

A Case of Giant Cell Glioblastoma : A Mimicker of a Cerebral Metastasis

Nagao, Eiki

Departments of Clinical Radiology, Graduate School of Medical Sciences, Kyushu University

Yoshiura, Takashi

Departments of Clinical Radiology, Graduate School of Medical Sciences, Kyushu University

Hiwatashi, Akio

Departments of Clinical Radiology, Graduate School of Medical Sciences, Kyushu University

Togao, Osamu

他

<https://doi.org/10.15017/18474>

出版情報 : 福岡醫學雜誌. 101 (7), pp.142-147, 2010-07-25. 福岡医学会
バージョン :
権利関係 :

Case Report

A Case of Giant Cell Glioblastoma : A Mimicker of a Cerebral Metastasis

Eiki NAGAO*, Takashi YOSHIURA*, Akio HIWATASHI*, Osamu TOGAO*, Kouji YAMASHITA*,
Hironori KAMANO*, Masahiro MIZOGUCHI†, Toshiyuki AMANO† and Hiroshi HONDA*

*Departments of *Clinical Radiology and †Neurosurgery, Graduate
School of Medical Sciences, Kyushu University*

Abstract We report a rare case of giant cell glioblastoma that was difficult to distinguish from cerebral metastasis. The MRI finding was a ring-enhancing well-circumscribed solitary brain tumor that was very similar to cerebral metastasis. Even when MRI results were considered together with the findings by magnet resonance spectroscopy and perfusion-weighted MRI, it was hard to distinguish between giant cell glioblastoma and cerebral metastasis before surgery. When we find a solitary ring-enhancing intracranial mass with little tendency of invasion, we need to consider the possibility of giant cell GBM as a differential diagnosis.

Key words : giant cell glioblastoma, solitary metastasis, MRI, perfusion-weighted imaging, MR spectroscopy

Introduction

Glioblastoma (GBM) is the common primary brain tumor in adults, constituting 50–55% of gliomas and 25% of all intraparenchymal primary brain tumors¹⁾. Giant cell GBM is a subtype of GBM. It is pathologically characterized by numerous multinucleated giant cells and small cells mixed in high density, and bizarre nuclei with rich chromatin are found in giant cells²⁾. To the best of our knowledge, there are very few reports regarding MRI findings of giant cell GBM. Here we report a case of giant cell GBM that was difficult to distinguish from cerebral metastasis by MRI.

Case report

A 64-year-old female was referred to the neurosurgical unit of our hospital with apraxia as her chief complaint. Neurological examination could not point out any obvious abnormality. The contrast-enhanced CT images of the head showed a ring-enhancing well-circumscribed solitary tumor in the left parietal lobe, with a low

density region found around it. MRI was performed by a 3T unit (Achieva Quasar Dual, Philips Medical Systems, Best, The Netherlands) with an 8-channel head array coil. The T1-weighted image showed a well-circumscribed hypointense mass lesion in the left parietal lobe (Fig. 1a). The T2-weighted image showed a heterogeneous hyperintense mass lesion with a T2-prolongation in the surrounding white matter (Fig. 1b). Contrast-enhanced T1-weighted images showed a ring-like contrast enhancement in the mass lesion (Fig. 1c).

The patient also underwent perfusion-weighted MRI and multi-voxel proton MR spectroscopy (MRS). For perfusion-weighted imaging, a series of T2*-weighted gradient-echo echo-planar images (TR/TE/flip angle = 2069 msec/60 msec/90°) were obtained during the first pass of a bolus of gadopentetate dimeglumine (Magnevist, Berlex Laboratories, Wayne, NJ, USA) at a dose of 0.1 mmol per kilogram of body weight. Mapping of the relative cerebral blood volume (rCBV) was performed using Perfusion Mismatch Analyzer (ASIST-Japan, <http://asist.umin.jp/>). Relative

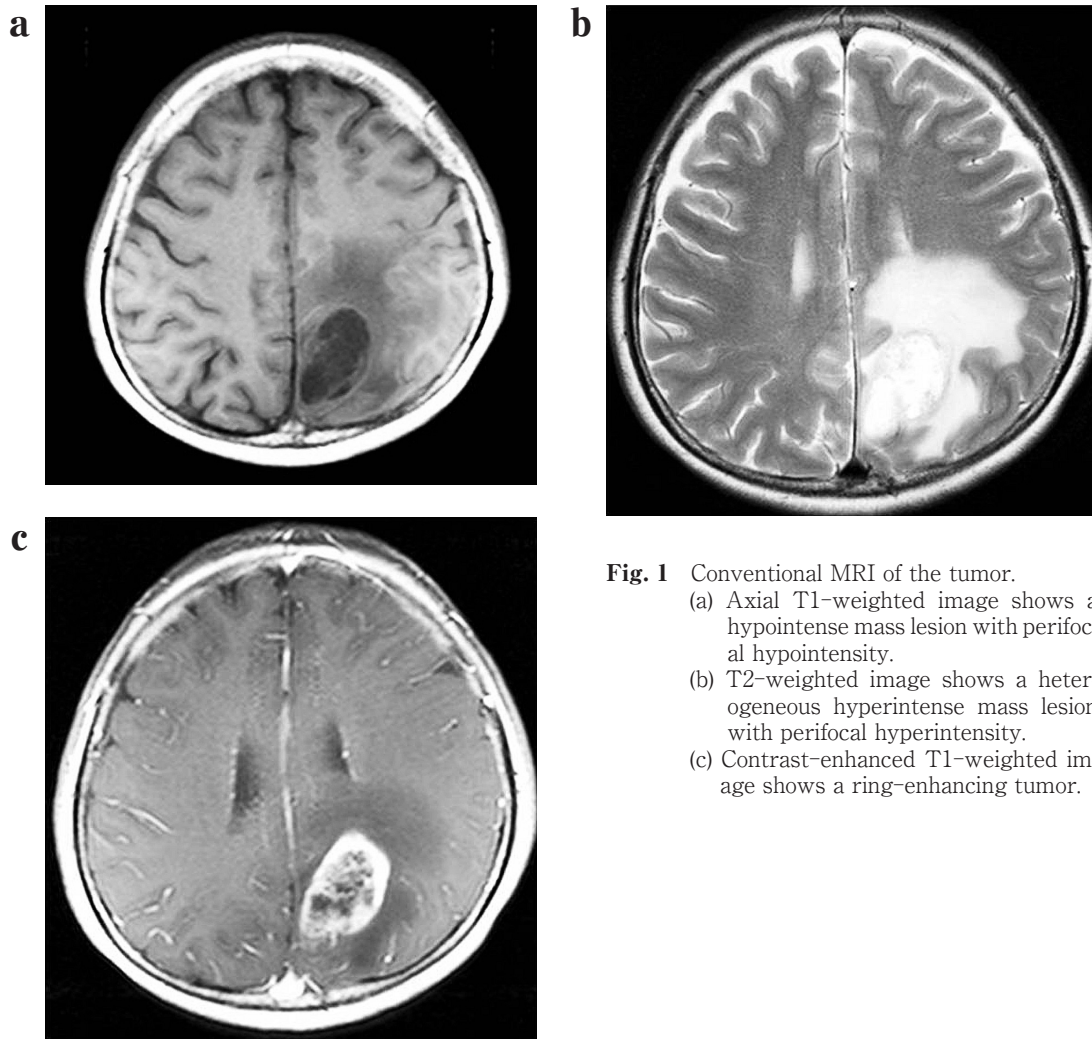


Fig. 1 Conventional MRI of the tumor.
 (a) Axial T1-weighted image shows a hypointense mass lesion with perifocal hypointensity.
 (b) T2-weighted image shows a heterogeneous hyperintense mass lesion with perifocal hyperintensity.
 (c) Contrast-enhanced T1-weighted image shows a ring-enhancing tumor.

regional CBV (rrCBV) was obtained in the peritumoral T2-prolonged region as well as in the enhancing tumor by a region-of interest (ROI) analysis as the rCBV in a probed region divided by that within the normal white matter in the contra-lesional hemisphere. The rrCBV within the peritumoral area ranged from 0.33 to 0.69, while the maximum rrCBV within the enhancing tumor was 1.21. Thus there was no abnormal elevation of rCBV in the peritumoral region (Fig. 2).

MRS (TR/TE = 2000 msec/288 msec, voxel size = $13 \times 13 \times 15 \text{ mm}^3$) was performed after the contrast agent administration. The section was positioned to include the enhancing tumor, peritumoral region, and normal contralateral brain parenchyma (Fig. 3a). In visual inspection

of the spectra, there was no noticeable increase in choline peak within the enhancing tumor in comparison with normal brain parenchyma, while diminished N-acetylaspartate peaks and increased lactate/lipid peaks were observed (Fig. 3b). The maximum choline/creatine ratio (Cho/Cre) within the tumor was 6.20. The Cho/Cre in the peritumoral region ranged from 0.26 to 1.23, demonstrating no abnormal increase. On ^{18}F -fluorodeoxy glucose-positron emission tomography (FDG-PET), the tumor showed a ring-like high uptake (SUVmax = 18.0), suggesting a malignant tumor with the central necrosis (Fig. 4). Based on the test results just described, while we could not exclude the possibility of GBM, we most suspected cerebral metastasis, although screening body CT and FDG-PET revealed no

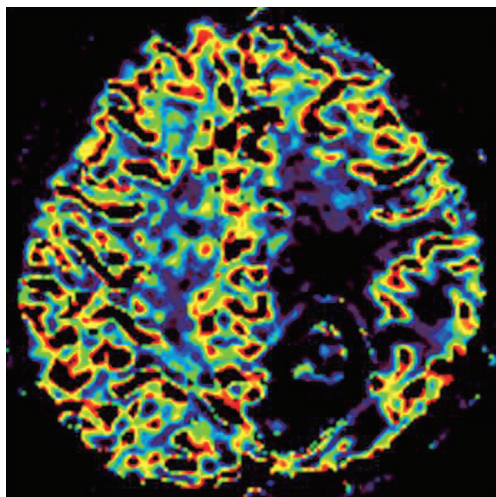


Fig. 2 Regional cerebral blood volume (rCBV) map obtained from perfusion-weighted MRI data. Note that there is no abnormal elevation of rCBV in the peritumoral region.

extracranial malignant lesion.

At surgical removal, the back of the tumor was hard and well-circumscribed so that it was detached easily from the surrounding brain tissue. Its front was soft and the boundary between the tumor and the surrounding brain tissue was not clear. While it was extirpated as a block, excision was added at the same time as it was determined as GBM upon rapid pathological diagnosis, and as its front had a positive margin.

The pathological finding showed that numerous multinucleated giant cells and small cells were mixed at high density, and there were bizarre nuclei with rich chromatin in the giant cells (Fig. 5). The tumor cells were diffusely positive for glial fibrillary acidic protein (GFAP), and the MIB1 index was 58.4%. The histological diagnosis was giant cell GBM.

After the operation, the patient underwent the chemotherapy with temozolomide and radiotherapy. There has been no clinical evidence of recurrence for one year.

Discussion

Among malignant gliomas, there are cases seen from time to time that have many giant cells with a mysterious type of nucleus. This histology has

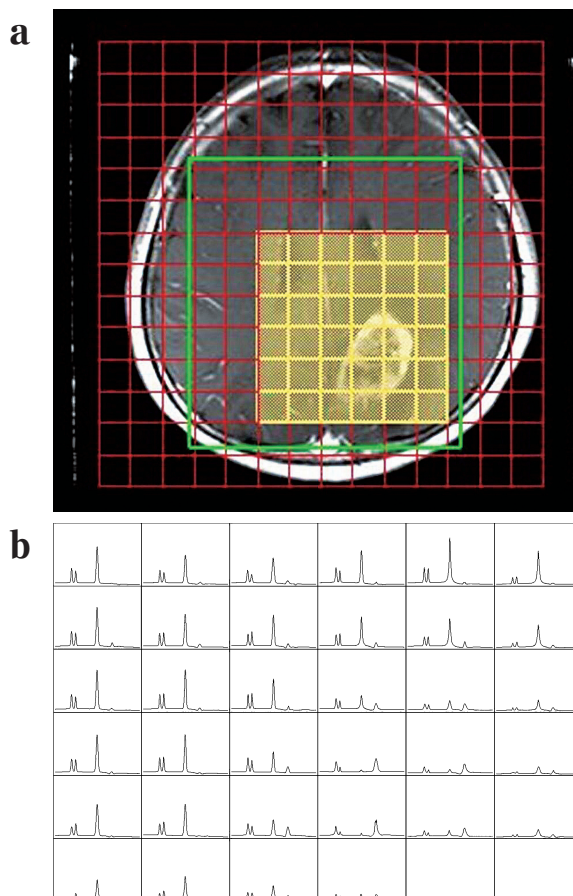


Fig. 3 Multi-voxel proton MR spectroscopy.

- (a) The section includes the normal brain parenchyma in the contra-lesional hemisphere as well as the enhancing tumor and peritumoral region.
- (b) Spectra over the probed area. Note that there is no obvious elevation in choline peaks in the region of the enhancing tumor. Also note that no elevation of choline/creatine ratio is observed in the peritumoral region.

been called monstrocellular sarcoma and giant cell GBM [3] etc. There is no consensus about whether this giant cell is of glioma origin or mesenchymal origin. Historically, since Meyer⁴ and others called this condition giant cell GBM in their of 3 cases of giant cells with mysterious nuclei, with tumor characteristics similar to those of glioblastoma multiforme such as necrosis and hemorrhage, the giant cell has been called in various names depending on whether it is of glioma origin or sarcoma origin. However, this condition is roughly classified into either giant cell GBM³, regarded by Russel et al. as glioma

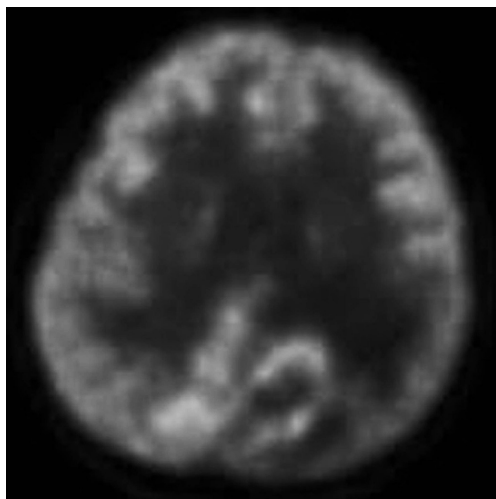


Fig. 4 ^{18}F -fluorodeoxy glucose-positron emission tomography. The tumor shows a ring-like high uptake ($\text{SUV}_{\text{max}} = 18.0$), suggesting a malignant tumor with the central necrosis.

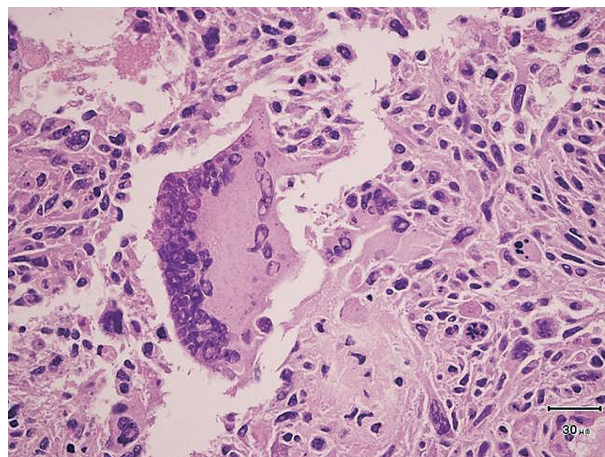


Fig. 5 Pathological finding of the tumor. Specimen (H and E) shows diffuse, cellular proliferation of highly anaplastic, epithelioid-to-spindle glioma cells exhibiting hyperchromatic, pleomorphic nuclei, associated with multinucleated giant cells. The largest tumor cell is 160 micrometers in diameter.

origin, or monstrocellular sarcoma⁵⁾, regarded as being of sarcoma origin.

Microscopically, the characteristic feature of this giant cell is that its cytoplasm has fibers of 80 angstroms in diameter clustered around the nucleus⁶⁾. Because GFAP, which is immunologically a specific tumor marker of astrocytes, can be found markedly in this giant cell's cytoplasm and fiber, the theory that this type of cell is of glioma origin has become more prevalent⁷⁾⁸⁾.

The clinical features of giant cell GBM include an age of onset from 18 to 75 years old and a survival time that varies from case to case, with some cases of much longer survival documented, compared with ordinary GBM⁹⁾. While according to WHO classification the giant cell GBM is described as well circumscribed, there are very few reports of concrete MRI findings available.

In this particular case, the tumor was apparently well circumscribed on conventional MRI (Fig. 1), which is not typical of a high-grade glioma. In addition to ordinary examinations, perfusion-weighted MRI and MRS were added as pre-operation tests. This was because there is a report¹⁰⁾ that increases of rCBV and Cho/Cre in the T2-prolonged region around the enhancing

tumor reflect microscopic invasion of GBM, and such findings are useful as indicators for distinguishing GBM from solitary brain metastasis. In perfusion-weighted MRI, the rrCVB value in the peritumoral region was considered closer to the value indicating brain metastasis than that indicating a high-grade glioma (Fig. 2). Also by MRS, no elevation of Cho/Cre in the circumference of the tumor was found (Fig. 3). Based on these results, we made a pre-operation diagnosis of a suspected solitary brain metastasis. While the finding during surgery showed invasion to the surrounding cerebral parenchyma, the images had suggested very little invasion tendency.

We have reported a case of giant cell GBM that was hard to distinguish from brain metastasis even by using perfusion-weighted MRI and MRS. We believe that when we find a solitary ring-enhancing intracranial mass with little tendency of invasion, we need to consider the possibility of giant cell GBM as a differential diagnosis.

References

- 1) Ohgaki H, Peraud A and Nakazato Y : Pathology and Genetics of tumors of the Nervous system. pp. 40-41, IARC. Lyon, 2000.
- 2) F. Gullota, L. Casentini and J. Neumann : Giant cell gliomas of the temporal lobe. *Acta neurochirurgica*. 54 : 25-31, 1980.
- 3) Russell DS and Rubinstein LJ : Pathology of Tumors of the Nervous System, edition 5, pp. 219-240, Edward Arnold. London. 1989.
- 4) Meyer O : Ein besonderer Typus von Riesen-zellengliom. *Frankf Z Pathol* 14 : 185-203, 1913.
- 5) Zulch KJ and Christensen E : Pathologische Anatomie der raum-beengenden intrakraniellen prosesse. in *Handbuch der Neurochirurgie*, Bd 3, pp.800, SpringerVerlag, Berlin. 1956.
- 6) Hadfield MG and Silverberg SG : Light and electron microscopy of giant cell glioblastoma. *Cancer*. 30 : 989-996, 1972.
- 7) Duffy PE, Graf L and Reppert MM : Identification of glial fibrillary acidic protein by the immunoperoxidase method in human brain tumors. *J Neuropathol Exp Neurol* 36 : 645-652, 1977.
- 8) David L, Hiroko O, Otmar D and Webster K : WHO classification of tumours of the central nervous system 4th ed. pp. 46-47, IARC, Lyon, 2007.
- 9) Masahito K, Toshimitsu A and Yutaka S : Immunohistochemical analysis of giant cell glioblastoma. *Pathology international*. 45 : 275-282, 2008.
- 10) Meng L, Soonmee Cha, Edmond A, Glyn J, John A and Andrew W : High-grade gliomas and solitary metastasis. *Radiology*. 222 : 715-721, 2002.

(Received for publication May 26, 2010)

(和文抄録)

転移性脳腫瘍との鑑別が困難であった巨細胞膠芽腫の一例

¹⁾九州大学大学院医学研究院 臨床放射線科学分野

²⁾九州大学大学院医学研究院 脳神経外科学

永尾英毅¹⁾, 吉浦 敬¹⁾, 樋渡昭雄¹⁾, 梅尾 理¹⁾, 山下孝二¹⁾,
鎌野宏礼¹⁾, 溝口昌弘²⁾, 天野敏之²⁾, 本田 浩¹⁾

緒言：画像所見上，転移性脳腫瘍との鑑別が困難であった巨細胞膠芽腫の症例を報告する。

症例：失行を主訴とする64歳の女性が当院脳外科に紹介された。CTおよびMRIで左頭頂葉にリング状増強を示す境界明瞭な腫瘍がみとめられた。MRI灌流画像では，増強腫瘍周囲のT2延長域において局所血液量の増加をみとめず，MRスペクトロスコピーでは，同部にコリン/クレアチン比の増加をみとめなかった。これらの画像所見から，転移性腫瘍が疑われた。開頭腫瘍摘出術が行われ，病理組織学的に巨細胞膠芽腫と診断された。

考察：巨細胞膠芽腫は膠芽腫の一亜型であるが，その画像診断所見についての報告は少ない。本症例では増強腫瘍の境界が明瞭だったことに加え，増強腫瘍周囲のT2延長域において，局所血液量の増加やコリン/クレアチン比の増加などの腫瘍の浸潤を示唆する所見がみられなかったことから，転移性脳腫瘍との鑑別が困難であった。

結語：画像上浸潤傾向に乏しいリング状増強腫瘍がみとめられた場合，巨細胞膠芽腫は鑑別診断として考慮すべきである。