

Case Report

Juvenile Pilomyxoid Astrocytoma in the Opticohypothalamus

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Pilomyxoid astrocytoma (PMA) is a newly recognized variant of a pilocytic astrocytoma. This report describes a case of a pilomyxoid astrocytoma that occurred in the opticohypothalamus. The patient was a 18-year-old girl who complained decreased visual acuity and visual field over a period of two years. Magnetic resonance imaging (MRI) showed an irregular lobulated tumor with heterogeneous enhancement at the suprasellar region involving the hypothalamus. The mass was partially removed via the subfrontal approach. Its pathology was confirmed to be PMA. Adjuvant chemotherapy with cisplatin and vincristine was started following tumor resection. After four cycles, the mass showed a partial response to the chemotherapy. Although long-term outcome is yet to be determined, the administration of combined cisplatin and vincristine treatment seems to be an effective regimen for a pilomyxoid astrocytoma.

KEY WORDS : Adjuvant chemotherapy · Opticohypothalamus · Pilomyxoid astrocytoma.

INTRODUCTION

Pilomyxoid astrocytoma (PMA) is a rare glioma that occurs in infants and young children and is recognized as a variant of pilocytic astrocytoma^{2,4}. When compared to the typical biphasic histology of pilocytic astrocytomas, these neoplasms demonstrate the presence of monomorphous piloid cells in a loose fibrillary and myxoid background^{1,3}. The most common location for this type of infantile tumor is the hypothalamus, followed by optic chiasm. A PMA typically occurs in young children and the median age of PMA patients at presentation is 10 months. However, these tumors can occur in older children^{2,13}. In this report, we present a case of PMA in a teenager and provide a review of the literature.

CASE REPORT

The patient is an 18-year-old female who presented with decreased visual acuity and visual field that lasted for two years prior to admission. Magnetic resonance imaging (MRI)

showed a well-defined lesion that was 4 × 4 × 3 cm in size and was located in the suprasellar region involving the hypothalamus. The lesion showed low signal intensity on T1-weighted images and high signal intensity on T2-weighted images (Fig. 1A, B). The mass was seen as an irregular lobulated mass following gadolinium administration and was not associated with perilesional edema (Fig. 1C). Surgery was performed using the subfrontal approach. Intraoperatively, the tumor originated from the opticochiasmatic area and was soft and multilobulated. The mass in the opticocarotid space was partially removed. The histological features of the parasellar mass showed a monomorphous neoplasm composed of bipolar (piloid) tumor cells lying within a rich myxoid background (Fig. 2A). As based on immunohistochemical staining, the tumor showed strong and diffuse staining for glial fibrillary acidic protein (Fig. 2B) but was negative for staining for neuronal markers such as synaptophysin and chromogranin. The Ki-67 labeling index was less than 1% in the neoplastic nuclei. Based on these findings, the patient was diagnosed as PMA.

Ventriculoperitoneal shunt was undergone on the third postoperative day due to persistent drowsiness related to the obstructive hydrocephalus. Adjuvant chemotherapy with cisplatin and vincristine for four cycles was started following the operation. Six months after surgery, a follow-up MRI examination demonstrated that the tumor showed a partial

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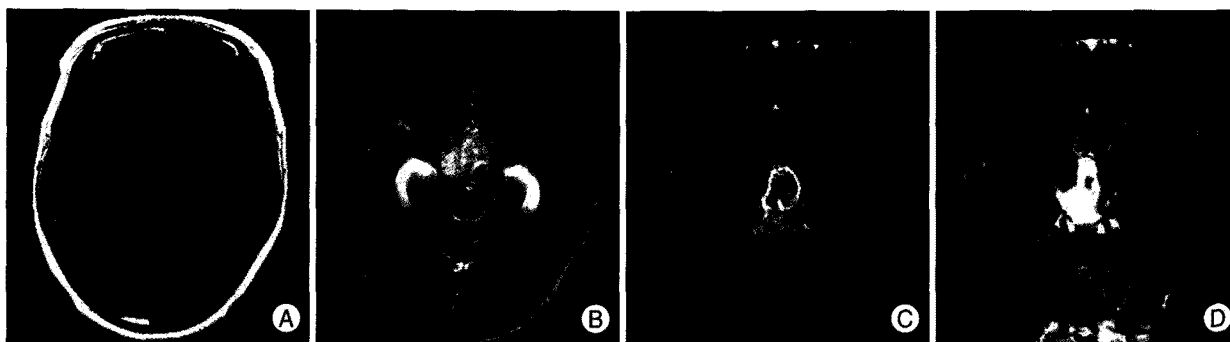


Fig. 1. Radiological findings are presented. Magnetic resonance imaging (MRI) shows a 4 × 4 × 3 cm sized opticohypothalamic mass. The lesion is seen with low signal intensity on T1-weighted images and high signal intensity on T2-weighted images (A, B). The mass is seen as an irregular lobulated mass following gadolinium administration (C). After chemotherapy, the central necrotic portion is decreased (D).

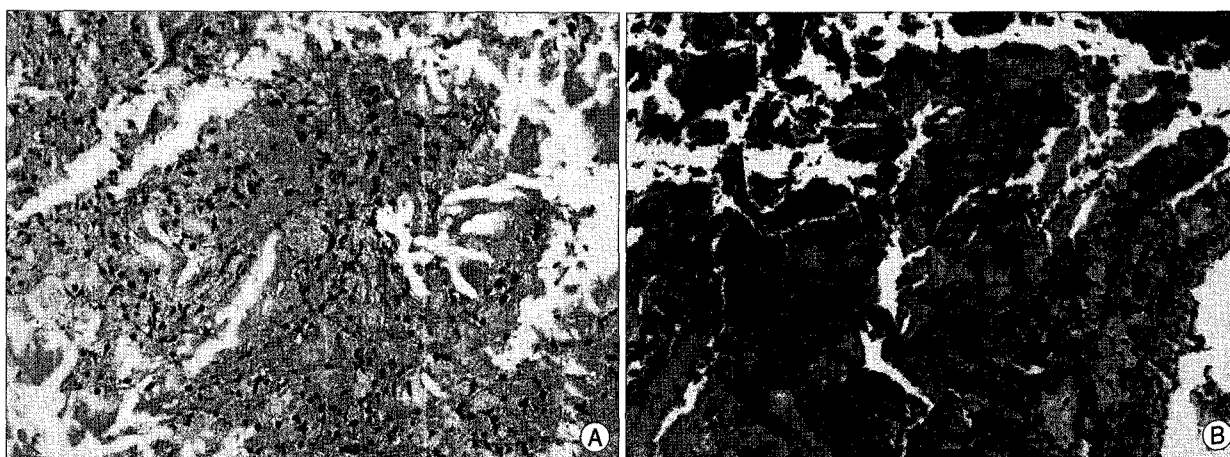


Fig. 2. Pathological findings are presented. The histological features show a monomorphous neoplasm composed of bipolar (piloid) tumor cells lying within a rich myxoid background (A, H&E stain × 200). As based on immunohistochemical staining for the tumor, strong and diffuse staining for glial fibrillary acidic protein was seen (B, × 200).

response to the chemotherapy. The central necrotic portion was decreased as seen on gadolinium-enhanced images (Fig. 1D). The proximal shunt tip was inserted on right lateral ventricle which was shrunken. The patient did not show improvement or aggravation of visual symptoms. Patient did not demonstrate a neck or back pain and the cytology of cerebrospinal fluid was negative for tumor cells.

DISCUSSION

Pilocytic astrocytomas (PAs) are common World Health Organization grade I tumors that occur most frequently in the posterior fossa and the hypothalamic-chiasmatic region of children and young adults. These relatively well-circumscribed gliomas have an indolent clinical course, even with partial removal, with a 10-year survival rate ranging from 80% to 100%. PAs are associated with favorable outcomes, and cerebrospinal dissemination occurs only on rare occasions^{3,5,6}. However, some clinicopathological factors, opto-chiasmatic location, invasion of surrounding structures and the pilomyxoid variant, are associated with a worse prognosis³.

Tihan et al. reported that PMA is an aggressive variant of PA, and the entity was given the name 'pilomyxoid astrocytoma' due to its distinguishing histological features¹³. A PMA is a monomorphous neoplasm composed of bipolar (piloid) tumor cells lying within a rich myxoid background^{2,4,7,10,13}. These tumor cells often show a striking angiocentric arrangement. Although largely solid in architecture, the tumor may, as with a pilocytic astrocytoma, show limited parenchymal infiltration in the periphery. Unlike an ordinary PA, a PMA typically lacks Rosenthal fibers and only displays eosinophilic granular bodies in exceptional cases. Mitotic figures may be seen but are not abundant. Base on a PMA stains strongly and diffusely for glial fibrillary acidic protein and vimentin, but is negative for neuronal markers, such as synaptophysin, neurofilament proteins and chromogranin. MIB-1 labeling indices are usually approximately 5%, but no detailed analysis of the proliferation index relative to tumor behavior has been reported. PMA was recently classified as a Grade II tumor in the 2007 WHO Classification.

PMA is typically a tumor of infancy and early childhood (median age, 10 months), but has been reported in older

children^{2,13}). The hypothalamic/chiasmatic region is the most frequent PMA location. The signs and symptoms of PMA are related to the mass effect. Local recurrences and cerebrospinal spread are more likely to occur in a PMA as compared to a PA. Komotar et al.⁹ demonstrated that sixteen patients of 21 PMAs (76%) experienced local recurrence and three of those patients demonstrated evidence of cerebrospinal fluid dissemination⁸.

Radiologically, 57% of tumors were located in the hypothalamic/chiasmatic/third ventricular region¹². The rest of the tumors occurred in other locations, including the parietal lobe, temporal lobe, cerebellum, basal ganglia, and fourth ventricle. Forty-eight percent of tumors showed heterogeneous rim enhancement, 43 percent showed uniform enhancement and 9% showed no enhancement. Intratumoral hemorrhage was associated in 24% masses. Our case was located in the opticohypothalamic region with heterogeneous rim enhancement and there was no evidence of intratumoral hemorrhage.

For the treatment of PMA, variability in the use of adjuvant therapy seems to account for the less favorable outcomes of patients with PMAs. It has been suggested that a platinum-containing regimen may be the most effective for treating an opticohypothalamic astrocytoma¹. Carboplatin (CBDCA) has been utilized as a key drug in platinum-based chemotherapeutic regimens. Cisplatin (CDDP) has also been applied in a regimen for optic pathway/hypothalamic gliomas^{8,11}. Some authors reported that pilomyxoid astrocytoma patients treated with the chemotherapy with CDDP/CBCCA showed good results. In the present case, CDDP was administered as a 2-hour infusion at a dose of 20 mg/m²/day on days 1-5 and vincristine was administered as an intravenous bolus injection at a dose of 1.4 mg/m²/day (maximum dose, 2.0 mg/day) on days 1, 8 and 15. There was a 4-week interval between cycles. After four cycles, the tumor showed a partial response.

CONCLUSION

Having treated a case of opticohypothalamic PMA in a teenager with partial resection followed by combined use of cisplatin and vincristine, we suggest this combined regimen is

effective for the treatment of this tumor.

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References

1. Brown MT, Friedman HS, Oakes WJ, Boyko OB, Hockenberger B, Schold SC Jr : Chemotherapy for pilocytic astrocytomas. *Cancer* 71 : 3165-3172, 1993
2. Burger PC, Cohen KJ, Rosenblum MK, Tihan T : Pathology of diencephalic astrocytomas. *Pediatr Neurosurg* 32 : 214-219, 2000
3. Fernandez C, Figarella-Branger D, Girard N, Bouvier-Labit C, Gouvernet J, Paz Paredes A, et al. : Pilocytic astrocytomas in children : prognostic factors-a retrospective study of 80 cases. *Neurosurgery* 53 : 544-553; discussion 554-555, 2003
4. Fuller CE, Frankel B, Smith M, Rodziewicz G, Landas SK, Caruso R, et al. : Suprasellar monomorphous pilomyxoid neoplasm : an ultrastructural analysis. *Clin Neuropathol* 20 : 256-262, 2001
5. Giannini C, Scheithauer BW, Burger PC, Christensen MR, Wollan PC, Sebo TJ, et al. : Cellular proliferation in pilocytic and diffuse astrocytomas. *J Neuropathol Exp Neurol* 58 : 46-53, 1999
6. Gjerris F, Klinken L : Long-term prognosis in children with benign cerebellar astrocytoma. Case report. *J Neurosurg* 49 : 179-184, 1978
7. Gotteried ON, Fulst DW, Townsend JJ, Cudwell WT : Spontaneous hemorrhage associated with a pilomyxoid astrocytoma. Case Report. *J Neurosurg* 99 : 416-420, 2003
8. Kato T, Sawamura Y, Tada M, Ikeda J, Ishii N, Abe H : Cisplatin/Vincristine chemotherapy for hypothalamic/visual pathway astrocytoma in young children. *J Neurooncol* 37 : 263-270, 1998
9. Komotar RJ, Burger PC, Carson BS, Brem H, Olivi A, Goldthwaite PT, et al. : Pilocytic and pilomyxoid hypothalamic/chiasmatic astrocytomas. *Neurosurgery* 54 : 72-79; discussion 79-80, 2004
10. Komotar RJ, Mocco J, Zacharia BE, Wilson DA, Kim PY, Canoll PD, et al. : Astrocytoma with pilomyxoid features presenting in an adult. *Neuropathology* 26 : 89-93, 2006
11. Laithier V, Grill J, Le Deley MC, Ruchoux MM, Couanet D, Doz F, et al. : Progression-free survival in children with optic pathway tumors--dependence on age and the quality of the response to chemotherapy--results of the first French prospective study for the French Society of Pediatric Oncology. *J Clin Oncol* 21 : 4572-4578, 2003
12. Linscott LL, Osborn AG, Blaser S, Castillo M, Hewlett RH, Wieselthaler N, et al. : Pilomyxoid astrocytoma: expanding the imaging spectrum. *AJNR Am J Neuroradiol* 29 : 1861-1866, 2008
13. Tihan T, Fisher PG, Kepner JL, Godfraind C, McComb RD, Goldthwaite PT, et al. : Pediatric astrocytomas with monomorphous pilomyxoid features and a less favorable outcome. *J Neuropathol Exp Neurol* 58 : 1061-1068, 1999
14. Tsugu H, Oshiro S, Yanai F, Komatsu F, Abe H, Fukushima T, et al. : Management of pilomyxoid astrocytomas: our experience. *Anticancer Res* 29 : 919-926, 2009