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Central Neurocytoma with Clinically Malignant Behavior

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Summary: We describe two cases of central neurocytoma that did not show histopathologic features of anaplasia but did show tumor dissemination after surgery and radiation therapy. CT and MR imaging before surgery depicted extraventricular extension of the tumors. The importance of radiologic findings is stressed.

Index terms: Neurocytoma; Brain neoplasms

Central neurocytomas, described by Hassoun et al (1), are characterized by ultrastructural features resembling neurons. Immunohistochemical studies have identified markers of neuronal differentiation such as neuron-specific enolase and synaptophysin (2, 3). The majority of previously reported central neurocytomas did not recur after tumor removal, and central neurocytomas are generally regarded as benign tumors with a favorable postoperative prognosis. We recently encountered two cases of central neurocytomas without histologic evidence of malignancy that showed dissemination after surgery and radiation therapy.

Case Reports

Case 1

A 43-year-old man presented with diplopia, blurred vision, and occipital headache. Bilateral papilledema was observed. A computed tomographic (CT) scan revealed a mass in the midline of the lateral ventricles with extension to the foramen of Monro. At CT, the tumor was isodense relative to the cortex on noncontrast scans and enhanced moderately on postcontrast scans. Multiple small cysts were present in the periphery of the tumor, but no calcifications were observed. T1-weighted magnetic resonance (MR) images, 520/13/2 (repetition time/echo time/excitations), showed a tumor of mixed signal intensity attached to the septum pellucidum and lateral walls of the lateral ventricles. Vascular flow voids within the tumor were observed. Periventricular hypointensity on the right side suggested tumor invasion. The lesion enhanced homogeneously after administration of contrast material (Fig 1A). T2-weighted MR images obtained with a fast spin-echo technique (4200/100/2) revealed the mass to be of inhomogeneous signal intensity and showed periventricular hyperintensity. Multiple small foci of increased intensity were present, as were compatible intratumoral cysts. The tumor was attached to the septum pellucidum and to the lateral walls of the lateral ventricles. Internal carotid and vertebral angiography revealed a vascular mass. Positron emission tomography showed a high consumption rate of glucose in the tumor.

Partial resection of the tumor was performed through an anterior transcallosal approach. Light microscopy disclosed a neoplasm composed of uniformly small, round cells with a perinuclear halo. Mitotic figures, necrosis, and atypia were not observed. Immunostains were positive for neuron-specific enolase and synaptophysin. Electron microscopic examination revealed numerous synapselike structures and spherical and/or dense-cored vesicles. After surgery, the patient received 60.6 Gy of radiation therapy. Two months after discharge, the patient's visual acuity worsened. Follow-up CT and MR studies revealed an increase in the size of the residual tumor and newly formed disseminated tumors in the ventricular wall (Fig 1B). Despite therapy, the patient died 17 months after the initial operation. Permission for autopsy was not granted.

Case 2

A 46-year-old man presented with diplopia and occipital headache. Bilateral papilledema and muscle atrophy of the upper extremities were observed. Imaging revealed a mass in the lateral ventricles. A CT scan showed an intraventricular mass in the body and trigone of the left lateral ventricle. The tumor enhanced moderately after injection of contrast material. Multiple intratumoral cysts were present, but no calcifications were observed. T1-weighted MR images (480/11/2) showed a tumor of mixed signal intensity. Vascular flow voids within the tumor were observed. T2-weighted MR images obtained with a fast spin-echo technique (4200/100/2) showed the mass to

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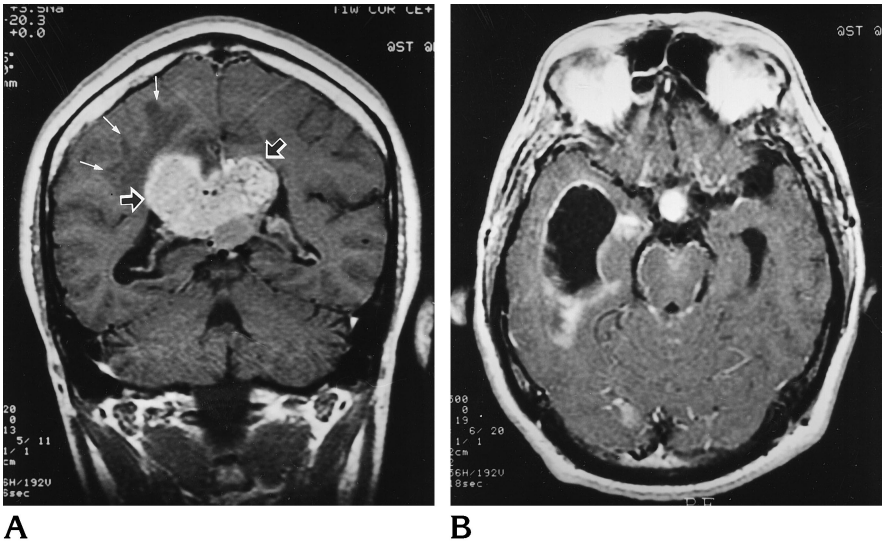

Fig 1. Case 1: 43-year-old man with diplopia, blurred vision, and occipital headache.

A, Contrast-enhanced coronal T1-weighted MR image (520/13/2) shows mass (*thick arrows*) in the right lateral ventricle extending into the left lateral ventricle. Contrast enhancement of the solid portion is observed. Note hypointensity in periventricular white matter on right side (*thin arrows*), suggesting edema.

B, Contrast-enhanced axial T1-weighted MR image (500/19/2) 15 months after surgery reveals disseminated tumor in all cerebrospinal fluid–containing spaces.

have heterogeneous signal intensity (Fig 2A). Postcontrast T1-weighted MR images depicted extension of the tumor to the thalamus and the cistern of the velum interpositum (Fig 2B and C). Angiography revealed a hypervascular tumor.

At surgery, the tumor occupied the body and trigone of the left lateral ventricle. The tumor appeared to arise from the superior aspect of the thalamus and to extended into the cistern of the velum interpositum. Light microscopic pathologic examination revealed a neoplasm composed of uniformly small, round cells with perinuclear halos. Neither cell pleomorphism nor mitosis was observed. Immunostains were positive for neuron-specific enolase and synaptophysin. Synapselike structures and spherical and/or dense-cored vesicles were detected by electron microscopy.

After partial resection of the tumor, the patient received 60 Gy of local brain irradiation. MR imaging 5 months after surgery revealed tumor growth in the third ventricle and in the frontal horn of the lateral ventricle. An additional 56 Gy of local brain irradiation was administered. MR imaging 7 months after surgery showed disseminated tumor (Fig 2D and E).

Discussion

Since the report by Hassoun et al in 1982 (1), more than 80 central neurocytomas have been reported. Central neurocytoma and cerebral neuroblastoma have often been confused in the literature. Cerebral neuroblastoma may be differentiated from central neurocytomas by means of light microscopy, because cerebral neuroblastomas are composed of immature cells (4). Radiologically, the typical appearance of a central neurocytoma as reported in the literature (5–12) is that of a well-circumscribed mass confined to the anterior portion of the lateral ventricles. Punctate or coarse calcifications and multiple small cysts within the tumor are often observed. Mild to moderate contrast enhancement is common. Intraventricular oligodendroglioma or ependymoma may be indistinguishable from central neurocytoma without ultrastructural and immunohistochemical studies. A number of published cases of intraventricular oligodendroglioma may actually be examples of central neurocytoma that were misdiagnosed pathologically.

Previously reported central neurocytomas have usually been confined to the ventricular system. Our literature review found six cases of extraventricular extension (13, 14). Three of these six were histologically proved to be anaplastic or malignant central neurocytomas, showing increased mitotic activity, presence of necrosis, and vascular proliferation. Although our cases did not show histopathologic features of malignancy, Wichmann et al (9) reported that extraventricular extension of central neurocytoma most probably indicates malignant transformation of the tumor.

The benefits of radiation therapy and/or chemotherapy after surgery for central neurocytomas are controversial and may depend on the presence or absence of a residual tumor. The response of central neurocytomas to radiation or chemotherapy have yet to be determined. More than 50% of patients described in the literature received radiation therapy after subtotal resection or biopsy (3, 4, 6, 7, 13–19). Two cases of central neurocytoma with evidence of

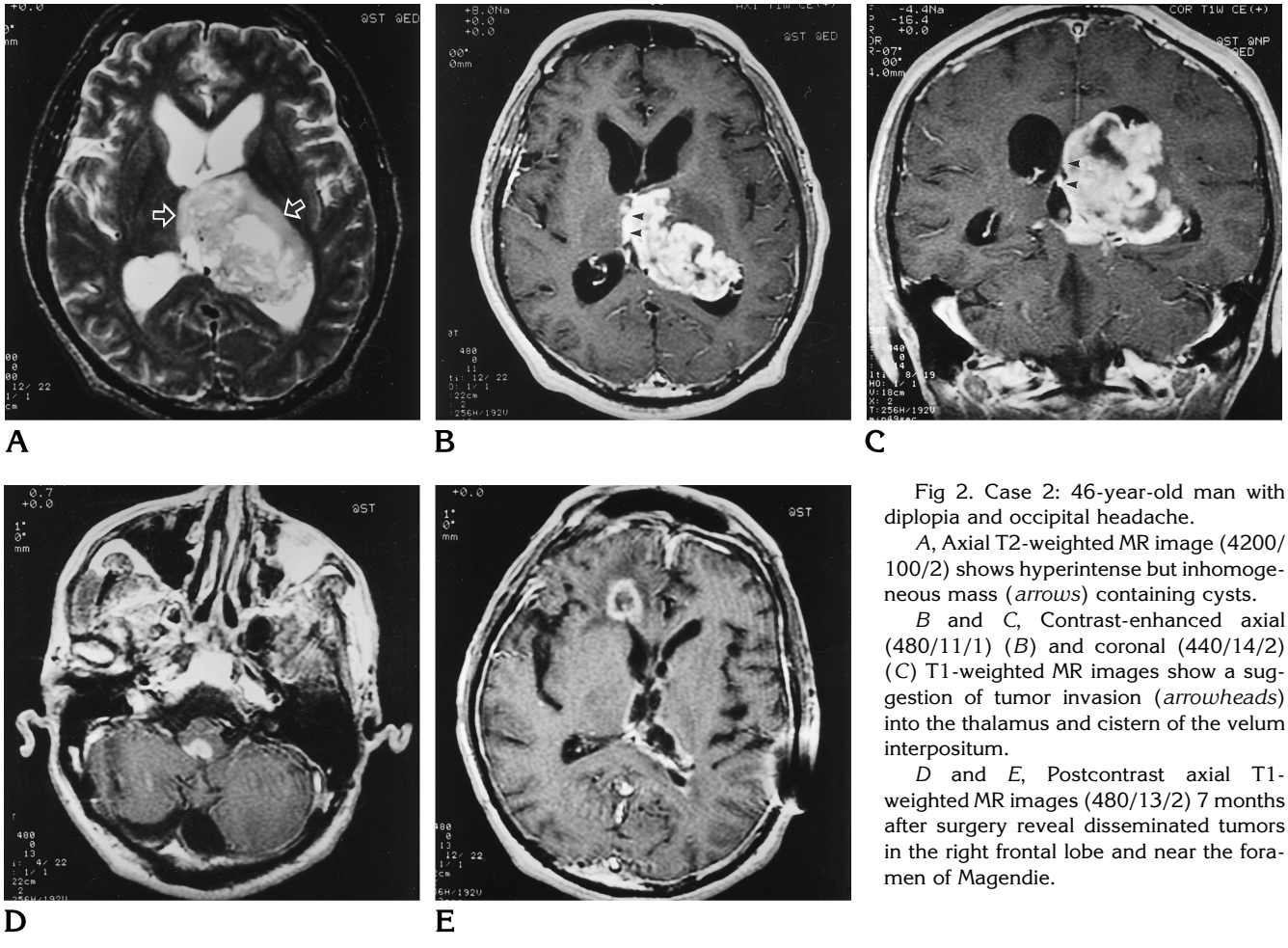

Fig 2. Case 2: 46-year-old man with diplopia and occipital headache.

A, Axial T2-weighted MR image (4200/100/2) shows hyperintense but inhomogeneous mass (*arrows*) containing cysts.

B and *C*, Contrast-enhanced axial (480/11/1) (*B*) and coronal (440/14/2) (*C*) T1-weighted MR images show a suggestion of tumor invasion (*arrowheads*) into the thalamus and cistern of the velum interpositum.

D and *E*, Postcontrast axial T1-weighted MR images (480/13/2) 7 months after surgery reveal disseminated tumors in the right frontal lobe and near the foramen of Magendie.

response to radiation therapy have been reported. Even when patients did not receive radiation therapy, the majority had no recurrence (5, 16, 20). We found recurrence of central neurocytoma reported in four cases. Three of eight cases reported by Yasargil et al (13) and one of seven cases reported by Kim et al (14) (none of which showed histopathologic features of anaplasia) had recurrence after removal. The period of recurrence after surgery ranged from 2 to 72 months.

We found three cases of central neurocytoma with potentially malignant central neurocytomas reported previously (9, 13). Two patients received postoperative radiation therapy and had no recurrence after 5 and 12 months, respectively (13). Therefore, standard histopathologic evaluation may not always correlate with the potential for regrowth of central neurocytomas. Evaluation of glucose consumption of the tumor with positron emission tomography can be useful for predicting the potential of regrowth (21). We suggest that postoperative radiation therapy be considered in cases of tumors with radiologic evidence of extraventricular extension. Radiation therapy is also useful for patients in whom there is histopathologic evidence of malignancy.

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