CHILDHOOD INTRACRANIAL EPENDYMOMA PRESENTING AS CYSTIC SUPRATENTORIAL BRAIN TUMOUR

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ABSTRACT

Supratentorial ependymomas in children are rare, and ependymomas that fill the whole supratentorial hemicramium is even rarer. We present a 5-year old male patient who was admitted with left spastic hemiparesis, generalized tonic-clonic seizures and altered level of consciousness. CT scan revealed a cystic right cerebral mass with secondary obstructive hydrocephalus. A frontoparietal craniotomy for drainage of the cyst and resection of the tumour was performed. The histopathology report indicated an ependymoma. Being the first and only childhood ependymoma in our centre so far, this confirms the rarity of this condition in children and also highlights the diagnostic challenges presented by its atypical radiological appearance.

Key words: Cystic brain tumors - childhood intracranial ependymoma

INTRODUCTION

Approximately 50% of all childhood brain tumours arise in the infratentorial fossa and the most common tumours in this region of the brain are cerebellar astrocytomas, medulloblastomas, ependymomas, and brainstem gliomas [1]. Conversely in the suratentorial fossa, up to 20% of childhood tumours arise in the suprasellar region with craniopharyngiomas, visual pathway gliomas, and germinomas as the predominant tumours and contrasts with gliomas which constitute the majority of childhood cortical tumours with a predominance of low-grade tumours [1]. Ependymomas are rare gliomas and nearly half of the supratentorial ependymomas arise from the wall of the ventricles, while the rest appear to arise from the brain parenchyma [2, 3, 4]. The clinical characteristics and pathological description of the supratentorial ependymomas are not well defined in the literature and therefore still debated [5]. Despite aggressive therapy the attendant outcome for ependymomas has been poor, though the outcome are believed to be better for supratentorial ependymomas than infratentorial ependymomas, largely due to the possibility of performing a gross total resection in the supratentorial space [2]. Our case report highlights the challenges in the diagnosis and treatment of this rare supratentorial mass lesion which presented to us as a cystic, calcified supratentorial brain lesion in a child.

PRESENTATION OF THE CASE

A 5-year old boy, the first born of three siblings was brought by his mother from Goma, Democratic Republic of Congo (DRC) to King Faisal Hospital, Kigali (KFHK) on the 17th October 2009. The mother noticed progressive left sided weakness at 18 months of age. There were associated generalized tonic-clonic convulsions which started shortly after the onset of the weakness. He underwent physiotherapy for the limb weakness with some improvement though he walked with a limp on the left side with the weakness was worse in the upper limb than the lower limb. The convulsions were controlled on antiepileptics. He remained in stable clinical condition until 3 weeks prior to presentation in our hospital when his level of consciousness deteriorated necessitating a visit to Goma Hospital in DRC and subsequent referral for neurosurgical consultation at KFHK.

Neurological examination at KFHK revealed a Glasgow Coma Score (GCS) of 12/15 (E3M5V4) with bilaterally normal and reactive pupils, and a left spastic hemiparesis. Routine blood analysis was normal. Contrast enhanced CT scan of the brain showed a heterogeneously enhancing mass lesion extending from the frontal lobe region to the occipital lobe region. The lesion was considered to be intra-axial and had 2 large cysts, one in the frontal region, and the other in the occipital region. There were associated areas of calcification, subfalcine herniation and entrapment hydrocephalus of the contralateral left ventricle (Fig. 1). The CT scan findings were radiologically suspicious for ependymoma with possible differential diagnosis of Primitive Neuroectodermal Tumour (PNET) and oligodendroglioma.

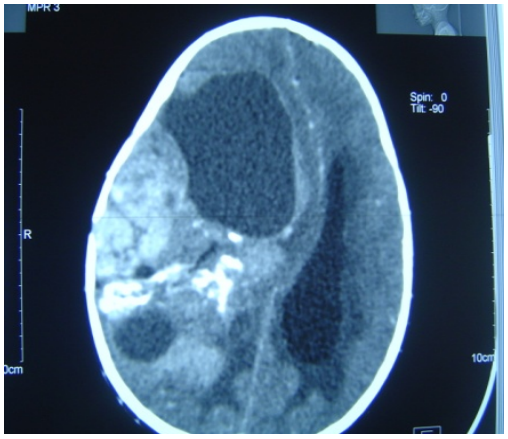

Figure 1: Axial post-contrast cranial CT scan showing cystic right cortical supratentorial lesion with heterogeneous enhancement and areas of calcification

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Frontoparietal craniotomy for gross total removal of a cystic calcified firm mass with a good plane between normal brain and the mass was performed. The tumour resection was performed in 2 stages. Drainage of the large cyst in the frontal lobe and subtotal resection of the tumour was performed at stage 1 while gross total resection of the tumour was performed 10 days afterwards at stage 2. Craniotomy revealed a thin bone which was defective in 2 areas but with intact underlying dura. Sixty five (65) ml of straw coloured fluid was aspirated from the large cyst in the frontal lobe at stage 1. The cyst wall was smooth and whitish in colour. The overlying involved dura was excised, the bone flap was discarded and a cranioplasty was performed with bone cement. He was discharged home five days after tumour resection. He was reviewed 10 days after discharge and CT scan of the brain showed no evidence of residual tumour (Fig. 2). Clinically he was well, alert and with remarkable improvement in his left sided weakness. The operative findings of a bone invasion, dural attachment and firm calcified mass with good plane between normal brain and the mass made us to consider an intra-operative diagnosis of a cystic meningioma as a possible cause of the lesion.

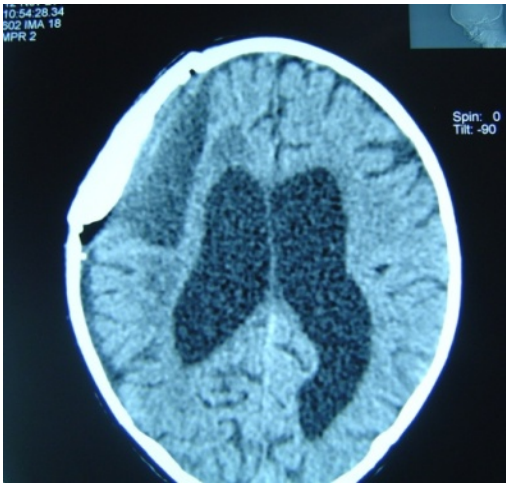
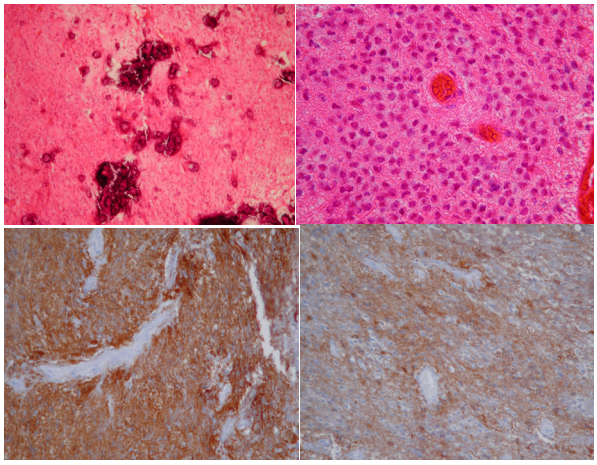


Figure 2: Axial post-contrast cranial CT scan at 10 days postop showing gross total tumour resection

To give the tissue result more credibility, it was sent to a Neuropathologist at Dalhousie Medical School in Halifax, Nova Scotia, Canada. Microscopic sections showed a variably cellular neoplasm with limited invasion of adjacent brain. The neoplasm was predominantly disposed in moderately cellular patternless sheets with frequent interruption by paucicellular zones resembling neuropil. There was discohesion of some regions, with cord-like formations approaching a cribriform pattern. There were zones of coarse microcalcification (Fig. 3) by calcospherites, some of which resembled psammoma bodies. No Rosenthal fiber or eosinophilic granular body was seen. There was no meningothelial whorl. Syncitial nesting was not conspicuous; although there were some foci exhibiting interlacing delicate vessels; most vessels were thin-walled but gaping and engorged with fresh blood. In some areas small vessels were subtended by nuclear-free zones, with subtle centripetal orientation of neoplastic cells (perivascular rosettes) (Fig. 4); no definite ependymal rosette, cleft or tubule was detected. Neoplastic cells possessed scant eosinophilic cytoplasm generally lacking fibrillary processes; however, in one of the blocks there was extensive process formation in a tanycytic pattern. Some regions showed cytoplasmic clearing, but preservation was suboptimal and this may be artifactual. Nuclei were moderate-sized, generally oval and showed mild hyperchromatism with dispersed chromatin; nucleoli were occasionally seen but were not prominent. There was no mitotic activity. There was no microvascular proliferation. Geographic necrosis was noted within zones of heavy calcification; there was no pseudopalisading. Reticulin expression was confined to the vicinity of the vasculature.

Immunohistochemistry (IHC) for GFAP showed variable expression within neoplastic cells (Figs. 5 and 6); suboptimal preservation may account for the lack of uniform positivity. Vimentin was expressed focally. Synaptophysin was not detected in tumour cells, but was strongly expressed in adjacent brain. IDH1 expression was not found. EMA was negative. There was negligible Ki-67 staining, in keeping with the absence of mitotic activity. Pale nuclear INI1 expression was discernable in occasional tumour cells and in normal vascular elements; the pallor of staining may reflect suboptimal tumour preservation.

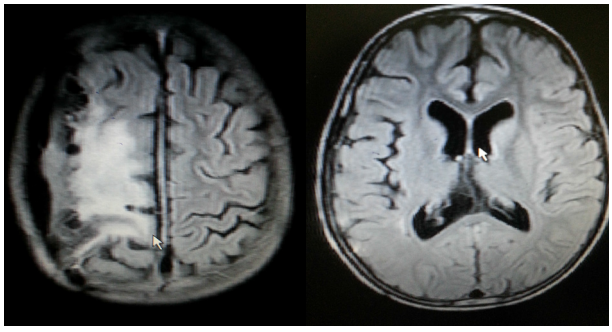


Figures 3, 4, 5 and **6** From top left to right and bottom left to right showing microcalcifications (HE ×40), perivascular rosettes (HE ×40), GFAP ependymal (HE ×40) and GFAP rosettes respectively (HE

The Neuropathologist's comment indicated a broad differential diagnosis including diffuse (low grade) astrocytoma, oligodendroglioma, pilocytic astrocytoma, neurocytoma, cribriform neuroepithelial tumour (CRINET), ependymoma and subependymoma. Meningioma was excluded on the basis of the histopathology, supported by the immunohistochemical results. Fibrillary astrocytoma would show a patternless architecture with diffuse infiltration, and pilocytic astrocytoma should show microcystic zones and Rosenthal fibers. The perivascular rosette formation, variable cellularity, coarse calcification, cytology and GFAP expression are all supportive of a diagnosis of ependymoma; the cellularity is too high for subependymoma. The

recently described CRINET bears some similarity to this case, but this tumour is generally mitotically active and shows loss of INI1 expression. Neurocytoma may show similar features to those described above, but the lack of synaptophysin expression essentially excludes this diagnosis. Suboptimal preservation might have affected the IHC results, particularly for the sensitive Ki-67 and INI1 antigens, which should therefore be interpreted with caution. Grading of ependymoma correlates poorly with clinical behaviour, but there is no histopathologic evidence of tumour anaplasia. Focal clear cell and tanycytic features are of dubious significance. A diagnosis of ependymoma (WHO grade 2) was made.

At his last follow up visit 16 months postoperatively, he has remained well and recommenced schooling. There is no recurrence of generalized tonic-clonic seizures, although he still has minimal residual left sided weakness. Follow up MRI shows no evidence of tumour recurrence (Fig. 6 and 7).



Figures 6 and 7: Axial cranial FLAIR MRI scans at 16 months postop showing areas of gliosis with no evidence of tumour recurrence

DISCUSSION

We considered this case radiologically, operatively and histologically fascinating and hence our presentation of the case.
Ependymomas develop from the neuroepithelial lining of the ventricular system of the central nervous system [3, 7]. They are common in the brain in childhood accounting for 12% of childhood brain tumours [3]. Intracranial ependymomas are located predominantly infratentorially but also occur supratentorially arising from the lateral or third ventricle (60%) or from the brain parenchyma (40%) [3, 6, 7].

It has been theorized that ependymal tumours originate from ependymal cell "rests," which are predominate at ventricular sites that form sharp angles such as spur of the aqueduct of Sylvius, the area adjacent to the trigone of the lateral ventricle, the region near the foramen of Luschka, and in the terminal filum [3, 8]. Supratentorial ependymomas occurring in the brain parenchyma are thought to originate from rests of ependymal cells remaining within the brain parenchyma during embryological development [3, 4].

Supratentorial ependymomas may present with features of raised intracranial pressure, including headache, nausea, vomiting, papilledema and decreasing conscious level. The tumours may also lead to focal deficits such as speech problems and motor weakness. They may also present with seizures which have been reported to occur in one third of the cases [3, 4]. Our patient presented with seizures, motor weakness and decreased level of consciousness consistent with reports in the literature [3, 4]. However, the long duration of symptoms before presentation and spanning over 3 years implies a benign slow growing lesion. Similar observation has been noted in the literature especially for ependymomas originating within the lateral ventricles which are mostly benign [3, 9]. These lateral ventricle tumours usually expand slowly and cause nonspecific symptoms and therefore may grow to a large size before detection [3, 9]. Whereas lateral ventricle ependymomas consistently present with cognitive impairment associated with hydrocephalus [3, 9], parenchymal ependymomas as in our patient tend to present with focal deficts and seizures [3, 9]. This may explain the late presentation in our patient until features of raised intracranial pressure necessitated neurosurgical consultation.

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