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Gliosarcoma with thallium-201 SPECT

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Thallium-201 (^{201}Tl) chloride scintigraphy is the imaging method use for the detection of various tumors including glioblastoma, but only limited information on ^{201}Tl uptake in gliosarcoma is available. We investigated a patient with gliosarcoma by means of ^{201}Tl single-photon emission computed tomography (SPECT) and MRI. SPECT imaging revealed high ^{201}Tl uptake in the tumor, which was closely correlated with contrast-enhancement on MRI. These results suggest that SPECT with ^{201}Tl may be useful for detecting gliosarcoma and provide physiological information on this tumor.

Key words: gliosarcoma, ^{201}Tl, SPECT, MRI

INTRODUCTION

GLIOSARCOMA is an uncommon malignant brain tumor, composed of neuroectodermal and mesenchymal tissue. It has been reported as representing described 2.3% of all gliomas, 5% of astrocytomas, and 8% of glioblastomas.[1] Many reports have focused on histogenic and pathological aspects of this tumor, but only limited information is available concerning the MR characteristics of gliosarcoma.[2,3]

One general tumor scanning agent in clinical use for the detection of brain tumors including glioblastomas is thallium-201 (^{201}Tl) chloride.[4–6] These researchers suggested that ^{201}Tl imaging may be a useful technique for investigating patients with glioblastoma.

The purpose of this paper is to report the ^{201}Tl SPECT and MRI findings in a patient with gliosarcoma.

CASE REPORT

A 44-year-old woman was admitted with recent memory disturbance and head heaviness. MRI (Toshiba, MRT 50A, Japan) was performed to evaluate the neurological symptoms. MRI on enhanced T1 weighted images revealed an irregular ring-enhanced mass in the left temporoparietal lobe (Fig. 1). Transverse reconstruction of SPECT images was performed at 15 min postinjection of 3 mCi (111 MBq) of ^{201}Tl chloride with a high-resolution SPECT system with three-head rotating cameras (Toshiba, GCA 9300A, Japan). Axial SPECT images (Fig. 2) showed prominent tumor localization. SPECT findings were correlated with those of subsequent MRI. By histopathological and immunohistochemical examination of the operation site, the tumor was considered to be an anaplastic neoplasm derived from glial tissue containing a sarcomatous component as a gliosarcoma (Fig. 3A–C).

DISCUSSION

The tumor was first described in 1895 by Stroebe who reported a glioblastoma with sarcomatous elements and subsequently applied the term "gliosarcoma."[7] In 1955 Feigin et al. revealed a detailed review of several cases of gliosarcoma in which they discussed the origin of the sarcomatous components of the tumor.[8] The histological origin of gliosarcoma is controversial; the sarcomatous component might be the result of neoplastic degeneration of the mesenchymal cells, or of neoplastic growth of the endothelial vasal elements within gliosarcoma of glial

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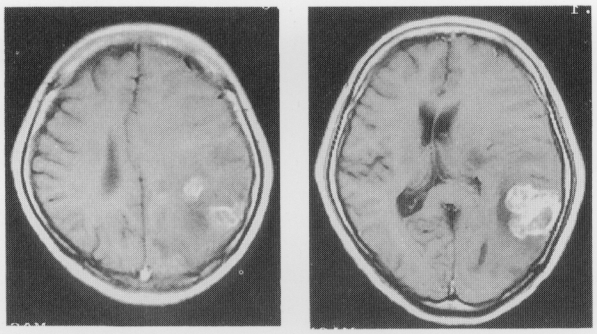


Fig. 1 MRI on enhanced T1 weighted images revealed irregular ring-enhanced tumor in the left temporo-parietal lobe.

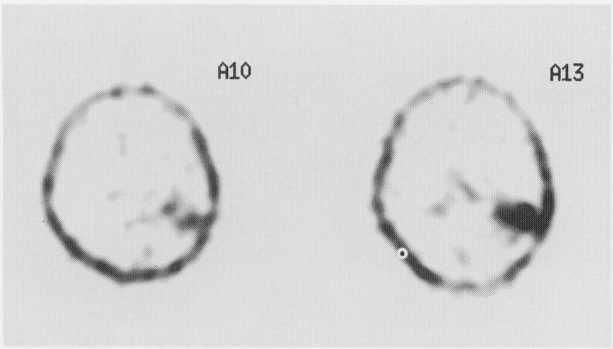
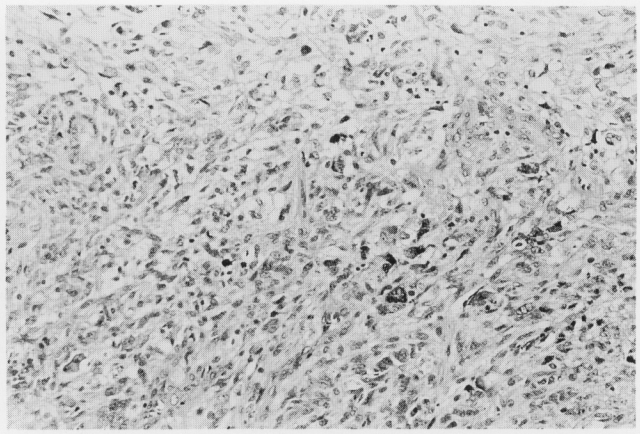


Fig. 2 Transverse SPECT image showed prominent tumor uptake in the left temporo-parietal lobe.

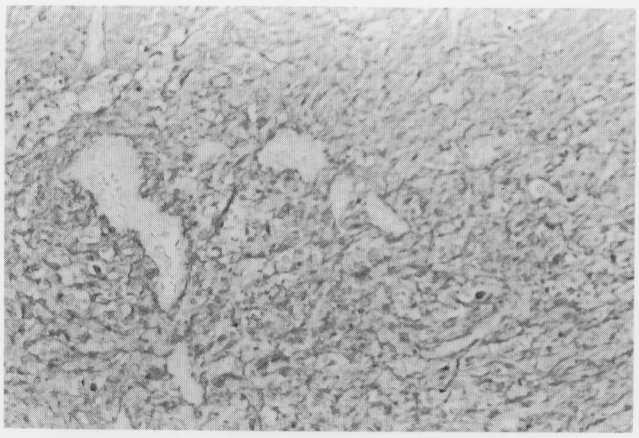
and sarcomatous neoplastic elements that appear de novo and at the same time.[1,9,10] Galani et al. demonstrated that gliosarcoma behaves similarly to glioblastoma multiforme (GBM). When similar treatments (combined radiation and chemotherapy) were administered, there was no significant difference between patients with GBM and gliosarcoma in time to progression and overall survival time. The median survival time was 9 months for patients with gliosarcoma.[11] Although, in this patient radiotherapy and chemotherapy were performed, this patient died 14 months after admission.

Dwyer reported 6 gliosarcoma patients with emphasis on the MR feature. All of the tumors showed enhancement on T1-weighted images that corresponded to the areas of intermediate signal intensity on T2-weighted images. Three of the tumors diffuse inhomogeneous enhancement with more intense peripheral enhancement. The other three tumors had intense, irregular, ring-like enhancement surrounding central hypointensity.[3] Our findings of gliosarcoma on MRI were also irregular, ring-enhanced tumors similar to the above mentioned.

^{201}Tl scintigraphy can be generally used to detect of various malignant tumors including glioblastoma.[4–6] Ishibashi et al. reported that ^{201}Tl uptake in glioma is correlated with proliferating cell nuclear antigen.[12] ^{201}Tl scintigraphy may distinguish the histologic grade of



A



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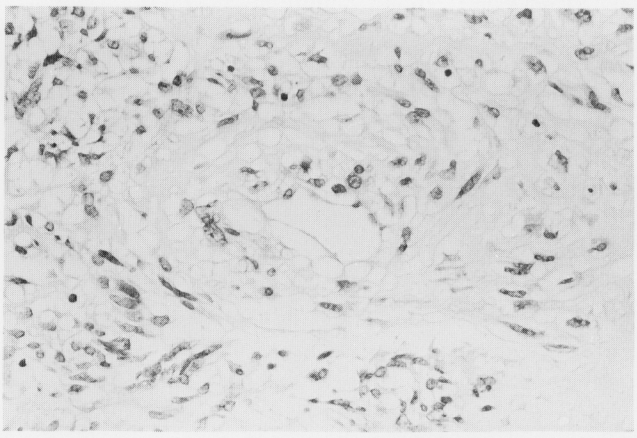

C

Fig. 3 A. Hematoxylin-eosin stain (× 50). The tumor was composed of haphazardly arranged anaplastic polygonal or pump spindle cells presenting severe atypia. A few giant atypical cells with bizarre nuclei were present among them. B. Immunohistochemistry (× 50). Immunohistochemistry using anti-GFAP (glial fiber acid protein) antibody presented intensive positive reaction in the tumor cells demonstrating glial origin. C. Hematoxylin-eosin stain (× 93). Atypical spindle-shaped tumor cells were present in the perivascular regions.

glioma, tumor uptake with ^{201}Tl in gliosarcoma has not been extensively reported. Taki et al. recently reported that the degree of early ^{201}Tl uptake in malignant brain tumors including glioblastoma is correlated well with that of contrast-enhancement on MRI. ^{201}Tl uptake depends in the main on regional blood flow, destruction of the blood brain barrier and tumor viability, whereas contrast-enhancement on MRI depends on BBB dysfunction, regional blood flow and tissue permeability.[13] It is suggested that ^{201}Tl may evaluate tumor viability.

In this patient, we could visualize high ^{201}Tl uptake in gliosarcoma on SPECT imaging. High ^{201}Tl uptake in our case is correlated with the histological grade as with glioblastoma.[4–6] This shows the precise localization and histological characteristics of the tumor, and correlates closely with the results of contrast-enhancement on MRI. We suggest that ^{201}Tl SPECT may be useful for detecting gliosarcoma and providing physiological information on this tumor.

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