

SHORT REPORT

Gliomyosarcoma: an immunohistochemical analysis

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Abstract

Tumours of mixed glial and sarcomatous elements occurring in intracranial neoplasms are well recognised and have been termed gliosarcomas. These tumours account for up to 8% of all glioblastomas. The sarcomatous elements are thought to derive from the neoplastic transformation of mesenchymal cells in or adjacent to the tumour. This transformation usually has the appearance of a fibrosarcoma or angiosarcoma. Alternative mesenchymal neoplastic differentiation may occur, however, giving rise to the appearances of chondrosarcoma and osteosarcoma. In 1969 Goldman described a case in which the sarcomatous elements of a mixed gliosarcoma appeared, on the basis of light microscopy alone, to differentiate towards skeletal muscle having the features of a rhabdomyosarcoma. He coined the term gliomyosarcoma. In 1986 Barnard *et al* reported a second case and demonstrated the features of rhabdomyosarcoma using the electron microscope. A further case characterised with both light microscopic and immunohistochemical techniques is reported.

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Case report

A 73 year old left handed man with a history of bronchial carcinoma treated with radiotherapy four years before admission, presented with a two week history of confusion and drowsiness. He had otherwise been well but smoked heavily and required bronchodilators. On examination he was not fully orientated but obeyed commands and his eyes opened spontaneously. There was bilateral papilloedema but normal visual acuity and external ocular movements. There was no focal neurological deficit in the limbs and his gait was normal. There was no evidence of recurrent bronchial carcinoma. CT scan revealed a well circumscribed enhancing mass in the left temporal lobe with considerable surrounding oedema and shift of the midline structures (fig 1). Craniotomy was performed with macroscopic resection of a firm, well demarcated tumour but with an infiltrating deep surface. Post-operatively he made a good recovery with a resolution of his symptoms, although his short term memory remained poor. He was treated further with radiotherapy.

Histology

Parraffin wax sections showed a tumour with a biphasic pattern. Discrete islands of pleomorphic glial fibre producing tumour cells that stained positively for glial fibrillary acidic protein (GFAP) (fig 2a) and vimentin were surrounded by a spindle cell sarcomatous component that was rich in reticulin fibres and positive for vimentin but negative for GFAP. Within the sarcomatous element were elongated strap-like cells and rounded, intensely eosinophilic cells with the appearance of rhabdomyoblasts. Cross striations were readily identified (fig 2b). These cells were strongly positive for the markers desmin (fig 2c) and myoglobin (fig 2d) as well as vimentin. The appearances were those of a gliosarcoma showing rhabdomyoblastic differentiation.

Discussion

The term gliosarcoma was first used by Stroebe in 1895 to describe sarcomatous change in a glioblastoma.⁴ Since then the entity has been well described by Feigin *et al* and by Rubinstein.^{5,6} The tumour is said to account for 8% of all glioblastomas.¹ Light microscopic and immunohistochemical exam-

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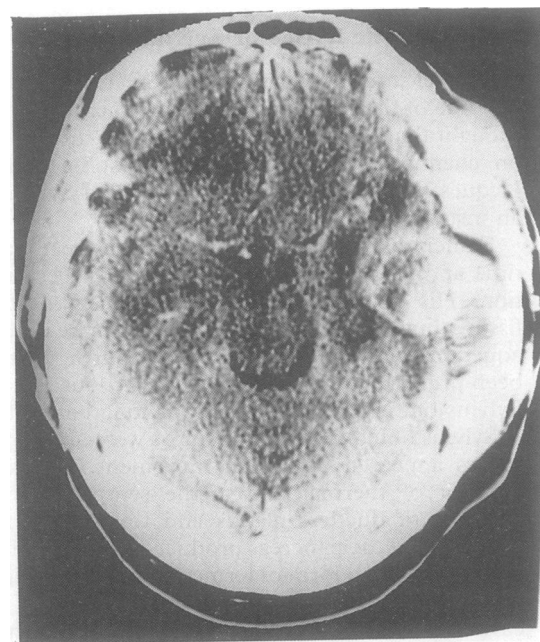


Figure 1 Contrasted CT scan showing a moderately well demarcated enhancing mass in the left temporal lobe.

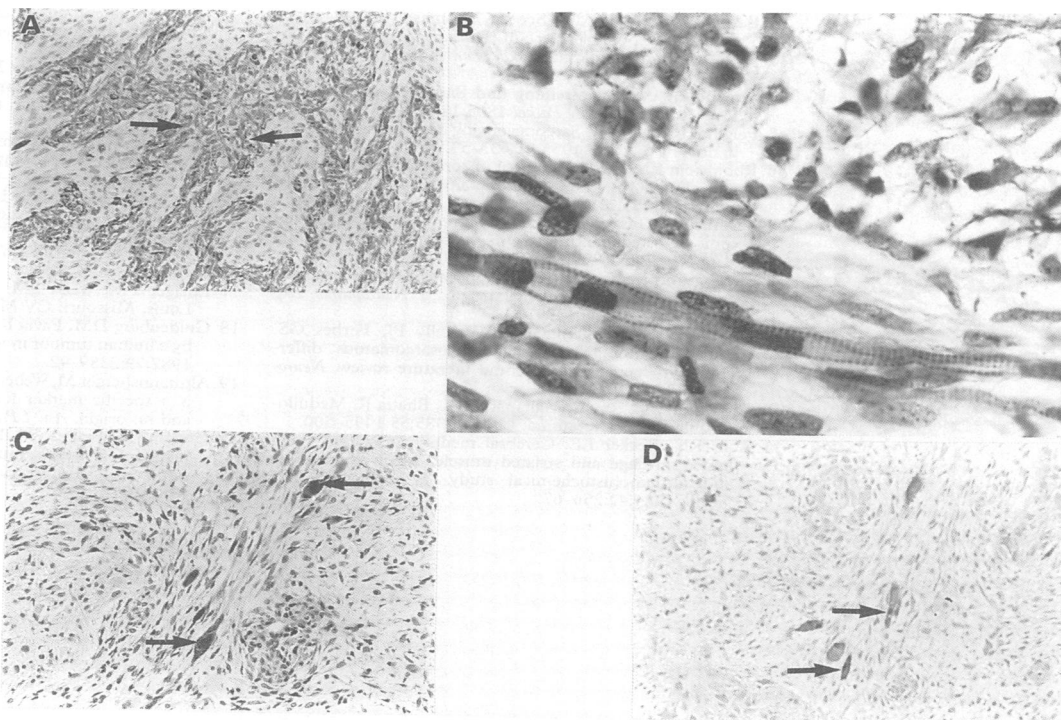


Figure 2a Islands of glial fibrillary acidic protein (GFAP) positive tumour cells (arrows) amongst immunonegative sarcomatous tissue. (original objective magnification $\times 20$); **b** Areas of rhabdomyoblastic differentiation with elongated cells showing cross-striations. (Haematoxylin and eosin, original objective magnification $\times 40$); **c** Strap-like cells showing immunopositivity for desmin. (arrows) (original objective magnification $\times 20$); **d** Strap-like cells showing immunopositivity for myoglobin. (arrows) (original objective magnification $\times 20$).

inations reveal prominent spindle cells with the nuclear features that suggest fibrosarcoma or angiosarcoma and may even show chondroid or osteoid metaplasia.⁷ In 1969 Goldman described a case of gliosarcoma with light microscopic evidence of rhabdomyoblastic differentiation and coined the term gliomyosarcoma.² In 1971 a case of a mixed tumour containing both astrocytic and mesenchymal elements, with light microscopic features of rhabdomyoblasts was described by Shuang-shoti and Netsky.⁸

In 1986 Barnard *et al* reported another case with electron microscopic features of striated muscle³ and recently rhabdomyoblastic differentiation has been described in a subependymoma.⁹ We have identified a case of gliosarcoma with rhabdomyoblastic differentiation using light microscopic and immunohistochemical techniques.

The occurrence of rhabdomyoblastic differentiation in various neuroepithelial tumours is well recognised as in the medulloblastoma¹⁰ and the medulloepithelioma of childhood,¹¹ and is a feature of malignant schwannoma (malignant Triton tumour)¹² and ganglioneuroma or malignant ectomesenchymoma.¹³ Primary cerebral rhabdomyosarcoma has also been described.^{14–17} An explanation for such divergent differentiation in these tumours may lie in the pluripotential potency of the proposed cells of origin in the primitive medullary epithelium and hence their tendency to occur in childhood.

By contrast, the gliosarcoma is a tumour with an age distribution more akin to the

purely glial tumours of the CNS. The debate on such tumours relates to the origin of the sarcomatous element. As in the childhood tumours, the gliosarcoma may represent one manifestation of a bimodal differentiation potential along neuroepithelial and mesenchymal lines. Rhabdomyoblastic cells would then be present as a result of an extension of the pluripotential nature of these neoplastic mesenchymal cells. An alternative explanation is that the sarcomatous elements of the gliosarcoma arise by metaplasia of the connective tissue stroma and ultimately malignant transformation, possibly under the influence of transforming growth factors or oncogene activating factors elaborated by the malignant glial component; the process is termed "horizontal malignant transformation".¹⁸ In view of the age distribution of the cases described this latter mechanism seems the most plausible explanation for the gliosarcoma.

We have demonstrated the presence of rhabdomyoblasts within a gliosarcoma both under the light microscope and immunohistochemically, using the muscle cell markers desmin and myoglobin.^{19–20} The expanding use of such immunohistochemical markers will no doubt reveal that this type of cellular differentiation occurs more frequently than previously appreciated.

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