



Case Report

Pediatric angiocentric glioma with acute intracerebral hemorrhage: A case report with 36 months follow-up

Rui Zhang^{1,2}, Xin Xu³, Huakang Zhou², Dongying Yao³, Ru Wei⁴, Sajjad Muhammad^{2,5}

¹Department of Neurosurgery, Xingtai People's Hospital Hebei Medical University, Xingtai, China, ²Department of Neurosurgery, Medical Faculty, Heinrich-Heine-University, Düsseldorf, Germany, ³Department of Pathology, Xingtai People's Hospital Hebei Medical University, ⁴Department of Microbiology and Immunology, Xingtai Medical College, Xingtai, China, ⁵Department of Neurosurgery, University of Helsinki and Helsinki University Hospital, Helsinki, Finland.

E-mail: *Rui Zhang - zr85125@icloud.com; Xin Xu - xx7766@sina.com; Huakang Zhou - huakang.zhou@med.uni-duesseldorf.de; Dongying Yao - yaodongying11@126.com; Ru Wei - bojingyan017@163.com; Sajjad Muhammad - sajjad.muhammad@med.uni-duesseldorf.de



*Corresponding author:

Sajjad Muhammad,
Department of Neurosurgery,
Medical Faculty, Heinrich-Heine-University, Düsseldorf, Germany; Department of Neurosurgery, University of Helsinki and Helsinki University Hospital, Helsinki, Finland.

Sajjad.Muhammad@med.uni-duesseldorf.de

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ABSTRACT

Background: Angiocentric glioma (AG) is an extremely rare intracranial tumor that was first described in 2005 and identified as a special type of intracranial tumor in 2007 by the WHO, which mainly affects children and young adolescents. Epilepsy is the main presentation; therefore, it was recognized as a seizure-related tumor in the past. Here, we report a case of AG with acute intracerebral hemorrhage (ICH) as the first symptom who never had a seizure onset.

Case Description: A 3-year-old girl with the right limb weakness was admitted to our hospital 4 h after onset in 2018. Computed tomography showed a hematoma of about 20 ml accompanied by a hyper/iso-dense spheroid lesion located in the sub-cortex of the left parietal lobe. Magnetic resonance image (MRI) showed signs of hypointense signal in T1, T2, and fluid-attenuated inversion recovery sequence, distinct enhancement of this tumefactive lesion in the contrast-enhanced sequence. Thus, the admission diagnosis was neoplasm with acute ICH. A gross total resection of the tumor was achieved by parietal craniotomy. The histopathological diagnosis was AG. No signs showed tumor recurrence after 36 months of follow-up.

Conclusion: This is the sole case of AGs with acute intracranial hemorrhage as the first symptom without any kind of epilepsy by far. This case had unique MRI signs that were different from the previous description. This case enriches the clinical and radiological manifestations of AG and reveals that further investigations are needed to further understand AG.

Keywords: Angiocentric glioma, Epilepsy, Intracranial hemorrhage

INTRODUCTION AND HISTORICAL BACKGROUND

Angiocentric glioma (AG) is a rare intracranial tumor. WANG and Lellouch-Tubiana, respectively, 1st time reported in 2005. This special type of tumor mainly affects children and young adults.^[8,12]

Two years later, the WHO officially confirmed it as a central nervous system entity tumor for the 1st time in *the classification of tumors of the central nervous system*.^[9] Considering the low incidence of this tumor, 108 cases had been reported until December 2019,^[5] excluding this case we described. They had similar radiological features, such as magnetic resonance image

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(MRI) T1 hypointense signal, hyperintense signal in T2, and fluid-attenuated inversion recovery (FLAIR's) without contrast enhancement.^[1,5]

Mostly AG is located in the supratentorial area in hemispheric lobes, with a benign biological behavior: slow-growing, possibility to be surgically removed, rare postoperation recurrence, and low proliferation index; so AG was classified as WHO Grade I.^[10] Drug-refractory epilepsy is the most common complaint in this tumor, other symptoms such as headache, vision deficit, dizziness, earache, ataxia, dysphagia, weakness, numbness, and strabismus had been reported.^[5] Here, we reported a case of AG with acute intracerebral hemorrhage (ICH) that never has been described in the literature.

CLINICAL PRESENTATION

A 3-year-old girl was admitted to our emergency department due to the sudden onset of the right limb weakness.

Physical examination showed a conscious child with poor spirit, normal-sized bilateral reactive pupils, hemiplegia of the right limb with low muscle tone, and muscle strength level 0. The child had vomited several times after the onset. No seizures occurred before and after onset.

Diagnosis

After admission, a computed tomography (CT) scan of the head showed a hematoma with the amount of 20 ml in the left parietal lobe. The primary diagnosis was ICH. However, a suspect lesion has a different density anterior to the hematoma suggesting the presence of neoplasm. The MRI scan and MRI contrast enhancement showed that admix signals (hypointense of the tumor part and isointense of the hematoma part) on T1 sequence, hypointense or isointense lesion with annularity hyperintense around on T2 and FLAIR sequence, and part of the lesion can be significantly enhanced on the contrast sequence. Thus, the modified diagnosis was the left parietal lobe tumor with ICH [Figure 1].

MANAGEMENT

Surgical procedure

This is a cortex-sub-cortex lesion that includes tumor and hematoma situated at the central region of the left hemisphere.

With the assistance of the neuronavigation, a left parietal craniotomy was performed. A trans-sulcus approach was used to perform the minimal cortical incision. We successfully removed all the hematoma and the gross total resection of the tumor was achieved [Figure 2].

Histological analysis

Gross specimen

The tumor is located in the superficial layer of the sub-cortex, with clear borders, 2 cm × 2 cm × 2.3 cm in size, gray-pink cut surface, and slightly tough texture.

Microscopical observation

The tumor is composed of glial components, blood vessels, and degenerated neurons. The tumor cells are spindle-shaped, bipolar, single-layered or multi-layered, arranged in a chrysanthemum-like structure, or forming a pseudo-chrysanthemum-like structure around the blood vessels, and ependymal-like structure; in some areas, spindle cells are interwoven into sheets to form a nerve sheath-like structure; tumor cell nuclei are oval, round, or spindle-shaped, with visible nucleoli and abundant cytoplasm. No nucleic mitosis was observed; the proliferation of microvessels, necrosis, and hemorrhage can be seen.

Immunohistochemical characteristics

Tumor cells are diffusely positive for glial fibrillary acid protein (GFAP), S-100, CD99, blood vessels CD31, and F-8 are positive; proliferation index KI-67 hot spot is about 5%. Syn, CgA, NSE, AE1/AE3, and epithelial membrane antigen (EMA) are negative [Figure 3].

PROGNOSIS AND OUTCOMES

No postoperative complications occurred. After 2 weeks, the muscle strength of the right arm was reached level 3, and level 4 in her right leg.

Then, this patient was transferred to a rehabilitation center.

Due to its benign characteristic, adjuvant treatment such as chemo- or radiotherapy was not needed. Three months after discharge, the patient's right limb hemiplegia was completely resolved.

Twelve months later, there was no sign of tumor recurrence in the cranial MRI. After that, MRI examination was performed every 12 months, and the past MRI scan was 36 months later. No tumor recurrence was found till the past follow-up [Figure 4]. The child now is in stable condition and is living a normal life.

DISCUSSION

Here, we report a successfully surgically treated pediatric case of AG who presented with ICH and hemiplegia. The neurological condition of the child recovered fast. Long-term follow-up after 36 months showed no recurrence. AG was first reported by WANG and Lellouch-Tubiana in 2005 separately.

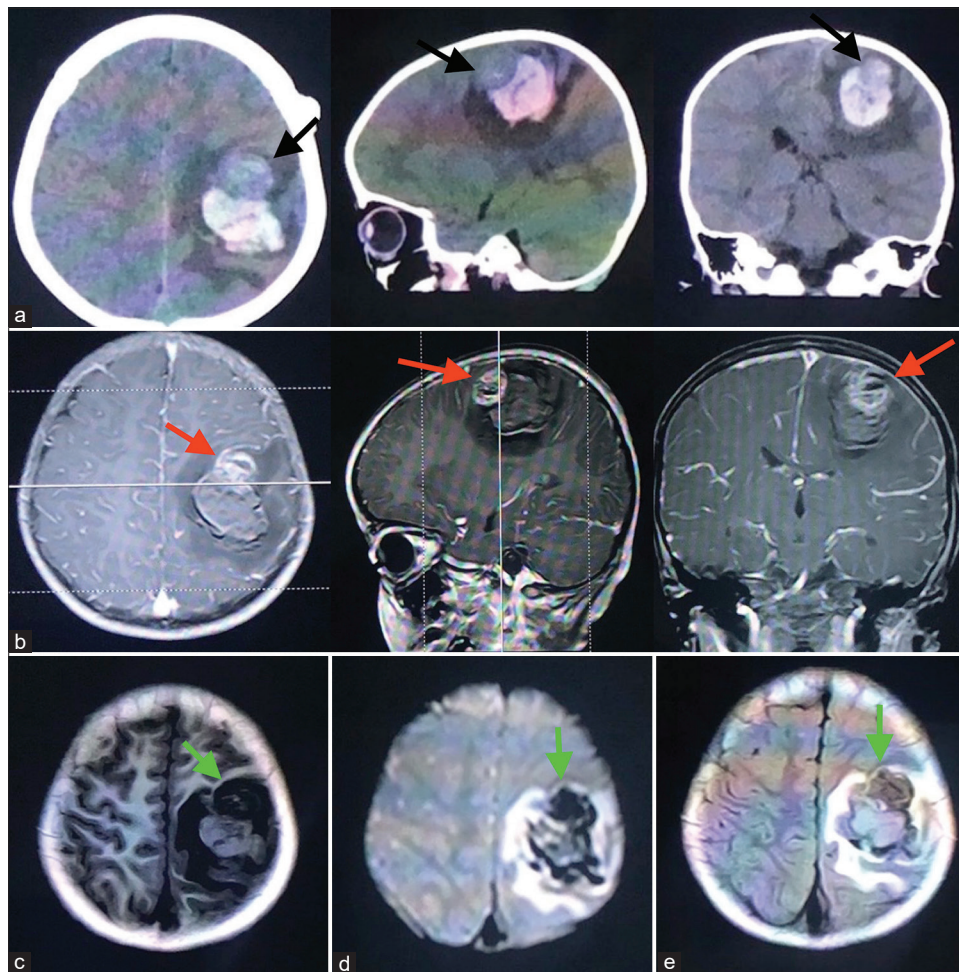


Figure 1: In the computed tomography images (a): an ICH located in the parietal lobe surrounded by circle edema. An ellipse entity that had the same density as the cortex can be seen in the anterior part of this lesion. In MRI images: this lesion can be significantly enhanced in the contrast sequence (b), with an extremely low signal in the T1 sequence (c), and in the T2 (d) and FLAIR (e) sequence the signals were still low, which were different from the previous literature.

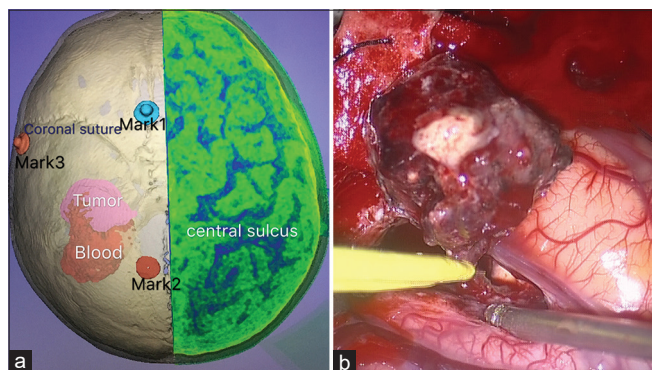


Figure 2: Three-dimensional reconstruction virtual image of the preoperative computed tomography scan showed the relationship between the tumor hematoma and the central sulcus [the left part of Figure 2]. The intra-operation image showed a gross total resection of the tumor, meanwhile, the cortical incision was limited [the right part of Figure 2].

This is a rare brain tumor that mainly affects children and young people. Most patients have drug-resistance epilepsy as the chief complaint.^[8,12]

In 2007, in the *classification of tumors of the central nervous system*, the WHO recognized it as a special type of central nervous system entity tumor for the 1st time.^[9]

In 2016, it was classified as other gliomas. As a result of its benign biological behavior, the possibility of surgical resection, and low recurrence, it was attributed to the WHO Grade I.^[10]

AG was considered an epilepsy-related neoplasm since it was first reported. In the previous literature reviews, most of the conclusions supported this argument.^[1,5,8,12]

In a recent retrospect literature review, Han *et al.* summarized 108 cases, 90 patients (85.7%; 90/105) had a long history of

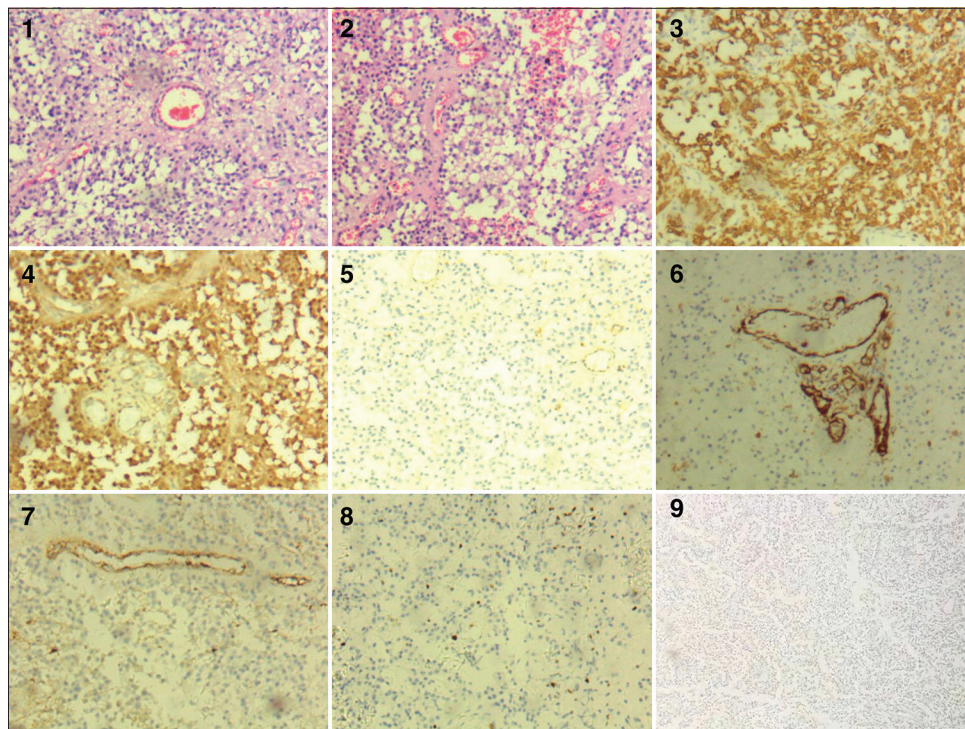


Figure 3: (1 and 2) Hematoxylin and eosin staining. Spindle tumor cells, bipolar, single-layered or multi-layered, arranged in a chrysanthemum-like structure, or forming a pseudo-chrysanthemum-like structure around the blood vessels. Glial fibrillary acidic protein (3), S-100 (4), CD99 (5), CD31 (6), and F-8 (7) are positive. KI-67 hot spot is about 5% (8) EMA is negative (9). Original magnification $\times 100$.

various types of refractory seizures (the symptoms of three cases were not described). Only 15 (14.3%; 15/105) patients showed other symptoms.^[5]

Our patient was the only case so far in the world literature who presented with an acute ICH, and never had a history of seizure no matter before or after the disease onset. This enriched AG's clinical symptoms. A similar case was previously reported stating that a chronic hemorrhage inside the tumor with cystic changes may occur.^[6] However, we did not see any relevant cystic changes in this specimen, and the hematoma was entirely outside. A recent case report shows a cystic AG, but no testimony of chronic hemorrhage in that case, so the relationship between the cystic AG and hemorrhage needs more evidence to prove.^[13]

The typical features on CT scan images have been previously described, in fact, there were no specificity on CT images, sometimes seemed such as edema, ischemic disease, or low-grade glioma. The diagnosis often was hard to be achieved only through the CT scan.^[3,6,8]

In this case, we could observe hyper/iso-dense lesion located in the parietal lobe, anterior and superior to the hematoma. And circular low-density cerebral edema accompanied the lesion.

AG has similar features to low-grade gliomas. As previously described, the tumor's characteristics on

MRI are the hypointense signals in the T1 sequence and hyperintense signals in T2 and FLAIR sequence, without enhancement.^[1,3,5-12] However, in our case, we observed different MRI features, hypointense signals in T1, T2, and FLAIR sequences, with an obvious enhancement in the contrast sequence. This presentation might be due to acute and sub-acute hemorrhage. Radiologically, it was difficult to distinguish AG from low-grade glioma and the final diagnosis was made after histopathological examination.

The histopathological finding that we observed are in line with the findings described previously.^[1-5,7,11-13] The histopathology revealed monomorphic spindle-shaped bipolar tumor cells, single-layer or multi-layer arranged into a chrysanthemum-like structure, forming pseudo-chrysanthemum-like, and ependymal-like patterns around blood vessels; in some areas, the spindle-shaped cells were interwoven into sheets to form a nerve sheath-like pattern.

Tumor cells were diffusely positive for GFAP, S-100, and CD99, but neuronal antigens such as CgA, NSE, and AE1/AE3 were negative. Proliferation index KI-67 hot spot is about 5%.

Blood vessels CD31, and F-8 were positive, necrosis, and hemorrhage, microvascular proliferation was observed.

Interestingly, EMA was negative which is different from the typical presentation. However, some cases in the three

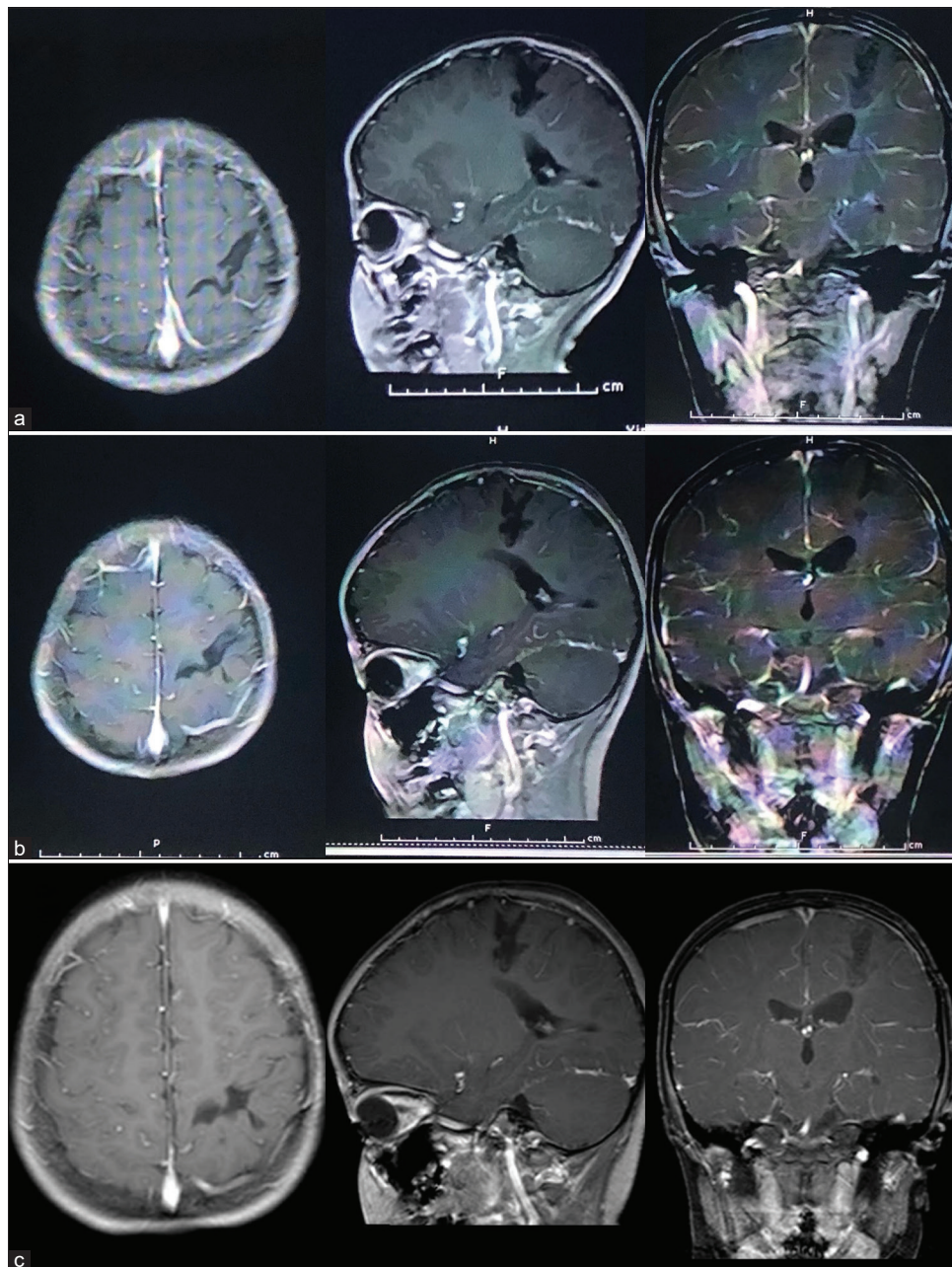


Figure 4: Postoperative MRI checks from the year 2019 (a) to 2021 (c). The tumor has a total resection. No signal of recurrence was found.

literature showed similar findings, reported by Arsene *et al.*, Hu *et al.*, and Sugita *et al.*^[3,6,11]

Surgical procedure plays a fundamental role in the treatment of AG; gross total resection often achieved curative results, despite some cases showed a malignant process and tumor recrudescence.

After undergoing a successful operation, our patient did not receive any chemotherapy or radiotherapy. In most circumstances, adjuvant treatments are not necessary unless in cases with subtotal resection or biopsy.

We conducted a 36 months follow-up, the MRI scan performed every 12 months, till to now showing no signs of tumor recurrence.

CONCLUSION

Here, we present a case of AG, which has some unique characteristics, the onset of ICH without a history of epilepsy with some different MR images. Postoperative results and 36 months follow-up showed good tumor control. Microsurgery remains the main treatment option for AGs.

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Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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