Postradiation gliosarcoma with osteosarcomatous components

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Received: 4 April 2000
Accepted: 6 December 2000

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Abstract A 49-year-old man developed a gliosarcoma with prominent osteoid components 15 months after surgical resection and postoperative radiation and chemotherapy for a right frontal glioblastoma multiforme. The recurrent tumor was distinguished from the original lesion by the presence of dense ossification, visible on CT, at the original tumor site. The relevant literature is reviewed.

Keywords Gliosarcoma · Glioblastoma multiforme · Radiation injury

Introduction
The side effects of central nervous system irradiation, such as radiation necrosis, mineralizing microangiopathy, arteritis and progressive leukoencephalopathy, are well known. Several radiation-induced tumors have been described, including leukemias, lymphoma, thyroid cancer and peripheral fibrosarcoma. Radiation-induced intracranial lesions have also been reported, including neoplasms (the most common being meningioma [1]), cavernous angiomas and telangiectasia [2]. Gliosarcoma has primarily occurred following radiation therapy for pituitary adenomas and extracranial tumors such as lymphoma and leukemia [3, 4]. Predominance of osteoid-chondral elements within gliosarcomas is extremely rare, only three cases having been reported [5, 6, 7].

Case report
A 49-year-old man developed progressively worsening headaches, confusion, left-sided tonic/clonic seizures, and left leg weakness 15 months after treatment for a multicentric glioblastoma multiforme. At the time of the original diagnosis, he had presented with headaches, nausea, vomiting, and blurring of vision. CT and MRI had revealed two irregular ring-enhancing lesions in the right frontal lobe with surrounding edema (Fig. 1a, b). A stereotactic brain biopsy, followed by a right frontal craniotomy and resection disclosed glioblastoma multiforme. MRI and CT 2 days after the surgery showed no residual tumor. Postoperatively, the patient received external beam radiation therapy, 5900 cGy over 44 days, by a linear accelerator with bilateral parallel opposed fields on the frontal lobes, followed by chemotherapy with Carmustine, procarbazine, and carboplatin over 3 months. He remained neurologically stable following treatment.

The patient underwent bimonthly CT, and approximately 2 months after the initial surgery, a new focus of nodular contrast enhancement in the genu of the corpus callosum was found, consistent with recurrent disease. By 13 months after completion of radiation therapy, new calcific densities were seen on CT within the right frontal lobe. Over the next 2 months, these were followed by CT and considered to be dystrophic, secondary to radiation therapy.
Fig. 1 a, b Contrast-enhanced sagittal and axial T1-weighted sagittal images at initial presentation demonstrate two right frontal ring-enhancing lesions (arrowheads). Ferromagnetic artifact (black arrow) is due to a tiny metallic foreign body in the scalp. c CT through the midfrontal lobes at the time of recurrence demonstrating a cluster of calcific densities in the region of the previous surgical resection, above the right lateral ventricle (white arrows). d Photomicrograph of glioblastoma component showing pleomorphic astrocytes with fibrillar processes and vascular hyperplasia (black arrows) (hematoxylin and eosin, original magnification x 400). e Photomicrograph of osteosarcoma component showing highly atypical neoplastic cells (black arrows) within the lacunar spaces of an osseous matrix.