Primary frontoparietal lobe convexity germinoma with dural invasion mimics meningioma

Xituan Ji, *PhD, MD,* ***Xiaodong Chao,*** *PhD,* ***Zhou Fei,*** *PhD, MD,* ***Yu Zhao,*** *PhD.*

ABSTRACT

تعد الأورام الجرثومية داخل القحف من الحالات النادرة جداً حيث أنها تشكل ما نسبته 0.4–3.4% من مجموع الأورام الأخرى الرئيسية التي تنمو داخل القحف. تنشأ مثل هذه الأورام النادرة في بنية الخط الناصف لدى البالغين، كما تعد الغدة الصنوبرية من أكثر المناطق التي تنتشر فيها هذه الأورام. نستعرض في هذا المقال حالة نادرة لمريض يبلغ من العمر 19 عاماً، وقد أسفرت نتائج الأشعة في البداية عن وجود أورام مشابهة للورم السحائي، وبعد ذلك اتضحت إصابته بأورام جرثومية ضخمة داخل القحف في نصف الكرة المخيخية. لقد كان التشخيص السريري الصحيح لمثل هذه الحالة صعباً وذلك بسبب ندرة أعراضها السريرية، وموقع حدوث الورم، بالإضافة إلى نتائج التصوير الإشعاعي التي لم تظهر التشخيص بدقة. واعتماداً على هذه الحالة فإننا توصلنا إلى أنه يمكن تشخيص الورم على أنه جرثومياً عند نشوءه في نصف الكرة المخيخية مع انتشاره في الجافية، وإذا كان مشابهاً في نتائجه لنتائج الأورام السحائية وخصوصاً لدى البالغين. ونحن ننصح بأخذ خزعة مجمدة أثناء الجراحة من أجل المساعدة في التوصل إلى التشخيص السريع والعلاج الفعال.

Intracranial germinomas are rare and account for only 0.4-3.4% of primary intracranial tumors. They develop mainly in the midline structures in adolescents. The pineal gland is the most common site of this tumor. Here, we describe an unusual case of a giant primary intracranial germinoma located in the intracranial hemisphere with radiological findings that mimicked a meningioma. The clinical diagnosis of the intracranial germinoma was difficult because of its unusual clinical presentation, the location of the lesion, and atypical imaging findings. Based on this case study, we suggest that germinoma might be a possible diagnosis when a tumor of the hemispheres with dura invasion mimics meningioma, especially in young patients. Furthermore, we recommend that frozen biopsy sections should be taken routinely during surgery to aid in rapid diagnosis and effective therapy.

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From the Department of Neurosurgery (Ji, Chao, Fei), Xi Jing Hospital, and the Institute of Neuroscience (Zhao), Fourth Military Medical University, Xi'an, P. R. China.

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Address correspondence and reprint request to: Dr. Zhou Fei, Department of Neurosurgery, Xijing Institute of Clinical Neuroscience, Xi Jing Hospital, Fourth Military Medical University, Xi'an, Shannxi 710032, P. R. China. Tel. +86 (29) 84775330. Fax. +86 (29) 84775567. E-mail: feizhou@fmmu.edu.cn

Germinomas in the CNS typically develop as midline mass lesions during the first 3 decades of life. Intracranial germinomas mainly occur in the pineal region and occasionally in the suprasellar region or the floor of the third ventricle. Ectopic germinomas originating in other regions of the brain are rare.[1,2] To date, little is known about cases of primary intracranial germinomas in the cerebral hemisphere. Here, we described an unusual case of a giant primary intracranial germinoma located in the intracranial hemisphere with radiological findings that mimicked a meningioma. It had a nonspecific clinical manifestation and was successfully treated by surgery, chemotherapy, and radiotherapy, resulting in a good clinical outcome. Our objective in presenting this particular case is to recommend that frozen biopsy sections should be taken routinely during surgery for this kind of patient.

Case Report. The ethics committee of the Fourth Military Medical University approved this study, and written informed consent was obtained from the patient. A 19-year-old man from a remote and poor area in China was admitted to the Xi-Jing Hospital, Fourth Military Medical University in May 2006. He complained of a mild headache, fever for 3 months, and occasional nausea and vomiting. The fever usually appeared from 3 p.m. to 1 a.m. and body temperature ranged from 37.5-38.3°C. There was no history of night sweats and hemoptysis. Routine blood test results were normal. He had no history of contact with tuberculosis, and the tuberculin test was negative. Erythrocyte sedimentation rate was in the normal range. The results of other laboratory tests and physical examination revealed that the patient had been infected with hepatitis B, although

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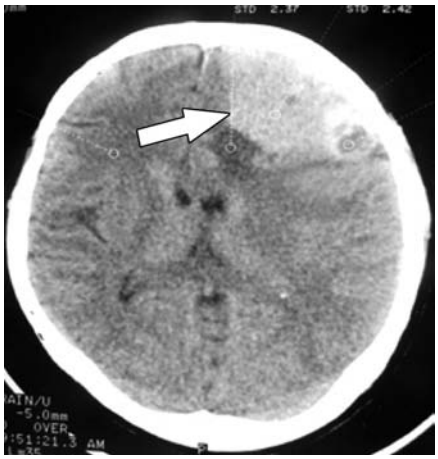

Figure 1 - A representative plain CT scan image showing a large uneven high density lesion (arrow) in the frontal lobe convex that was attached to the local dura.

liver function had recovered to the normal level. No positive signs of neurological disorders were found. He had an incision on the right side of his scalp that resulted from surgery to treat an epidural hematoma that developed after a traffic accident when he was 10 years old. An unenhanced CT scan of the head revealed a large, uneven, high-density lesion in the left frontoparietal lobe convex that was attached to the local dura mater (**Figure 1**). Brain contrast-enhanced axial, sagittal, and coronal T1-weighted MRI (Philips, Achieva 1.5T A-series MRI, Best, Netherlands) showed an apparent contrast-enhanced effect of the lesion and hyperostotic meninges next to the lesion (**Figure 2**). Cerebrospinal fluid examination and serological screening for tumor markers were normal. He was admitted to the hospital with a presumptive diagnosis of having a meningioma in the left frontoparietal lobe. The tumor was identified and totally resected by the left frontoparietal surgical approach 3 days after the diagnosis. Encroachment of the tumor into the dura mater was observed in the left frontoparietal lobe during the operation. The tumor had no envelope at all. Although the boundary of this tumor was distinct, invasion of the tumor into normal tissue around the tumor was found. Microscopically, hematoxylin and eosin (HE) staining[3] demonstrated that the lesion was composed of large, uniform cells with a distinct cell membrane, a clear and glycogen-rich cytoplasm, and round nuclei with conspicuous nucleoli. The cells were arrayed in small lobules with intervening fibrous septa. Infiltration of lymphocytic tissue was observed (**Figure 3a**). The pathological diagnosis was germinoma. To further identify the nature of the tumor and find a proper treatment, a number of highly specific immunohistochemical markers for intracranial tumors were used (all from Santa Cruz Biotechnology, Santa Cruz, California, USA).[4] The results of immunohistochemical analysis demonstrated that the tumor cells were diffusely and intensively immunoreactive for placental alkaline phosphatase (PLAP) and kit-c (CD117), whereas they were negative for epithelial membrane antigen (EMA), leukocyte common antigen (LCA), and vimentin (Santa

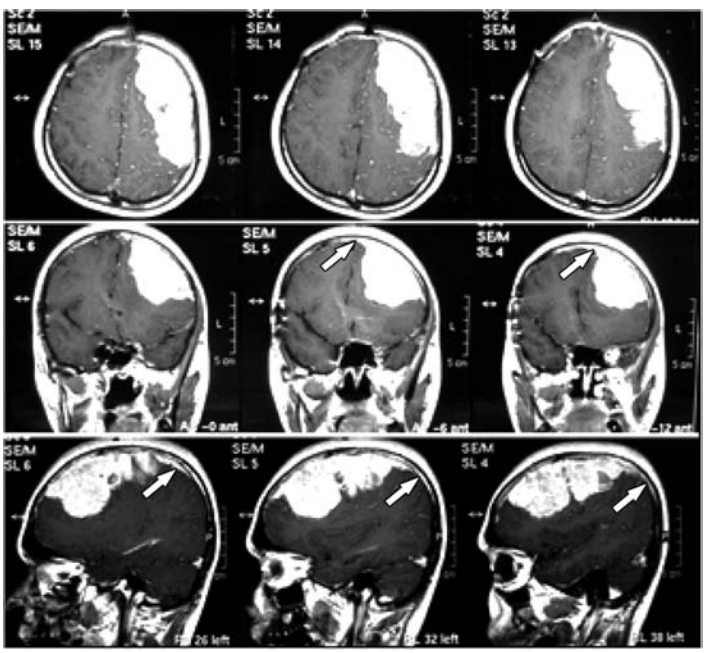

Figure 2 - Contrast-enhanced axial, coronal, and sagittal T1-weighted MR images showing the apparent contrast-enhanced effect of the lesion (arrows) and the enhancement of the dura mater next to the lesion (arrows indicate invasion of the dura matter).

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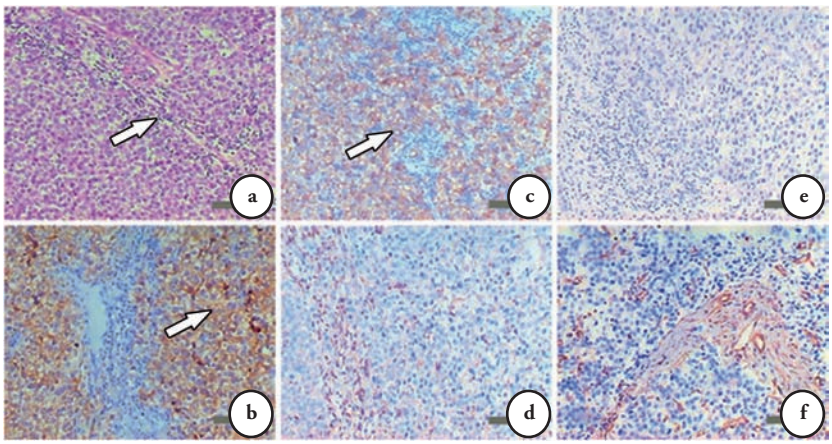

Figure 3 - Immunohistochemical staining of the intracranial tumor showing: **a**) Histological section of the lesion showing the cells characteristic of germinoma (hematoxylin and eosin stain). **b**) PLAP-positive cells were brown. The lymphocytes and fibrocytes were PLAP negative. Lymphocytes are the round cells stained with blue. Fibrocytes are the light blue fusiform-like cells. **c**) Expression of CD-117-positive cells in the cellular membrane; expression was negative in the lymphocytes. **d**) The expression of LCA was positive in the lymphocytes and negative in the tumor cells. **e**) Negative staining for EMA in the section of the lesion (the streptavidin-biotin complex method was used). **f**) Vimentin staining was negative in both tumor cells and lymphocytes, but positive in the fibrocytes. Scale bar = 100 µm. PLAP - placental alkaline phosphatase, LCA - leukocyte common antigen, EMA - epithelial membrane antigen (arrows indicate positive cells).

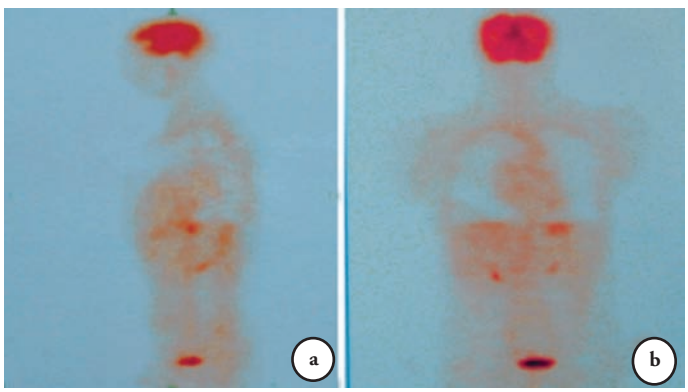

Figure 4 - Patient PET scan showing no positive regions. **a**) Lateral view. **b**) Anteroposterior view. PET - positron emission tomography.

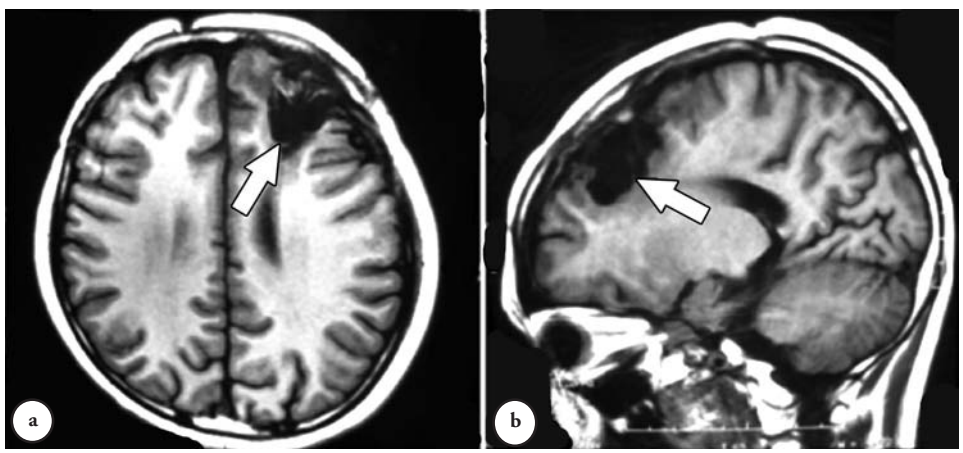

Figure 5 - Unenhanced, postoperative **a**) axial and **b**) sagittal T1-weighted MR images showing the low-signal cerebromalacia region of the left frontoparietal lobe 3 years after resection of the tumor (arrows).

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Cruz Biotechnology, Santa Cruz, California, USA) (**Figure 3**). To exclude secondary germinoma originating in other parts of the body, positron emission tomography (PET) (Philips, CPET+, Shanghai, P. R. China) was used as an additional tool to identify the origin of the tumor, judge the feasibility of using radiotherapy, and predict the prognosis of the patient. The result of the PET scan was negative (**Figure 4**). Postoperatively, chemotherapy (cisplatin-etoposide) for 4 weeks following 30 Gy whole brain irradiation resulted in a complete response of the lesion so that secondary lesions did not form in the original position or in other sites of the brain. During the 4 weeks, he was treated with irradiation of whole brain and the spinal cord in fractions of 1.6 Gy, to a total dose of 44.8 Gy, which effectively reduced the complications that can occur due to irradiation. He was followed-up for 3 consecutive years. He recovered well and lives his life normally. However, he recently complained of deteriorating memory and vision. An MRI examination showed extensive brain atrophy but no evidence of tumor recurrence (**Figure 5**).

Discussion. Intracranial germinomas are rare and represent only 0.4–3.4% of all primary intracranial tumors.[5] Germinomas occur predominantly in children, with a peak incidence around 12 years of age.[6] They occur mainly in the midline structures in adolescents, and the region of the pineal gland is the most common site. Germinomas in other sites, such as the basal ganglia, the cerebellum, the cerebellopontine angle, and the lower brainstem, have been reported.[7] These tumors are sensitive to both radiotherapy and chemotherapy.[8] Depending on anatomical localization, patients with germinomas may present with a range of neurological, endocrine, and psychiatric symptoms. Typical symptoms and signs for germinomas are diabetes insipidus, visual field deficits, hypopituitarism, Parinaud's syndrome, and/or symptoms of increased intracranial pressure due to hydrocephalus.[9] On both T1- and T2-weighted images, the signal intensity is almost the same as that of the adjacent brain tissues, whereas on contrast enhanced images, the lesion usually shows an intense and homogeneous contrast enhancement. Patients with a germinoma usually have an excellent prognosis, with an overall survival of 90% for 10 years.

In this case study, the radiological features of a germinoma were absent. Based on the imaging findings, the differential diagnosis included meningioma, glioma, lymphoma, tuberculoma, and metastatic brain tumor. In this case, although a significant mass effect and enhancement after gadolinium administration was present, germinoma was difficult to differentiate from meningioma solely by the MRI results. Moreover, the plain CT scan showed that an uneven, high-density, large volume lesion with a distinctive boundary was located at the convex of the left frontoparietal lobe. Contrast-enhanced axial, sagittal, and coronal T1-weighted MRI images showed an apparent contrast-enhanced effect of the lesion and hyperostotic meninges next to the lesion. No edema was found in the surrounding tissues of the tumor. There were no available techniques to exclude other types of brain tumors before operation, especially meningioma. Germinoma is not amenable to surgical resection, however, in this case, the operation and accurate histological diagnosis were necessary to choose appropriate treatment. Based on these considerations, we used a range of markers, including PLAP, CD117, EMA, LCA, and vimentin, which are the markers used to identify carcinoma, melanoma, and primary lymphoma of the CNS. We diagnosed the tumor because of the compatible findings of histology and immunostains (namely, positive PLAP).

This case is accessible, although it is uncommon and exceptional in the location of the tumor, because the large mass lesion was obvious. Based on our experience with this case, we believe that total surgical resection followed by irradiation and chemotherapy will provide a good prognosis. The present case provides further radiographic evidence that might be useful for the future diagnosis of germinomas, which are radiosensitive and potentially curable. In addition, to obtain a fast and accurate pathological diagnosis, frozen sections should be collected during the removal of the tumor.

In conclusion, although germinomas that invade the dura mater are rare, they should be included in the differential diagnosis of hemispheric lesions, especially for young patients with dura invasion by tumors that mimic meningioma. Moreover, it is difficult to make a preoperative diagnosis under such conditions. We recommend that frozen biopsy sections should be taken routinely during surgery to aid in rapid diagnosis and effective therapy. In addition, immunohistochemical detection might be an additional approach to identifying some of these lesions.

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