Microcystic Meningioma Without Enhancement on Neuroimaging

—Case Report—

Yoshinori KUBOTA, Tatsuya UEDA*, Yasuo KAGAWA*, Noboru SAKAI*, and Akira HARA**

Department of Neurosurgery, Murakami Memorial Hospital, Asahi University, Gifu; Departments of *Neurosurgery and **Pathology, Gifu University School of Medicine, Gifu

Abstract

A 63-year-old female presented with an unusual case of microcystic meningioma manifesting as a 4-year history of unsteady gait, dysarthria, and hearing loss. Computed tomography disclosed a large hypodense mass in the right cerebellopontine angle, clivus, and middle fossa, with slight contrast enhancement. T_1-weighted magnetic resonance images demonstrated the lesion as a hypointense mass, which was little enhanced by gadolinium-diethylenetriaminepenta-acetic acid. Right carotid angiography revealed blood supply from the external carotid artery, but no tumor staining. The extracerebral tumor was subtotally removed. The histological diagnosis was microcystic meningioma. Light microscopy revealed abundant microcysts throughout the tumor tissue, and electron microscopy disclosed that the microcysts were mostly located in the extracellular spaces and only a few in the cytoplasm. Microcystic meningioma without enhancement is rare and should be differentiated from low-grade astrocytoma, epidermoid, or other non-enhanced tumor.

Key words: microcystic meningioma, vacuolated meningioma, histology, computed tomography, magnetic resonance imaging

Introduction

The typical appearance of meningiomas on computed tomography (CT) is isodense with the brain tissue and uniform enhancement by intravenous contrast medium. Hypodense meningiomas without enhancement are rarely described. We report the clinical, radiological, and histological features of a case of microcystic meningioma appearing as a hypodense mass on CT without enhancement after administration of contrast medium, and as hypointense on T_1-weighted magnetic resonance (MR) imaging without enhancement by gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA).

Case Report

A 63-year-old female presented with a 4-year history of gait disturbance, dysarthria, and right-sided partial hearing loss. Neurological examination revealed ataxic gait and hearing disturbance on the right side. CT showed a large hypodense mass with marked compression and distortion of the brain stem in the right cerebellopontine angle, clivus, and middle fossa. Most of the lesion remained hypodense except for the tumor capsule after intravenous administration of iodinated contrast medium (Fig. 1). MR imaging showed the cerebellopontine angle tumor as low intensity on the T_1-weighted image and homogeneous high intensity on the T_2-weighted image. The T_1-weighted image disclosed a slight enhancement effect after intravenous administration of Gd-DTPA (Fig. 2). Right carotid angiography demonstrated that the tumor received blood supply from a developed tentorial artery, but no tumor staining was observed (Fig. 3).

An extracerebral vessel-rich mass extending from the posterior side of the petrous bone to the subtentorial space and middle fossa on the right side was subtotally removed via the combined infra- and supratentorial approach. The firm tumor with no macroscopic cysts arose from the clivus and tentori-
and was clearly demarcated and separated from the surrounding brain tissue. Postoperatively, her gait disturbance gradually resolved, and the other neurological symptoms improved markedly.

Histological examination showed the tumor was a meningotheliomatous meningioma. However, a number of microcysts surrounded by stellate processes of the tumor cells were seen (Fig. 4 upper). The tumor cells contained oval nuclei and well-defined cytoplasm. Psammoma bodies were seen in some areas (Fig. 4 lower). Periodic acid-Schiff staining demonstrated no staining of microcysts or cytoplasmic vacuoles. Alcian blue staining and Sudan IV staining were negative. Immunohistochemical analysis for vimentin revealed positive reactivity of meningotheliomatous cells.

Electron microscopy demonstrated the characteristics of a meningioma. The tumor cell processes formed complex interdigitations, which were often punctured by desmosomes. Numerous cytoplasmic filaments were evident in the tumor cells. The larger and smaller microcysts were mainly located in the extracellular spaces, and only small, smoothly rounded microcysts were seen in the cytoplasm (Fig. 5).

**Discussion**

The characteristic features of vacuolated or microcystic meningiomas are a high rate of cyst formation and the distinctive CT appearance of hypodensity with marked postcontrast enhance-
The most interesting features of the meningioma in our case were that the tumor was hypodense without apparent enhancement on CT and hypointense without enhancement on the T1-weighted MR image. Cystic or necrotic changes within the common type of meningioma occasionally result in absence of enhancement. Diffusely hypodense meningioma without enhancement has been reported previously in only four cases. All five patients were in the 6th or 7th decade of life, with lesions located in the frontal, temporal, frontoparietotemporal, or cerebellopontine areas. All of these five cases of microcystic meningioma were composed of meningotheliomatous cells. Microcystic meningiomas can be classified into two types based on the histological components: the meningothelial and microcystic component type, and the angiomatous and microcystic component type. The meningioma in our patient is considered to be of the former type, which is not enhanced on CT. However, whether the absence of enhancement is related to this morphological change remains unclear. The possible pathogenic mechanisms of the microcysts are many, and include pia-arachnoid differentiation, the secretory activity of the tumor cells, certain degenerative processes, and arachnoid trabecular cell origin.

The CT and MR imaging appearance of microcystic meningiomas such as the present case may resemble that of tumors such as low grade astrocytoma, schwannoma, angioma, and epidermoid. Electron microscopy or reticulin staining can be used to distinguish meningiomas from schwannomas. Angiography is also very helpful in differential diagnosis and discloses the arterial supply derived from the meningeal or tentorial arteries in most cases of meningioma. In our patient, the demonstration of a distinct blood supply from a tentorial artery was also strongly suggestive of a meningeal neoplasm.

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Address reprint requests to: Y. Kubota, M.D., Department of Neurosurgery, Murakami Memorial Hospital, Asahi University, 3–23 Hashimoto-cho, Gifu 500, Japan.