INTRODUCTION

Meningioma accounts for 13-19\% of all primary intracranial tumors, and most meningiomas are slowly growing and benign. The prognosis for this tumor has been reported to be good. But, papillary meningioma (PM) is an aggressive histologic variant of meningioma, and it occurs so rarely that its incidence approximately corresponds to 1.0-2.5\% of all intracranial meningiomas\(^\text{[18]}\). The tumor is pathologically identified when perivascular or pseudopapillary pattern in a component of meningioma is present which corresponds to grade III of the 2007 revision of the World Health Organization (WHO) classification. Local recurrence of PM has been 9\% to 32\% and extracranial metastases of general meningioma has been reported to be 0.1\%\(^\text{[17]}\). We experienced a case of papillary meningioma with leptomeningeal seeding.

CASE REPORT

The patient was a 43-year-old male whose chief complaints were headache and dizziness. The preoperative brain magnetic resonance imaging (MRI) showed a 31×28×29 mm mass with a broad base on the falcotentorium and the tumor had a mass effect on the left occipital lobe with minimal edematous changes in the adjacent brain parenchyma. The mass revealed mixed isointensity and hypointensity on T1WI, heterogeneous hyperintensity on T2WI and it was densely enhanced with Gadolinium enhancement. The mass was totally removed via the supratentorial interhemispheric approach. Microscopically, the tumor consisted of solid nests and papillary growth with some perivascular pseudorosette formation of rather round, uniform cells with variable eosinophilic cytoplasm and the some tumor cells showed epithelioid or rhambdoid in shape. Eight mitosis were observed in average from 10 high power field microscope. Necrosis was not seen (Fig. 4A). This finding was very similar to the bronchoalveolar adenocarcinoma of the lung. For the immunohistochemical staining, the tumor cells were positive for epithelial membrane antigen (EMA), vimentin and pancytokeratin. The immunostaining was negative for progesterone receptor, CK20, HMB45 and GFAP (Fig. 4B, C). The differential diagnosis of PM was considered. Clinically, there were no primary lesions in other organs including both lungs. This tumor showed the typical positive findings for EMA and vimentin. Bronchoalveolar carcinoma is restricted to the lung and it usually does not accompany metastasis. Also, bronchoalveolar carcinoma generally show positivity for progesterone receptors. It has been reported that these phenomena does not occur for grade III meningioma and particularly for male patients with grade III meningioma. According to the above criteria, the pa-
Patient was diagnosed as PM based on histological and immunohistochemical findings.

The patient received radiotherapy after the pathologic diagnosis was made. On postoperative day 27, he had complex partial seizure and was in confused state. Electroencephalographic measurement exhibited abnormal II-III with continuous slow, generalized and severe diffuse cerebral dysfunction. The patient was then given an additional anticonvulsant, and the seizure was temporally controlled. On postoperative day 40, he had another general tonic clonic type seizure. At the time, an electrolyte analysis showed Na 120 mmol/L, K 4.2 mmol/L and Cl 82 mmol/L. Brain MRI was performed again which revealed irregularly enhanced meningeal involvement with a significant peritumoral lesion and leptomeningeal seeding (Fig. 3A, B, C). Tumor cells were also identified from cerebrospinal fluid (CSF) studies. Thereafter, the patient complained of low extremity weakness and pain. Whole spine MRI was performed and there were findings suggestive of multiple, small spinal cord metastases and bony metastases on T2, T3, T6, T7, T8, T10 and L1 (Fig. 3D). We reviewed the initial MRI and found that leptomeningeal seeding had occurred before the operation (Fig. 1A : white arrow). He began to suffer from intractable seizure from postoperative day 40 onwards. On postoperative day 61, a brain computed tomography showed diffuse low densities over both hemispheres except for the basal ganglia and cerebellum. These findings were assumed to be from the changes due to the repeated damages caused by inadequate control of the status epilepticus. He died on the postoperative day 62. With this unexpected clinical course, we reviewed the MRI findings on admission. As a result, the patient was assumed to have had leptomeningeal spread before clinical presentation. So, we believe that the abrupt leptomeningeal seeding have caused the dissemination of the tumor during the surgery.

**DISCUSSION**

There have been reported cases of hematogenous or lymphatic dissemination of meningioma or spread through the CSF. CSF dissemination is uncommon, but it can occur in 4% of these cases. Dissemination of meningioma can be increased following a surgical procedure.

According to the revised WHO classification, meningioma is classified into 15 different variants and it shows a wide range of histologic patterns. PM is characterized by a perivascular pseudopapillary pattern, atypical mitosis, necrosis and pleomorphism. PM was first reported by Cushing and Eisenhardt in 1938. Ludwin et al. analyzed 17 cases of PM. According to these authors, it frequently occurs in children (41%) showing frequent mitosis, local recurrence and brain invasion. Extracranial metastasis (23.5%) are commonly seen. In cases of histologi-
CONCLUSION

We experienced a case of papillary falcotentorial meningioma with leptomeningeal seeding complicated by status epilepticus and fatal neurologic deterioration within two months of surgery. Leptomeningeal seeding of PM rarely occurs, but when it happen and accompanied by status epilepticus, we think that careful seizure control will be needed.

Reference

1. Akimura T, Orita T, Hayashida O, Nishizaki T, Fudaba H: Malignant meningioma metastasizing through the cerebrospinal pathway. Acta Neurol Scand 85: 368-371, 1992
2. Al-Habib A, Lach B, Al Khani A: Intracerebral rhabdoid and papillary meningioma with leptomeningeal spread and rapid clinical progression. Clin Neuropathol 24: 1-7, 2005
3. Bigner SH, Johnston WW: The cytopathology of cerebrospinal fluid. II. Metastatic cancer, meningeal carcinomatosis and primary central nervous system neoplasms. Acta Cytol 25: 461-479, 1981
4. Chamberlain MC, Giantz MJ: Cerebrospinal fluid-disseminated meningioma. Cancer 103: 1427-1430, 2005
5. Cushing H, Eisenhardt L: Meningiomas: Their classification, Regional behaviour, life history and surgical end results. Springfield: Charles C Thomas, 1938
6. Delgado-López PD, Martín-Velasco V, Castilla-Diez JM, Fernandez-Arzonada O, Corrales-García EM, Galacho-Harnero A, et al.: Metastatic meningioma to the eleventh dorsal vertebral body: total en bloc spondylectomy. Case report and review of the literature. Neurocirugia (Astur) 17: 240-249, 2006
7. Enam SA, Abdulrauf S, Mehta B, Malik GM, Mahmood A: Metastasis in meningioma. Acta Neurochir (Wien) 138: 1172-1177; discussion 1177-1178, 1996
8. Eom KS, Kim DW, Kim TY: Diffuse crianiopial metastases of intraventricular rhabdoid papillary meningioma with glial fibrillary acidic protein expression: a case report. Clin Neurol Neurosurg 111: 619-623, 2009
9. Fukushima T, Tsugu H, Tomonaga M, Shirakusa T: Papillary meningioma with pulmonary metastasis. Case report. J Neurosurg 70: 478-482, 1989
10. Kepes JJ: Cellular whorls in brain tumors other than meningiomas. Cancer 37: 2232-2237, 1976
11. Kepes JJ, Moral LA, Wilkinson SB, Abdullah A, Llena JF: Rhabdoid transformation of tumor cells in meningiomas: a histologic indication of increased proliferative activity: report of four cases. Am J Surg Pathol 22: 231-238, 1998
12. Kleinschmidt-DeMasters BK, Avakian JJ: Wallenberg syndrome caused by CSF metastasis from malignant intraventricular meningioma. Clin Neuropathol 4: 214-219, 1985
13. Kros JM, Cella F, Bakker SL, Paz Y Geuze D, Egeler RM: Papillary meningioma with pleural metastasis: case report and literature review.
Acta Neurol Scand 102: 200-202, 2000
14. Lee TT, Landy HJ: Spinal metastases of malignant intracranial meningioma. Surg Neurol 50: 437-441, 1998
15. Ludwin SK, Rubinstein LJ, Russell DS: Papillary meningioma: a malignant variant of meningioma. Cancer 36: 1363-1373, 1975
16. Noterman J, Depierreux M, Raftopoulos C, Brotchi J: [Metastases of meningioma. Apropos of 2 cases.] Neurochirurgie 33: 184-189, 1987
17. Pasquier B, Gasnier F, Pasquier D, Keddiari E, Morens A, Couderc P: Papillary meningioma. Clinico-pathologic study of seven cases and review of the literature. Cancer 58: 299-305, 1986
18. Russell T, Moss T: Metastasizing meningioma. Neurosurgery 19: 1028-1030, 1986
19. Satoh T, Kageyama T, Yoshimoto Y, Kamata I, Date I, Motoi M: [Intrathecal dissemination of meningiomas; a case report.] No Shinkei Geka 20: 805-808, 1992
20. Stefanko SZ, Mackay WM: Papillary meningioma. Acta Neuropathol Suppl 7: 126-128, 1981