

## High-grade Glioma Masquerading as a Small Cerebral Hemorrhage: A Case Report

Atsushi Kambe,\* Tomohiro Hosoya,† Makoto Sakamoto,\* Shinji Kondo‡ and Masamichi Kurosaki\*

\*Division of Neurosurgery, Department of Brain and Neurosciences, School of Medicine, Tottori University Faculty of Medicine, Yonago 683-8503, Japan, †Department of Neurosurgery, Nojima Hospital, Kurayoshi 682-0863, Japan, and ‡Department of Neurosurgery, San-in Rosai Hospital, Yonago 683-8605, Japan

### ABSTRACT

We report a rare case of a high-grade glioma masquerading as a small subcortical hemorrhage. A 71-year-old woman came to a local hospital with sudden right upper extremity numbness. Computed tomography revealed a small subcortical hemorrhage with faint perifocal edema in the left postcentral gyrus. Conservative treatment was initiated, and she was discharged from the hospital with no neurological deficits. Six months later after discharge, she suffered an acute partial seizure of the right upper extremity. Magnetic resonance imaging with gadolinium demonstrated a ring-enhancing mass surrounded by severe perifocal edema in the hemorrhagic scar. We performed complete resection of the tumor, and the histological diagnosis was anaplastic oligodendroglioma. The diagnosis of a high-grade glioma was delayed due to intratumoral hemorrhages mimicking a small subcortical hemorrhage; consequently, we suspected the hemorrhage was induced by cerebral amyloid angiopathy. It may be important to repeat radiological follow up, if necessary, and to maintain clinical observance of possible intracranial neoplasm, even when the hemorrhage is small, particularly when the cause of bleeding is unknown.

**Key words** amyloid angiopathy; high-grade glioma; intratumoral hemorrhage; subcortical hemorrhage

Spontaneous intracranial hemorrhages are usually caused by underlying chronic hypertension, but approximately 10% are due to brain tumors.<sup>1</sup> Intratumoral hemorrhages are sometimes missed due to their low incidence and being classified as hemorrhages of unknown origin. Intratumoral hemorrhages are usually associated with high-grade gliomas and occur in 3.7–7.2% of patients with any type of glioma.<sup>2</sup> Most high-grade gliomas have already infiltrated extensively and have massive perifocal edema by the time that hemorrhage is

detected by radiological examination. Here, we report a rare case of high-grade glioma with tumor bleeding, which was overlooked as subcortical hemorrhage due to cerebral amyloid angiopathy. Furthermore, the hemorrhage is very little with faint perifocal edema, which resulted in diagnostic delay.

### PATIENT REPORT

A 71-year-old woman who was under medical management for hyperlipidemia, entered a local hospital with sudden right upper extremity numbness. Computed tomography (CT) revealed a small subcortical hemorrhage with faint perifocal edema in the left postcentral gyrus (Fig. 1a). CT angiography demonstrated no vascular malformations. She was diagnosed with subcortical hemorrhage due to cerebral amyloid angiopathy. Conservative treatment was initiated, and the patient was discharged without any neurological deficits. One month later, she underwent magnetic resonance (MR) imaging for a detailed examination, which only revealed absorption of the subcortical hemorrhage (Fig. 1b). Six months later, she went to another hospital suffering from acute partial seizure of the right upper extremity. MR imaging with gadolinium demonstrated a ring-enhancing mass surrounded by severe perifocal edema (Fig. 1c). She was referred to our institution for further evaluation.

On admission, neurological examination revealed mild right hemiparesis and right upper extremity numbness. We reviewed past radiological studies and MR imaging performed at the first hospital 2 months prior, which showed a hyperintense nodule in the hemorrhage scar on the T<sub>2</sub>-weighted sequence (Fig. 1d). Since gadolinium contrast was not administered, it was unclear whether this nodule was enhancing.

We speculated that the past subcortical hemorrhage was induced by high-grade glioma or metastatic brain tumor, and performed complete resection of the tumor. The tumor had well-differentiated borders and a grayish fibrous capsule. It was buried in the subcortical lesions (Fig. 2a). Hemosiderin deposition along the border was also observed (Fig. 2b). Histological examination revealed the presence of an atypical glial neoplasm composed of nodular clusters and diffuse small cells

Corresponding author: Atsushi Kambe, MD, PhD

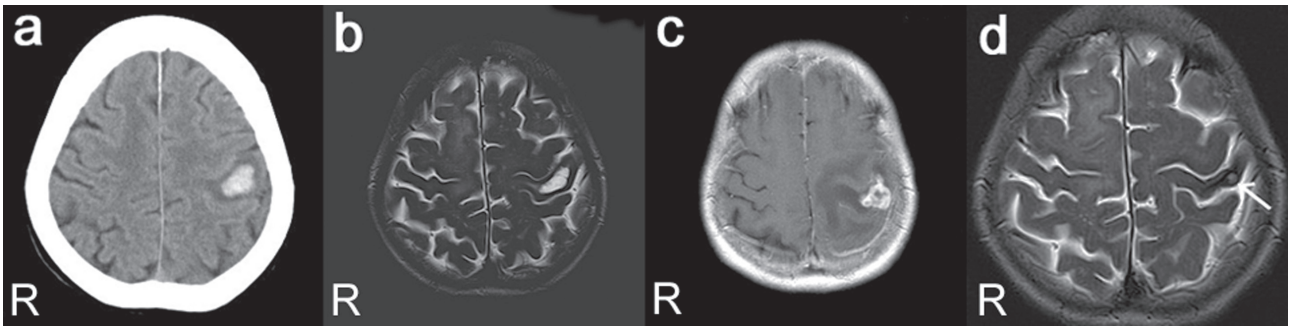
kanimo@tottori-u.ac.jp

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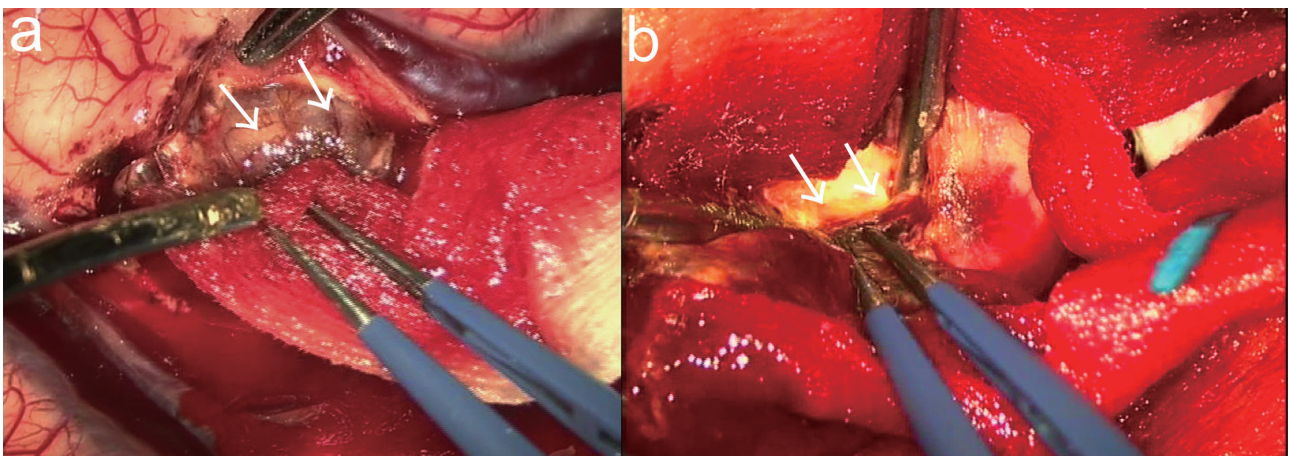
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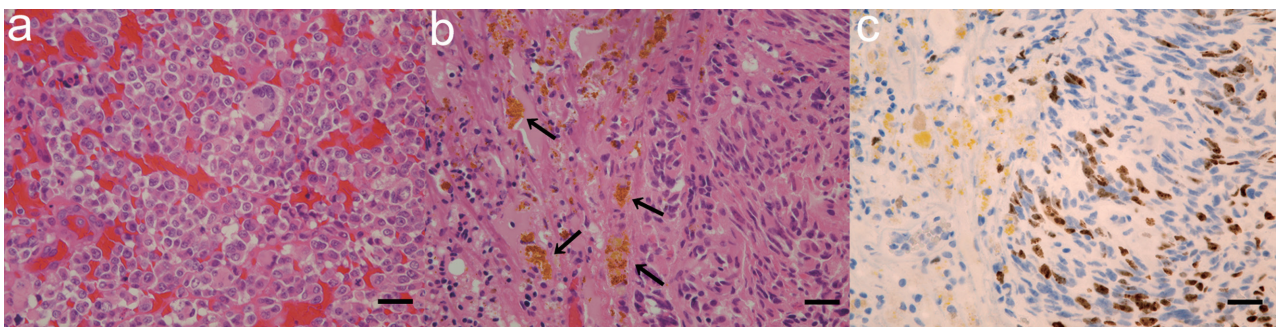
Abbreviations: CT, computed tomography; MR, magnetic resonance



**Fig. 1.** CT revealed a small area of subcortical hemorrhage with faint perifocal edema in the left postcentral gyrus (a). Axial T<sub>2</sub>-weighted imaging revealed only absorption of the subcortical hemorrhage (b). Axial MR imaging with gadolinium revealed a ring-enhancing mass surrounded by massive perifocal edema (c). Axial T<sub>2</sub>-weighted imaging demonstrated a hyperintense nodule (white arrow) in the hemorrhage scar (d). CT, computed tomography; MR, magnetic resonance.



**Fig. 2.** Intraoperatively, the tumor had well-differentiated borders with a grayish fibrous capsule (white arrows) (a) and was surrounded by hemosiderin deposition (white arrows) (b).



**Fig. 3.** Histological examination revealed the presence of an atypical glial neoplasm (a) and massive hemosiderin deposition (black arrows) around the perivascular space (b) (hematoxylin and eosin stain). The immunohistochemical staining of MIB-1 index of the tumor tissue was very high, but the index of surrounding areas of hemosiderin deposition was very low (c). Bar = 50  $\mu$ m.

with clear or eosinophilic cytoplasm, enlarged irregular or multiple nuclei, and brisk mitotic activity (Fig. 3a). There were also areas of massive hemosiderin deposition around the perivascular space (Fig. 3b). The capillary

network had proliferated into a chicken wire appearance. Pseudopalisading necrosis and microvascular proliferation were not observed. Immunohistochemical staining demonstrated positive reactivity for Olig2,

nestin, S-100, and glial fibrillary acidic protein. The average MIB-1 labeling index of the tumor tissue was 52.9%, but the index of the surrounding areas of hemosiderin deposition was very low (Fig. 3c). The histological diagnosis was anaplastic oligodendroglioma.

The postoperative course was uneventful, and the patient's right hemiparesis and upper extremity numbness gradually improved. Postoperative MR imaging demonstrated complete removal of the tumor and resolution of perifocal edema. Postoperative concomitant radiation therapy and chemotherapy with temozolomide were performed, and the patient was discharged without any neurological deficits. At 24 months after surgery, she remained disease-free and there were no findings suggestive of recurrence on follow-up MR imaging.

## DISCUSSION

The high-grade gliomas, especially oligodendroglial tumor, are known to bleed spontaneously into cerebral parenchyma compared to the other cerebral neoplasms.<sup>3</sup> The mechanism of intratumoral hemorrhage remains unclear, but some literature explains the mechanism as a rupture from an abnormal newborn vessel by rapid tumor growth, inadequate blood supply to the tumor by the endothelial proliferation, and so on.<sup>4</sup>

Most malignant brain tumors have already infiltrated extensively and have massive peri-focal edema by the time that a hemorrhage is detected by radiological examination. However, in this patient, there was very little cerebral hemorrhage, which was accompanied only by faint perifocal edema. Follow-up MR imaging at 1 month revealed no signal changes around the hemorrhage scar, indicating the presence of tumor infiltration (Fig. 1b). Furthermore, a small nodule was found within the hemorrhage scar 4 months after hemorrhage (Fig. 1d). Intraoperative and pathological findings indicate

that the tumor was surrounded by well-defined grayish fibrous tissue and hemosiderin deposition (Figs. 2 and 3b). These findings suggest that "microscopic" glioma, which is undetectable radiologically, caused the subcortical hemorrhage. However, we think it still would have been difficult to document the existence of glioma at the time of the cerebral hemorrhage even if studies with contrast had been performed because of the hemorrhage itself and brain edema. Subcortical hemorrhages in elderly patients tend to be diagnosed as cerebral amyloid angiopathy and further examinations are usually not performed at the initial presentation. In many cases, it may be important to repeat the radiological follow up and to maintain clinical suspicion for intracranial neoplasm, even when the hemorrhage is small, particularly when the cause of the bleeding is unknown.

*The authors declare no conflicts of interest.*

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