

## Case Report

# Primary intracerebral fibrosarcoma with intraventricular hemorrhage: a case report and literature review

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**Abstract:** Primary intracerebral fibrosarcomas are rare tumors of mesenchymal origin in the central nervous system (CNS). Fibrosarcoma presenting with spontaneous hemorrhage in the ventricles and without ventricle seeding has not been described in primary cerebral fibrosarcoma. We report the case of a 29-year-old male presenting with spontaneous hemorrhage of a fibrosarcoma that bled into the ventricles. Initially, his condition was considered a cerebral hemorrhage. With the absorption of the hematoma, the clot retracted, but a CT image of the head revealed increased density. The patient was subsequently diagnosed with a tumor. The tumor was completely resected. After 12 months of follow-up, the tumor did not relapse in situ, and no seeding metastasis was observed in the ventricles. Fibrosarcoma is a highly malignant tumor that commonly exhibits recurrence in situ and distant metastasis. The hematoma of the cancer can bleed in the ventricles without implantation metastasis. Furthermore, we examined CD31 and CD68 expression to predict progression-free survival (PFS) and distant metastases-free survival (DMFS). We concluded that fibrosarcoma near the cerebral ventricle can present with a hematoma that can drain into the ventricles. However, fibrosarcoma is often misdiagnosed as a cerebral hemorrhage that has bled into the ventricles. Thus, increased attention must be paid to a tumor that presents with a hematoma in young people.

**Keywords:** Primary fibrosarcoma, intraventricular hemorrhage, treatment

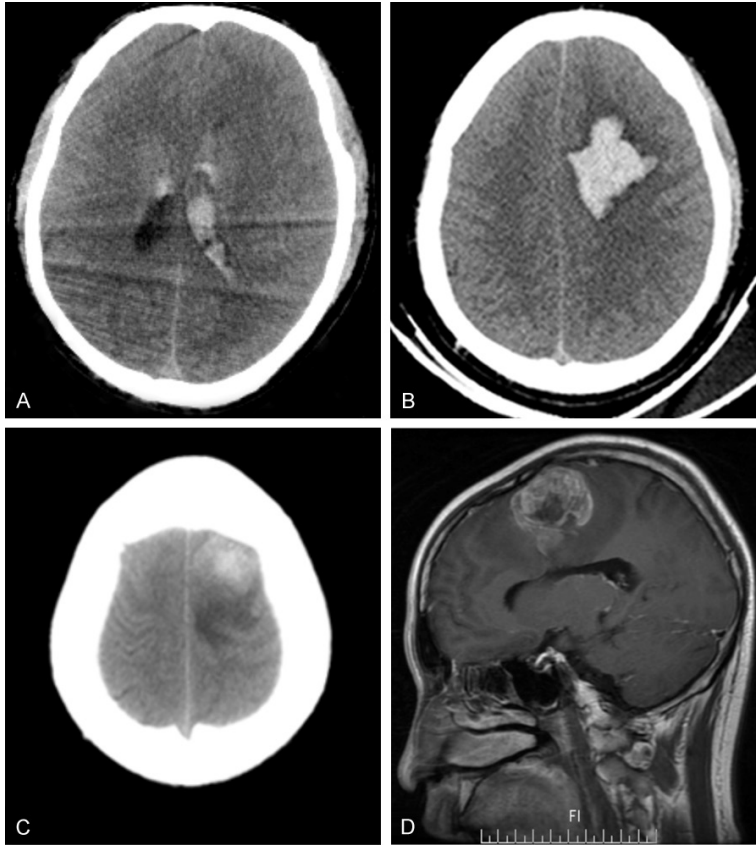
## Introduction

Primary intracerebral fibrosarcoma is uncommon and accounts for 1-3% of all adult sarcomas [1]. Primary central nervous system sarcomas are rare and comprise approximately 1.5% of all intracranial tumors [2, 3]. To date, only two presenting events with spontaneous hemorrhage in a primary cerebral hemorrhage have been reported [4, 5], but no observations of bleeding in the ventricles have been described. Here, we report a case of a 29-year-old man with a primary intracerebral fibrosarcoma presenting with spontaneous intracerebral hemorrhage that bled into the ventricles. In young individuals, the primary reason for spontaneous hemorrhage is cerebrovascular malformation; when this condition is excluded, the subsequent diagnosis is always spontaneous hemorrhage. Thus, a tumor can be missed, especially if the hemorrhage bleeds, but the hematoma is reabsorbed, and the tumor is still visible. Therefore, it is important that physicians know the importance of focusing on imaging

manifestations for early diagnosis of this type of tumor to avoid tumor growth.

## Case presentation

A 29-year-old man presented in our hospital with sudden onset of headaches, nausea, vomiting and right-sided weakness; he then collapsed. A physical examination revealed a disturbance of consciousness, hyperreflexia of the right upper extremity, nuchal rigidity and plantar responses that were flexor on the right side. An initial bilateral papilledema was also observed. A non-enhanced computer axial tomography (CAT) scan of the head revealed a large parietal mass with a hematoma with bleeding in the ventricles (**Figure 1A** and **1B**). An urgent computer tomography angiography (CTA) examination was conducted, which revealed neither an intracranial aneurysm nor an arteriovenous malformation. The patient's coagulation screen was normal, leading to a diagnosis of cerebral hemorrhage with bleeding in the ventricles, and he received conservative treatment. A CAT scan



**Figure 1.** Preoperative image of the patient's head. A, B. CAT scan at the time of onset of intraventricular hemorrhage and the brain hemorrhage. C. The CAT scan revealed increased density at seven days. D. Gadolinium enhanced T1 sagittal view showing a nonhomogenous contrast enhanced signal.

conducted seven days later revealed hyperintensity that was greater in the region of the bleeding (**Figure 1C**). When the patient's condition was stable, a gadolinium-enhanced magnetic resonance imaging (MRI) examination was performed, which showed a left parietal 5.2 cm × 4.2 cm × 3.5 cm mass with a slightly low T1WI signal, mixed high T2WI signal, high DWI signal, slightly high T2WI FLAIR signal, non-homogenous contrast enhancement, and significant perilesional edema (**Figure 1D**). The patient agreed to undergo resection of the tumor. The operation revealed that the dura was intact, and the tumor was pink, soft, and had an extremely rich blood supply. A gelatin sponge was used to stop the exchange between the tumor cavity and ventricles and to prevent the blood from flushing into the ventricle. The tumor was completely removed, and a neuropathological examination was conducted. Paraffin-embedded sections were stained with hematoxylin and eosin (H&E). The neoplasm

was composed of spindle cells focally disbursed in a herringbone-like pattern (**Figure 2A and 2B**). Staining for MIB-1 demonstrated a nuclear proliferative index of 25-30% within the fibrosarcoma (**Figure 2C**). Immunohistochemical staining was performed. The tumor cells stained focally positive for vimentin and CD31 (**Figure 2D and 2E**), diffusely positive for CD68 (**Figure 2F**), and negatively for glial fibrillary acidic protein (GFAP), epithelial membrane antigen (EMA), S-100 protein and creatine kinase (not shown). The patient was then diagnosed with fibrosarcoma.

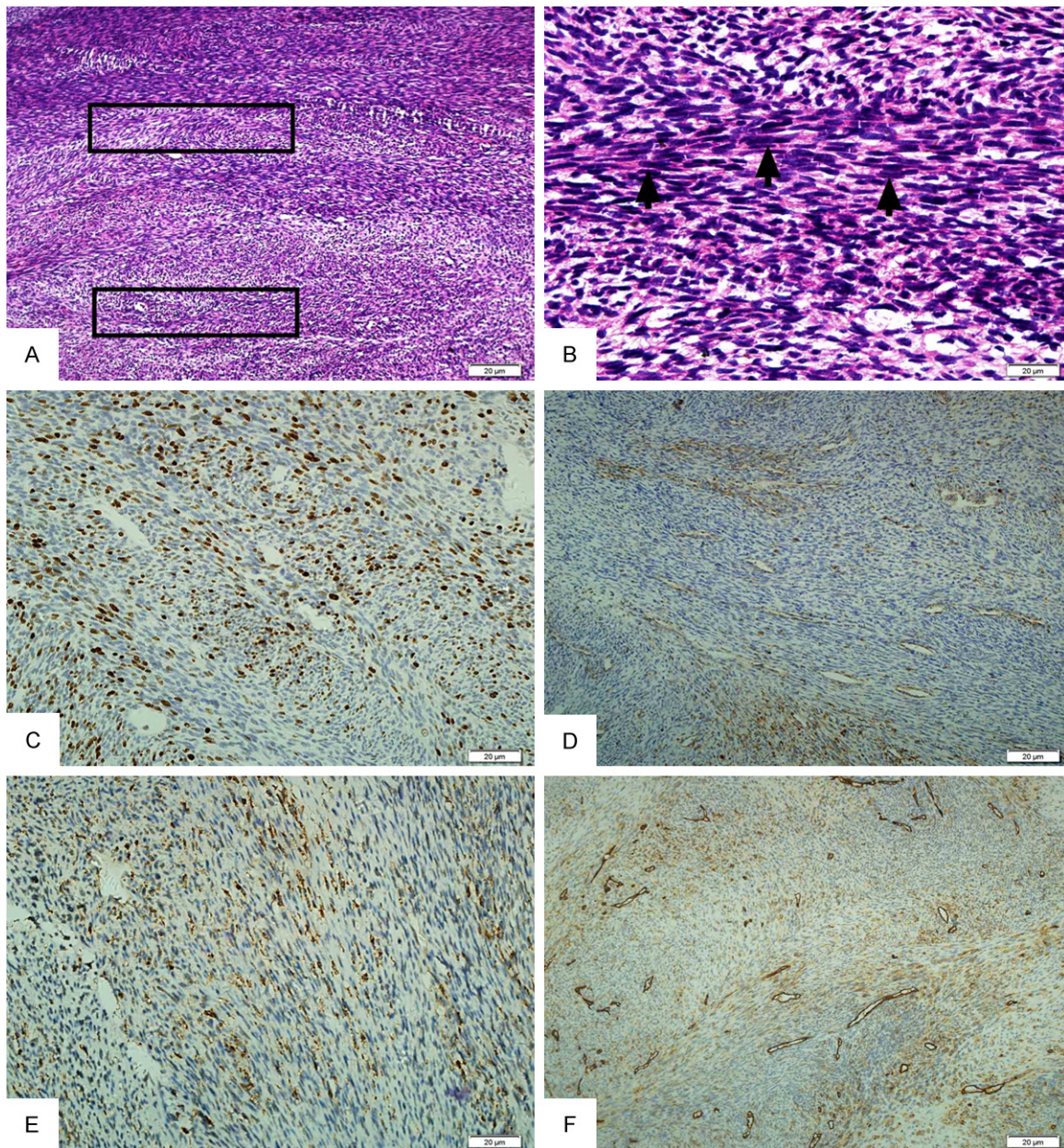
Following surgery, the patient underwent CT scans of the chest, abdomen, and pelvis and MRI of the spinal cord, which did not reveal any other lesions. He was treated with focal radiotherapy consisting of 2.4 Gy five times per week for a total of 25 times. However, the patient suffered from focal seizures, and he received

oral valproate treatment for approximately six months. No recurrence of epilepsy was observed, and the patient stopped using valproate. Clinical and MRI follow-up revealed no recurrence 12 months later (**Figure 3A and 3B**).

## Discussion

Primary intracerebral fibrosarcoma is rare, and its approximate incidence is 1.5% according to some reports [6, 7]. To date, only 47 cases have been reported [5, 6, 8-13], which have been classified into the four following categories: i.) arising from mesenchymal cells; ii.) transformed from a preexisting brain tumor, such as glioblastoma or meningioma; iii.) radiation-induced sarcoma; and iv.) systemic sarcoma metastatic to the CNS [3, 4, 6, 13-18]. In our patient, GFAP and EMA staining were both negative; therefore, the diagnoses of meningeal sarcoma and gliosarcoma were excluded. The patient had not received radiotherapy





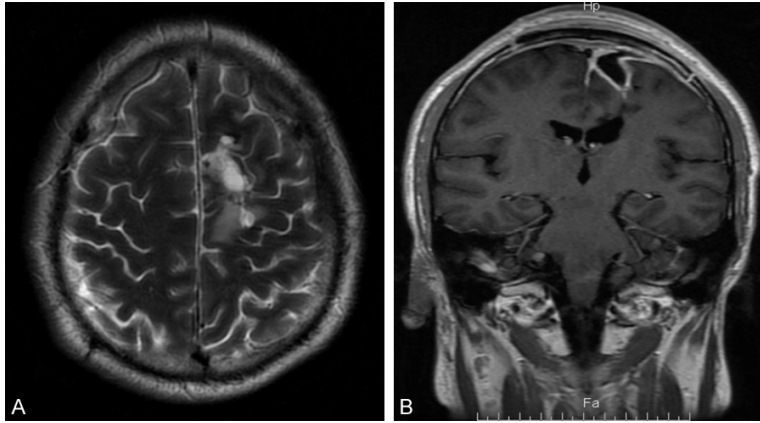
**Figure 2.** Pathology slides of the fibrosarcoma. (A) The herringbone-like pattern (H&E  $\times 100$ , black rectangle). (B) Spindle-shaped cells of the fibrosarcoma (H&E  $\times 400$ , black arrows). (C) MIB-1 immunohistochemical staining indicated proliferative activity ( $\times 200$ ). (D, E) Focally positive staining for vimentin ( $\times 100$ ) and CD31 ( $\times 100$ ). (F) Diffusely positive immunohistochemical staining for CD68 ( $\times 200$ ). Positive staining of the cells is brown in (C-F).

before, and CT scans of the chest, abdomen, pelvis and MRI of the spinal cord did not reveal any tumor. Therefore, radiation-induced fibrosarcoma and metastasis were also excluded. Although vimentin was focally positive in this patient, Laurie E. Gaspar reported that negative vimentin was observed in four of nine patients, and positive individual cells were observed in two of nine patients [19]. In our patient, fibrosarcoma arising from mesenchy-

mal cells was the most probable diagnosis. In addition, two other reports have described the same origin [4, 5] (**Table 1**).

The incidence of spontaneous hemorrhage in brain tumors is correlated with the histological types of tumors; the rates range from 1% to 15%, and the tumors are always macroscopic [20]. To date, only two patients presenting with hematomas of fibrosarcoma have been report-





**Figure 3.** Postoperative MRI of the patient's head. A. Postoperative T2-weighted axial MRI showing a hyperintense water-like signal. B. Gadolinium-enhanced T1-weighted axial view showing no enhanced intensity in the operative region at 12 months after surgery.

ed [4, 5]. The most common cause of intracranial hemorrhage in young people is vascular malformation. When vascular malformation is excluded based on CTA, and tumor bleeding completely covers the tumor, the condition can be easily misdiagnosed as a cerebral hemorrhage that has bled into the ventricles based on CT imaging. With the absorption of the hematoma, the tumor mass effect will be more obvious. Edema caused by a hematoma is observed as low density on CT imaging. Thus, when a tumor is characterized as low density, it can be easily missed. Therefore, attention should be focused on changes at every level and the shape of a bleed on CT imaging, especially during the absorption of a hematoma. In this patient, the hematoma appeared near the top level and was indicated by around placeholder. CT imaging revealed low density around a central area of high density, and the edema around the mass was nonuniform. The tumor was confirmed by further MRI examination. The patient received timely and appropriate treatment and has a good prognosis. It is very important for tumors that are located in functional areas to be diagnosed without delay to ensure the most favorable conditions for postoperative functional recovery. If a mass is misdiagnosed as a hemorrhage, tumor growth will lead to serious consequences for patients. Furthermore, the mechanism of intratumoral hemorrhage is multifactorial and complex. The course of hemorrhage due to an intracranial fibrosarcoma is unknown, but several hypotheses have been proposed. First, the vascular network grows

quickly to match the rapid growth of the tumor. Endothelial hyperproliferation is always associated with vascular instability and remodeling, and the lesion may rupture due to its abnormal development and fragility [21-23]. Second, the tumor cells invade the vessel wall, and the venous channel is destroyed by the tumor, which leads to an increase in the pressure within the tumor [22, 24]. Third, endothelial hyperproliferation is always associated with vascular instability and remodeling, leading to a higher incidence of intratumoral hemorrhage [4, 25].

Lee et al. [5] reported that the arteries that feed a fibrosarcoma are dilated and tortuous; therefore, they lose the ability to regulate blood pressure. The main tumor-feeding arteries contain multiple aneurysms, which may aberrantly develop due to increased blood flow. However, according to the CTA results of our patient, no aneurysms or malformations of the vascular mass were present. Furthermore, no vessel thrombosis or internal necrosis of the tumor was found in the pathological examination. Studies have reported that fibrosarcomas exhibit rapid growth [12]. These tumors are soft and have an extremely rich blood supply, making it very difficult to stop the bleeding of a tumor during operation. Therefore, we concluded that the hemorrhage in this fibrosarcoma resulted from ruptured blood vessels. Due to the pressure gradient, the hemorrhage infiltrated the tumor tissues and bled into the ventricles.

Due to its rarity and poor prognosis, no standard treatments or prognostic markers exist for primary intracranial fibrosarcoma. Additionally, the prognosis is generally very poor, with a mean survival of only 7.5 months despite optimal treatment [6, 19]. However, sporadic reports of patients with gliosarcoma surviving for more than 8 years have also been published [7]. Gaspar et al. [19] reported that fibrosarcoma has a high rate of meningeal seeding and distant relapse. Fibrosarcoma is capable of recurrence in situ and metastasis, but no intraspinal or ventricle fibrosarcomas were found in

**Table 1.** Summary of published primary cerebral fibrosarcoma with hemorrhage

No.	Author/Year	Age/Sex	Symptom duration	Location	Symptoms	Treatment	Radio-therapy	Origin	Outcome
1	Patrick/1997 [4]	43/Female	Sudden onset	Right parieto-occipital lobe	Sudden onset of dizziness, left-sided weakness and focal left leg seizures	Total resection	60 Gy focal	Peri-vascular	Favorable
2	Lee/2013 [5]	17/Male	3 months	Both frontal lobes	Headache, an episode of convulsions	Total resection	γ knife with 18 Gy	Leptomeninges	Not available

this patient. It is possible that the blood in the ventricles did not contain tumor cells. Bisogno et al. [7] advised that radiotherapy should be initiated as soon as possible after surgical resection. Our patient underwent total resection of the fibrosarcoma followed by radiation therapy, and the tumor did not relapse. This outcome maybe correlated with the moderate levels of CD68 and CD31. Diana et al. reported that high tumor compartment CD68 expression is correlated with worse PFS and DMFS. Increased CD31 expression has also been shown to predict worse PFS and DMFS. CD31 and CD68 constitute prognostic markers in patient subgroups [26]. However, CD68 and CD31 levels were examined in only one patient, and these proteins remained negative 44 months later [6]. In this case, CD68 and CD31 levels were low, and PFS and DMFS were 12 months until now, which may predict a good prognosis. We suggest that CD68 and CD31 levels should be evaluated in patients diagnosed with fibrosarcoma.

In our case, the patient was treated by total resection of the tumor followed by radiotherapy. Although this patient had a good outcome during a short 12-month follow-up, further study is needed. However, increased attention should be paid to a tumor that presents with a hematoma, particularly because a hematoma that bleeds into the ventricles could be easily missed.

Fibrosarcoma near the cerebral ventricle can present with a hematoma that can drain into the ventricles. Fibrosarcoma is often diagnosed as a cerebral hemorrhage that has bled into the ventricles. Thus, increased attention must be paid to a tumor that presents with a hematoma because the tumor can be easily missed under these conditions. Fibrosarcomas should be completely resected, and subsequent radiotherapy is necessary. CD68 and CD31 levels should be examined to predict PFS and DMFS if the patient is diagnosed with fibrosarcoma.

## Disclosure of conflict of interest

None.

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