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Papillary Tumor of the Pineal Region

—Case Report—

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Abstract

A 48-year-old female presented with an extremely rare primary tumor of the pineal region with papillary features manifesting as morning headaches persisting for 1 month. Magnetic resonance imaging showed a well-defined mass, with some cystic components, in the region of the pineal gland. The tumor was completely removed through an occipital transtentorial approach in the prone position. Histological examination found a distinctive papillary growth pattern in which the vessels were covered by multiple layers of tumor cells. The histological diagnosis was papillary tumor of the pineal region (PTPR), which has recently been described as a distinct clinicopathological entity requiring careful follow up because the prognosis is not well understood. Postoperatively, the patient has continued to do well, with no recurrence at the 8-month follow-up examination. PTPR should be considered in the differential diagnosis of pineal tumors. PTPR may have been frequently misinterpreted in the past as either ependymoma or choroid plexus papilloma due to the similar morphology.

Key words: ependymoma, differential diagnosis, immunohistochemistry, papillary feature, pineal region

Introduction

Primary tumors of the pineal region with papillary features include papillary pineal parenchymal tumors (i.e. pineocytoma and pineoblastoma),[4,14,15] papillary ependymoma,[12] choroid plexus papilloma,[10] papillary meningioma,[1] and germ cell tumors. These tumors are extremely rare, and the differential diagnosis in adults must consider papillary metastatic tumors from various primary sites. Accurate histological diagnosis of these types of tumors is often difficult because of their similar morphological characteristics. Recently, papillary tumors of the pineal region (PTPRs) were described as a distinct entity.[8]

Here we describe a similar unusual case involving a PTPR.

Case Report

A 48-year-old female consulted another hospital in May 2006 after experiencing morning headaches persisting for 1 month. Neurological examination was unremarkable except for bilateral prominent papilledema. Magnetic resonance (MR) imaging showed a well-defined mass with some cystic components in the region of the pineal gland apparently causing obstructive hydrocephalus. The maximal diameter of the mass was about 2 cm. The solid component (excluding the cystic components) appeared as isointense on the T_1-weighted images, and hyperintense on the T_2-weighted images (Fig. 1A, B). The solid component of the lesion was prominently enhanced after administration of contrast medium (Fig. 1C, D). Computed tomography demonstrated a non-calcified isodense mass. Blood examination failed to identify any tumor markers (α-fetoprotein [AFP], carcinoembryonic antigen, β-human chorionic gonadotrophin [β-HCG], and carbohydrate antigen 19-9). No extracranial neoplastic manifestation was found.

Left ventriculoperitoneal shunting was performed to treat the obstructive hydrocephalus. The tumor was then treated via an occipital transtentorial approach in the prone position. The adhesion of the tumor and the circumferential organization were comparatively tight. Moreover, many small vessels passed into the tumor, causing the tumor to bleed

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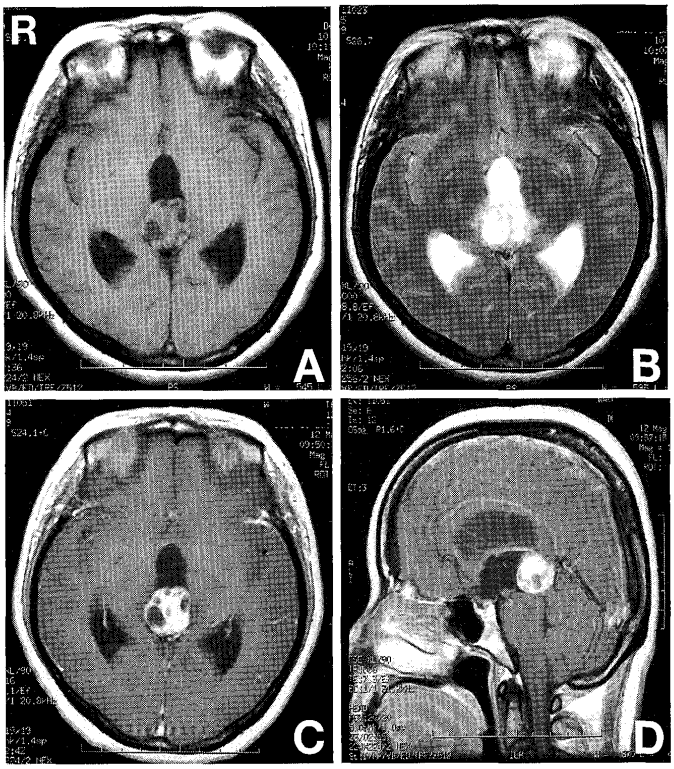

Fig. 1 **A: T_1-weighted magnetic resonance (MR) image showing the solid component of the pineal tumor as isointense with some cystic components, and apparently causing obstructive hydrocephalus. B: T_2-weighted MR image showing the tumor as hyperintense. C: T_1-weighted MR image with contrast medium showing the solid and partly cystic tumor with regions of enhancement. D: Sagittal T_1-weighted MR image with contrast medium.**

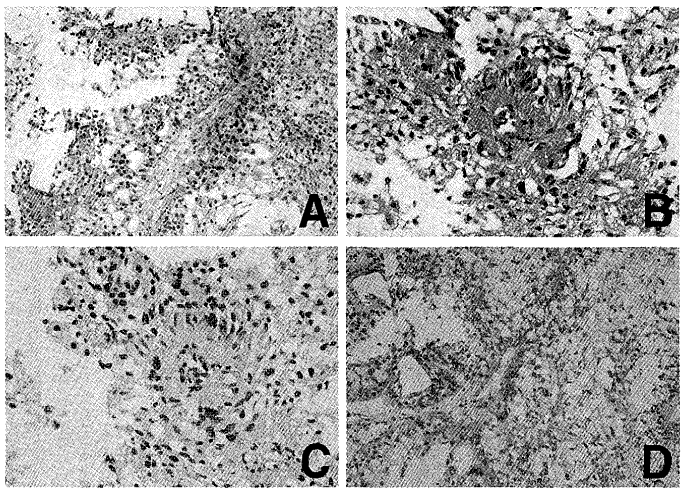

Fig. 2 **Photomicrographs of the surgical specimens. A: The polygonal tumor cells show a distinctive papillary growth pattern with a vascular core. Hematoxylin and eosin (H&E) stain, ×100. B: The tumor cells exhibit a focal ependymoma-like pseudorosette appearance. H&E stain, ×200. C: Immunoreactivity for glial fibrillary acidic protein is negative in the ependymoma-like pseudorosettes. ×200. D: Immunoreactivity for cytokeratin is positive. ×100.**

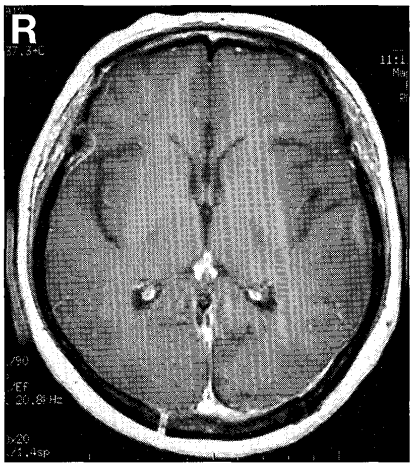

Fig. 3 **Postoperative T_1-weighted magnetic resonance image with contrast medium showing the tumor of the pineal region has been completely removed, and the obstructive hydrocephalus has also improved (performed in 3 days after surgery).**

easily. However, the bleeding was controlled and the tumor was completely removed.

Histological examination showed polygonal tumor cells containing clear cytoplasm and various sizes of nuclei with papillary growth and a vascular core (Fig. 2A). Both edematous and hyalinized changes were observed in some perivascular areas. Focal ependymoma-like perivascular pseudorosettes were present, but these showed no immunoreactivity for glial fibrillary acidic protein (GFAP) (Fig. 2B, C). Immunohistochemical staining also found no reactivity for synaptophysin, chromogranin A, human melanoma black-45, epithelial membrane antigen (EMA), placental alkaline phosphatase (PLAP), or β-HCG. On the other hand, immunoreactivity was present for S-100 protein, cytokeratin (Fig. 2D), and vimentin. The MIB-1 labeling index was very low. The final histological diagnosis was PTPR based on the morphological features of the tumor cells and the immunohistochemical results.

Postoperatively, the patient did not undergo adjuvant therapy because the MIB-1 labeling index was very low, and postoperative MR imaging detected no regrowth of the tumor (Fig. 3). The patient con-

tinues to do well, and no recurrent tumor was found at the 8-month follow-up examination.

Discussion

PTPR is characterized by an epithelial-like growth pattern in which the vessels are covered by multiple layers of tumor cells forming perivascular pseudorosettes. PTPR is considered to be significantly different to ependymoma and choroid plexus papilloma, although the morphologic and immunohistochemical characteristics of PTPR are very similar. The immunohistochemical characteristics of PTPR include variable immunoreactivity for cytokeratin, widespread immunoreactivity for neuron-specific enolase and S-100 protein, focal immunoreactivity for vimentin, and complete absence of immunoreactivity for GFAP. Immunoreactivity is usually observed for EMA, and may be present for synaptophysin and chromogranin A.[11] Ultrastructural examination suggests that PTPR may derive from specialized ependymal cells of the subcommissural organ.[4,9] Chordoid glioma of the third ventricle may also originate from specialized ependymal cells of the subcommissural organ, and may be a subtype of ependymoma.[3]

In the present case, the differential diagnosis included various tumors with papillary features. Pineocytoma was excluded because of the presence of immunoreactivity for cytokeratin, and the absence for synaptophysin and chromogranin A. In addition, a pronounced epithelial nature is not a main characteristic of pineal parenchymal tumors. All markers (PLAP, HCG, AFP) for germ cell tumors were negative. Choroid plexus papilloma was another possibility, but this tumor rarely occurs in the posterior third ventricle.[10] PTPR is generally immunoreactive for GFAP and EMA, and the morphological appearance is less papillary than that of choroid plexus papilloma. Papillary ependymoma shares many similarities with PTPR. Immunoreactivity to GFAP and EMA is frequently observed in ependymoma but is only expressed with wide-spectrum keratins (AE1/AE3). In the present case, some pseudorosette appearances were observed, but no immunoreactivity to GFAP. Most cases of PTPR can be distinguished from ependymomas and choroid plexus tumors by the absence of EMA staining, membranous inwardly rectifying potassium channel Kir7.1 and cytoplasmic staniocalcin-1 staining, and the presence of distinct microtubule associated protein-2.[7] Other tumors of the central nervous system with papillary features may occur in the region of the pineal gland, but are generally more easily distinguished from PTPR on the basis of the clinical, neuroimaging, and morphological presentations. The present pineal tumor shared several common histological and immunophenotypic characteristics with the entity described as PTPR, including the papillary growth pattern and diffuse immunoreactivity to cytokeratin. No ultrastructural analysis was performed in the present case, but the immunohistochemical analysis reflects the ultrastructural findings of PTPR, including ependymomal, secretory, and neuroendocrine organelles.[8] Therefore, our final histological diagnosis was PTPR.

The treatment guidelines for PTPR have not yet been established due to the small number of reported cases.[2,5,7-9,11,13] The prognosis for PTPR is also still not well understood. However, the clinical course of PTPR is characterized by frequent local recurrence and gross total resection is probably the only clinical factor associated with good survival and absence of recurrence.[6] The effect of radiotherapy on disease progression will need to be investigated. The present case seemed to have low malignant potential, but the biological behavior will be monitored by follow-up examination.

PTPR is extremely rare but should be considered in the differential diagnosis of pineal tumors, because PTPR may have been frequently misinterpreted in the past as either ependymoma or choroid plexus papilloma. We should carefully follow up such patients because the prognosis of PTPR is still not well understood.

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