Bilateral Thalamic Glioma

—Case Report—

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Abstract

A 35-year-old woman presented with a bilateral thalamic glioma manifesting as dysesthesia over the left side of the body and mental deterioration. T₁-weighted magnetic resonance imaging revealed enlarged bilateral thalami with homogeneous isointensity and no enhancement after gadolinium administration. Histological examination of a stereotactic biopsy specimen identified anaplastic astrocytoma. Radiotherapy and chemotherapy failed to arrest tumor growth. She subsequently died. Magnetic resonance imaging and clinical findings support the view that bilateral thalamic gliomas represent a distinct clinicopathologic entity among thalamic tumors.

Key words: glioma, bilateral thalamic tumor, personality changes, thalamus

Introduction

Thalamic tumors account for approximately 1% to 1.5% of all brain tumors, and are usually unilateral astrocytoma.^{3,7,9,13} Primary thalamic gliomas include a distinct type known as bilateral thalamic glioma, which occurs as a large tumor located in symmetrical areas in the bilateral thalami, and typically manifesting as behavioral impairments varying from personality changes to frank dementia. This type of thalamic tumor can be distinguished clinically and radiologically from other gliomas. We present a case of bilateral thalamic glioma manifesting as personality change and memory impairment in the absence of hydrocephalus.

Case Report

A 35-year-old woman presented with a feeling of heaviness in the head and dysesthesia over the left side of the body. Six months earlier, she had begun to show a decline in physical and mental activity, and diminished verbal output. She had developed disturbance of recent memory. Neurological examination found hemianopia on the left. Fundus examination detected no papilledema. Recent memory impairment and dyscalculia were noted. The Wechsler Adult Intelligence Scale-Revised scores suggested

dementia with verbal intelligence quotient (IQ) 67, performance IQ 54, and overall IQ 56. Computed tomography (CT) showed bilateral isodense thalamic masses without contrast enhancement. T₁-weighted magnetic resonance (MR) imaging showed enlarged bilateral thalami with isointensity and no enhancement after gadolinium administration (Fig. 1A, B). The enlarged thalami protruded into the third and lateral ventricles (Fig. 1D). T₂-weighted MR imaging demonstrated essentially homogeneous hyperintense areas in the bilateral thalami (Fig. 1C). Extension into the pulvinars of the bilateral thalami was seen abutting the posterior limb of the internal capsule without involving the corpus callosum or the rostral midbrain. Vertebral and internal carotid angiography revealed a faint tumor stain supplied from the posterior cerebral artery on each side (Fig. 2).

Stereotactic biopsy was performed. Histological examination showed tumor cells with scant eosinophilic cytoplasm and hyperchromatic nuclei, increased cellularity, and mitoses. The tumor cells had diffusely infiltrated but showed no vascular proliferation or necrosis (Fig. 3). The MIB-1 labeling index of the specimen was 11.1%. The diagnosis was anaplastic astrocytoma. Radiotherapy was performed with an overall dose of 60 Gy. Chemotherapy including carboplatin (30 mg/day × 6 wks) was given, but MR imaging showed no change in tumor size. The patient died 12 months after the initial presentation.

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Fig. 1 A: Axial T₁-weighted magnetic resonance (MR) image showing enlarged bilateral thalami with isointense signal. B: Axial T₁-weighted MR image after gadolinium administration showing no enhancement of the bilateral thalami. C: Axial T₂-weighted MR image showing prominent hyperintense areas in the bilateral thalami. D: Coronal T₁-weighted MR image showing extension of the thalami to the medial temporal lobes.

Discussion

Bilateral thalamic glioma is extremely rare, with only known 16 cases including the present case (Table 1).^{4-6,10,11,15} The patients were nine men and seven women aged from 8 to 70 years (mean 39 years). Principal symptoms included personality change, confusion, memory loss, apathy, emotional lability, and dementia. Personality change and mental deterioration with relative sparing of motor and sensory functions are distinctive symptoms.

Increased intracranial pressure is commonly associated with thalamic tumor.^{3,9,13} Symptoms particularly associated with hydrocephalus, including headache and vomiting, are common, as well as signs of mental deterioration. Unilateral thalamic tumor was associated with hemiparesis in 48–75% and headache in 56–68% of patients.^{1,2,8,14} Hydrocephalus was found in 50% of patients,¹⁴ and placement of cerebrospinal fluid shunts at the time of first

Fig. 2 Right internal carotid angiograms, anteroposterior (A) and lateral views (B), showing a faint tumor stain supplied from the posterior cerebral artery.

Fig. 3 Photomicrograph of the stereotactic biopsy specimen showing anaplastic astrocytoma. The glial tumor is highly cellular with nuclear pleomorphism and mitotic figures. No focal necrosis or vascular endothelial proliferation is seen. HE stain, $\times 250$.

presentation was required in 62% of patients.¹⁾

Such symptoms are uncommon in the early stages of bilateral thalamic glioma, as only two of the 16 patients had headache, none had hemiparesis, and only one exhibited moderate hydrocephalus. The symptoms of bilateral thalamic glioma may result from dysfunction of the dorsomedial nuclei, which receives connections from the amygdala and temporal neocortex, and projects to the prefrontal area.⁵⁾ Two patterns of presentation of thalamic glioma can be differentiated reflecting the specific anatomic origin.¹²⁾ In group 1, the tumor originates in the peduncular and capsulothalamic areas and invades the lateral or ventrolateral thalamus, leading to early

Table 1 Reported cases of bilateral thalamic glioma

Case No.	Author (Year)	Age	Sex	Symptoms	Diagnosis	Glioma grade	Hydrocephalus
1	Ziegler et al. (1977) ¹⁵⁾	59	M	memory impairment	CT, autopsy	IV	none
2	Gutmann et al. (1990) ⁵⁾	27	F	personality change	CT, MR imaging	—	none
3	Ruel et al. (1992) ¹¹⁾	70	M	disorientation	CT, MR imaging, autopsy	IV	none
4		8	M	personality change	CT, MR imaging, biopsy	III	none
5	Partlow et al. (1992) ¹⁰⁾	8	F	slow mentation	CT, MR imaging, biopsy	I, II	none
6		15	F	personality change	CT, MR imaging	—	none
7		15	F	personality change	CT, MR imaging, biopsy	III, IV	mild
8		35	M	memory loss, loss of interest	biopsy, autopsy	I, II	mild
9		49	M	memory loss, confusion	angiography, autopsy	III, IV	moderate
10		53	M	personality change, memory loss	CT, MR imaging, angiography, biopsy	I, II	mild
11		67	F	progressive dementia	autopsy	I, II	mild
12		68	F	disorientation, confusion, memory loss	CT, angiography	—	mild
13	Esteve et al. (1999) ⁴⁾	31	M	behavioral change, loss of interest, hemianopsia	MR imaging, biopsy	II	none
14		21	M	loss of visual acuity, loss of interest	MR imaging, biopsy	II	mild
15	Hirano et al. (2000) ⁶⁾	63	M	heavy head, memory impairment	MR imaging, biopsy	III	mild
16	Present case	35	F	mental deterioration, memory impairment	CT, MR imaging, biopsy	III	none

CT: computed tomography, MR: magnetic resonance, —: no tissue diagnosed.

sensory disturbances. In group 2, or intrinsic thalamic gliomas, the tumor originates in the subependymal glia bordering the third ventricle and expands laterally from the medial nuclei, leading to early mental deterioration. Although astrocytomas in the cerebral hemispheres usually grow along the fiber tracts in the white matter, invasion in bilateral thalamic gliomas tends to stop at interfaces between gray and white matter. The symmetric appearance on MR imaging suggests that bilateral thalamic gliomas originate unilaterally in a central area, but soon extend to the other side via the interthalamic adhesion.¹²⁾ However, 42% of patients with unilateral thalamic tumor showed extension into the adjacent structures, but none had extension to the other side of the thalamus.⁸⁾ The present case is an example of group 2 intrinsic thalamic glioma.

MR imaging has been more useful than CT for investigating bilateral thalamic glioma. Fluid-attenuated inversion recovery imaging and T₂-weighted imaging show homogeneous high signal intensities throughout the thalamus.⁶⁾ Histological examination has found grade I to IV gliomas, but seven of 13 were grade III or IV. Malignant astrocytoma may be more common in bilateral thalamic glioma. No correlation of tumor type with age is evident.

Bilateral thalamic glioma has radiologic and clinical features that differ from those of unilateral thalamic tumors. Bilateral thalamic glioma is an important, though infrequent, component of the

differential diagnosis for patients with personality change and dementia. These symptoms reflect destruction of the medial and intralaminar nuclei.

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