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Metastatic Renal Cell Carcinoma in a Meningioma : A Case Report

Tumor-to-tumor metastasis is rare. We report a case of metastatic renal cell carcinoma in meningioma. A 67-year-old woman presented a two-week history of motor dysphagia and decreased short-term memory. She had undergone a left radical nephrectomy for a renal cell carcinoma 7 years ago and had not received any adjuvant therapy. MRI disclosed a 3.0×3.0×3.0-cm sized round tentorial-based extraaxial mass with peritumoral edema in the left posterior temporal lobe. During operation, the tumor was found to be an encapsulated mass firmly attached to the tentorium. Histologically, the tumor was a meningotheliomatous meningioma extensively infiltrated by metastatic renal cell carcinoma, accompanying widespread coagulative necrosis. Immunohistochemical staining for cytokeratin revealed strong positivity only in the renal cell carcinoma component. The patient's postoperative course was uneventful. Post-operative radiation therapy was applied to the whole brain. Three months after operation, the patient developed right hemiparesis and dysphagia. Brain MRI at that time did not reveal recurrence or any other causative lesions, although the whole body scan disclosed uptake at the second lumbar vertebra and rib. The patient refused further treatment.

Key Words: *Meningioma; Neoplasm Metastasis; Carcinoma, Renal Cell*

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INTRODUCTION

Metastasis of extracranial malignant neoplasms to meningioma is a very rare event. The precise mechanism of this unique phenomena remains undefined. Tumors most frequently metastasizing to meningiomas are primary tumors of the breast and lung, while rare cases of metastasis from tumors of the kidney, thyroid, uterus endometrium, and even from melanomas have also been reported (1). We report a case of metastatic renal cell carcinoma in a meningioma.

CASE REPORT

A 67-year-old woman with a two-week history of motor dysphagia and decreased short-term memory was presented. She had undergone a left radical nephrectomy for renal cell carcinoma 7 years ago and had not received any adjuvant therapy. Urological follow-up 2 months prior did not disclose any regional recurrence. Neurological examinations revealed that the patient had some difficulty in finding appropriate words and a slight decrease in short-term memory. Visual field test revealed a right homonymous hemianopsia. Magnetic resonance imaging (MRI) disclosed a 3.0×3.0×3.0-cm sized round tentorial-based extraaxial mass with peritumoral edema in the left posterior temporal lobe. There was a thickening of the adjacent tentorium with enhancing dural tails. The inferior and peripheral portion of the mass showed a slightly high-signal intensity on T1-weighted and iso-signal intensity on T2-weighted images, with an intense heterogenous enhancement after intravenous administration of gadolinium diethylenetriamine pentaacetic acid. The central portion showed a low-signal intensity on T1-weighted and a high-signal intensity on T2-weighted images, with slight contrast enhancement (Fig. 1, 2). A left posterior temporal craniotomy was performed. The tumor presented as an encapsulated mass firmly attached to the tentorium. The inferior and peripheral portion of the mass was rubbery and yellowish brown, and the central portion was soft and reddish. Brain invasion was not found during the operation. The tumor and the attached tentorium were resected. Histologically, the large central soft area revealed a metastatic carcinoma accompanying an widespread coagulative necrosis rimed by the menin-

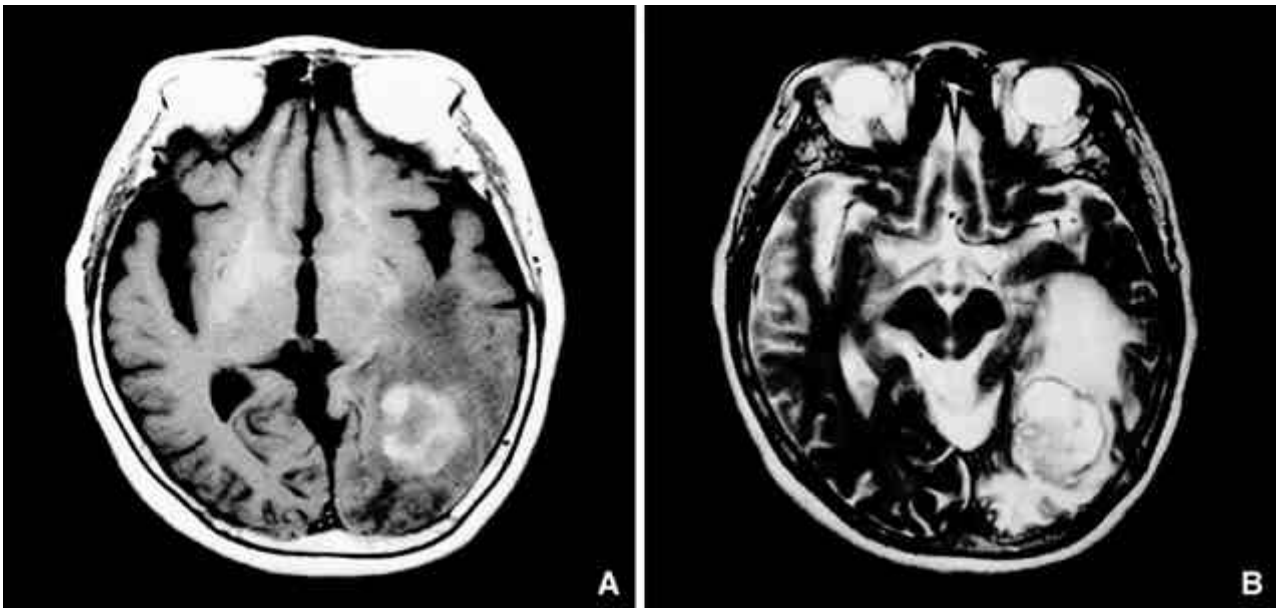

Fig. 1. A: While the inferior-peripheral portion of the mass shows slightly high-signal intensity, the central portion shows low-signal intensity on T1-weighted images. **B:** While the inferior-peripheral portion of the mass shows iso-signal intensity, the central portion shows high-signal intensity on T2-weighted images.

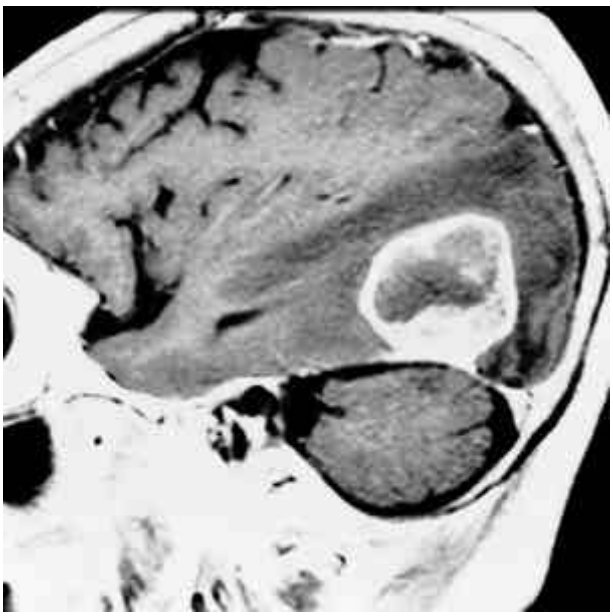

Fig. 2. The inferior-peripheral portion of the mass shows intense heterogenous enhancement and the central portion of the mass shows slight contrast enhancement after intravenous administration of gadolinium diethylenetriamine pentaacetic acid.

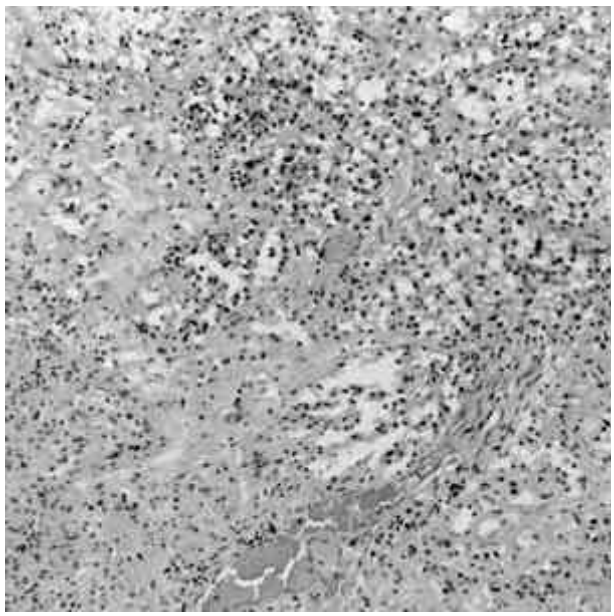

Fig. 3. In a lower power view, the meningotheliomatous meningioma (left bottom) is extensively infiltrated by metastatic renal cell carcinoma (H&E, ×40).

gioma (Fig. 3). Most of the metastatic tumor was surrounded by meningioma, but focally and directly abutted on the brain parenchyme. The histologic feature of the metastatic carcinoma was compatible with clear-cell type of renal cell carcinoma and the peripheral rim of the meningioma which was composed of sheets of uniform, small, neoplastc meningothelial cells with a vague whorl formation (Fig. 4). Psammoma bodies were not present. Both tumor component, showed positive immunoreactivity for epithelial membrane antigen and vimentin. Immunohistochemical staining for cytokeratin showed strong positivity only in the renal cell carcinoma com-

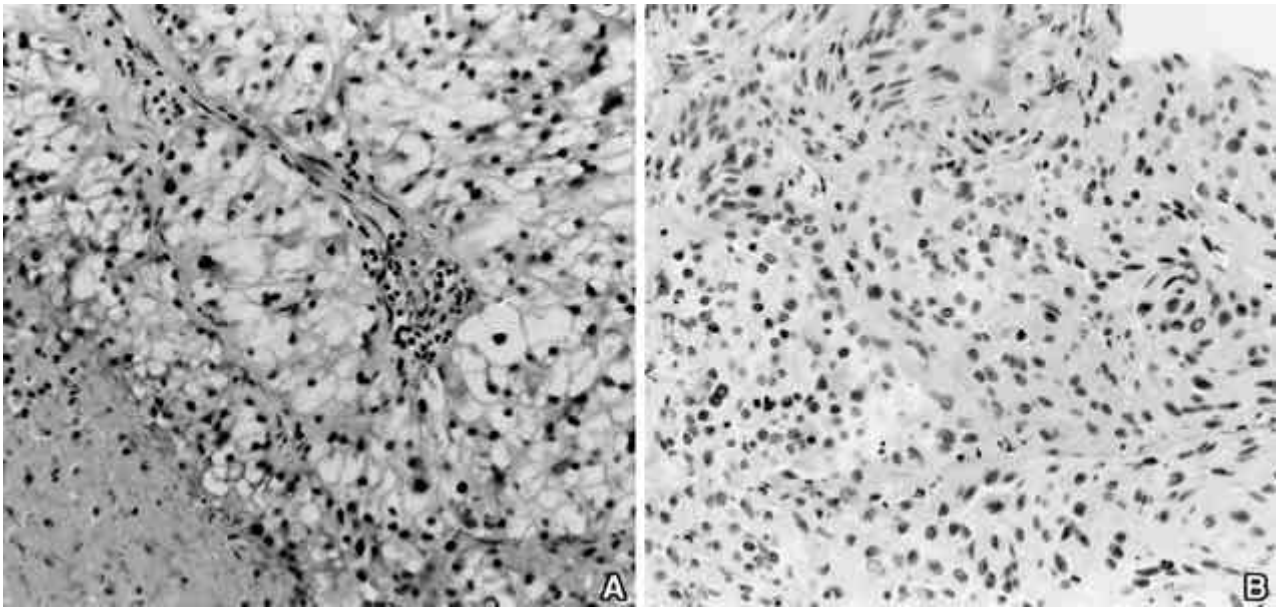

Fig. 4. A: Remaining tumor cells around the vessel exhibit characteristic features of renal cell carcinoma, clear-cell type (H&E, ×200). B: The peripheral rim of meningioma was composed of sheets of uniform, small, neoplastic meningothelial cells with a vague whorl formation (H&E, ×200).

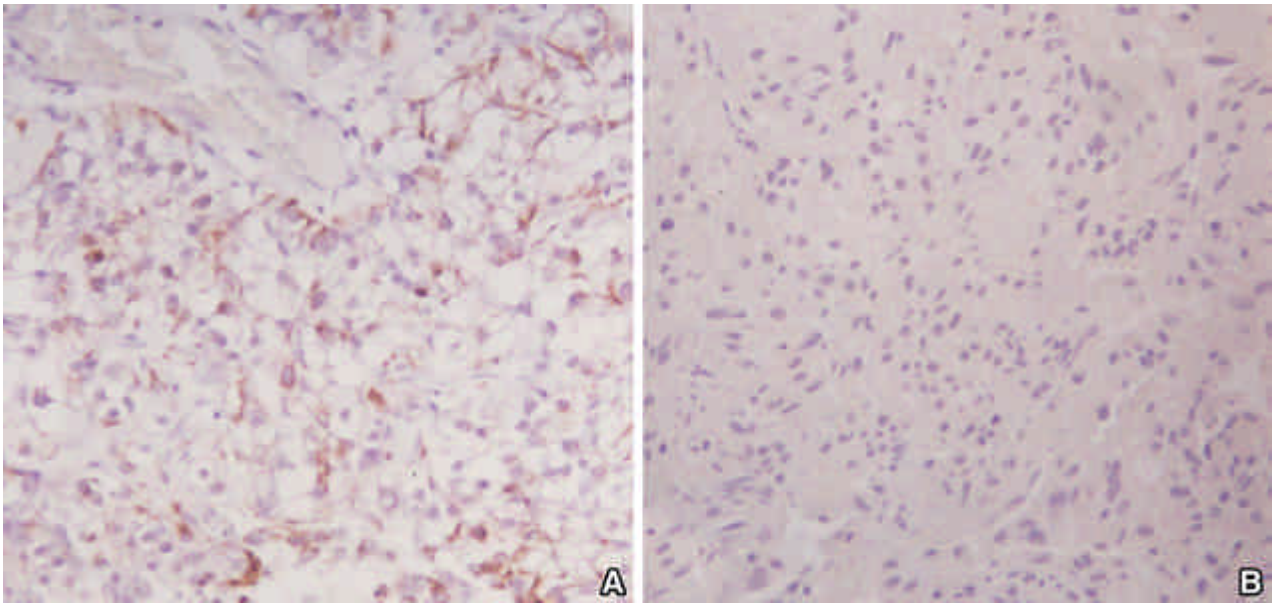

Fig. 5. A: Immunostaining for cytokeratin shows strong positivity only in the renal cell carcinoma component (×200). B: Immunostaining for cytokeratin shows negative reaction in the meningioma component (×200).

ponent (Fig. 5). The patient's postoperative course was uneventful. Post-operative radiation therapy was applied to the whole brain. Three months after the operation, the patient developed right hemiparesis and dysphagia. Brain MRI at that time did not reveal recurrence or any other causative lesions, although the whole body scan disclosed uptake at second lumbar vertebra and rib. The patient refused further treatment.

DISCUSSION

Tumor-to-tumor metastasis is rare. In a few reported cases, meningiomas have been implicated as the most common intracranial neoplasm harboring metastasis (2). A criterion which could be used to assess a true tumor-to-tumor metastasis is as follows: 1) The metastatic focus must at least be partially enclosed by a rim of benign

histologically distinct host tumor tissue and 2) The existence of the metastasising primary carcinoma must be proven and compatible with the metastasis (3). This case fulfils the above criteria.

Intracranial meningioma is a relatively common tumor with an incidence of 4 per 100,000 and a female predominance of 2.5:1 (4). However, about 50 cases of meningiomas containing metastases have been reported (1, 3, 5-13). In a review of 39 cases by Breadmore et al., it is apparent that the lung and breast carcinomas account for the majority of metastatic tumors (11). Rare cases of metastasis from tumors of the kidney, prostate, thyroid, cervix, endometrium, gallbladder, esophagus, lymphoma, and even from melanomas have also been reported (1, 11).

Meningiomas have been found to be the most common intracranial tumor to host a metastatic cancer (13). It has been suggested that the highly vascular architecture of meningiomas may make them particularly susceptible to seeding from an extracranial cancer (2). The indolent growth of meningiomas provides prolonged exposure to the primary tumor, and the low metabolic rate may act as a noncompetitive metabolic environment conducive to the growth of metastatic tumors (14). The high collagen and lipid content of meningiomas has also been postulated to provide a "fertile soil" for the seeding of malignant cells (15). Some investigators have suggested that cellular signaling may be important in determining organ specificity during metastasis (16). Others have suggested that more complex interaction involving hormonal, enzymatic and immunological factors occurred (5, 6). However, the precise mechanism of this unique phenomenon remains undefined. One author has speculated that psammoma bodies confer some degree of protection from metastatic implants (17), but others disagree (3, 18). Psammoma bodies were not found in our case.

A review of 20 cases of metastatic carcinoma (17 to meningioma and three to neurilemmoma) disclosed several interesting facts: 1) metastasis to an intracranial meningioma or neurilemmoma is prevalent twice as frequently in autopsy material as in surgical material, 2) this phenomenon is twice as common in females, 3) adenocarcinoma of the lung in males and of the breast in females are the most consistently implanted with metastatic tumors, 4) provided an autopsy is performed, the metastasizing tumor is always found to be widely disseminated, 5) despite the presence of widespread metastases, the existence of the primary carcinoma was known prior to autopsy in only about 60% of the cases, 6) central nervous system (CNS) symptoms were present in 2/3 of the patients, yet additional metastases to nonneoplastic CNS tissue was much more common in those without symptoms (3).

Our case was a female with a previous history of left radical nephrectomy for renal cell carcinoma 7 years ago without evidence of recurrence. Additional metastasis to nonneoplastic CNS tissue was not found in the operation field. Radiologic techniques cannot reliably exclude the presence of metastasis within the meningioma, which may appear as a hyperdense area or, when associated with necrotic component, as a hypodense area within a meningioma on computed tomography (8, 19). Hypodense regions that enhanced poorly within the tumor usually reflect not only the presence of necrotic component but also cystic component, hemorrhage, or myxomatous degeneration (8). The inferior and peripheral portion of the mass in our case showed a slightly high-signal intensity on T1-weighted and iso-signal intensity on T2-weighted images, with intense heterogenous enhancement after intravenous administration of gadolinium diethylenetriamine pentaacetic acid. The central portion showed low-signal intensity on T1-weighted and high-signal intensity on T2-weighted images, with slight contrast enhancement. The central portion of the tumor showed us that a solitary intracranial lesion with radiologic features suggestive of meningioma in a patient with primary cancer could represent a meningioma, a metastasis, or both.

Meningiomas are generally indolent tumors that are treated with surgery alone. However, meningioma with metastatic carcinoma may have an unusual aggressive behavior and may require postoperative radiotherapy of the tumor bed for optimal management (12).

A case of an intracranial meningioma containing metastatic deposits from renal cell carcinoma has been presented. Only a few cases of renal cell carcinoma metastasized to an intracranial meningioma has been previously reported. Even though it is rare, the possibility of another tumor present within a meningioma should be considered when we deal with a case of a solitary intracranial lesion in a patient harboring a primary tumor in another site of the body, with radiologic features suggestive of meningioma with atypical signal characteristics.

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