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CASE REPORT

Unilateral Germinoma in the Basal Ganglia: Computed Tomography and Magnetic Resonance Imaging Findings

KM Auyeung,[1] PL Khong,[2] HKF Mak,[3] GCF Chan[4]

[1]Department of Radiology, The Hong Kong Sanatorium and Hospital, [2]Department of Diagnostic Radiology, The University of Hong Kong, Queen Mary Hospital, [3]Department of Diagnostic Radiology and Organ Imaging, Prince of Wales Hospital, and [4]Department of Paediatric and Adolescent Medicine, The University of Hong Kong, Hong Kong

ABSTRACT

This report describes the clinical presentation and imaging findings of a young boy with an uncommon brain tumour, basal ganglia germinoma. The evolution of the tumour on magnetic resonance imaging is illustrated.

Key Words: *Basal ganglia; Germinoma; Magnetic resonance imaging*

INTRODUCTION

Primary intracranial germ cell tumour (GCT) is a rare malignant brain tumour accounting for 0.5% to 3.2% of primary intracranial tumours in adults and 11.8% in children.[1] The midline pineal and suprasellar regions are the most common sites of involvement, comprising 76% to 90% of primary intracranial GCTs.[2-4] Other rarer sites include the basal ganglia and thalamus,[5-13] cerebellar vermis,[14] pituitary fossa,[15] ventricular system,[16] and optic chiasm.[17] This report is of the presentation, clinical course, and magnetic resonance imaging (MRI) findings of a young boy with a basal ganglia germinoma. This presentation was a diagnostic challenge with delayed diagnosis made over a 6-year period.

CASE REPORT

A 13-year-old right-handed boy presented to a paediatric neurologist with recurrent syncope since he was 7 years. He was otherwise well but had been seen by a clinical psychologist at the age of 8 years for behavioural problems. He was diagnosed with psychosomatic manifestations of depression. His school performance and handwriting gradually deteriorated when he was 11 years. He was then referred to a neurologist. Physical examination revealed a well-orientated boy with a paucity of facial expression. He had dystonia over his right hand during writing, that was aggravated by stress. His right upper and lower limbs were hyper-reflexic. Limping and unsteady gait of his right lower limb was noted. Other organ systems were unremarkable.

Investigations of serum copper, ceruloplasmin, lactate, and pyruvate levels were all within normal range.

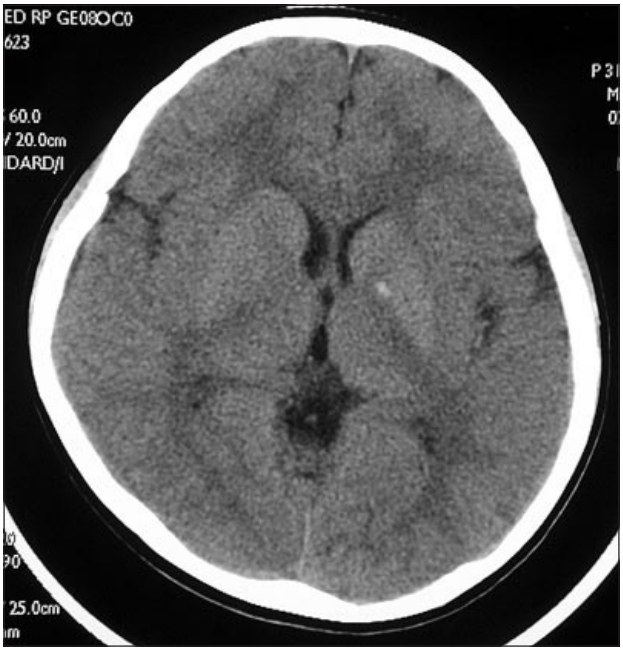

Figure 1. Non-contrast computed tomography scan at the level of the basal ganglia shows a small focus of calcification at the left globus pallidus.

Correspondence: *Dr PL Khong, Department of Diagnostic Radiology, The University of Hong Kong, Queen Mary Hospital, 102 Pokfulam Road, Hong Kong.*
Tel: (852) 2855 3307; Fax: 2855 1652;
E-mail: plkhong@hkucc.hku.hk

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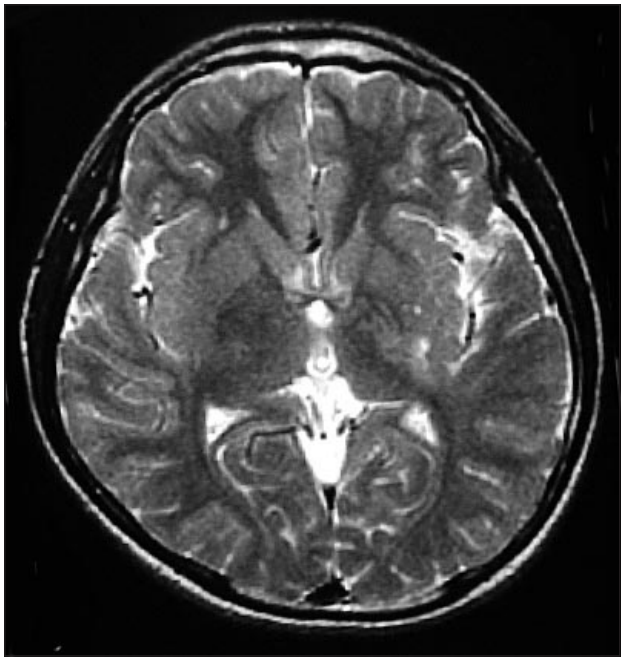

Figure 2. Axial T2-weighted magnetic resonance imaging at the level of the basal ganglia shows an ill-defined area of hyperintensity in the left globus pallidus and posterior aspect of the lentiform nucleus, with small punctuate hyperintense foci within.

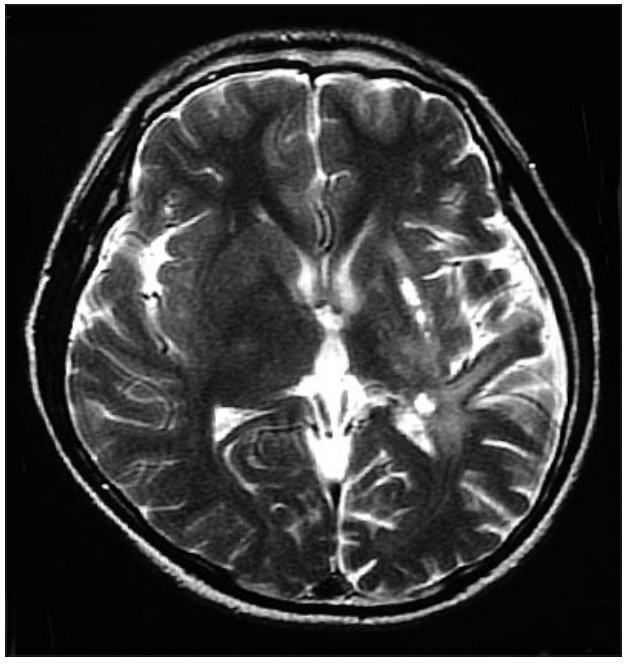

Figure 3. Axial T2-weighted magnetic resonance imaging at the level of the basal ganglia shows extension of the hyperintense lesion to involve the whole lentiform nucleus, and the posterior limb of the internal capsule to the ventromedial aspect of the thalamus. There is volume loss in these regions and the foci of hypertensity are enlarged.

Computed tomography (CT) of the brain, done when he was 11 years and 10 months, showed a small focus of calcification over the left basal ganglion (Figure 1). MRI of the brain performed at the age of 12 years showed T2-weighted hyperintense signals over the left lentiform nucleus and adjacent posterior limb of the internal capsule, with extension to the corona radiata of the left cerebral hemisphere (Figure 2). Contrast-enhanced scans were not performed at the time as there was no suspicion of tumour. Proton-MR spectroscopy was normal, based on visual inspection of the metabolite ratios. Positron emission tomography (PET) scan of the brain, done at 13 years for a suspected ischaemic lesion, revealed diffuse hypometabolism of the left cerebral hemisphere. Repeat MRI of the brain at 13 years and 2 months showed left cerebral atrophy with T2-weighted hyperintensity at the left basal ganglion and centrum semi-ovale (Figure 3). Proton-MR spectroscopy over these areas showed a decrease in N-acetyl aspartate/total creatine and elevated choline/total creatine. No lactate peak was visualised (Figure 4). MR angiography demonstrated patency of the anterior and posterior circulations on both sides. At this juncture, the diagnosis was cerebral infarct/ischaemia with atrophy.

Follow-up MRI of the brain was done at the age of 13 years and 9 months. A large heterogeneous mass replacing the left thalamus and basal ganglia with multiple cystic components and patchy enhancement was present, in keeping with a brain tumour (Figure 5). Proton-MR spectroscopy showed a markedly elevated lactate peak, markedly reduced N-acetyl aspartate and elevated choline/total creatine (Figure 6). At the brainstem, atrophy of the left side of the midbrain and pons was noted, suggesting Wallerian degeneration.

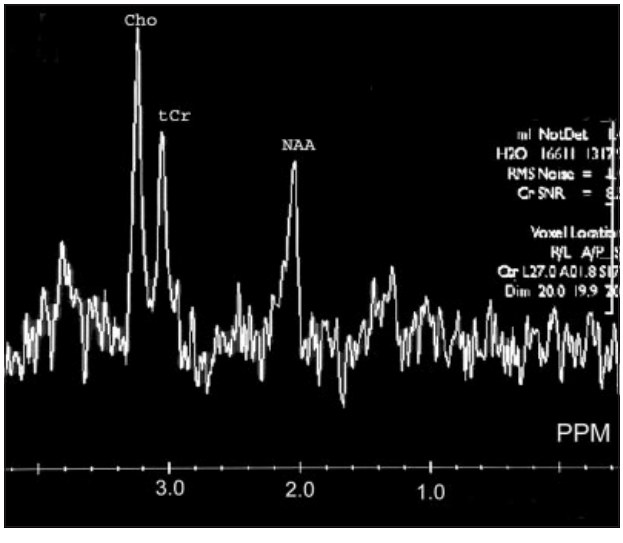

Figure 4. Proton-magnetic resonance spectroscopy shows decrease in N-acetyl aspartate/total creatine and elevated choline/total creatine, with no lactate peak discerned.
Abbreviations: Cho = choline; tCr = total creatine; NAA = N-acetyl aspartate.

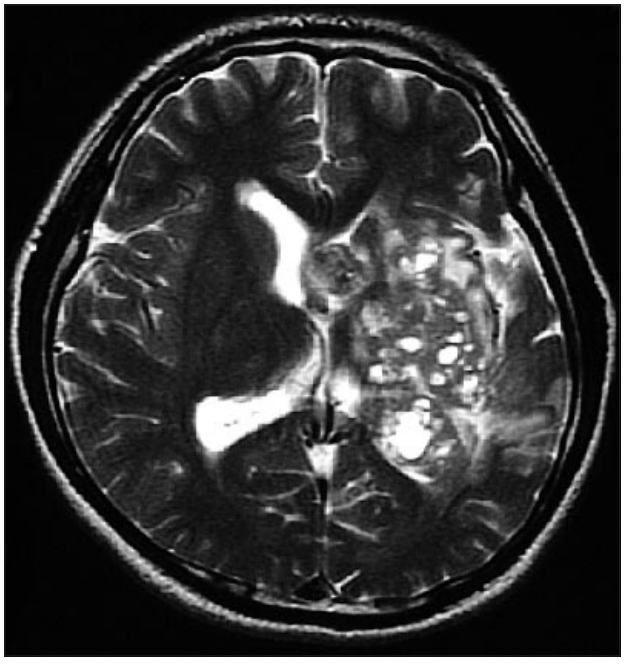

Figure 5. Axial T2-weighted magnetic resonance imaging at the level of the basal ganglia shows a large heterogeneous tumour mass with cystic areas extending to the whole basal ganglia and thalamus, and lateral ventricle.

Brain biopsy showed infiltration of tumour cells, which were large, polygonal, and arranged in nests and aggregates with large round nuclei and prominent central nucleoli. Immunohistochemically, the tumour cells were strongly positive for placental alkaline phosphatase and negative for leukocyte common antigen, glial fibrillary acidic protein, and synaptophysin. Serum β-human chorionic gonadotrophin was elevated to 56 IU/L (normal range, 0-5 IU/L) but α-foetoprotein was within normal range. The final diagnosis of a germinoma of the left thalamus and basal ganglion was made.

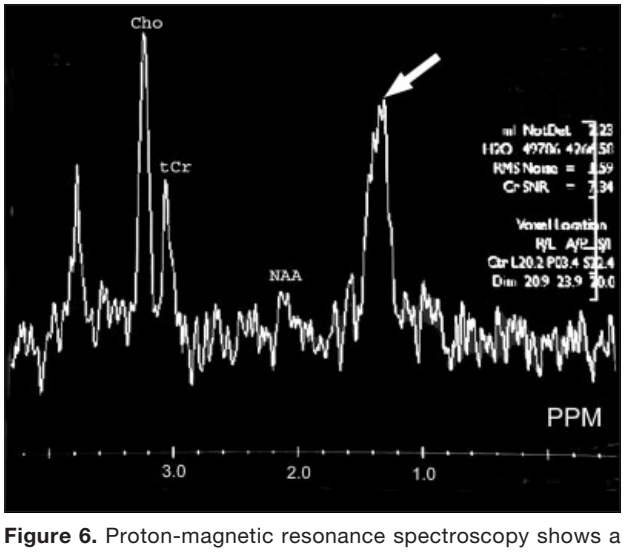

Figure 6. Proton-magnetic resonance spectroscopy shows a markedly elevated lactate peak (arrow), markedly reduced N-acetyl aspartate/total creatine and elevated choline/total creatine. Abbreviations: Cho = choline; tCr = total creatine; NAA = N-acetyl aspartate.

DISCUSSION

Basal ganglia and thalamic GCTs are primarily germinomas, and these locations account for 4% to 14% of all intracranial germinomas.[6-9] Symptoms and signs are varied and those reported include hemiparesis, fever of unknown origin, mental deterioration, psychiatric signs, convulsions, precocious puberty, and diabetes insipidus.[5,6,10,11]

The initial CT scan showed the typical CT feature of calcification in the basal ganglia, and the subsequent MRI showed tumour enlargement, accompanied by mass effect, intratumoural cysts, and haemorrhage. These features have previously been described.[1,11] However, the 'quiescent' period between a small focus of calcification and the development of an aggressive tumour was unusually long in this patient at approximately 4 years. Another unusual feature on imaging was the tumour's presentation as an 'ischaemic' lesion with evidence of volume loss in the adjacent corona radiata and parietal lobe. This ischaemic appearance was supported by the finding of hypometabolism on PET scan. A tendency to ipsilateral hemicerebral atrophy with or without ipsilateral cerebral peduncle atrophy has been reported for basal ganglia GCTs.[5-11] In retrospect, the proton-MR spectroscopy findings of increasing choline/total creatine and decreased N-acetyl aspartate/total creatine were suspicious of tumour (Figure 4).

Although germinomas originating from the basal ganglia and thalamus are generally radiosensitive and potentially curable,[7,11] this patient had residual hemiparesis after treatment. This clinical finding is in concordance with the imaging finding of disrupted posterior limb of the internal capsule by the tumour, compounded by the presence of Wallerian degeneration. Wallerian degeneration has been attributed to tumour involvement of anterograde fibre tracks in the advanced stage of disease.[7,9,10,12,13] Higano et al suggested that such hemiatrophic features tend to be more remarkable when the tumours have irregular margins that extend to the internal capsule, and progression of hemiatrophy has been observed to be parallel with extension of the tumour to the internal capsule.[11]

This report presents the diagnostic challenges at initial presentation and imaging of a patient with a basal

ganglia GCT. The imaging findings of the tumour are reviewed with emphasis on the early apparent 'benign' appearances before the presentation of the full-blown tumour. Knowledge of the CT and MRI findings of this rare, but well-documented tumour is essential for early diagnosis.

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