Low-Grade Astroblastoma Recurring With Extensive Invasion
—Case Report—

Masatomo KAJI, Hideo TAKESHIMA*, Yoichi NAKAZATO**, and Jun-ichi KURATSU*

Department of Neurosurgery, Kagoshima University Graduate School of Medical and Dental Sciences, Kagoshima; *Department of Neurosurgery, Faculty of Medical and Pharmaceutical Sciences, Kumamoto University, Kumamoto; **Department of Pathology, Gunma University School of Medicine, Maebashi, Gunma

Abstract

A 17-year-old male presented with morning headache and double vision. Neuroimaging revealed a lobulated enhanced mass lesion with a blurred margin and remarkable peritumoral edema, and high uptake of methionine. The gray, soft, well-circumscribed mass was grossly totally resected. Histological examination showed the tumor cells were well differentiated with the perivascular pseudorosette pattern with broad, non-tapering processes radiating towards a central vessel without anaplastic features such as necrosis and endothelial proliferation. The histological diagnosis was low-grade astroblastoma. Follow-up magnetic resonance imaging demonstrated local recurrence 5 months later. Second surgery was followed by adjuvant radiotherapy and combination chemotherapy. Histological examination disclosed wide invasion by tumor cells into the subpial and perivascular space of the surrounding brain tissue. Follow-up magnetic resonance imaging demonstrated further recurrence around the tumor cavity. Surgical removal followed by six courses of combination chemotherapy (ifosfamide, cisplatin, and etoposide) resulted in complete remission of the tumor. Although gross total resection of astroblastoma usually results in long-term survival, some of these yet unfamiliar tumors may develop a more malignant character.

Key words: astroblastoma, invasion, recurrence, radiotherapy, chemotherapy

Introduction

Astroblastoma is a rare type of glial tumor which mainly occurs in young adults and is estimated to account for 0.45–2.8% of primary brain gliomas.10) Astroblastoma is characterized by a perivascular pseudorosette pattern of glial fibrillary acidic protein (GFAP)-positive astrocytic cells with broad, non-tapering processes radiating towards a central vessel.1) Little information is available on the biological behavior, correlations between radiological and histological findings, or the optimum treatment. Ki-67/MIB-1 labeling index varies between 1% and 18%,3,7) suggesting a wide spectrum of proliferative activity. Gross total resection is possible as astroblastoma is usually well circumscribed, so may result in long-term survival and account for the unexpectedly favorable course of some patients with apparently malignant tumors.2) In one series, none of 13 totally resected astroblastomas recurred within 24 months.3)

We treated a young patient with low-grade astroblastoma with high migratory activity which recurred twice after initial gross total resection.

Case Report

A 17-year-old male was referred to Kagoshima University Hospital in February 2003 complaining of morning headache and double vision. On admis-
Fig. 1 Computed tomography scans (A) showing a large, lobulated high-density mass lesion with multiple cystic components in the right frontal operculum, with (B) slight enhancement after the administration of contrast medium.

Fig. 2 Preoperative axial magnetic resonance images showing the tumor consisted of a mixture of solid and cystic components. The solid component was isointense with the white matter on T₁-weighted image (A) and isointense with the gray matter on T₂-weighted image (B), with homogeneous enhancement with a blurred margin after administration of gadolinium-diethylene-triaminepenta-acetic acid (C). There was marked peritumoral edema and remarkable shift of the midline structures.

Sion, neurological examination disclosed slight consciousness disturbance, slight left hemiparesis, papilledema, and bilateral abducens nerve palsy. Computed tomography revealed a large, lobulated high-density mass lesion with multiple cystic components in the right frontal operculum. The mass was slightly enhanced after the administration of contrast medium (Fig. 1). The solid component was isointense with the white matter on T₁-weighted magnetic resonance (MR) imaging, isointense with the gray matter on T₂-weighted MR imaging, and homogeneously enhanced with a blurred margin after administration of gadolinium-diethylene-triaminepenta-acetic acid. The tumor was surrounded by remarkable peritumoral edema with shift of the midline structures (Fig. 2). L-[methyl]-¹¹C-methionine (¹¹C-MET) positron emission tomography (PET) showed high uptake in the solid component, whereas [¹⁸F]fluorodeoxyglucose ([¹⁸F]FDG) PET demonstrated low accumulation (Fig. 3).

Gross total resection of the tumor was performed via a right frontotemporal craniotomy. The tumor was soft, pinkish-gray, and macroscopically well demarcated. Xanthochromic fluid was aspirated from the cystic component. Histological examination found the tumor predominantly consisted of elongated cells characterized by a thick footplate and arranged in perivascular pseudorosettes around numerous thin-walled, capillary-like vessels. The blood vessels frequently had thickened hyalinized walls which results in large hyalinized stromal areas. These features were preserved in most fields (Fig. 4). A few mitotic figures were present. Other anaplastic features such as endothelial proliferation and necrosis were absent. The MIB-1 labeling index was 5.6%. Immunohistochemical analysis demonstrated that the tumor cells were immunoreactive for GFAP, vimentin, epithelial membrane antigen, S-100 protein, and matrix metalloproteinase (MMP)-9 (Fig. 5). The histological diagnosis was low-grade astroblastoma. Postoperative MR imaging showed no residual tumor, so neither irradiation nor chemotherapy was administered.

The patient returned to Kagoshima University Hospital 5 months later because of radiological evidence of tumor recurrence. MR imaging showed a small enhanced tumor surrounded by remarkable peritumoral edema (Fig. 6). The enhanced lesion was totally resected together with the adjacent edematous brain tissue. Histological examination showed the tumor cells were lined up and had accumulated in the subpial zone, with distant invasion along the vasculature in the surrounding brain parenchyma (Fig. 7). The MIB-1 labeling index showed no significant change at 5.4%. However, he was treated under a diagnosis of anaplastic glioma with extended local irradiation (60 Gy) and two courses of combination chemotherapy (ACNU, etoposide [VP-16], vincristine, and interferon-β).

Follow-up MR imaging after the second course of chemotherapy in November 2003 revealed tumor recurrence around the tumor removal cavity and the patient underwent a third operation followed by six courses of combination chemotherapy consisting of ifosfamide (900 mg/m²), cisplatin (20 mg/m²), and VP-16 (60 mg/m²) for 5 consecutive days in each course. At present he is doing well without neurological deficits and follow-up MR imaging detected...
Discussion

The present case of astroblastoma with subpial invasion consisted of tumor cells lined up and accumulated in the subpial zone of the cortex, with invasion into the perivascular space of the adjacent brain. This pattern is the result of interactions between migratory glioma cells and host brain structures and is highly indicative of malignant glioma. However, our tumor exhibited the histological characteristics of well-differentiated astroblastoma with low proliferative activity.

Analysis of 23 astroblastoma cases identified two distinct histological subtypes of astroblastoma, low-grade and high-grade tumors. Low-grade astroblastoma consists of a uniform perivascular arrangement of pseudorosettes, low to moderate numbers of mitotic figures, little cellular atypia, minimal or no proliferation into the vascular endothelium, and prominent sclerosis of the vascular walls. High-grade astroblastomas have more anaplastic features such as cytological atypia,
types of tumors. Therefore, MMP-9 expression ed with the invasive phenotype of glioma and other biology. Increased expression of MMP-9 is correlat-
regulates various cell behaviors relevant to tumor
MMPs are proteolytic enzymes and their basic
features. Gross total resection of sharply circum-
scribed astroblastomas may result in long-term sur-
Anaplastic histology is associated with tumor
Aggressive treatment is necessary for high-grade
Radiological evidence of a tumor response to
There is no consensus regarding the optimal
imaging and 11C-MET PET, and histological
ufiure.
Our PET findings may open a new perspective on
the pathophysiology and management of these patients. The uptake of [18F]FDG is usually low in
low-grade gliomas and high in high-grade tumors. The uptake of 11C-MET is present in most low-grade gliomas and high in high-grade gliomas. 11C-MET uptake may be a prognostic factor in patients with low-grade gliomas. In our case of astroblastoma, the low [18F]FDG uptake was consistent with the low grade of this tumor. On the other hand, the high uptake of 11C-MET may have reflected the high potential for the malignant evolution of this tumor.

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Address reprint requests to: M. Kaji, M.D., Department of Neurosurgery, Saiseikai Kumamoto Hospital, 5–3–1 Chikami, Kumamoto 861–4193, Japan.
e-mail: kaji@m2.kufm.kagoshima-u.ac.jp