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Enlarging symptomatic arachnoid cyst in an elderly patient: illustrative case

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BACKGROUND Arachnoid cysts are congenital or acquired structures found within the brain and are rarely symptomatic for adults. The literature documenting enlarging arachnoid cysts in adults is also discussed.

OBSERVATIONS An elderly woman presented with acutely worsening headaches, photophobia, cognitive function, and a seizure-like episode. The patient had a known arachnoid cyst with a decade of radiographic stability, which was now idiopathically enlarging. The patient had a previous history of traumatic brain injuries but no reported trauma around the time of presentation. Due to the severity of midline shift and symptomatology, the decision was made to treat the patient surgically with fenestration and shunting. She recovered well postoperatively.

LESSONS During the workup for a symptomatic elderly patient, enlargement of a previously asymptomatic arachnoid cyst should remain on the differential until specifically ruled out, even in the absence of recent trauma. While rare, enlarging arachnoid cysts result in neurological findings and impact the quality of life for patients.

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KEYWORDS arachnoid cyst; enlarging arachnoid cyst; fenestration and shunting; symptomatic arachnoid cyst

Arachnoid cysts are cerebrospinal fluid (CSF)-filled cavities enclosed by a membrane of ependymal cells in the subarachnoid space. Arachnoid cysts are relatively uncommon, with a prevalence of approximately 2.6% in children and 0.2%–1.7% in adults.¹ Arachnoid cysts typically occur in the middle cranial fossa, and in pediatric patients are much more common in males than females.² Primary, or “true,” arachnoid cysts are congenital structures, whereas secondary or acquired arachnoid cysts can be the result of an infection, intracranial hemorrhage, or trauma to the brain. In adults, acquired arachnoid cysts can result from minor head trauma, skull base surgery, and infection.³ Anatomical anomalies such as corpus callosum agenesis can be associated with congenital cysts, which help differentiate them from acquired cysts.⁴

In adults, arachnoid cysts are rarely symptomatic and most often are incidental imaging findings.^{4,5} When arachnoid cysts do have symptoms or signs, they are caused by cyst enlargement and mass effect. Symptomatic arachnoid cysts are more common in children because arachnoid cyst enlargement is more common in them. Interestingly, cyst enlargement becomes increasingly rare beyond the age of 4–5 years old.⁶ A change in arachnoid cyst volume is more

common in children than in adults, and reports of decreasing arachnoid cyst size and even spontaneous resolution exist.⁷

Four separate mechanisms have been proposed to explain arachnoid cyst enlargement^{3,4}: (1) osmotic force gradient between the cyst lumen and the subarachnoid space, (2) pressure gradient and a corresponding slit-valve or ball-valve mechanism, (3) secretion of luminal contents by the cyst wall, or (4) venous or arterial fluid draining into the cystic cavity. There are likely multiple underlying etiologies of arachnoid cysts, with yet unknown impacts on symptomatology and treatment methods. Cyst enlargement in children has also been hypothesized to be partially a byproduct of normal cranial growth, especially in early childhood.¹

Enlargement of arachnoid cysts in elderly individuals is an extremely rare phenomenon. To our knowledge, only 2 other case reports with radiological evidence for cyst enlargement have been published to date.^{3,8} Other elderly patients with enlarging arachnoid cysts have been reported, although typically citing symptom onset as the sole evidence of cyst enlargement.^{4,9} Here, we present the case of a symptomatic elderly patient with an enlarging, supratentorial hemispheric

ABBREVIATIONS CSF = cerebrospinal fluid; MLS = midline shift; MRI = magnetic resonance imaging.

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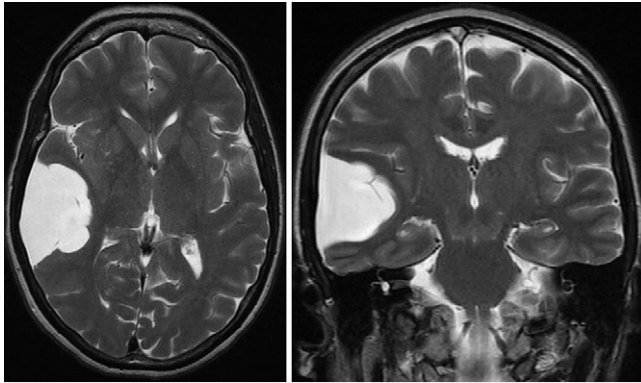


FIG. 1. 2012 axial (left) and coronal (right) T2-weighted MRI demonstrating a right temporal arachnoid cyst measuring $5.5 \times 3.8 \times 3.6$ cm with 2.5 mm of leftward MLS.

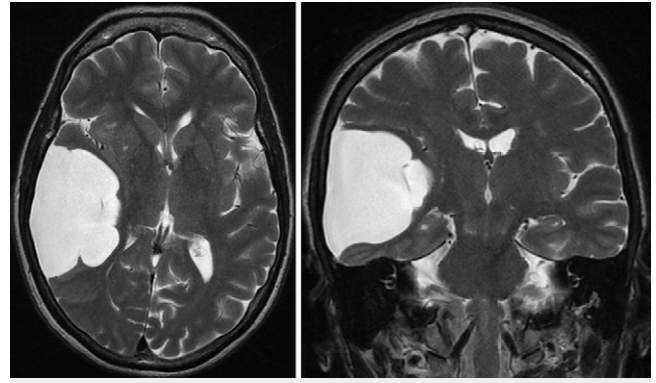


FIG. 2. 2018 axial (left) and coronal (right) T2-weighted MRI demonstrating a right temporal arachnoid cyst measuring $6.9 \times 4.5 \times 5.0$ cm with 7 mm of leftward MLS.

arachnoid cyst with mass effect and significant midline shift, as well as a review of the corresponding literature.

Illustrative Case

A 71-year-old female presented to the emergency department with acutely worsening headaches, photophobia, slowed cognition, and a seizure-like episode. The patient had previously been diagnosed with a large right temporal arachnoid cyst. She had a history of prior concussions/mild traumatic brain injury, although never any intracranial hemorrhage. She had been followed conservatively by another neurosurgeon and had been doing well until the most recent presentation. A subtle left pronator drift was observed on examination, but otherwise strength and deep tendon reflexes were normal and cranial nerves and gait were within normal limits. Mental status examination was unremarkable, although the patient reported slowed cognition and difficulty with daily tasks. Review of the patient's imaging revealed an arachnoid cyst measuring $5.5 \times 3.8 \times 3.6$ cm with 2.5 mm of leftward midline shift (MLS) on magnetic resonance imaging (MRI) 10 years prior to her current presentation (Fig. 1), followed by progressive enlargement to $6.9 \times 4.5 \times 5.0$ cm with 7 mm of MLS 5 years earlier than her current presentation, which remained stable on imaging 2 years before the current presentation (Fig. 2). At her most recent presentation, the cyst had enlarged to $7.4 \times 5.5 \times 5.8$ cm with 13 mm of MLS (Fig. 3).

Given the progressive symptomatology, along with growth of the cyst and increasing mass effect, fenestration and shunting were offered, to which the patient agreed. Fenestration alone was not believed to be a definitive option, as there was no adjacent CSF space or cistern. A small right-sided supratentorial craniotomy was performed. Clear CSF, which was under pressure, egressed upon dural opening, although the brain did not fill the cavity upon CSF release. The surgical microscope was used to visualize the interior of the cavity to identify any septations or loculations. M2 branches were visualized within the cavity and left intact. The shunt catheter was placed 3 cm into the cyst and connected to the peritoneal catheter in a standard fashion. A right-angle catheter fixation device was utilized to maintain the trajectory of the intracranial catheter within the cyst.

The patient recovered well, with resolution of headaches and improved cognition with mild surgical pain. Immediate postoperative imaging demonstrated diminished arachnoid cyst volume with some air

within the cyst. On follow-up imaging, the cyst was significantly smaller, with complete resolution of the mass effect and MLS (Fig. 4).

Discussion

Observations

Enlargement of an arachnoid cyst in an adult patient is extremely rare, with only a handful of cases reported within the literature (Table 1).^{3,4,8,9} Reports of symptomatic elderly patients with arachnoid cysts exist but typically lack radiological evidence of cyst enlargement. In some cases, head trauma in elderly patients occurs around the time of symptom onset. In cases in which no trauma was noted, it is possible that a minor occult trauma could accelerate cyst enlargement, increasing the probability of symptom presentation.¹⁰ Interestingly, this patient had multiple mild head traumas/concussions over the years. Ultimately, enlargement of arachnoid cysts in adults is most likely multifactorial, without a direct precedent in some cases.

Grailon et al.⁸ published a similar case with radiological evidence of an enlarging arachnoid cyst with significant midline shift in an elderly patient. Their patient presented with a 48-hour history of hemiplegia and aphasia. The patient was treated with endoscopic marsupialization of the cyst using a catheter balloon. The patient experienced complete postoperative resolution of aphasia and marked improvement in the hemiplegia.

Previously, Yamasaki et al.⁴ published a literature review of adult interhemispheric arachnoid cysts that became symptomatic later in life. However, no radiological evidence of cyst growth was included. Interestingly, unlike in pediatric patients with interhemispheric arachnoid cyst, elderly patients do not have corresponding corpus callosum agenesis, implying an acquired etiology of the cyst and subsequent enlargement.⁴

Corona-Ruiz and De Jesus³ reported a 71-year-old woman with an enlarging arachnoid cyst invading the sphenoid sinus. Radiologic evidence demonstrated rapid enlargement of the cyst into the sphenoid sinus and the greater sphenoid wing. The only neurological complaints were persistent headache and a possible episode of a temporal lobe seizure. The patient had no other neurological deficits and ultimately underwent craniotomy for cyst fenestration. No new headache or seizure-like episodes were reported at the 6-month follow-up.

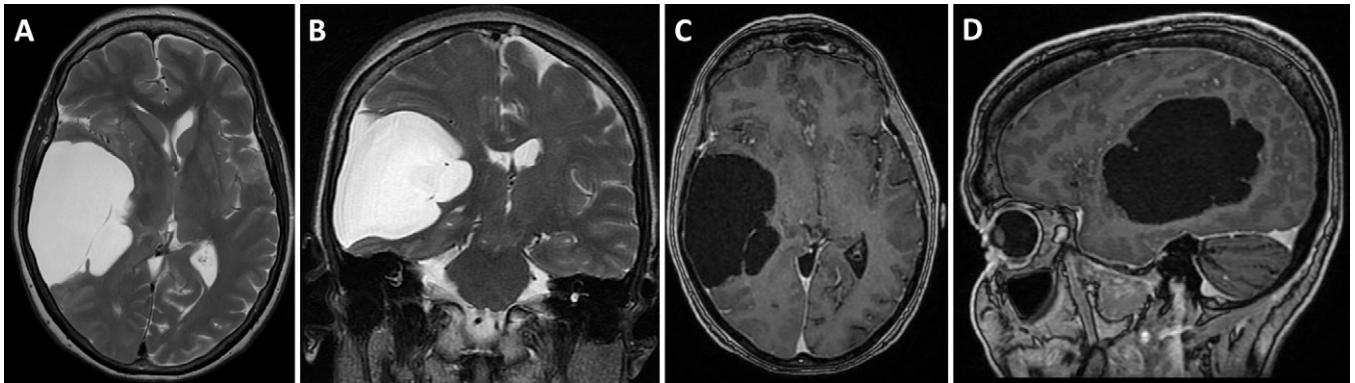


FIG. 3. 2022 preoperative axial (A) and coronal (B) T2-weighted MRI and axial (C) and sagittal (D) T1-weighted MRI with gadolinium contrast demonstrating a right temporal arachnoid cyst measuring $7.4 \times 5.5 \times 5.8$ cm with 13 mm of leftward MLS.

Lessons

Surgical intervention for arachnoid cysts in asymptomatic adults is a contentious topic.^{11,12} Asymptomatic patients are at greater risk for symptoms with minor trauma,^{11,13} presumably caused by occult rupture of blood vessels into arachnoid cyst, thought to be a common occurrence that may be difficult to visualize on imaging. In elderly patients, concern for vessel rupture due to minor trauma should be elevated, especially considering the age group's increased subdural hematoma incidence and fall risk.¹⁴ During workup for a fall in an elderly patient with an arachnoid cyst, potential subacute cyst enlargement should be considered, including short-interval follow-up and counseling regarding symptoms that may indicate cyst enlargement.

Treatment methods for symptomatic arachnoid cysts typically include ventriculocystostomy, shunting, and excision of the membrane wall, also known as a "membranectomy." Typically, all 3 mechanisms are considered effective, with a reported cyst recurrence rate of 29%.¹⁵ For superficial cysts, fenestration and shunting are optimal, while membranectomy is preferred for deeper cysts,² which relates to the ability to fenestrate the cyst into CSF spaces. The primary goal of treatment is to normalize pressure between the cyst lumen and the subarachnoid space to allow for normal CSF circulation to balance out the intracranial pressure as well as relieve the mass effect exerted by the cyst. Yamakawa et al.¹³ reported that 76% of elderly patients treated surgically had a good prognosis, whereas conservative

management did not yield improvement in symptoms.² Surgical complications of arachnoid cysts in the elderly include intracerebral hemorrhage, postoperative seizures, and temporary worsening of motor symptoms.⁴ Shunt-specific complications include shunt obstruction and infections, which are also present in other neurosurgical shunt procedures.¹⁶

Here, we report an elderly patient with a symptomatic and radiographically enlarging arachnoid cyst. To our knowledge, this is only the third adult patient reported with radiographic evidence of idiopathic cyst enlargement. Symptomatic arachnoid cysts in adults are rare. Most arachnoid cysts in adults are asymptomatic and incidentally discovered on imaging.¹³ Arachnoid cysts can be acquired in adulthood from minor trauma, but once formed they typically do not change in size. Children are far more likely to present with changes in arachnoid cysts, which have been shown to enlarge, shrink, and even spontaneously resolve.⁷

We also reviewed the literature on enlarging arachnoid cysts in adults. Most published cases are interhemispheric arachnoid cysts, with temporal or frontotemporal cysts as the second most common location for arachnoid cysts. Location-specific surgical management of symptomatic arachnoid cysts is effective with high success rates. The prognosis of a rare symptomatic enlarging arachnoid cyst in an elderly patient treated surgically is quite favorable. While rare, enlarging arachnoid cysts should be considered in the differential in

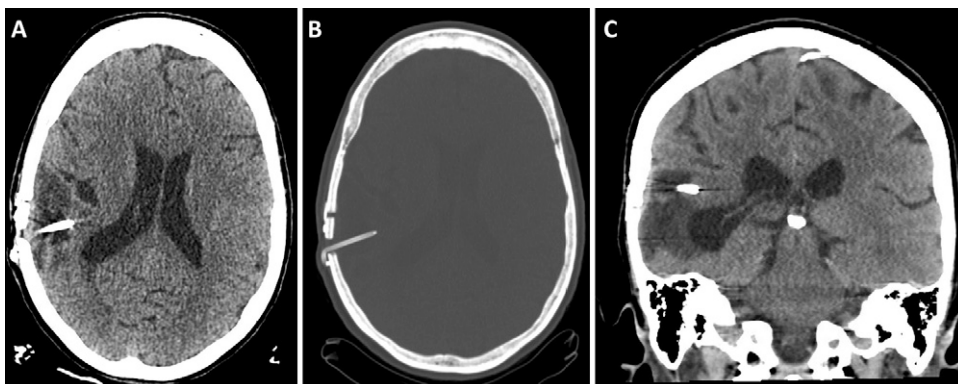


FIG. 4. Axial computed tomography (CT) (A), axial bone window (B), and coronal (C) postoperative CT imaging without contrast demonstrating a right-angle shunt, resolution of the MLS and arachnoid cyst, with residual encephalomalacia.

TABLE 1. Literature review of enlarging arachnoid cysts in adults

Authors & Year	Cases Reported	Cyst Location
Corona-Ruiz & De Jesus, 2018 ³	1	Temporal, sphenoid sinus
Yamasaki et al., 2003 ⁴	8	Interhemispheric fissure
Graillon et al., 2013 ⁸	1	Frontotemporal
Bigder et al., 2017 ⁹	1	Meckel's cave

the adult population, especially those with a documented cyst and a history of head trauma.

References

- Al-Holou WN, Yew AY, Boomsaad ZE, Garton HJ, Muraszko KM, Maher CO. Prevalence and natural history of arachnoid cysts in children. *J Neurosurg Pediatr.* 2010;5(6):578–585.
- Gosalakkal JA. Intracranial arachnoid cysts in children: a review of pathogenesis, clinical features, and management. *Pediatr Neurol.* 2002;26(2):93–98.
- Corona-Ruiz JM, De Jesus O. Enlarging temporal arachnoid cyst extending inside the sphenoid sinus. *World Neurosurg.* 2018;115:1–4.
- Yamasaki F, Kodama Y, Hotta T, et al. Interhemispheric arachnoid cyst in the elderly: case report and review of the literature. *Surg Neurol.* 2003;59(1):68–74.
- Garcia-Bach M, Isamat F, Vila F. Intracranial arachnoid cysts in adults. *Acta Neurochir Suppl (Wien).* 1988;42:205–209.
- Kaliaperumal C, O'Connor B, Marks C. Development of intracranial hypertension after surgical management of intracranial arachnoid cyst: report of three cases and review of the literature. *World Neurosurg.* 2013;80(1–2):222.e1–222.e4.
- Reddy RD. Intracranial arachnoid cysts. *Neurol India.* 2013;61(1):1–2.
- Graillon T, Metellus P, Adetchessi T, Dufour H, Fuentes S. Adult symptomatic and growing arachnoid cyst successfully treated by ventriculocystostomy: a new insight on adult arachnoid cyst history. *Neurochirurgie.* 2013;59(6):218–220.
- Bigder MG, Helmi A, Kaufmann AM. Trigeminal neuropathy associated with an enlarging arachnoid cyst in Meckel's cave: case report,

management strategy and review of the literature. *Acta Neurochir (Wien).* 2017;159(12):2309–2312.

- Watanabe M, Kameyama S, Takeda N, Tanaka R. Two cases of symptomatic interhemispheric arachnoid cyst in the elderly. *Surg Neurol.* 1994;42(4):346–351.
- Spacca B, Kandasamy J, Mallucci CL, Genitori L. Endoscopic treatment of middle fossa arachnoid cysts: a series of 40 patients treated endoscopically in two centres. *Childs Nerv Syst.* 2010;26(2):163–172.
- Hayes MJ, TerMaath SC, Crook TR, Killeffer JA. A review on the effectiveness of surgical intervention for symptomatic intracranial arachnoid cysts in adults. *World Neurosurg.* 2019;123:e259–e272.
- Yamakawa H, Ohkuma A, Hattori T, Niikawa S, Kobayashi H. Primary intracranial arachnoid cyst in the elderly: a survey on 39 cases. *Acta Neurochir (Wien).* 1991;113(1–2):42–47.
- Feghali J, Yang W, Huang J. Updates in chronic subdural hematoma: epidemiology, etiology, pathogenesis, treatment, and outcome. *World Neurosurg.* 2020;141:339–345.
- Boutarouch M, El Ouahabi A, Rifi L, Arkha Y, Derraz S, El Khamli-chi A. Management of intracranial arachnoid cysts: institutional experience with initial 32 cases and review of the literature. *Clin Neurol Neurosurg.* 2008;110(1):1–7.
- Komolafe EO, Adeolu AA, Komolafe MA. Treatment of cerebrospinal fluid shunting complications in a Nigerian neurosurgery programme. Case illustrations and review. *Pediatr Neurosurg.* 2008;44(1):36–42.

Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Steinberg. Acquisition of data: all authors. Analysis and interpretation of data: all authors. Drafting of the article: all authors. Critically revising the article: all authors. Reviewed submitted version of the manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Brandel. Administrative/technical/material support: Steinberg. Study supervision: Steinberg.

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