Germinoma With Syncytiotrophoblastic Giant Cells Arising in the Corpus Callosum

—Case Report—

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Abstract

A previously healthy 31-year-old Japanese man presented with a very rare germinoma of the corpus callosum without other intracranial lesions manifesting as transitory speech disturbance. Magnetic resonance (MR) imaging revealed a heterogeneously enhanced mass in the corpus callosum extending into the cavity of the septum pellucidum. A tumor specimen obtained by stereotactic biopsy revealed a two-cell pattern germinoma containing human chorionic gonadotropin (HCG)- β -positive giant cells. The cerebrospinal fluid and serum levels of HCG and HCG- β subunit were measurable. The diagnosis was germinoma with syncytiotrophoblastic giant cells. Three cycles of chemotherapy consisting of ifosfamide, cisplatin, and etoposide, followed by radiation therapy achieved complete remission, and 5 cycles of chemotherapy with carboplatin and etoposide were added. MR imaging performed 40 months after the diagnosis showed a cicatricial cyst in the body of the corpus callosum, the original tumor site. All 11 previously reported cases of germinoma in the corpus callosum were associated with synchronous or metachronous intracranial lesions. These patients tended to be older than patients with general intracranial germinoma. Germinoma should be included in the differential diagnosis of corpus callosum tumors, especially in young adult males.

Key words: germinoma with syncytiotrophoblastic giant cells, germ cell tumor, corpus callosum, ectopic germinoma, human chorionic gonadotropin

Introduction

Intracranial germinomas preferentially arise in the pineal or neurohypophyseal regions,^{9,11} whereas only 5–10% develop in other brain regions, which are known as “ectopic germinomas.” Germinomas in the basal ganglia and thalamus are quite common,⁸ but are rarer in the corona radiata,¹³ temporal lobe,²⁰ posterior cranial fossa,^{4,11} medulla oblongata,²² cerebellum,^{11,12} pituitary fossa,² optic chiasm,²¹ and intramedullary spinal cord.⁵ Ectopic germinomas may result from mismigration of embryonic cells into the neural plate area, so the midline of the embryonic disk is a site of germ cell tumor origin.¹⁴ Therefore, these tumors may originate from any midline structure of the central nervous system. Germ cell tumors including germinomas in the corpus callosum are very rare and are usually associated with other intracranial lesions.^{1,7,9,11,16–20} Only one of 153 germ cell tumors was located in the corpus callosum (0.7%).¹¹ The reason for the low incidence of germ cell tumors arising at the corpus callosum is unclear, but may be related to the pathogenesis of intracranial germ cell tumors. Mismigration of proliferating embryonic

disk cells may precede the formation of the corpus callosum, which occurs in the 12th to 13th week of embryogenesis.

We report a case of primary corpus callosum germinoma without other intracranial lesions.

Case Report

A 31-year-old Japanese man noticed sudden onset of speech disturbance lasting a few minutes followed by transient numbness in the fingers of the right hand. Computed tomography of the brain obtained 2 days after the event demonstrated a mass in the corpus callosum. Magnetic resonance (MR) imaging revealed a heterogeneously enhanced mass measuring 40 mm in maximum diameter, located in the body of the corpus callosum and extending into the cavity of the septum pellucidum. No other intracranial lesions were identified (Fig. 1).

Stereotactic biopsy was performed. Histological examination revealed a two-cell pattern consisting of sheets of large tumor cells and infiltrating small lymphocytes. The large tumor cells had round vesicular nuclei with prominent nucleoli and abundant clear cytoplasm. Immunohistochemical staining was positive for placental alkaline

Fig. 1 Preoperative midsagittal (A), sagittal (B, 5 mm to right of center), axial (C), and coronal (D) T₁-weighted magnetic resonance images with gadolinium showing a heterogeneously enhanced tumor located in the corpus callosum with extension into the cavity of the septum pellucidum, but no other lesions.

phosphatase and c-kit (Fig. 2A–C). Giant cells scattered in the tumor were positive for human chorionic gonadotropin (HCG)- β (Fig. 2D). The diagnosis was germinoma with syncytiotrophoblastic giant cells (STGC). The serum and cerebrospinal fluid (CSF) titers were 17 and 71 mIU/ml for HCG, and 0.2 and 1.5 ng/ml for HCG- β subunit, respectively. The serum titer of alpha-fetoprotein was within normal limits (1.7 ng/ml), and the CSF titer was below detectability.

Chemotherapy consisting of ifosfamide, cisplatin, and etoposide (ICE)¹⁰ was started. The tumor had completely disappeared after the second cycle of ICE therapy (Fig. 3A). MR imaging showed a cystic lesion in the body of the corpus callosum. The serum levels of HCG and HCG- β subunit fell below the level of detectability. Radiation therapy was then begun consisting of multi-fractionated 30 Gy of extended local irradiation covering the whole ventricular system followed by 20 Gy of boost irradiation to the initial tumor site. Subsequently, he received another cycle of ICE therapy and 5 cycles of a chemotherapeutic regimen consisting of carboplatin and etoposide (CARB-VP).¹⁰ The entire treatment course was completed by 17 months after the onset. The latest follow-up MR imaging, 24 months after the completion of treatment and 40 months after the diagnosis, showed no tumor recurrence or dissemination. The cicatricial cyst in the corpus callosum, the original tumor site, persisted and the callosal body showed topical atrophy (Fig. 3B).

There were no signs and symptoms of hypopituitarism or diabetes insipidus throughout the clinical course. The basal levels of thyroid-stimulating hormone, cortisol,

Fig. 2 A: Photomicrograph showing the tumor tissues consisting of 2 distinct cell types: large round cells with clear cytoplasm and central nuclei, and small lymphocytes infiltrating fibrous tissue. Hematoxylin and eosin stain, $\times 200$. B–D: Immunostaining showing the large round cells are positive for placental alkaline phosphatase (B) and c-kit (C), and scattered giant cells are positive for human chorionic gonadotropin- β (D). $\times 200$.

Fig. 3 Sagittal T₁-weighted magnetic resonance images with gadolinium after the second cycle of chemotherapy (A), and 24 months after completion of treatment (B), showing the callosal lesion has completely disappeared and a cicatricial cyst is present in the body of the corpus callosum (A, B), and atrophy of the corpus callosum (B).

prolactin, and adrenocorticotrophic hormone remained within the normal ranges, and were 0.72 μ IU/ml, 9.6 μ g/dl, 7.1 ng/ml, and 10.1 pg/ml, respectively, at the end point of treatment.

Discussion

Preoperative MR imaging of our patient showed an intracranial lesion in the corpus callosum that extended to the cavity of the septum pellucidum. MR imaging performed after chemoradiation therapy revealed a cicatricial cyst associated with surrounding atrophy in the body of the corpus callosum. We conclude that this tumor arose and grew in the corpus callosum, a very rare origin for

Table 1 Reported cases of germ cell tumors in the corpus callosum

Case No.	Author (Year)	Age (yrs)/ Sex	Histology	Associated lesions	Size (mm)	Initial symptom
1	Carrillo et al. (1977) ¹⁾ *	13/M	embryonal carcinoma	Me; pineal (mature teratoma)	NM	intracranial hypertension
2	So and Ho (1980) ¹⁶⁾ *	26/M	germinoma	S; thalamus, cerebral peduncle	40**	involuntary movement
3	Sumida et al. (1995) ¹⁸⁾	13/M	germinoma	S; suprasellar, pineal	10***	diabetes insipidus
4	Matsutani et al. (1997) ¹¹⁾	NM	NM	NM	NM	NM
5	Liang et al. (2002) ⁹⁾	NM	germinoma	S; diffuse dissemination	NM	NM
6		20/M	immature teratoma/ germinoma	S; diffuse dissemination, adjacent frontal lobe	70***	NM
7	Utsuki et al. (2005) ²⁰⁾	28/M	germinoma	S; adjacent parietal lobe	78	hemiparesis
8		22/M	germinoma	S; adjacent frontal lobe	62	memory disturbance
9	Uchino et al. (2006) ¹⁹⁾	45/F	germinoma	S; diffuse dissemination	no mass	NM
10	Sugiyama et al. (2006) ¹⁷⁾	8/M	HCG + germinoma (basal ganglia)	S; basal ganglia, internal capsule	30***	precocious puberty
11	Kamoshima et al. (2008) ⁷⁾	31/M	mature teratoma	Me; pineal (germinoma)	10	absence
12	Present case	31/M	HCG + germinoma	absence	40	speech disturbance

*Magnetic resonance imaging was not performed. **Removed specimen size. ***Estimated from the published figure. HCG: human chorionic gonadotropin, Me: metachronous lesions, NM: not mentioned, S: synchronous lesions.

intracranial germ cell tumors. Only 11 patients with germ cell tumors in the corpus callosum have been reported,^{1,7,9,11,16–20)} all associated other intracranial lesions including disseminated periventricular tumors, adjacent cerebral parenchymal lesions, and so-called favorite site lesions (Table 1). Patients with corpus callosum germ cell tumors tended to be older (mean $\pm$ standard deviation [SD] 23.7 ± 10.9 years) than patients with more common intracranial germinomas.^{6,10,15)} The initial symptoms included intracranial hypertension, involuntary movement, memory disturbance, and symptoms related to the associated lesions. The symptoms elicited by callosal tumors are relatively mild considering their large size (mean $\pm$ SD 50.0 ± 25.0 mm). We think that such lesions developed without eliciting conspicuous symptoms because the corpus callosum is a relatively non-eloquent brain structure.²⁰⁾

The histological diagnosis in our case was germinoma with STGC or HCG-producing germinoma. Intracranial germinomas with STGC account for 12.6–18.9% of all intracranial germinomas.^{11,15)} The prognosis for patients with germinoma containing STGC is not as good as that for patients with pure germinoma due to the high rate of recurrence.^{11,15)} The 5-year survival rate of 7 patients with germinoma with STGC was as low as 83.3% compared to 95.4% in 50 patients with pure germinoma.¹¹⁾ Analysis of 111 germ cell tumors, including 60 pure and 14 HCG-producing germinomas, found the recurrence rate of HCG-producing germinomas was higher than that of pure germinomas.¹⁵⁾ According to the treatment protocol for intracranial germ cell tumors,¹⁰⁾ HCG-producing germinomas are in the intermediate prognosis group. In our case, 3 cycles of ICE therapy combined with extended local and

local boost irradiation were delivered followed by 5 cycles of a CARB-VP regimen, resulting in complete response in our patient. He remained in good condition with no signs of recurrence at 24 months after the completion of treatment. Longitudinal regular follow-up MR imaging continues because germinomas with STGC tend to recur later than pure germinomas.^{3,15)}

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