



# Arachnoid cyst presenting as a neurosurgical emergency: a case report

Himal B. Bhattarai, MBBS<sup>a,\*</sup>, Shabal Sapkota, MBBS, MS, MCh<sup>a</sup>, Prince Mandal, MBBS<sup>b</sup>, Madhur Bhattarai, MBBS<sup>b</sup>, Roshan Pathak, MBBS<sup>b</sup>

**Introduction:** Arachnoid cysts are intra-arachnoid lesions filled with cerebrospinal fluid. They account for ~1% of all intracranial mass lesions and are non-neoplastic collections of cerebrospinal fluid within an anomalous arachnoid enclosure.

**Case presentation:** The authors report a 35-year-old Arabian male who presented to the ER with a history of sudden loss of consciousness, anisocoria, and right hemiparesis. Contrast tomography showed a large frontoparietotemporal cyst (7.7 × 5.8 × 5.4) with uncal herniation and a midline shift of 12 mm. An emergency left FTP craniotomy with an excision of the cyst was performed.

**Discussion:** Arachnoid cysts can be categorized as primary or secondary, arising congenitally or due to factors like trauma, infection, or neoplasia. It can rupture, leading to internal bleeding, causing symptoms such as headaches, seizures, and neurological decline. Rapid diagnosis is vital, with cranial computed tomography scans preferred for emergencies. Treatment options include surgical intervention like craniotomy, fenestration, or cyst peritoneal shunts. For uncal herniation, surgery can be successful and results depends on the amount of herniation.

**Conclusion:** Although benign, the arachnoid cysts led to uncal herniation when they become ‘tension’ cysts. A high level of suspicion is crucial for early recognition of the condition. Timely intervention has shown positive recovery outcomes.

**Keywords:** arachnoid cyst, emergency, neurosurgery, uncal herniation

## Introduction

Arachnoid cysts are congenital, intra-arachnoidal lesions filled with cerebrospinal fluid (CSF), frequently discovered incidentally during routine brain or spine scans. Most arachnoid cysts are asymptomatic, though they occasionally cause symptoms if they grow big enough to put pressure on nearby structures, mostly in very young children<sup>[1]</sup>. Arachnoid cysts comprise about 0.3–1.7% of all intracranial mass lesions and are well-known non-neoplastic extra-axial lesions of CSF collection within an anomalous arachnoid enclosure<sup>[2]</sup>. While intracranial abnormalities are present in less than 3% of healthy individuals<sup>[3]</sup> the incidence in the pediatric population is high<sup>[4,5]</sup>. Arachnoid cysts located in the temporal region can enlarge quickly and cause uncal herniation, believed to be due to the ‘ball valve’ effect<sup>[6,7]</sup>. The literature has only reported

## HIGHLIGHTS

- Arachnoid cysts are intra-arachnoid lesion filled with cerebrospinal fluid.
- It accounts for 1% of all intracranial mass lesion.
- Cyst in the middle cranial fossa can have sudden deterioration due to haemorrhage.
- Early intervention has shown good recovery.

a few cases of uncal herniation caused by large arachnoid cysts, primarily focusing on the MRI demonstration<sup>[2,8–10]</sup>. We present a case of a 35-year-old gentleman, who presented with sudden loss of consciousness, anisocoria, and right hemiparesis with computed tomography (CT) brain revealing a large arachnoid cyst causing midline shift and brain herniation. This is by far the youngest patient where an arachnoid cyst presenting with uncal herniation. The case has been report following Surgical CAse REport (SCARE) guideline<sup>[11]</sup>.

## Case presentation

A 35-year-old Arabian gentleman was brought to the emergency room by ambulance with the history of sudden onset of disorientation, confusion, and vomiting at his residence. On examination, his vitals were within the normal range. He was opening his eyes spontaneously, disoriented, and localizing to pain with the Glasgow Coma Scale of E4V4M5. He was planned for CT brain. Suddenly he lost consciousness, and his GCS dropped to E1V1M4. He was noted to have anisocoria, with a right pupil of 2.5 mm and a left pupil of 4 mm and weakness of both upper and lower limbs (1/5). The patient was intubated for airway protection and

<sup>a</sup>Gandaki Medical College, Tribhuvan University, Pokhara and <sup>b</sup>Maharajgunj Medical Campus, Tribhuvan University, Institute of Medicine, Maharajgunj, Nepal

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

\*Corresponding author. Address: Gandaki Medical College, Tribhuvan University, Pokhara 33700, Nepal. Tel./fax: +977 984 650 539. E-mail: himalbikrambhattarai@gmail.com (H.B. Bhattarai).

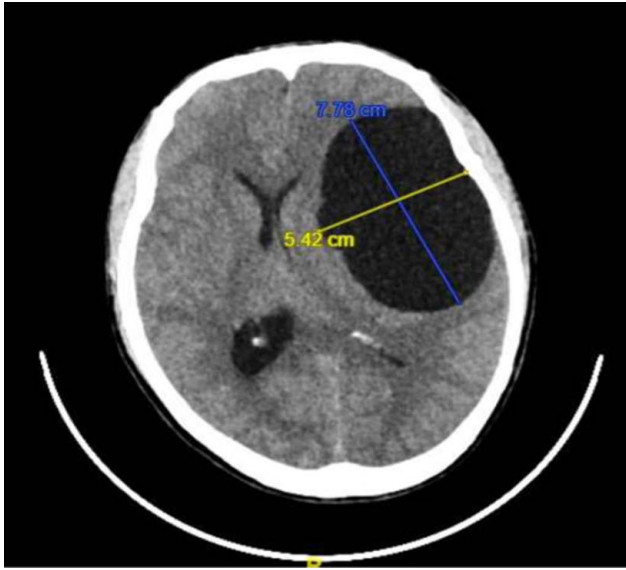
Copyright © 2023 The Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Annals of Medicine & Surgery (2023) 85:6164–6167

Received 25 August 2023; Accepted 22 September 2023

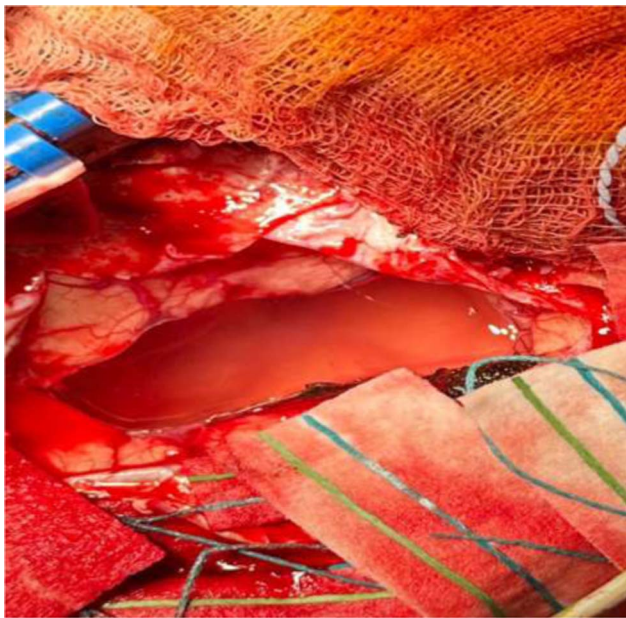
Published online 1 November 2023

<http://dx.doi.org/10.1097/MS9.0000000000001373>



**Figure 1.** Contrast tomography showed a large frontoparietotemporal cyst (7.7 × 5.8 × 5.4) with uncal herniation and a midline shift of 12 mm.

transferred for CT brain. A CT scan of his head was done, which revealed a large left cerebral cyst (7.7 × 5.8 × 5.4 cm<sup>3</sup>) over the frontoparietotemporal region with uncal herniation with a midline shift of 12 mm (Fig. 1). An emergency left frontoparietotemporal craniotomy was performed in the supine position. Dura was incised with care and reflected, which revealed a purplish membrane-covered cyst over the frontal and temporal lobes. The cyst was dissected carefully. A clear watery fluid came with pressure. The cyst cavity was inspected for any bleeding or daughter cyst. Irrigation of the cyst was done (Fig. 2). Pulsation of the brain was encountered indicating no pressure effect. The membrane covering the cyst was excised and sent for histopathology, which revealed a



**Figure 2.** Postoperative cyst after marsupialization.

cystic wall formed of delicate fibrous connective tissue lined with meningotheial cells expressing EMA – Arachnoid cyst. Overall, the surgery was uneventful. The patient was extubated the next day with full GCS and equal and reactive pupils.

## Discussion

Arachnoid cysts can be primary or secondary. Primary arachnoid cyst are more common congenital cyst caused by defects in cortical formation or anomalies in the leptomeninges. Secondary cysts, on the other hand, are due to trauma, infection, or neoplasia<sup>[12]</sup>. Arachnoid cysts tend to form within the sub-arachnoid space and arachnoid membrane of the major cerebral fissures and arachnoid cisterns, with the Sylvian fissure being the most common location. Along with these areas, the quadrigeminal plate, sellar and suprasellar regions, quadrigeminal cerebellopontine angle, posterior infratentorial midline cisterns, and convexities of the brain are other potential sites<sup>[13–15]</sup>.

Galassi *et al.* have classified arachnoid cysts by according to their size, location, effect on surrounding tissues, and connection to the subarachnoid space. Among the arachnoid cysts situated in the middle cranial fossa, the Galassi classification distinguishes three types:

Type I cysts, located anteriorly in the middle cranial fossa, are small and usually asymptomatic;

Type II cysts are positioned superiorly along the Sylvian fissure, causing displacement of the temporal lobe; and

Type III cysts, which are extremely large and can occupy the entire middle cranial fossa, resulting in a displacement of the frontal, temporal, and parietal lobes, as in our case<sup>[16]</sup>.

Arachnoid cysts can rupture or bleed internally due to sudden changes in intracranial pressure, which can happen spontaneously or because of trauma. People with cysts in the middle cranial fossa may experience sudden deterioration due to hemorrhage, which can occur within the cyst or from the tearing of bridging veins, or because of the cyst rupturing<sup>[2]</sup>. In our case, the cyst was under intense pressure with engorged cyst wall vessels and bleeding from the bridging veins<sup>[2]</sup> Figure 1.

When arachnoid cysts are located in the Sylvian fissure, the most common symptom is a unilateral headache in the temporal and supra-orbital region. Seizures are the second most common symptom in up to a quarter of patients and can be focal, complex-partial, or generalized. As our patient was in the ER, there was no evidence of seizure despite a sudden decrease in the Glasgow coma scale. Patients with arachnoid cysts may experience sudden neurological deterioration due to uncommon complications such as spontaneous intracystic hemorrhage or spontaneous cyst rupture<sup>[7]</sup>. Cushing's triad, characterized by hypertension, bradycardia, and irregular breathing or apnea due to increased intracranial pressure, may be discovered during a physical examination<sup>[17]</sup>. A unilaterally dilated pupil is a hallmark feature that can occur even without severe consciousness impairment or contralateral hemiparesis. Isolated anisocoria in a patient may indicate impending uncal herniation<sup>[18]</sup>. Neurosurgical patients must be diagnosed and treated as soon as possible to receive the best possible care.

In the emergency setting, a cranial CT scan is preferred over MRI because it can be completed quickly, and is more widely available<sup>[17]</sup>. CT imaging of an arachnoid cyst reveals a non-enhancing hypodense lesion that can cause remodeling and scalloping of the surrounding bone<sup>[10]</sup> whereas, MRI demonstrates a

**Table 1****Review of cases on subarachnoid cyst with uncal herniation.**

References	Age	Symptoms and sign	CT	MRI	Treatment	Outcome
Iwama <i>et al.</i> <sup>[8]</sup>	62 years/ Female	2-year history of gradually progressive right hemiparesis and speech disturbance. Vomiting and clouding of consciousness	A hypodense lesion in the left cerebral hemisphere	A large cerebrospinal fluid intensity mass in the left Sylvian fissure. Herniations of the left uncus, parahippocampal gyrus and inferior horn of the left lateral ventricle into the tentorial hiatus	Partial membranectomy of the cyst	At 6 months, she could walk unaided and independently go for shopping
Tahir <i>et al.</i> <sup>[7]</sup>	60 years /Female	Headaches since last 1 week followed by vomiting, seizures, and altered state of consciousness	A large well-defined hypo-attenuated area with well-defined margins in the left temporal region causing a mass-effect on the ipsilateral ventricle with a midline shift	Left temporal cystic lesion	Left temporal craniotomy and marsupialization of the arachnoid cyst	At discharge, awake and follows command
Balani <i>et al.</i> 2015 <sup>[10]</sup>	70 years/ Female	Multiple episodes of seizures followed by sudden onset loss of consciousness	–	Extra-axial lesion in the right middle cranial fossa and right sylvian fissure; right transtentorial, and uncal herniation with midline shift	Cystoperitoneal shunting	Good recovery at follow-up
Onyia <i>et al.</i> 2019 <sup>[2]</sup>	48 years/ Male	Fever, headache, and altered sensorium for 5 days. Complains of neck stiffness as well as impaired hearing on the right side. Later optosis of the right eye with an ipsilateral dilated, nonreactive pupil, and was observed to be drifting in and out of impaired consciousness with confused speech. Few hour later oculomotor palsy and subtle left hemiparesis. (ongoing uncal herniation and Kernohan's notch due to mass-effect)	Homogenous hypodense cystic collection with features suggestive of an arachnoid cyst in left temporal region of the middle cranial fossa extending medially toward the midbrain	Left temporal cystic mass with pressure effect of the medial aspect of the cyst against the tentorium, as well as massive shift of cerebral tissue posteriorly toward the posterior aspect of left cerebellar lobe	Emergency frontotemporal craniotomy and excision of the cyst	No improvement. Patient died of cardiac arrest on 5th day
Our case	35 year/ Male	Disorientation, confusion, and vomiting; GCS initially 14, drop to 5 with anisocoria and left hemiparesis	Left large cerebral cyst over frontoparieto temporal region with uncal herniation with midline shift	–	Emergency left frontoparieto temporal craniotomy and cyst marsupialization	Good recovery

signal intensity consistent with CSF on all sequences, including fluid-attenuated inversion recovery (FLAIR) and diffusion-weighted image (DWI)<sup>[10]</sup>.

Managing symptomatic lesions can involve various procedures such as craniotomy (fenestration or removal), a cyst peritoneal shunt, or endoscopic fenestration<sup>[10]</sup>. If the cyst is situated in a noncritical area and can be extracted without harm to the surrounding brain tissue, complete removal of the cyst along with its wall and contents is the most suitable treatment for a symptomatic lesion<sup>[19]</sup>. We chose to perform a craniotomy and cyst marsupialization as the patient was presented with anisocoria suggestive of uncal herniation. Surgical decompression of arachnoid cysts can lead to complications such as cyst recurrence, hydrocephalus, subdural hematomas, cerebral edema, infection, and seizures<sup>[20]</sup>. In our review, three of the four patients recovered well; however, one died of cardiac arrest. The prognosis of patients with uncal herniation is determined by the extent of the herniation<sup>[17]</sup>. Uncal herniation can be reversed in 50–75% of adult patients if presented early<sup>[17]</sup> (Table 1).

## Conclusion

Even though arachnoid cysts are typically benign and tend to grow slowly, they can cause uncal herniation when they become ‘tension’ cysts, likely due to a ‘ball-valve’ mechanism. It is crucial to maintain a high level of suspicion to recognize the condition early and intervene in a timely manner. Early intervention after diagnosis has shown favorable recovery outcomes.

## Ethical approval

None.

## Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Sources of funding

No funding was received for study.

## Author contribution

H.B.B., S.S., M.B., and P.M.: wrote the original manuscript, reviewed, and edited the original manuscript; H.B.B., S.S., P.M., M.B., and R.P.: reviewed and edited the original manuscript.

## Conflicts of interest disclosures

None.

## Research registration unique identifying number (UIN)

None.

## Guarantor

Dr Shabal Sapkota, Gandaki Medical College, Tribhuvan University, Pokhara 33700, Nepal. E-mail: shabalsapkota@gmail.com.

## Data availability statement

All the required information is in manuscript itself.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

## References

- [1] Goswami P, Medhi N, Sarma P, *et al.* Case report: middle cranial fossa arachnoid cyst in association with subdural hygroma. *Indian J Radiol Imaging* 2008;18:222.
- [2] Onyia CU, Akinniranye O, Olaitan A, *et al.* Short report on a rare presentation of temporal arachnoid cyst and lessons learned. *World Neurosurg* 2019;126:310–3.
- [3] Weber F, Knopf H. Incidental findings in magnetic resonance imaging of the brains of healthy young men. *J Neurol Sci* 2006;240(1–2):81–4.
- [4] Wahl AS, Löffler M, Hausner L, *et al.* Case report: a giant arachnoid cyst masking Alzheimer’s disease. *BMC Psychiatry* 2019;19:274.
- [5] Al-Holou WN, Yew AY, Boomsaad ZE, *et al.* Prevalence and natural history of arachnoid cysts in children. *J Neurosurg Pediatr* 2010;5: 578–85.
- [6] Oliver L. Expanding lesions of the temporal fossa. *Postgrad Med J* 1959; 35:546.
- [7] Tahir MZ, Quadri SA, Farooqui M, *et al.* Tension arachnoid cyst causing uncal herniation in a 60 year old: a rare presentation. *CNS Neurol Disord Drug Targets* 2012;11:127–31.
- [8] Iwama T, Kuroda T, Sugimoto S, *et al.* MRI demonstration of uncal herniation caused by arachnoid cyst in the Sylvian fissure. *Neuroradiology* 1991;33:346–8.
- [9] Tahir MZ, Quadri SA, Hanif S, *et al.* Traumatic retroclival epidural hematoma in pediatric patient—Case report and review of literature. *Surg Neurol Int* 2011;2:78.
- [10] Balani A, Kumar AD, Marda SS, *et al.* Tension arachnoid cyst with transtentorial herniation: a rare entity. *Neurol India* 2015;63:801–2.
- [11] Agha RA, Franchi T, Sohrabi C, *et al.* The SCARE 2020 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. *Int J Surg* 2020;84:226–30.
- [12] Shettar M, Karkal R, Misra R, *et al.* Arachnoid cyst causing depression and neuropsychiatry symptoms: a case report. *East Asian Arch Psychiatr* 2018;28:64–7.
- [13] Pradilla G, Jallo G. Arachnoid cysts: case series and review of the literature. *Neurosurg Focus [Internet]* 2007;22:E7.
- [14] Cincu R, Agrawal A, Eiras J. Intracranial arachnoid cysts: current concepts and treatment alternatives. *Clin Neurol Neurosurg [Internet]* 2007; 109:837–43.
- [15] Dlaka D, Raguž M, Muller D, *et al.* Intraparenchymal supratentorial arachnoid cyst: a case report. *Egypt J Neurosurg* 2019;34:28.
- [16] Galassi E, Tognetti F, Gaist G, *et al.* CT scan and metrizamide CT cisternography in arachnoid cysts of the middle cranial fossa: classification and pathophysiological aspects. *Surg Neurol* 1982;17:363–9.
- [17] Cadena R, Shoykhet M, Ratcliff JJ. Emergency neurological life support: intracranial hypertension and herniation. *Neurocrit Care* 2017;27(Suppl 1): 82–8.
- [18] Munakomi S, Kumar BM. Case report: frontalis sign for early bedside consideration of impending uncal herniation. *F1000Res [Internet]* 2016; 5:125.
- [19] Park KJ, Kang SH, Chae YS, *et al.* Supratentorial arachnoid cyst located in the brain parenchyma: case report. *Neurosurgery* 2011;68:E258–62.
- [20] Wang XJ. Intraparenchymal hemorrhage after surgical decompression of an epencephalon arachnoid cyst: a case report. *World J Clin Cases* 2021; 9:274–7.