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Case Report

Pineal region pilocytic astrocytoma showing uncommon growth: a case report

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ABSTRACT

Pineal region pilocytic astrocytomas are extremely rare, and there is limited information about their radiological features. We report the case of a 22-year-old woman with a cystic lesion in the pineal region. In the 2 years after diagnosis, the lesion irregularly extended along the bilateral internal cerebral veins and the inferolateral surface of the corpus callosum. Gross total resection was achieved, and the histopathological study revealed that the lesion was a pilocytic astrocytoma. The lesion exhibited uncommon growth, leading to difficulty in establishing an accurate preoperative diagnosis. It should be noted that pineal region pilocytic astrocytomas can demonstrate atypical appearances.

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Introduction

Pineal region tumors account for 0.4%–1.0% of all intracranial tumors [1–3], and gliomas are rare entities that account for only 14%–22% of all pineal region tumors [3,4]. Moreover, pilocytic astrocytomas (PAs) are exceptionally uncommon among pineal region gliomas [1–4]. Although PAs are usually round or oval, well-defined lesions [5], information regarding the shape and extension pattern of pineal region PAs is limited. Here we report a case of a pineal region PA with uncommon growth, which made establishing an accurate preoperative diagnosis

difficult. We also discuss the differences in radiological findings among pineal region tumors.

Case report

A 22-year-old woman was incidentally found to have an 18 × 21 × 25 mm cystic lesion in the pineal region on magnetic resonance imaging (MRI) that showed hypointensity on T1-weighted images and hyperintensity on T2-weighted images (Fig. 1). The lesion was initially presumed to consist of only a cystic component and was considered benign. Therefore, no additional study such as gadolinium-enhanced imaging was performed and conservative follow-up was planned. However, the follow-up was unintentionally interrupted because the pa-

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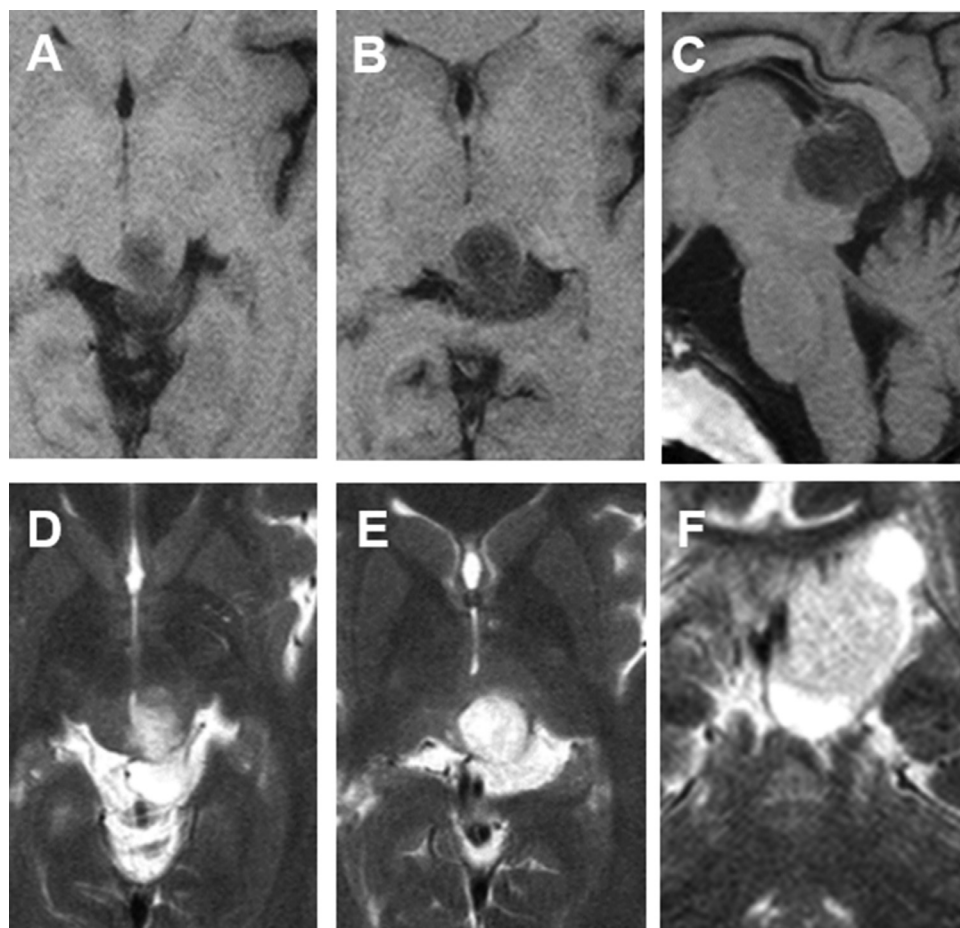


Fig. 1 – Initial magnetic resonance image of an 18 × 21 × 25 mm cystic lesion in the pineal region showing hypointensity on T1-weighted imaging (A, B; axial, C; sagittal) and hyperintensity on T2-weighted imaging (D, E; axial, F; coronal).

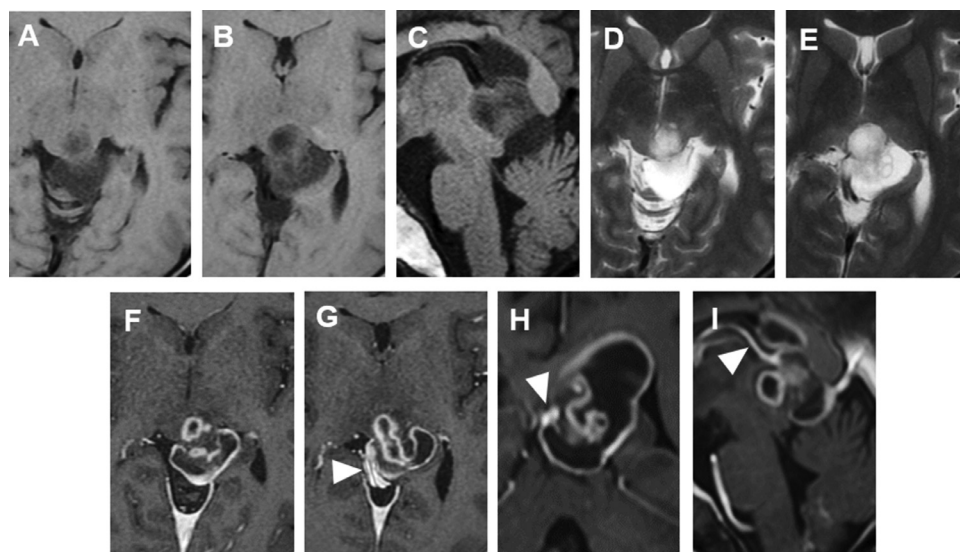


Fig. 2 – Magnetic resonance imaging performed 2 years after the initial study. T1-weighted (A, B; axial, C; sagittal) and T2-weighted images (D, E; axial) show that the lesion has grown in size to 29 × 32 × 49 mm. Gadolinium-enhanced T1-weighted imaging (F, G; axial, H; coronal, I; sagittal) shows an irregular extension of the lesion along the bilateral internal cerebral veins (G, I, arrowheads) and the inferolateral surface of the corpus callosum.

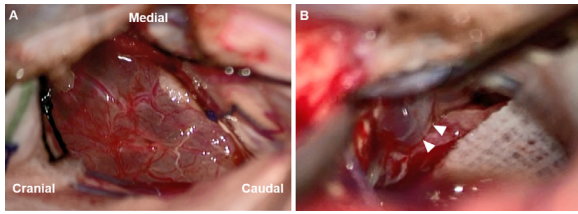


Fig. 3 – Intraoperative view of the cystic lesion through the posterior interhemispheric fissure. The lesion measured approximately 19 × 12 mm in the operative view (A) and adhered to the right internal cerebral vein (B; arrowheads).

tient moved to a different location soon after the initial study. Two years later, the patient presented with headaches. No focal neurological deficits were observed; however, T1- and T2-weighted images revealed that the lesion had grown in size to 29 × 32 × 49 mm (Fig. 2A–E). In addition, gadolinium-enhanced T1-weighted imaging (Fig. 2F–I) showed an irregular extension of the lesion along the bilateral internal cerebral veins (ICVs) (Fig. 2G–I, arrowheads) and the inferolateral surface of the corpus callosum (CC). Diffusion-weighted imaging (DWI) demonstrated no hyperintense areas. No abnormal findings were observed in the examination of hormone levels or tumor markers.

Surgical resection was performed via the posterior interhemispheric fissure (Fig. 3). Although the lesion irregularly extended along the inferolateral surface of the CC and adhered to the bilateral ICVs and the vein of Galen, gross total resection was achieved because the adhesion was not strong and the infiltration of the lesion into the normal brain structures was minimal.

The histopathological examination revealed a biphasic pattern consisting of densely fibrillated areas with bipolar cells or Rosenthal fibers as well as hypocellular areas (Fig. 4A–C). Immunohistochemistry showed positivity for glial fibrillary acidic protein (Fig. 4D) and S-100 protein (Fig. 4E), although IDH

1 and p53 were negative. The Ki-67 index was lower than 5% (Fig. 4F). These findings support the diagnosis of PA [5,6].

The patient's postoperative course was uneventful except for some transient visual field defects. Postoperative MRI showed complete resection of the lesion (Fig. 5). Three years after surgery, the patient is doing well without tumor recurrence.

Discussion

Some studies have focused on pineal region PAs; however, there is no detailed analysis on distinguishing pineal region PAs from other pineal region tumors based on radiological features [1–3]. The tumor intensity on T1- and T2-weighted images in the present case supports the diagnosis of PA or low-grade glioma [5,7]. However, available information regarding the shape or extension pattern of pineal region PAs is limited. A literature review revealed that pineal region PAs are usually round, well-defined masses located near the pineal gland (Table 1) [1,2,4,8]. Unlike previous cases, irregular extension along the bilateral ICVs and the inferolateral surface of the CC was observed in the present case. Such an extension pattern has never been reported, and this uncommon finding made establishing an accurate preoperative diagnosis difficult.

Alternatively, germ cell tumors or pineal parenchymal tumors, which are common pineal region tumors, were also preoperatively considered in the present case. Among germ cell tumors, germinomas, 20%–52% of which have a cystic component, and cystic teratomas exhibit similar features, although both tumors may show hyperintensity on T1-weighted imaging due to their heterogeneity [9]. Conversely, yolk sac tumors or choriocarcinomas are negligible as alpha-fetoprotein or human chorionic gonadotropin levels were not elevated [10]. Among pineal parenchymal tumors, the radiological features of pineocytomas and pineal parenchymal tumors of intermediate differentiation are more similar to those of the present case, compared with papillary tumors of pineal region or pi-

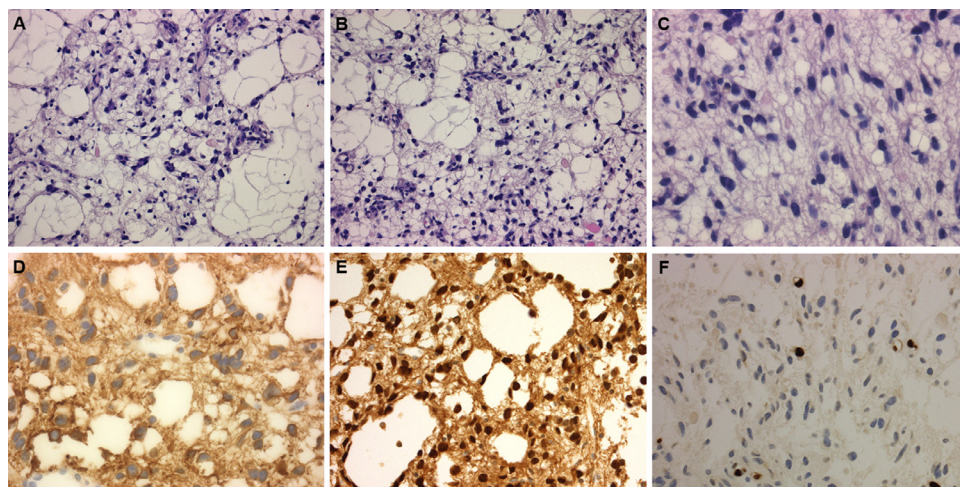
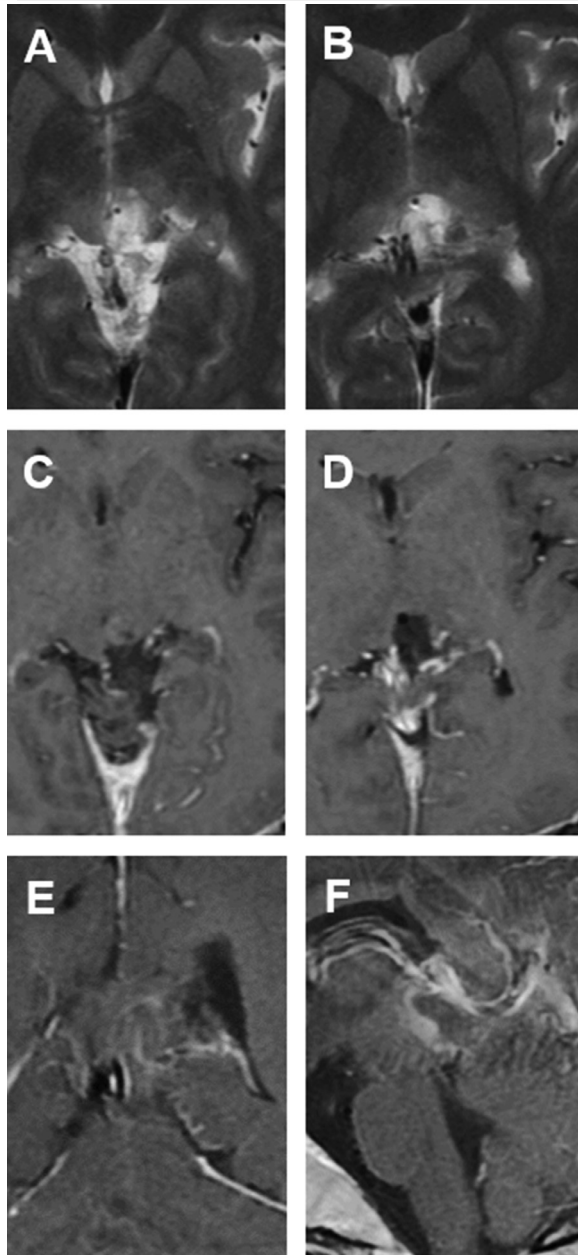


Fig. 4 – Histopathological examination. Hematoxylin and eosin staining reveals a biphasic pattern consisting of densely fibrillated and hypocellular areas (A and B, × 200, C, × 400). Immunohistochemical analysis shows positivity for glial fibrillary acidic protein (D, × 400) and S-100 protein (E, × 200). The Ki-67 index was lower than 5% (F, × 200).

Table 1 – Summary of characteristics and radiological features of patients with pineal region pilocytic astrocytomas.

Authors	Age (year)/Sex	Magnetic resonance imaging		
		Intensity (T1/T2)	Size (mm)	Shape
Arantes et al. [1]	36/male	Hypo/hyper	25 × 32 × 29	Round/well-defined
Gupta et al. [2]	11/female	Iso-hypo/hyper	40 × 33 × 29	Round/well-defined
	22/female	NA	87 × 80 × 78	Round/well-defined
Magrini et al. [4]	NA/female	NA	NA	Round/well-defined
Kim et al. [8]	14/male	Hypo/hyper	NA	Round/well-defined
Present case	24/female	Hypo/hyper	29 × 32 × 49	Irregular extension

NA, not available.

**Fig. 5 – Magnetic resonance imaging performed on the day after surgery. T2-weighted (A, B; axial) and gadolinium-enhanced T1-weighted images (C, D; axial, E; coronal, F; sagittal) show complete resection of the lesion.**

neoblastomas; papillary tumors of pineal region usually show hyperintensity on T1-weighted imaging, which is related to the concentration of protein and glycoprotein, and pineoblastomas usually show restricted diffusion on DWI [9]. Moreover, epidermoid cysts can be located in the pineal region, but they are usually bright on DWI [11].

Both pineal region PAs and some pineal region tumors have similar radiological features, and distinguishing PAs from other tumors is difficult, especially when PAs have irregular shapes or extension patterns, as in the present case. It should be noted that pineal region PAs can show atypical appearances.

Patient consent statement

The patient has provided consent to the submission of the case report to the journal.

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