

Glioneuronal-mesenchymal tumour with malignant transformation

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Abstract

We report a case of a 10-year-old girl with a tumour of the right temporoparietal region of the brain. The tumour consisted of three morphologically distinct portions: a well-differentiated one containing a mixture of a ganglioglioma with adipocytic-like cells and focal chondroid metaplasia, a separate island with neurocytic differentiation, and the malignant one, which exhibited an organoid pattern (trabecular and festooned) of primitive neuroectodermal tumour (PNET). We hypothesize that the latter component originated from the multicomponental glioneuronal tumour with mesenchymal differentiation and thus that lesion constituted an unusual example of malignant transformation of low-grade glioneuronal neoplasm.

Key words: ganglioglioma, neurocytoma, primitive neuroectodermal tumour, teratoma.

Introduction

Composite glial neoplasms containing, in addition to the gliomatous portion, also mesenchymal components are very rare. Gliomas showing such multidirectional differentiation are usually of ependymomatous or astrocytic origin. The mesenchymal components most frequently identified in these neoplasms are chondroid, osseous and adipose tissue [8,11,12,15,16,22]. These heterologous elements may arise from the mesenchymal stroma, but chondrocytes and adipocyte-like cells may show expression of GFAP, indicating purported aberrant functional capabilities of glioma cells [5,8,11,16,20,23]. In the case of adipocyte-like cells arising within the tumour, the process of lipidization of the primary tumour

cells rather than true adipocytic metaplasia was also suggested [5,16,20,23]. Composite tumours showing adipocyte-like cells within the otherwise non-specific astrocytoma were referred to as astrolipoma [15] or lipoastracytoma [5]. A similar mechanism is responsible for morphologic alteration in the structure of other non-glial neoplasms, such as primitive neuroectodermal tumour or neurocytoma [4,6,19,21]. Only in neurocytic tumours did that phenomenon confer clinical implications and separation into a separate entity, i.e. liponeurocytoma [9].

We identified a composite neoplasm in a 10-year-old girl and its variable histologic appearance required differentiation between teratoma and glioma with heterologous elements (adipocytic and chondromatous) and malignant transformation.

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Case report

A 10-year-old girl complained of recent onset of severe headache, nausea and vomiting. She had been treated for seizures for 3 years but neither CT nor MRI examinations have been performed until her admission to the clinic. CT and MRI scans revealed a non-homogeneous, contrast-enhancing mass in the right temporoparietal region (Fig. 1). It measured 5 × 4 × 4 cm and a small round calcification was identified at its superficial cortical margin. The patient was operated on and the tumour was totally removed. After an uneventful postoperative period, she was transferred to the Regional Oncological Centre for radiotherapy.

Pathologic findings

The tumour had a complex structure and consisted of three portions with distinct histopathological appearances. The largest one was well demarcated from the surrounding brain tissues and consisted of a mixture of diverse cellular elements (Fig. 2A). The predominating cells were astrocytes arranged in short intermingled fascicles separated by apparently normal neuropil with occasional Rosenthal fibres. Among them uni- and multivacuolar cells could be discerned. They were dispersed as single cells or clustered in small aggregations. GFAP immunoreactivity was identified both in the adipocyte-like cells and the astrocytes. In the same area the focus of cartilaginous tissue was also present. The border zone of the hyaline cartilage was surrounded by accumulation of astrocytic cells. Mature neurons made an additional component of that portion as they were scattered in the tumour mass (Fig. 2B).

Adjacent to the main tumour bulk, a separate lesion was found. It was well delineated and surrounded by small calcifications. The nodule was composed of small round cells with clear cytoplasm, distinct cell borders and central round nucleus. They resembled oligodendrocytes (Fig. 3A). No mitotic figures could be identified. Immunohistochemical analysis disclosed synaptophysin positivity (Fig. 3B) and lack of GFAP.

The border between the glioneuronal/mesenchymal portion of the neoplasm and PNET was abrupt. In this densely cellular area, the cells were monotonous, slightly elongated, with increased nuclear:cytoplasm ratio. Their nuclei were hyperchromatic. Scattered mitotic figures were seen (Fig. 4). This solid portion of the tumour gradually achieved a more organoid

pattern: the cells formed trabeculae and ribbons; focally, neuroblastic rosettes were present. Ultrastructurally, this portion consisted of small round or oval cells with prominent lobulated nuclei and a narrow rim of cytoplasm containing scanty organelles including microtubules and dense-cored vesicles. Symmetric adhesive plaque junctions connected cells or their processes. Numerous autophagic vacuoles and apoptotic bodies were also seen. The intercellular space contained abundant collagen fibres. Collectively, ultrastructural findings were typical of PNET with neuronal differentiation. The other areas of the tumour were not identified within the available material for ultrastructural analysis.

Discussion

The present case is a composite neoplasm that obviates precise classification. We could find mature astrocytic and neuronal/neurocytic components together with mature mesenchymal differentiation in the lesion, and a primitive neuroepithelial tumour-like element, which was seemingly a consequence of malignant progression. Simultaneous occurrence of multilineage somatic tissue neoplastic components in the same lesion suggested diagnosis of a teratoma. These lesions contain tissues from three germ cell layers; however, the neuroepithelial portion usually develops as structures of medullary neuroepithelium, retina and choroids plexus [3]. We could not identify epithelial elements, which frequently occur in teratomas. On the other hand, both chondroid [8,11,12,22] and adipocytic [5,15,16,20,23] differentiation had already been reported in otherwise typical ependymomas and astrocytic tumours. Therefore, the borderline between astrocytic tumour with mature mesenchymal differentiation and mature teratomas is not so sharply defined.

In our case, there had been progression of malignancy of the lesion, since a more anaplastic area with the morphology of PNET was found. Some adipocyte-like cells were entrapped within the structure of PNET, suggesting that malignant transformation might have occurred in the preexistent less malignant portion. This sequence of events is partly supported by the clinical course, as the patient presented with undiagnosed seizures for three years only with recent exacerbations of symptoms. The change of intensity and frequency of fits and appearance of signs of increased intracranial pressure indicated acceleration of

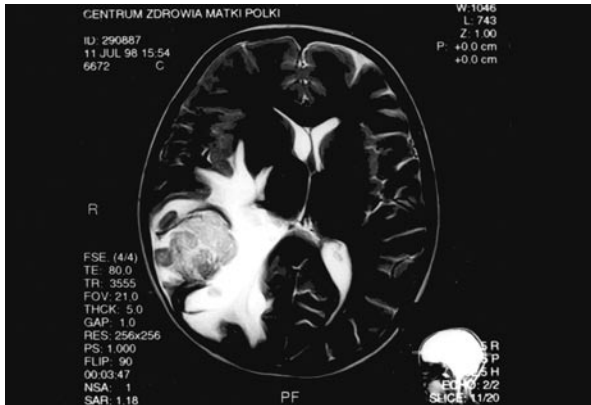


Fig. 1. CT scan discloses contrast enhancement of the mass within the right temporoparietal region of the brain. Note the multinodularity of the tumour and peritumoural oedema

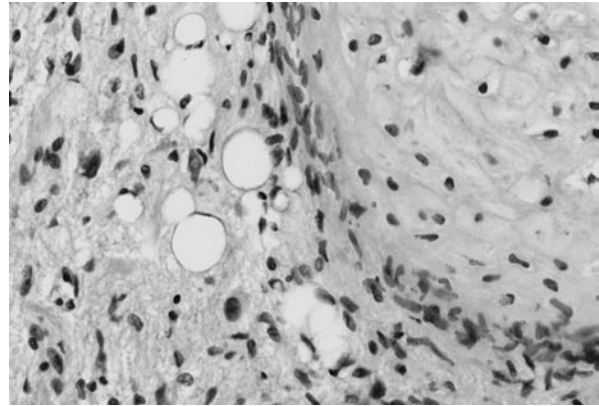


Fig. 2A. The predominating part of the tumour consisted of a mixture of intermingled astrocytic cells, neurons and adipocyte-like cells with an island of mature chondroid tissue.

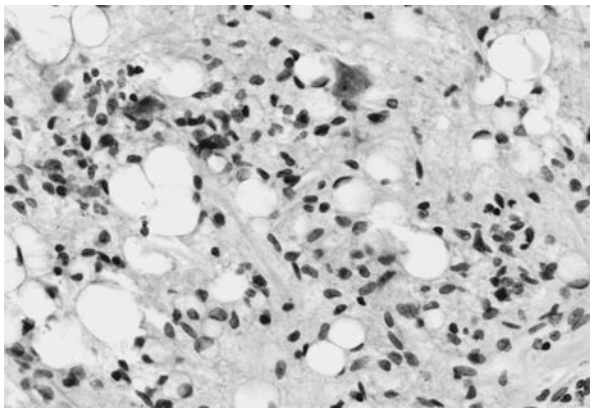


Fig. 2B. Note similarities of the nuclei of astrocytic and adipocyte-like cells on higher magnification

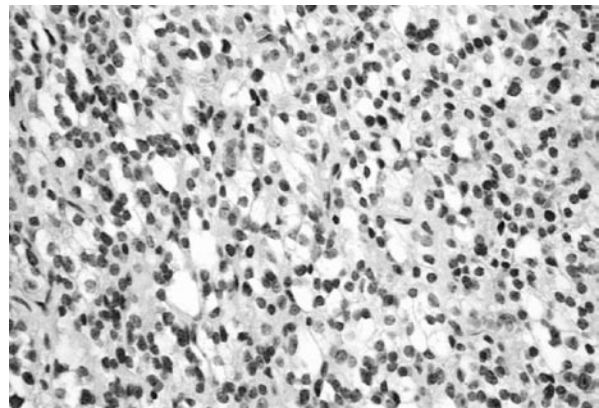


Fig. 3A. The well delineated nodule was composed of cells resembling oligodendroglial-cells

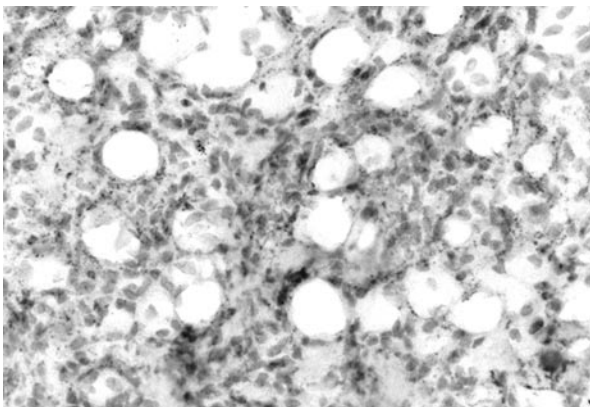


Fig. 3B. The oligodendroglial-like cells showed synaptophysin immunoreactivity

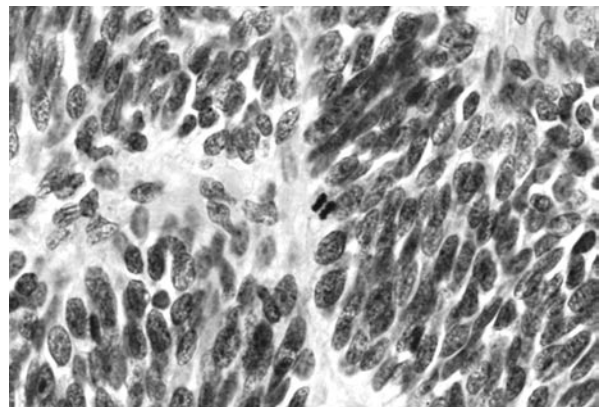


Fig. 4. The organoid structure of the malignant portion of the lesion with scattered mitotic figures

tumour growth, which might be dependent on the development of the malignant component within the pre-existent long standing low-grade lesion. Additionally, the presence of Rosenthal fibres within the astroglial portion of the lesion suggested protracted course of the lesion [3]. Therefore, we refer to our case as a teratoma, since such neoplasms show higher tendency for malignant change. Malignant transformation may occur in primary CNS neoplasms, and is a well known feature of diffuse low-grade astrocytomas. In addition, rare cases of gliomas with circumscribed growth pattern may also undergo malignant transformation. It was reported in a few cases of gangliogliomas [7,17,18] and pilocytic astrocytomas [1,2,10,14]. However, the majority of such lesions were radiation-induced, as those patients received adjuvant radiotherapy before tumour progression. Uncommonly, such a process has been reported to occur spontaneously [10,13]. We cannot exclude, of course, the chance of a collision tumour and coincidental development of PNET in the area of low-grade glioma; however, we think such an event is much less probable than the concept of teratoma.

As the low-grade component of the lesion in question shared some similarities with recently described tumours, for which the term 'lipoastrocytoma' [5] or 'astrolipoma' [15] has been proposed, we recommend thorough histopathological and immunohistochemical examination of the surgical material in such cases.

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