Intracranial Meningioma as Initial Clinical Manifestation of Occult Lung Carcinoma: Case Report

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Abstract

Intracranial meningioma with intratumor metastasis have been occasionally reported. However, to our knowledge, there are almost no reports of malignant tumors initially discovered due to metastasis to meningioma. A 74-year-old woman presented with amnesia. Magnetic resonance imaging showed a well-defined mass arising from falcotentorial junction and homogeneous enhancement. Histopathologic findings showed that the mass was a meningothelial meningioma, with the majority of the tumor cells propagating in sheets, however, a single area in the tumor tissue showed the different histology. Immunohistologically, cytokeratin 7 (CK7), thyroid transcription factor-1 (TTF-1), and Napsin were positive, which led to lung adenocarcinoma metastasis. Furthermore, E-cadherin staining showed a 70% positive rate in lung adenocarcinoma and 30% in meningothelial meningioma. We report our experiences regarding a case of lung cancer that metastasized to intracranial meningioma and its clinical presentation and pathology.

Key words: lung carcinoma, meningioma, metastasis, E-cadherin, tumor-to-tumor

Introduction

Intracranial meningiomas with intratumor metastasis are uncommon but frequently reported in the literature.[1–3] However, there are only few cases of malignant tumors initially discovered due to metastasis to meningioma. Several hypotheses have been previously suggested to explain this phenomenon, but the exact mechanisms responsible for the development of metastases in meningiomas are not known. Here, we report our experiences of a case of lung carcinoma that was initially discovered due to a metastasis to falcotentorial meningioma.

Clinical Report

A 74-year-old woman presented with amnesia and abnormal gait. Computed tomography (CT) demonstrated a roughly 3-cm mass that showed homogeneous enhancement mass without perifocal edema in the falcotentorial junction. Magnetic resonance imaging (MRI) showed a mass that had isointense signal on T_1-weighted image, while a hyper intensity signalon T_2-weighted image. Contrast-enhanced MRI showed homogeneous enhancement (Fig. 1). Chest radiograph and blood examination had no

clear abnormalities.

Gross total removal of tumor that was suspected to a falcotentorial meningioma was performed via interhemispheric approach. Histopathologic findings included propagation of dense sheets of cells, mostly with ovoid or spindle-shaped nuclei (Fig. 2A); thus, we diagnosed meningothelial meningioma. Immunohistologically, the presence of epithelial membrane antigen (EMA) was positive, and the rate of Ki-67 positive cells was 3.9%. However, we observed a single area that showed dense epipapillary propagation of tumor cells with nuclear atypia to suspect cancer metastasis (Fig. 2B). An additional immunohistologic examination that included differential diagnosis of papillary meningioma, cytokeratin 7 (CK7) (Fig. 3A), thyroid transcription factor-1 (TTF-1) (Fig. 3B), Napsin (Fig. 3C), and alcian blue (Fig. 3D) showed positive, while S-100 and thyroglobulin were negative. Therefore, lung adenocarcinoma metastasis was the most strongly suspected region. Furthermore, E-cadherin staining showed 70% positive rate in lung adenocarcinoma and 30% in meningothelial meningioma (Fig. 3E).

After a postoperative pathologic examination, contrast chest CT showed the presence of a 3-cm node in the inferior lobe of the right lung. No metastasis was observed to the hilus or mediastinal lymph nodes. The tumor marker, carcinoembryonic antigen (CEA), level increased to 5.8;
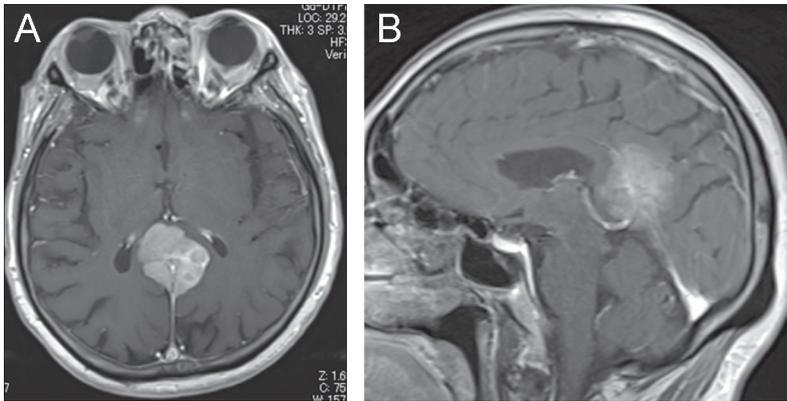
Fig. 1 Axial (A) and sagittal view (B) of contrast-enhanced magnetic resonance (MR) images showing an enhanced mass that spreads from the tentorium cerebelli at the straight sinus along the inferior border of the falxcerebri. The inferior sagittal sinus runs through the center of the mass, and a cerebral vein from the vein of Galen runs along the inferior border of the mass.
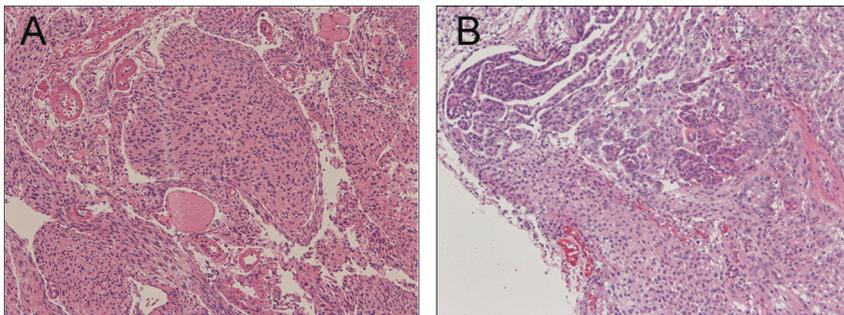

Fig. 2 A: Hematoxylin–eosin (HE) staining at ×100 magnification showing the meningioma and proliferation of tumor cells in sheets. B: HE staining at ×100 magnification showing the metastatic area and dense epipapillary propagation of tumor cells with nuclear atypia.
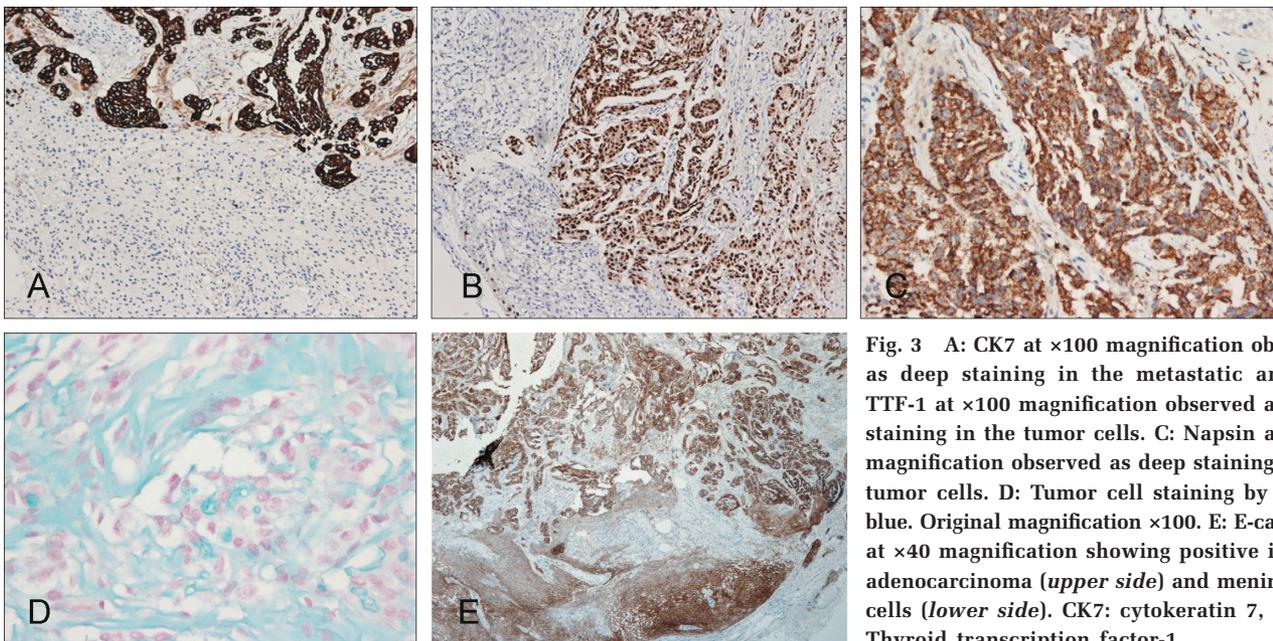

Fig. 3 A: CK7 at ×100 magnification observed as deep staining in the metastatic area. B: TTF-1 at ×100 magnification observed as deep staining in the tumor cells. C: Napsin at ×100 magnification observed as deep staining in the tumor cells. D: Tumor cell staining by alcian blue. Original magnification ×100. E: E-cadherin at ×40 magnification showing positive in both adenocarcinoma (*upper side*) and meningioma cells (*lower side*). CK7: cytokeratin 7, TTF-1: Thyroid transcription factor-1.

no increases were observed in the other marker levels. Then, a partial lobectomy in the right lung was performed and diagnosed adenocarcinoma.

Discussion

Cases of intracranial meningioma with intratumor metas-

tases are commonly reported. Breast and lung cancers are frequently observed primary lesions in reports of intracranial intratumor metastasis of meningioma.[1,3] However, almost all cases feature a previously existing malignant tumor, which then metastasizes. There are almost no reports of cases like that shown in the current case, in which a malignant tumor was initially discovered due to

metastasis to meningioma. In the present case, there were no preoperative findings of the presence of lung adeno-carcinoma. Characteristic imaging findings of intratumor metastasis include the following: presence of necrosis, cysts, and hemorrhaging; heterogeneous tumor with a region showing no contrast enhancement; and severe edema.[4] However, these typical imaging findings were not observed in the current case. Perfusion MRI and MR spectroscopy may suggest a possibility to differentiate an intratumor metastasis from meningioma.[4]

Typical pathologic findings were obtained in the meningioma. In metastatic tumors, TTF1 is a marker expressed in lung adenocarcinoma and thyroid cancer, while Napsin is expressed at a high rate in well-differentiated lung adenocarcinoma. A number of theories have been suggested to explain the mechanism of metastasis to meningiomas, including its rich vascularity, benign and slow growth rate allowing enough time for metastasis to develop, hormonal factors, and low metabolic rate providing a noncompetitive metabolic environment. However, the exact mechanism responsible for the occurrence of this phenomenon is still unknown. It was recently shown that the affinity between meningothelial meningioma and metastatic tumor cells is a cause of intratumor metastasis. E-cadherin, a cell adhesion factor, bonds with the E-cadherin expressed by other cells. Thus, primary lesion tumor cells can move through the bloodstream and arrive at the target organ. Although metastatic tumor cells are inhibited at the primary lesion, they are activated when they move to the metastatic lesion and entrench themselves in the tissues at the secondary location.[5,6] The rate of expression is observed to be particularly high in the case of breast cancer.[7] Zhou et al. showed that high rates of E-cadherin expression are observed even in benign, incipient meningioma.[7] This leads to affinity between tumors, which is thought to cause intratumor metastasis; further, this is considered the reason for frequent reports of intratumor metastasis of breast cancer. In the case of our patient as well, E-cadherin staining showed 70% positive rate in lung adenocarcinoma and 30% in meningioma, which was considered a conceivable factor for intratumor metastasis.

Conclusion

The mechanism of such tumor-to-tumor metastasis is not completely understood and the preoperative diagonosis remains challenging. We showed that malignant tumor metastasis could be observed even when it is not suspected from the symptoms or image findings. Therefore, it is necessary to suspect this possibility and performing a detailed preoperative image inspection.

Conflicts of Interest Disclosure

The authors have no personal, financial, or institutional interest in any of the drugs, materials, or devices in the article. All authors who are members of The Japan Neurosurgical Society (JNS) have registered online Self-reported COI Disclosure Statement Forms through the website for JNS members.

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