing was avoided. The dura was closed with inclusion of the attached outer cyst wall into the suture line and sealed with TachoSil. The craniotomy flap was reinserted, and multilayer closure was performed. A bandage with moderate compression to cover the whole temporal area was placed and kept for 3–5 days. Postoperatively all children were taken to the pediatric intermediate care unit. Discharge from hospital was according to

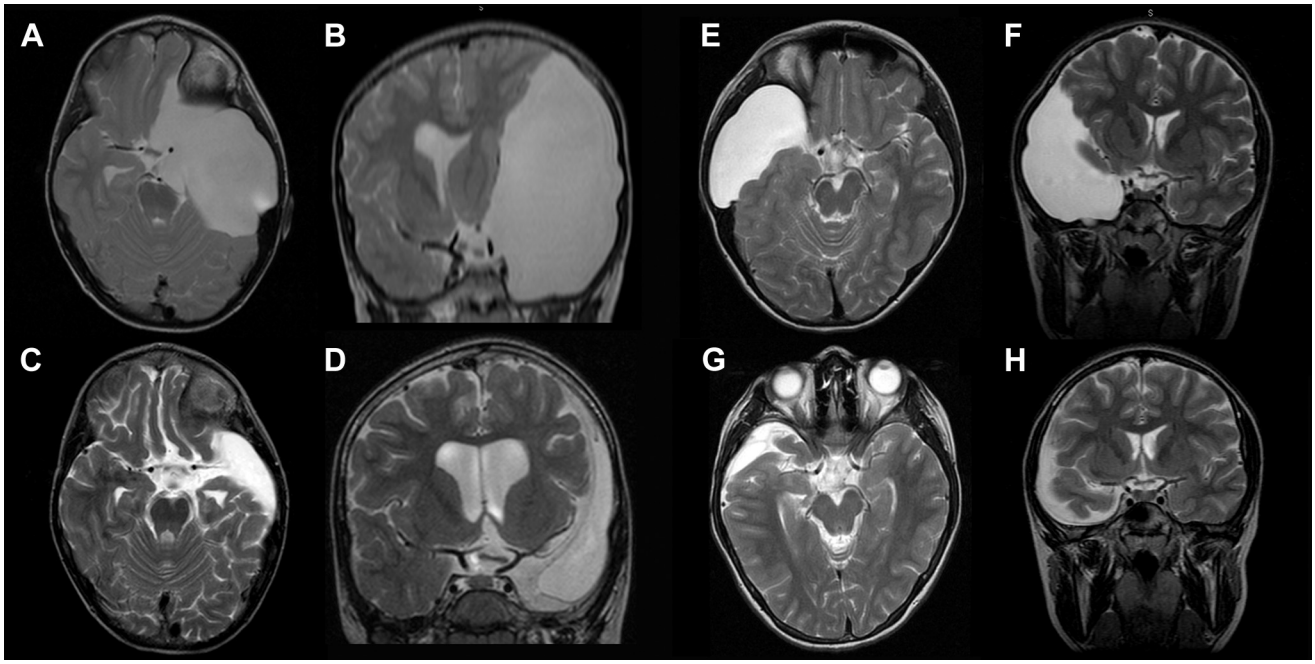

Figure 1. An example of a SAC suitable for endoscopic fenestration – the medial cyst wall has a broad contact to the basal cisterns (**A** and **B**). Postoperatively there is a marked reduction of residual cyst size (**C** and **D**). An example of a SAC treated with microsurgical fenestration – there is only punctual and very limited contact of the medial cyst wall to the basal cisterns (**E** and **F**). After microsurgical fenestration of the wall along the MCA branches reduction of the cyst size can be appreciated (**G** and **H**).