

Germinoma of the Basal Ganglia and Thalamus - CT and MRI Findings

L W Wong, C R Jayakumar

ABSTRACT

A case of germinoma originating in the basal ganglia and thalamus is presented. This tumour most commonly originates during childhood and adolescence, at pineal and suprasellar regions.

In the early stages, the diagnosis of germinoma in the basal ganglion and thalamus is difficult because of its rarity and non-specific findings. The computed tomography (CT) and magnetic resonance imaging (MRI) findings though non-diagnostic, are discussed here.

A few differential diagnoses had been discussed with radiological abnormality. Open biopsy done in this case proved to be two-cell pattern germinoma.

Early detection of the tumour is desirable, since this tumour is highly sensitive to radio and chemotherapy and is potentially curable. Our patient was treated with combined chemotherapy and the response was well and no residual tumour or recurrence was seen on the repeated imaging modality, however his neurological deficits remained unchanged.

Keywords: computed tomography, germinoma, magnetic resonance, chemotherapy, basal ganglion/thalamus

CASE REPORT

A 12-year-old Chinese boy was admitted in November 1994 to our department with left hemiparesis. He has been completely healthy until a fall 2 years prior to admission. After that he developed weakness in the left lower limb. The weakness was said to be non-progressive until 9 months prior to admission when he had another fall. This time, he began to develop weakness in the left upper limb. The patient did not have any history of headache, blurring or double vision, nausea, vomiting, involuntary movement, sensory or sphincteric disturbances. The patient gave no history of seizures.

Neurological examination revealed a left hemiparesis with hyper-reflexia and up-going Babinski reflex on the left side. There was also an isolated left twelve cranial nerve palsy. The rest of the cranial nerves were intact. There were no sensory deficit, papilloedema or cognitive dysfunction. Serum human chorionic gonadotrophin (HCG) and alpha fetoprotein levels were not elevated.

Computed tomography (CT) scan showed a large hyperdense mass in the right basal ganglia and

thalamic region. It has an ill-defined margin and has infiltrated into the right cerebral peduncle and right internal capsule. Minimal peritumoral oedema was seen. The mass lesion enhanced with intravenous contrast.

Magnetic resonance imaging (MRI) disclosed a tumour of mixed signal intensity (from low to isointense on T1-weighted images). On T2-weighted images, the tumour showed predominant hyperintensity. Perifocal low signal intensity on T1-weighted images and high signal intensity on T2-weighted images confirmed the presence of peritumoral oedema. The tumour enhanced with intravenous gadolinium (Gd-DPTA). There was minimal mass effect on the anterior horn of the right lateral ventricle. The right Sylvian fissure and cortical sulci were more dilated compared to the left, suggestive of ipsilateral cortical atrophy.

Open biopsy showed the tumour was composed of large polyhedral cells with abundant vacuolated cytoplasm and large central basophilic nuclei with prominent lymphocytes response. This is typical of two-cell pattern germinoma⁽²⁾.

He was treated with combined chemotherapy (carboplatinum, VP 16 and bleomycin) and responded well with neither evidence of residual tumour nor recurrence as seen on the repeat CT scan done on 29 May 1995. However his neurological deficits remained unchanged.

DISCUSSION

Intracranial germinomas constitute about 1% of all intracranial neoplasms⁽¹⁾. They form the most common pineal tumour and occur commonly during childhood and adolescence. The CT findings of germinoma in the pineal and suprasellar regions have been well-documented⁽²⁻⁴⁾. They appear as well-defined, round and homogenous areas of iso- to slightly increased density as compared to surrounding gray matter. Calcification of the tumour is rare. The tumour tends to enhance homogeneously though some occasionally show single or multiple low densities indicating the presence of cysts. When large, the tumour margin of the high density becomes irregular, suggesting infiltration.

The incidence of germinoma in basal ganglia and thalamus has been estimated to be around 10% of all intracranial germinomas⁽⁵⁾. The diagnosis of germinoma in this region is difficult at the early stage

Department of Radiology
University Hospital
50603 Kuala Lumpur
Malaysia

L W Wong, MBBS
Senior Resident

C R Jayakumar, MD, DMRD
Associate Professor

Correspondence to:
A/Prof C R Jayakumar

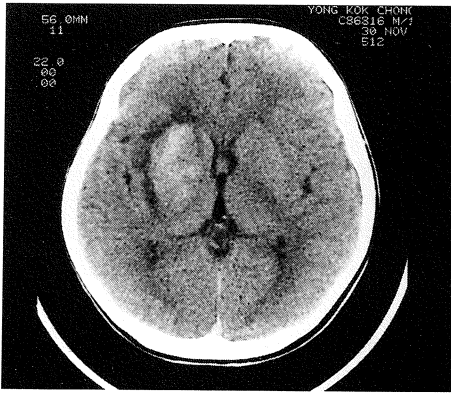


Fig 1 - Unenhanced CT scan showing inhomogenous hyperdense mass lesion in the right basal ganglia and thalamus. There is peritumoral low density noted suggestive of oedema.

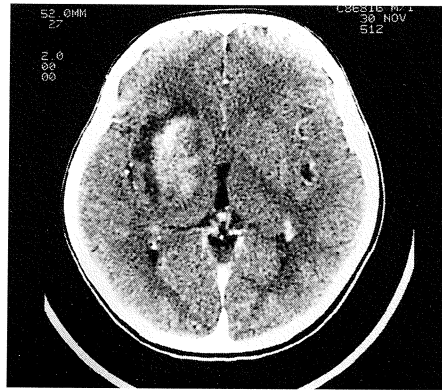


Fig 2 - Post-contrast CT scan showing slight enhancement of the tumour.

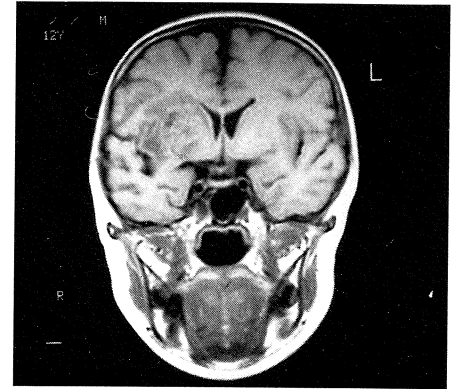


Fig 3 - Coronal T1-weighted MR image showing a low to iso-intense tumour in the right basal ganglia and thalamic region. The anterior horn of the right lateral ventricle is compressed but the right Sylvian fissure and cortical sulci are slightly dilated, consistent with ipsilateral cortical atrophy.

because of its rarity and non-specific findings. The CT scan findings of germinoma in the basal ganglia and thalamus are somewhat different from those of the pineal and suprasellar regions. Soejima et al⁽⁶⁾ and Kobayashi et al⁽⁵⁾ reported normal CT findings in the initial examination of germinoma cases of this region. The early abnormality on plain CT scan of germinoma in this region is a homogenous or inhomogenous area of slightly higher density without any mass effect. Cysts and calcifications are said to develop at a relatively early stage of the disease. The tumour shows mild to moderate and inhomogenous enhancement with intravenous contrast medium. In the advanced case, as in our patient, the tumour showed infiltration of the surrounding tissue and mass effect with perifocal oedema. Ipsilateral cerebral hemiatrophy is frequently seen in the advanced stage⁽⁵⁻⁸⁾.

The MR imaging of the basal ganglia germinoma is non-specific with the solid area being isointense to low on T1-weighted images and isointense to high on T2-weighted images^(7,8). They often show contrast enhancement. However, MRI is superior to CT in evaluating precise tumour extension, cystic component and intratumoral haemorrhages⁽⁸⁾. The cystic portion of the tumour usually appears as iso- to hypointense relative to brain parenchyma on T1-weighted images and iso- to hyperintense to CSF on T2-weighted images. Intratumoral haemorrhage⁽⁹⁾ usually appears as an area of hyperintensity on T1- and T2-weighted images indicating extracellular methaemoglobin or as marked hypointense precipitate in the cystic portion on T2-weighted images^(8,10), which suggests deoxyhaemoglobin component. Anno et al⁽¹¹⁾ also reported a case of basal ganglionic germinoma with old haemorrhage with a surrounding hypointense rim on T2-weighted images (due to degenerated cerebral parenchyma containing haemosiderin).

CT scan is superior to MRI in demonstrating calcification and the high density seen in the solid tumour on plain CT is more characteristic and helpful in the differential diagnosis. The differential diagnosis

should include glioma, lymphoma, cavernous angioma, and other germ cell tumours. It may be difficult to differentiate germinoma from glioma and lymphoma of basal ganglia on the basis of imaging findings alone. Germinoma is more likely when unenhanced CT scans show a high density mass; low-grade glioma is usually isodense to hypodense. The solid portions of germinoma, malignant glioma and lymphoma are all hyperdense on unenhanced CT scans and relatively isointense on MR images for all pulse sequences, due to the tumours' high cellularity and relatively low water content. Cystic changes, intratumoral haemorrhage, and a heterogeneous pattern of contrast enhancement are more frequent in germinoma and malignant glioma. Other germ cell tumours may show similar radiologic features and thus assays of serum and CSF for tumour markers may be helpful. Cavernous angiomas can arise in the basal ganglia. It may show areas of calcifications and intratumoral bleed on unenhanced CT scans. A reticulated core of mixed signal intensities combined with a surrounding rim of decreased signal intensity on the T2-weighted MRI is strongly suggestive of a cavernous angioma (the core consists of the angioma itself and chronic haemorrhage, and the rim is due to haemosiderin within macrophages). A striking male preponderance and the fact that germinoma tends to occur in children and young adults together with a high prevalence in the Far East such as Japan are important for its early detection and differential diagnosis from other kinds of mass lesions in the basal ganglia and/or thalamus⁽¹²⁾.

Early diagnosis of germinoma is important because this tumour is highly sensitive to both radiotherapy^(2,13-16) and chemotherapy^(17,18), and is potentially curable. The prognosis without treatment is poor. An advanced stage of disease with considerable degree of hemiatrophy usually results in residual neurological dysfunction of the patient after treatment due to incomplete recovery of hemiparesis and/or impairment of intelligence as in the present case. Early detection is therefore essential for a better outcome.

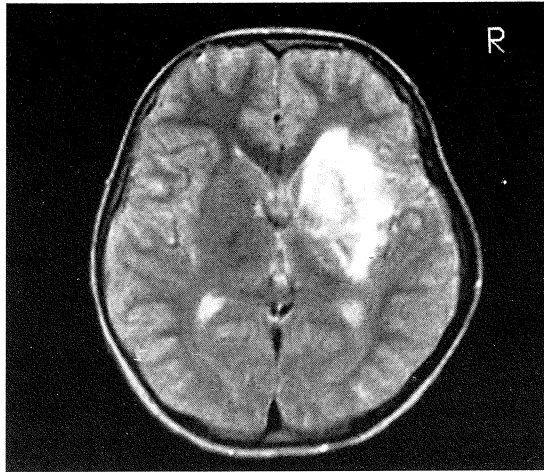


Fig 4 - Axial T2-weighted MR image shows that the mass is predominantly of high signal intensity. Peritumoral oedema is seen as high signal intensity around the mass.

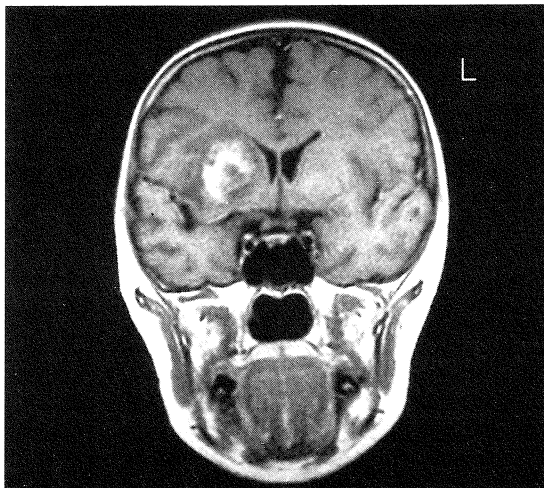


Fig 5 - Coronal T1-weighted MR image obtained after intravenous gadolinium shows enhancement of the tumour.

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