



Case Report

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The First Reported Case of a Hemorrhagic Solitary Fibrous Tumor at the Cerebellopontine Angle Successfully Managed with Multimodal Therapy

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ABSTRACT

Intracranial solitary fibrous tumors (SFTs) are rare mesenchymal neoplasms, and cases of tumor bleeding are rarely seen. While radiographically similar to meningioma, SFTs exhibit a more aggressive clinical course. The mainstay of treatment is surgical resection followed by adjuvant radiotherapy. We present the first case of a hemorrhagic SFT located at the cerebellopontine (CP) angle, which was successfully treated with multimodal therapy. A 31-year-old man presented with a headache and altered consciousness. Neuroimaging revealed a large dural-based tumor at the left CP angle with subdural hematoma (SDH). The patient underwent preoperative endovascular embolization and near-total surgical resection. Further histopathological analysis confirmed the diagnosis of intracranial SFT. The patient recovered favorably and underwent adjuvant gamma-knife stereotactic radiosurgery (SRS) for the residual tumor. To the best of our knowledge, this is the first reported case of a hemorrhagic SFT treated with a combination of preoperative endovascular embolization and adjuvant SRS. This case illustrates that tailored multimodal treatment is both effective and safe for managing hemorrhagic intracranial SFTs.

KEYWORDS: Solitary Fibrous Tumors, Cerebellopontine Angle, Hematoma, Subdural, Radiosurgery

ABBREVIATIONS: CP: Cerebellopontine, CT: Computed tomography, DSA: Digital subtraction angiography, IAC: Internal acoustic canal, ICH: Intracerebral hemorrhage, IVH: Intraventricular hemorrhage, MRI: Magnetic resonance imaging, mRS: Modified Rankin Scale, OP: Operation, RT: radiation therapy, SDH: Subdural hematoma, SFT: Solitary fibrous tumor, SRS: Stereotactic radiosurgery, T1W: T1-weighted, TAE: Transcatheter arterial embolization.

INTRODUCTION

Intracranial solitary fibrous tumors (SFTs) are rare dural-based neoplasms, and hemorrhagic cases are uncommon. Although SFTs may radiographically mimic meningiomas, they are associated with higher risks of recurrence and metastasis. Treatment typically involves surgical resection, followed by adjuvant radiotherapy. Preoperative embolization is recommended for large, hypervascular, or anatomically

challenging skull-base lesions. Given its aggressive clinical behavior, long-term follow up is necessary.

Here, we report the first documented case of a hemorrhagic SFT located at the cerebellopontine (CP) angle. Our patient was successfully managed with a multimodal approach, including preoperative endovascular embolization, near-total resection, and adjuvant stereotactic radiosurgery (SRS)—the first report of such interventions in a hemorrhagic SFT. This

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case highlights the importance of including SFT in the differential diagnosis of dural-based tumors and supports the feasibility and safety of tailored multimodal treatment.

CASE REPORT

A 31-year-old man initially presented to another facility with an acute onset of headache, nausea, and vomiting, followed by sudden disturbance of consciousness (Glasgow Coma Scale: E1 V2 M4). Head computed tomography (CT) revealed a mass lesion at the left CP angle accompanied by acute subdural hematoma (SDH) (Figure 1A). To relieve obstructive hydrocephalus and increased intracranial pressure, an emergent procedure with external ventricular drainage was performed.

Subsequently, the patient was transferred to our hospital. Magnetic resonance imaging (MRI) confirmed a dural-based tumor at the left CP angle, with strong contrast enhancement and invasion of the internal acoustic canal (Figure 1B). Due to acute tumor bleeding and the deep-seated location of the tumor mass, digital subtraction angiography (DSA) was arranged for further investigation of the vascular structure. DSA demonstrated a hypervascular tumor primarily supplied by the left anterior inferior cerebellar artery (Figure 2A). Consequently, preoperative transcatheter arterial embolization (TAE) using n-butyl cyanoacrylate was performed (Figure 2B). The patient subsequently underwent a left retrosigmoid craniotomy for tumor resection. The tumor was soft and easy-oozing, with

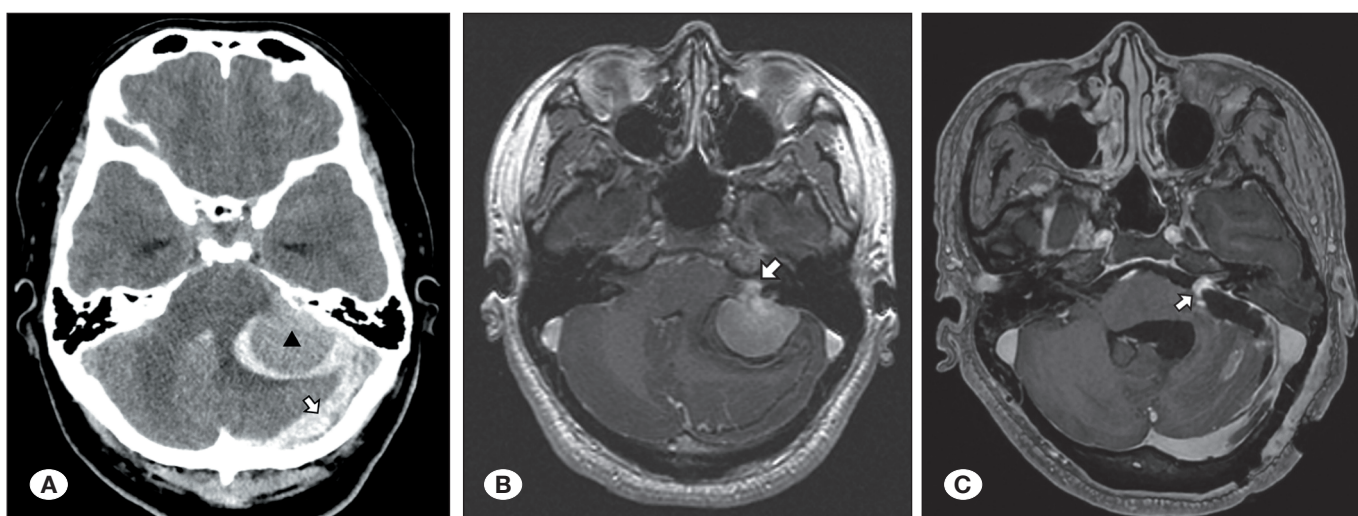


Figure 1: **A)** Non-contrast brain computed tomography shows a mass lesion (arrowhead) at the left cerebellopontine angle with acute subdural hematoma (white arrow). **B)** Preoperative brain T1-weighted magnetic resonance imaging (T1W-MRI) with contrast shows an extra-axial tumor ($3.3 \times 3.2 \times 2.6$ cm) with strong enhancement and invasion of the internal acoustic canal (IAC; white arrow). **C)** Post-operative brain T1W-MRI with contrast shows a small residual tumor (white arrow) around the IAC.

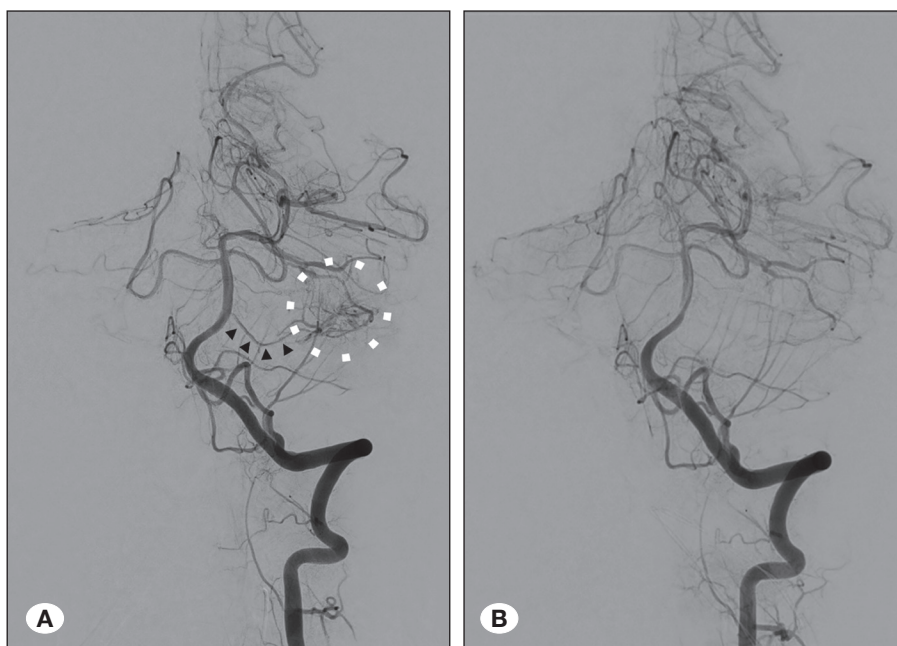


Figure 2: **A)** Pre-transcatheter arterial embolization (TAE) angiography shows a tumor stain (white dotted circle) in the left cerebellopontine angle with the main arterial supply via the left anterior inferior cerebellar artery (arrowheads). **B)** Post-TAE angiography shows no tumor stain.

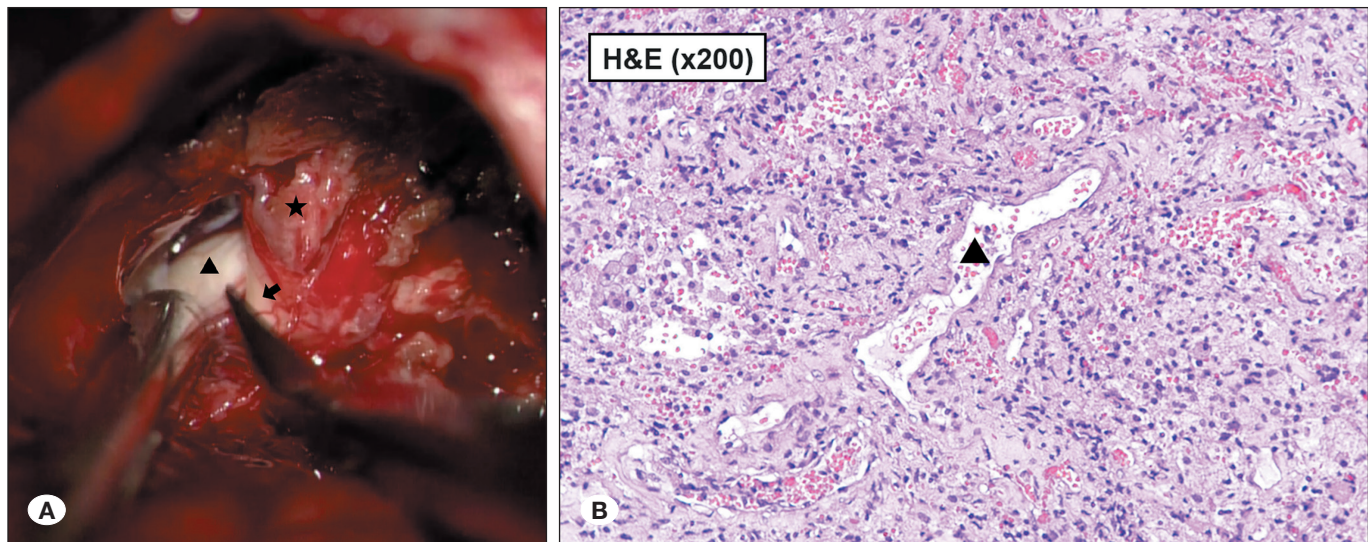


Figure 3: **A)** The tumor was greyish, soft, and rubbery. Some of the residual tumor (star) was attached to the 5th cranial nerve (arrowhead) and 7th and 8th nerve complex (arrow). **B)** Hematoxylin and eosin (H&E) staining (×200) showed that the tumor was composed of haphazardly arranged spindle to ovoid cells admixed with hyalinized, dilated, thin-walled, staghorn-shaped blood vessels (arrowhead).

some cystic cavity, and was removed piece by piece. Near-total resection was achieved because of tumor adherence to multiple cranial nerves (Figure 3A).

Histopathological analysis revealed spindle-to ovoid monomorphic cells with staghorn-shaped blood vessels (Figure 3B). Increased mitotic activity (up to 5 mitoses per 10 high-power fields) and moderate nuclear pleomorphism were observed. Immunohistochemical staining was positive for CD34 and STAT6. These findings were consistent with the diagnosis of an intracranial SFT (World Health Organization grade 3). Subsequently, gamma-knife SRS was planned for the residual tumor (Figure 1C) with a marginal dose of 16 Gy.

At the time of discharge, the patient regained full consciousness and was able to ambulate with assistance (modified Rankin Scale score, 3). There was no evidence of facial palsy or extraocular movement limitation. However, left-sided hearing impairments have been reported. The following year, imaging study with MRI showed a similar tumor size with no sign of recurrence.

DISCUSSION

Intracranial SFTs are rare, aggressive, highly vascularized mesenchymal neoplasms with a high risk of recurrence and metastasis. They account for less than 1% of all intracranial tumors and only 2.5% of meningeal tumors (6,10). These tumors predominantly affect adults between the ages of 40 and 50 years, with a slight male predominance (6,10). The most common intracranial locations include the dural convexity (36%), cerebellar tentorium (16%), and CP angle (10%) (11).

The clinical symptoms of intracranial SFTs typically result from a mass effect or local edema, leading to compression of the adjacent brain parenchyma and elevated intracranial pressure. Headache is the most common symptom, occurring

in approximately 50% of the cases, followed by gait instability, motor weakness, visual disturbances, and cranial nerve deficits (10,11). In our case, the acute onset of headache and impaired mental status was attributed to tumor-associated hemorrhage with brainstem compression and acute hydrocephalus.

Intracranial SFTs and cases of tumor bleeding are rare. The exact incidence of hemorrhage remains unknown because of the limited number of case reports. In 2013, Fredriksson *et al.* reviewed 13 cases of intracranial hemangiopericytomas with hemorrhage (1969–2006) — all of which involved supratentorial lesions with varying bleeding patterns (5). Through a literature review, we identified five cases reported after the 2016 revision of the *WHO Classification of Tumors of the Central Nervous System* (Table I) (1,4,8,11,15). Notably, our case represents the first hemorrhagic SFT occurring in the CP angle.

Intracranial SFTs typically appear on CT as well-defined, slightly hyperdense lesions (11,15). MRI usually shows iso- to hypointense signals on T1-weighted images with marked enhancement after contrast administration (15). Differentiation from meningiomas is difficult. Features favoring SFTs include narrow dural base, absence of the dural tail sign, lack of calcification, and presence of osteolysis (5,11). Under DSA, SFTs often exhibit a dual arterial supply from both the external carotid artery and the internal carotid artery/vertebral artery circulation, appearance of “dilated connecting feeders”, and prolonged contrast retention into the late venous phase (3).

In 2016, SFTs and hemangiopericytomas were grouped together because of a shared *NAB2::STAT6* gene fusion at chromosome 12q13, which causes nuclear overexpression of *STAT6* (2). Histologically, approximately 23.4% of SFTs demonstrate microscopic intratumoral hemorrhage (11). This is attributed to the fragile immature vessels and endothelial

Table I: Case reports of solitary fibrous tumors with hemorrhage after the last revision of the *World Health Organization Classification of Tumors of the Central Nervous System* in 2016.

Study	Age (years) / Sex	Tumor location	Symptoms	Hemorrhage	Treatment	Outcome
Abdelsadg et al. 2018, (1)	58/F	Right cerebellum	Headache	ICH, SDH	OP, RT	mRS 0
Ha et al. 2019, (8)	53/M	Right temporal lobe	Coma	ICH	OP, RT	mRS 5
Eom and Kim 2020, (4)	40/M	Right temporal lobe	Left side weakness	ICH, IVH	OP	mRS 2
Zhang et al. 2020, (15)	72/F	Bilateral parietal and occipital lobes	Headache and nausea	ICH	OP	mRS 1
Ohsaka et al. 2024, (11)	29/F	Midline cerebellum	Headache and vomiting	SDH	OP, RT	mRS 0
Present case	31/M	Left CP angle	Headache, then coma	SDH	TAE, OP, SRS	mRS 3

CP: Cerebellopontine, **ICH:** Intracerebral hemorrhage, **SDH:** Subdural hematoma, **IVH:** Intraventricular hemorrhage, **OP:** Operation, **RT:** Radiation therapy, **TAE:** Transcatheter arterial embolization, **SRS:** Stereotactic radiosurgery, **mRS:** Modified rankin scale, **F:** Female, **M:** Male.

proliferation, which can lead to vascular occlusion, necrosis, and subsequent bleeding (11).

The treatment of intracranial SFTs typically involves gross total or subtotal surgical resection, followed by adjuvant radiotherapy. Adjuvant radiotherapy significantly improves overall survival and reduces recurrence rates from 88% to 12.5%, with survival benefits comparable to those observed in patients who undergo gross tumor removal (6,7,10). Previous studies have also demonstrated the efficacy of SRS in managing intracranial SFTs (13,14). Tumor control rates and overall survival outcomes are comparable to conventional radiotherapy (13,14).

In our case, the patient received DSA and TAE due to acute tumor bleeding and the deep-seated tumor location. Preoperative embolization is recommended for the management of large, hypervascular, or anatomically challenging skull-base lesions, as it facilitates surgical resection by softening the tumor and reducing oozing in the surgical field (3,9). Preoperative TAE also has the advantages of minimizing intraoperative blood loss and transfusion requirements (3,9). Alternatively, intratumoral injection of fibrin sealant is an emerging technique that not only promotes hemostasis but also leads to a firmer tumor texture, allowing for safer and more controlled dissection (12).

Local recurrence rates of intracranial SFTs range from 34% to 90%, and extraneural metastases develop in up to 30% of cases (6,7,10,11). Notably, neither recurrence nor metastasis are linked to overall survival (7). In contrast, histological grade and extent of surgical resection are strong prognostic indicators (7). Given its aggressive nature, long-term surveillance is warranted.

CONCLUSION

Intracranial SFTs share similar imaging features with meningiomas and should be considered in the differential diagnosis of dural-based tumors. For large, deep-seated, and hemorrhagic SFTs, multimodal management, including preoperative TAE, surgical decompression, and adjuvant SRS, may be beneficial, safe and effective.

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Declarations

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Disclosure: The authors report there are no conflicts of interest to declare.

Ethics approval and consent to participate: The patient provided consent for publication, and the study was approved by the appropriate ethics review board (China Medical University Hospital Institutional Review Board, No: AF02-40642924, date: March 15, 2025).

AUTHORSHIP CONTRIBUTION

Study conception and design: HLL
Data collection: ICT
Analysis and interpretation of results: PYC
Draft manuscript preparation: ICT
Critical revision of the article: HLL
Other (study supervision, fundings, materials, etc.): PYC, HLL
All authors (ICT, PYC, HLL) reviewed the results and approved the final version of the manuscript.

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