

Rapidly Growing Microcystic Meningioma of the Middle Fossa Floor

—Case Report—

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Abstract

A 74-year-old woman presented with a microcystic meningioma which manifested as mental disturbance. A rapidly growing tumor in the left middle fossa had not been detected by examination 10 months before. The tumor was remarkably enhanced by contrast medium on both computed tomography and magnetic resonance imaging and was associated with massive perifocal edema. Cerebral angiography revealed that the tumor was mainly fed by the left middle meningeal artery, which was embolized preoperatively. The tumor was completely removed and no postoperative adjuvant therapy was administered. The histological diagnosis was microcystic meningioma with many mitotic figures and a MIB-1 labeling index of 12.8%. Four months later, the tumor recurred and invaded the paranasal sinus. Focal irradiation successfully controlled further regrowth. This case suggests that microcystic meningioma may have aggressive features, and close observation is necessary even after gross total removal.

Key words: microcystic meningioma, middle fossa floor, rapid growth

Introduction

Microcystic meningiomas have similar location, clinical features, and prognosis to common benign meningiomas.^{6,7,14-17} The characteristic feature of microcystic meningioma is cyst formation.^{5-7,14-17} The pathological mechanisms of microcyst formation include pia-arachnoid differentiation, secretory activity of the tumor cells, certain degenerative processes, and arachnoid trabecular cell origin.^{5,16,17} Microcystic meningioma can appear as a low density mass on computed tomography (CT) without enhancement by contrast medium, because the microcyst formation restricts the enhancement effect.^{7,14,17}

We report the clinical, radiological, and histological features of a case of microcystic meningioma of the middle fossa floor with rapid growth, which was enhanced on both CT and magnetic resonance (MR) imaging.

Case Report

A 74-year-old woman visited a local medical center because of headache, but MR imaging revealed no intracranial mass lesion (Fig. 1A). Ten months later, she gradually developed mild dementia and amnesic episodes. She visited the same hospital, where a large left middle fossa tumor was detected and she was transferred to our facility.

On admission, physical examination found sensory dominant aphasia and mild dementia but no cranial nerve deficits. CT revealed a large low density tumor and massive perifocal edema with hyperostosis of the lateral temporal bone. MR imaging revealed that the tumor had invaded the pterygopalatine fossa and destroyed the subtemporal muscles, and was remarkably enhanced by contrast medium (Fig. 1B, C). Cerebral angiography showed that the tumor was fed mainly by the middle meningeal artery and the tentorial artery. Embolization was performed through the former vessel using Guglielmi detachable coils (Target/Boston Scientific, Fremont, Calif., U.S.A.) and cellulose porous beads.²⁾ Then, gross total removal of the tumor was

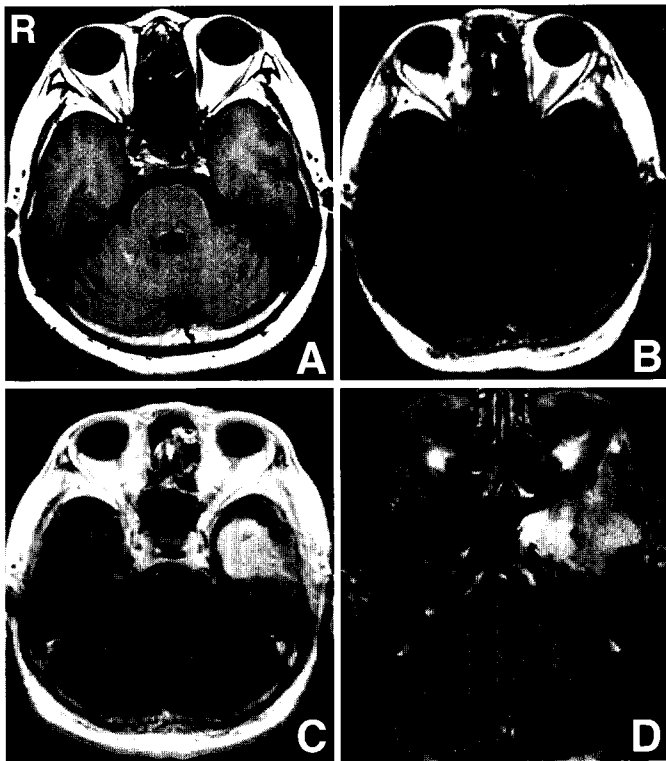


Fig. 1 A: Axial T₁-weighted magnetic resonance (MR) image taken 1 year before admission showing no left middle fossa floor tumor. B, C: Axial T₁-weighted MR image (B) on admission showing an iso- to low intensity tumor with perifocal edema in the left middle fossa floor with remarkable enhancement by contrast medium (C). D: Axial T₁-weighted MR image with contrast medium taken 4 months after discharge showing that the tumor had recurred and invaded the pterygoid muscles and paranasal sinus.

performed through a fronto-orbitozygomatic approach. The tumor was easily separated from the brain surface, but adhered tightly to the hyperostotic bone and muscles. After radical resection, dural plasty was performed with fascia lata and the dead space was filled with temporal muscle.

Histological examination showed that half of the tumor contained abundant vacuoles, in which the nuclei were regular, round or ovoid, and mitosis was present (Fig. 2A). The MIB-1 labeling index (LI) (Daco, Glostrup, Denmark) was 12.8% (Fig. 2B). The remainder of the tumor showed fibroblastic or meningothelial differentiation with many mitotic figures. The MIB-1 LI was 10.8%. Immunohistochemical staining showed positive reaction to epithelial membrane antigen and cytokeratin, but negative reaction to glial fibrillary acidic protein,

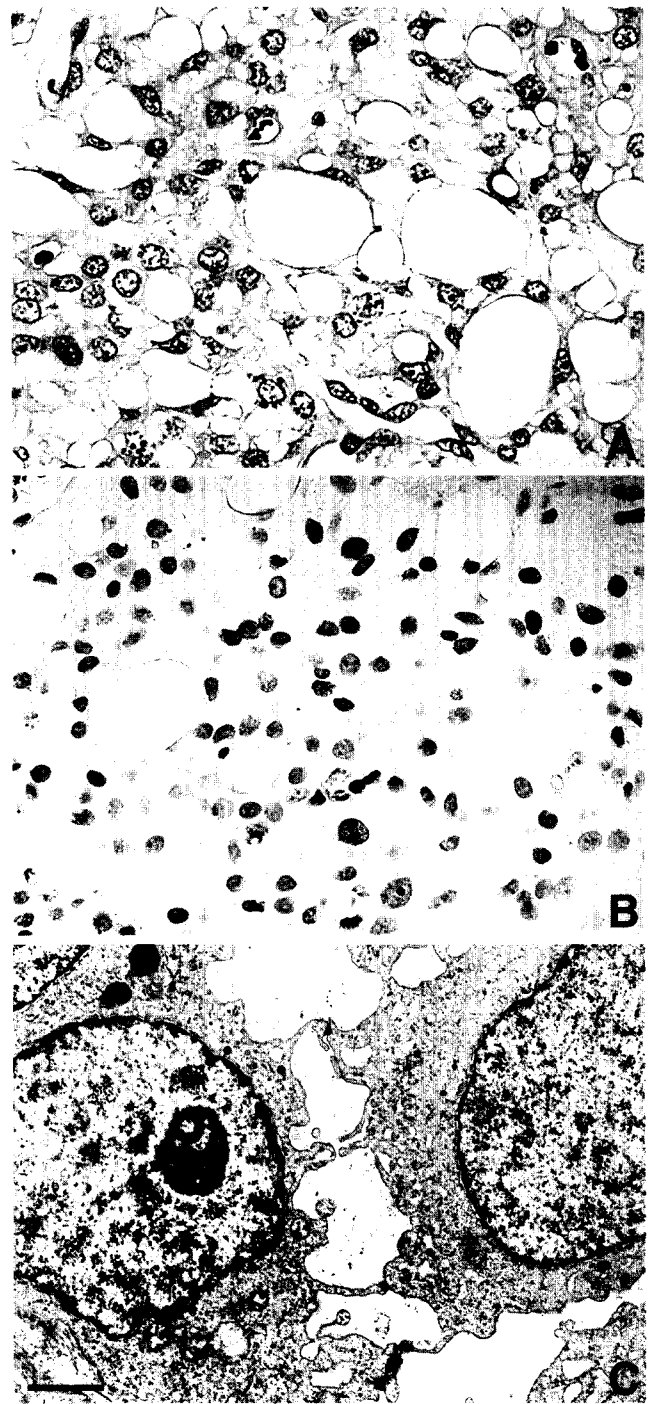


Fig. 2 A: Photomicrograph of the surgical specimen showing diffuse microcysts with cells containing round and oval nuclei, and mitosis at the center of the figure. Hematoxylin and eosin stain, original magnification $\times 40$. B: Immunohistochemical staining for MIB-1 indicating a positive reaction. The MIB-1 labeling index was 12.8%. $\times 40$. C: Electron micrograph of the tumor revealing that long cytoplasmic processes surrounded large extracellular spaces, and the processes were connected with desmosomes. Bar = 2 μ m.

vascular endothelial growth factor (VEGF), S-100 protein, and factor VIII. Vacuoles were not stained with Sudan red. Electron microscopy revealed that irregular long cell processes surrounded large extracellular spaces, and the processes were connected with desmosomes (Fig. 2C). Extracellular spaces were empty or filled with fine granular substances. The histological diagnosis was microcystic meningioma.

After the operation, her mental status fully recovered but she suffered from hyperalgesia of the left V2 nerve area of the face, and transient left peripheral facial paresis. MR imaging at discharge revealed no recurrence of the tumor. However, 4 months after discharge, follow-up MR imaging showed tumor recurrence and invasion into the paranasal sinus (Fig. 1D). Focal irradiation successfully controlled further regrowth of the tumor.

Discussion

Loss of architecture, more than 1.5 mitoses per mm², and necrosis are good indicators of malignant potential in meningioma.³ We found all these features in our case, but the significance of the necrosis was not evaluated because preoperative embolization was performed. Peritumoral edema of meningioma may be correlated with tumor aggressiveness as determined by MIB-1 LI.⁴ In our case, severe peritumoral edema and high MIB-1 LI (12.8%) were also observed. We performed gross total resection (Simpson grade 1), but rapid growth, severe peritumoral edema, and high MIB-1 LI prohibited a long recurrence-free period.

Microcysts are a characteristic feature for the diagnosis of microcystic meningioma, but the microcystic component did not reflect the proliferative potential in the present case. Therefore, microcystic meningioma might contain other meningiomatous components which determine the proliferative potential of the tumor. The rapid recurrence after total removal also supports the malignant potential of the tumor in our case, but we could not determine whether adjuvant irradiation after the operation could have prevented this recurrence.

MIB-1 LI,^{3,4,9,12} estrogen and progesterone receptors,¹³ proliferating cell nuclear antigen,⁸ VEGF,¹⁸ insulin-like growth factor,¹⁰ and matrix metalloproteinases¹¹ are all strongly related to the rapid growth and/or recurrence of meningioma. Incidental meningioma should be followed up carefully, especially in young patients and patients with large tumors.¹⁹ In addition, pregnancy may accelerate the rapid growth of meningioma.¹³ In our 74-year-old

female, the meningioma could not be detected at 10 months before admission. No traumatic event or medical treatment, including irradiation, occurred during the 10 months. The only factor we could identify to explain the rapid growth was the high MIB-1 LI.

Only 2–5% of all meningiomas occur in the middle fossa floor. A series of 11 cases of middle fossa floor meningioma indicated that the clinical features are female dominancy, no cranial nerve deficits, psychological impairment dominancy, and osteolytic change.¹ These meningiomas in the middle fossa showed benign pathological features and a long recurrence-free survival period. In contrast, malignant pathological features and rapid recurrence were observed in the present case.

Initial rapid growth within 10 months and rapid recurrence within 4 months after gross total removal occurred in the present case. The present case showed high proliferative potential, which also has not been observed in reported cases of microcystic meningioma. Generally, microcystic meningioma is considered to be a benign type of meningioma. We should be aware that a rapidly growing variant may occur.

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