Radiological Features of Germinoma Arising From Atypical Locations
—Three Case Reports—

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Abstract

Three cases of intracranial germinoma arising from atypical locations occurred in 13-, 22-, and 28-year-old males. The location of the tumor was the corpus callosum (2 cases) and the temporal lobe. Computed tomography and magnetic resonance imaging showed all three tumors had a largest dimension, including the internal cyst, of over 6 cm, and the cysts were larger than 2.5 cm. Radiotherapy and chemotherapy caused all tumors to disappear. Large tumor and large cyst are features of germinoma arising from atypical locations.

Key words: cyst, germinoma, hemorrhage, radiological feature, atypical location

Introduction

Germinoma and germinoma with syncytiotrophoblastic giant cells of the central nervous system usually develop in the midline structures, i.e., the pineal gland, suprasellar infundibulochiasmatic area, and basal ganglia. Such tumors located in other regions are most often multiple lesions also occurring in the pineal region, suprasellar area, or basal ganglia. Only 3.2% of solitary tumors occur at other sites. Computed tomography (CT) and magnetic resonance (MR) imaging findings have been described for germinoma in the corona radiata, frontal lobe, cerebellopontine angle, and medulla oblongata. However, the clinical features and imaging characteristics are still unclear.

This study describes three cases of germinoma arising in atypical locations and discusses the CT and MR imaging characteristics.

Case Reports

Case 1: A 28-year-old right-handed male presented with a 3-month history of right lower limb weakness and memory disturbance 1 month previously. Physical examination disclosed he was alert and oriented. Neurological examination revealed right hemiparesis, right hypesthesia, right paresthesia, and agraphia. \(^{T_1}\)-weighted MR imaging demonstrated a hypointense lesion with strong homogeneous enhancement after intravenous administration of gadolinium (Fig. 1A, C). Multiple cysts were present at the periphery and within the tumor (Fig. 1B, C). \(^{T_2}\)-weighted MR imaging demonstrated peripheral edema predominantly in the left occipital lobe (Fig. 1D). The largest dimension of the tumor, including the cysts, was 78 mm, and that of the largest cyst was 25 mm. The cysts were hypointense on \(^{T_1}\)-weighted MR imaging and hyperintense on \(^{T_2}\)-weighted MR imaging, indicating that the cyst contained cerebrospinal fluid or low protein content, for example xanthochromic fluid. The patient underwent tumor biopsy, but the cysts were not opened. The histological diagnosis was germinoma. The Ki-67 labeling index was 48%. Necrotic tissue was noted in a few areas. He received radiotherapy and three cycles of cisplatin and etoposide chemotherapy. The tumor disappeared and no recurrence has been detected in the 6 years after chemotherapy.

Case 2: A 22-year-old right-handed male presented with a 4-month history of memory disturbance and untidy behavior 1 month previously. Physical examination disclosed he was alert and oriented. He
had no neurological deficit. T1-weighted MR imaging demonstrated a hypointense lesion in the corpus callosum with strong homogeneous enhancement after intravenous administration of gadolinium (Fig. 2A, B). Multiple cysts were present at the periphery and within the tumor. T2-weighted MR imaging demonstrated peripheral edema, predominantly in the right frontal lobe (Fig. 2C). The largest dimension of the tumor, including the cysts, was 62 mm, and that of the largest cyst was 27 mm. The patient underwent right frontal craniotomy for resection of the anterior corpus callosum lesion. Xanthochromic fluid was found in the cyst. The histological diagnosis was germinoma. The Ki-67 labeling index was 65%. Necrotic tissue was noted in a few areas. He received radiotherapy and two cycles of cisplatin and etoposide chemotherapy. The tumor disappeared and no recurrence has been detected in the 2 years after chemotherapy.

**Case 3:** A 13-year-old right-handed boy presented with delayed psychomotor development and convulsions. He had suffered left hemiparesis and convulsions 9 months previously. T1- and T2-weighted MR imaging demonstrated previously. T1- and T2-weighted MR imaging demonstrated a cystic lesion in the right temporal lobe. CT showed strong enhancement of

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**Fig. 1** Case 1. Coronal T1-weighted magnetic resonance (MR) image showing a lesion in the corpus callosum with enhancement (A), but no lesion in the pineal area. Axial T1-weighted MR images showing large multiple cysts (B, C). Axial T2-weighted MR image showing peritumoral edema (D).

**Fig. 2** Case 2. Axial T1-weighted magnetic resonance (MR) image showing a lesion in the corpus callosum with large multiple cysts (A). The lesion showed strong homogeneous enhancement with gadolinium (B). Axial T2-weighted MR image showing peritumoral edema (C).

**Fig. 3** Case 3. Computed tomography (CT) scan showing a cystic mass with a high-density wall in the right temporal lobe (A). CT scan showing strong enhancement of the cyst wall (B).
the cyst wall (Fig. 3). The largest dimension of the tumor, including the cyst, was 74 mm, and that of the cyst was 72 mm. He underwent right craniotomy and the cyst wall was resected subtotally. Xanthochromic fluid and blackish-red hematoma was found in the cyst. The Ki-67 labeling index was 67%. No necrotic tissue was present. He received radiotherapy and two cycles of cisplatin and etoposide chemotherapy. The tumor disappeared and no recurrence has been detected in the 3 years after chemotherapy.

Discussion

The present three cases of germinoma in atypical locations all contained cystic components larger than 25 mm, and the tumors were larger than 60 mm. These specific findings are not common in germinoma in the usual locations.20 The Ki-67 staining index was 48–67% in these three cases, and is 40–75% in germinoma in the usual locations.9) Germinomas in atypical locations do not tend to become large because of the high proliferation potential. Germinoma in the pineal region or suprasellar area is often identified before becoming too large or developing a cyst because symptoms such as increased intracranial pressure due to hydrocephalus, eye movement disorders, visual disturbance, visual field disorders, and diabetes insipidus develop even if the tumor and cyst are small.20) On the other hand, germinoma in the basal ganglia can often be quite large with a cyst before discovery due to the absence of symptoms.5,7,13) Similarly, germinoma in the frontal lobe, the temporal lobe of the subordinate hemisphere, or the corpus callosum is usually large and contains a large cyst because of the minimal or nonspecific clinical findings.5,6,15,19)

All cases of germinoma arising from atypical locations, including those in this study, which were largely unfocused, had large cysts.6,8,15,19) Cysts are found in about 40% of germinomas.2,11,20) However, cysts occur in 50–100% of germinomas in the suprasellar area18,20) and 83–90% in the basal ganglia.5,7,13) In addition, most of these cases are multiple cysts.5,7,16,20) Therefore, most germinomas have cysts, except for those in the pineal gland, which agrees with the present neuroimaging features of germinoma. Hemorrhage may contribute to the cyst formation, since the cyst fluid is most often xanthochromic.5,7,13,19) Furthermore, the course of cyst formation due to hemorrhage could be followed by imaging in some cases.8,13)

In conclusion, these results suggest that asymptomatic germinomas that occur in atypical locations are characteristically large tumors with large cysts caused by repeated hemorrhage.

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References


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