



Contents lists available at ScienceDirect

## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

## De novo cerebellar malignant glioma: A case report



Hiroaki Matsumoto\*, Yasuhisa Yoshida

Department of Neurosurgery, Eisyokai Yoshida Hospital, Kobe, Japan

## ARTICLE INFO

## Article history:

Received 8 December 2015

Received in revised form 11 March 2016

Accepted 11 March 2016

Available online 18 March 2016

## Keywords:

Cerebellum

Glioma

MRI

Anaplastic astrocytoma

## ABSTRACT

**INTRODUCTION:** Gliomas of the cerebellum are rare in adults, and their natural history and clinical behavior are not well known. Because cerebellar glioma is not usually diagnosed until clinical symptoms have appeared, no reports have described the developmental process of new cerebellar gliomas. We describe a case of de novo cerebellar anaplastic astrocytoma in which the developmental process was detected on magnetic resonance imaging (MRI).

**PRESENTATION OF CASE:** A 78-year-old man with a history of cerebral infarction was undergoing follow-up MRI every 6 months. This follow-up revealed a small abnormality in the left cerebellar hemisphere without clinical symptoms. Subsequent MRI showed lesion growth accompanying clinical symptoms. As cerebellar tumor was suspected, the lesion was extirpated. The histological diagnosis was anaplastic astrocytoma. Local recurrence developed and the patient died 20 months postoperatively.

**DISCUSSION:** Cerebellar gliomas sometimes do not exhibit the common MRI findings of supratentorial gliomas, leading to difficulty with preoperative diagnosis. In this case, we initially diagnosed asymptomatic cerebellar infarction because the lesion was small and asymptomatic. The abnormal lesion gradually grew and clinical symptoms appeared. Cerebellar glioma may show few signs characteristic of tumor on MRI in the initial stages.

**CONCLUSION:** When MRI detects a new, faint abnormality in the cerebellum, close follow-up of clinical symptoms and MRI on suspicion of glioma is warranted

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## 1. Introduction

Glioma is one of the most frequent brain tumors. The most common location of glioma in adults is the cerebral hemispheres, and cerebellar gliomas are rare [1–8]. Given this rarity, cerebellar gliomas in adults are poorly characterized and little is known about their natural history and clinical behavior [7]. Moreover, cerebellar gliomas sometimes do not exhibit the findings on magnetic resonance imaging (MRI) commonly seen with supratentorial gliomas, leading to difficulty with preoperative diagnosis [1]. Because cerebellar glioma is usually diagnosed once clinical symptoms have appeared, previous reports have not described the developmental process of new cerebellar gliomas.

We describe a case of de novo cerebellar anaplastic astrocytoma in which the developmental process was detected on MRI.

## 2. Case report

A 78-year-old man with a history of cerebral infarction underwent follow-up MRI every 6 months. Although previous MRI

showed no abnormality in the cerebellum, MRI in July 2012 showed a small abnormality in the left cerebellar hemisphere (Fig. 1A,B). Because no clinical symptoms were apparent, we considered that MRI had incidentally detected an asymptomatic cerebellar infarction. Repeated MRI in October 2012 showed growth of the abnormal signal, although clinical symptoms remained absent (Fig. 1C). The lesion showed homogeneous nodular enhancement on gadolinium contrast-enhanced T1-weighted imaging (Fig. 2A), and metastatic cerebellar tumor was suspected. Repeated MRI in December 2012 showed growth of the enhanced mass lesion, and by this time the patient had developed dysarthria and floating sensation (Fig. 2B). Craniotomy was performed with gross total resection of the tumor in December 2012. The histological diagnosis was not metastatic tumor, but anaplastic astrocytoma. Histological examination revealed tumor cells showing eosinophilic cytoplasm and processes, with irregular and hyperchromatic nuclei. Although vascular endothelial proliferation was observed, micronecrosis was not detected. Immunohistochemical staining was positive for glial fibrillary acidic protein, and the MIB-1 labeling index was approximately 20% (Fig. 3). The patient subsequently underwent gamma knife radiosurgery (26 Gy) and chemotherapy with temozolomide, but local recurrence was observed 6 months postoperatively (Fig. 2C). The patient declined re-operation and died 20 months

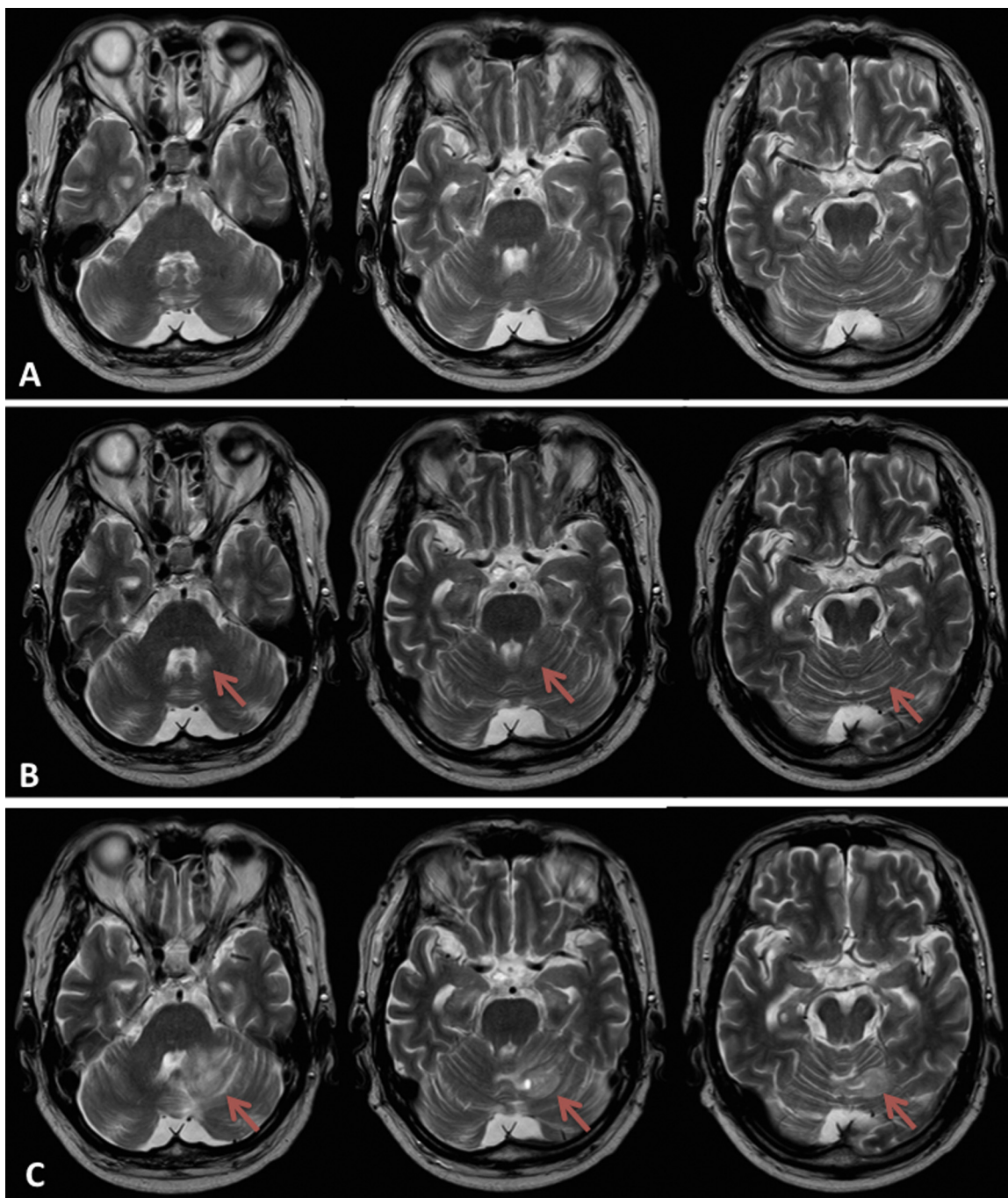
Abbreviations: MRI, magnetic resonance imaging.

\* Corresponding author at: Daikai-dori9-2-6, Hyogo-ku, Kobe 652-0803, Japan.

E-mail address: [hiroaki-matsu@umin.ac.jp](mailto:hiroaki-matsu@umin.ac.jp) (H. Matsumoto).

<http://dx.doi.org/10.1016/j.ijscr.2016.03.020>

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**Fig. 1.** Serial T2-weighted magnetic resonance imaging (MRI). (A) Previous follow-up MRI shows no abnormality in the cerebellum. (B) MRI in July 2012 shows a small, high-intensity area in the right cerebellar hemisphere (arrowhead). (C) MRI 3 months after detection of the abnormality shows expansion of the high-intensity area in the right cerebellar hemisphere (arrowhead).

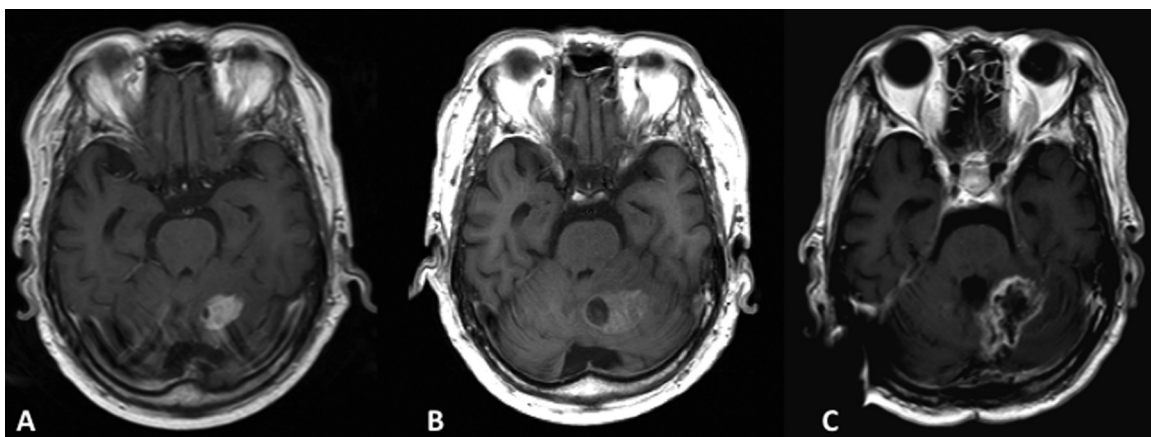
postoperatively. This work has been reported in line with the CARE criteria [9].

### 3. Discussion

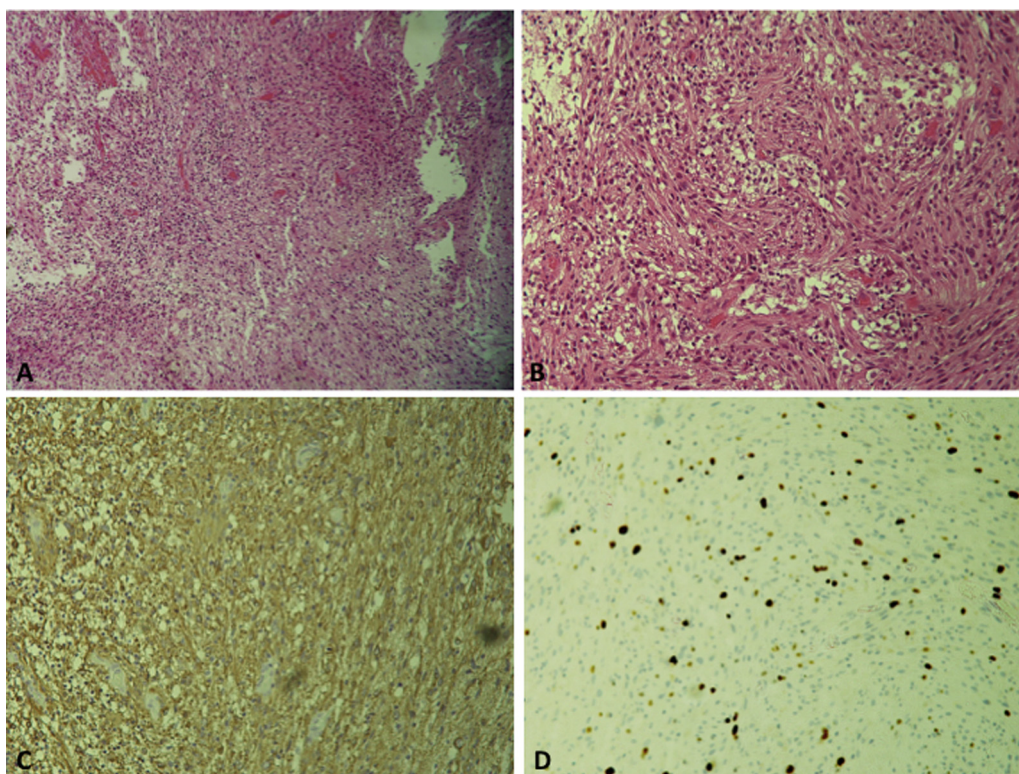
Gliomas of the cerebellum are rarer in adults than in children [1,3–8]. Malignant cerebellar glioma is a rare tumor, comprising approximately 3% of all malignant gliomas [10]. As a result, when diagnosing cerebellar tumors in adults preoperatively, primary consideration is given to metastatic tumors, hemangioblastoma, and primary central nervous system lymphoma as the major cerebellar tumors [1,10].

The diagnosis of cerebellar tumor is usually made once clinical symptoms have appeared. The most common initial symptoms of cerebellar glioma are ataxia, headache, and nausea [1,3,5–7]. In the present case, although MRI detected a faint abnormality, the patient remained asymptomatic. We therefore considered asymptomatic infarction as more likely than tumor. Repeated MRI revealed growth of the lesion, at which point tumor was considered likely. Clinical symptoms then developed, followed by the diagnosis of tumor. Akimoto et al. [1] reported four cases of cerebellar malignant glioma in adults. In those cases, although all patients developed symptoms, the initial diagnoses were infarction or cavernoma, rather than tumor. The conditions of these patients





**Fig. 2.** Serial gadolinium-enhanced T1-weighted magnetic resonance imaging (MRI). (A) MRI performed 3 months after detection of the abnormality shows homogeneous nodular enhancement. (B) MRI performed 5 months after detection of abnormality shows growth of the enhanced lesion. (C) MRI performed 6 months postoperatively shows an irregular, ring-like enhancing lesion, indicating local recurrence.



**Fig. 3.** Photomicrographs of surgical specimens. (A, B) Tumor cells show eosinophilic cytoplasm and processes with irregular and hyperchromatic nuclei. Although vascular endothelial proliferation is observed, micronecrosis is not detected. Hematoxylin and eosin stain. (C) Immunohistochemical staining for glial fibrillary acidic protein shows strongly positive tumor cells. (D) Immunohistochemical staining for MIB-1 shows that approximately 20% of cells are positive.

worsened gradually and the tumors were detected on second MRI. Malignant cerebellar glioma thus seems to show few signs of tumor on MRI in the initial stages, leading to difficulty with diagnosis. On the other hand, MR spectroscopy or positron emission tomography computed tomography (PET-CT) might be useful for the diagnosis.

Conventional treatment for cerebellar malignant gliomas has included surgical resection, radiotherapy, and chemotherapy, because they behave in a clinically similar way to cerebral malignant gliomas [2,7]. As a result, survival in patients with malignant cerebellar glioma has been comparable to that for malignant cerebral glioma [2,7]. Djalilian and Hall [3] reported that overall median survival with malignant cerebellar glioma was 18 months, with median survival of 11 months for grade IV tumors and 32

months for grade III tumors. Gross total resection and radiotherapy are associated with prolonged survival [2,3]. In our case, the patient underwent gross total resection followed by gamma knife radiosurgery and chemotherapy with temozolomide. Despite this multimodal treatment, the patient experienced local recurrence and died 20 months postoperatively. Akimoto et al. [1] reported that cerebellar glioma is likely to show malignant transformation within a short duration. Endo et al. [4] reported that cerebellar gliomas are likely to develop leptomeningeal dissemination. In our case, the patient showed local recurrence without leptomeningeal dissemination, and MRI showed an irregular, ring-like enhancing lesion, indicating malignant transformation to glioblastoma. Malignant

nant transformation to glioblastoma might have caused the poor prognosis.

#### 4. Conclusion

Cerebellar malignant glioma is rare and may show few signs characteristic of tumor on MRI in the initial stage. When MRI detects a new, faint abnormality in the cerebellum, close follow-up of clinical symptoms and MRI on suspicion of glioma is warranted.

#### Conflict of interest

None.

#### Funding

None.

#### Ethical approval

Ethical approval not required.

#### Consent

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

#### Author contributions

Hiroaki Matsumoto is first and corresponding author of this paper. He and Yasuhisa Yoshida performed the operation,

conceived and designed the study and drafted the manuscript. All the authors read and approved the final manuscript.

#### Guarantor

Yasuhisa Yoshida.

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