

# Supratentorial Pilocytic Astrocytoma Mimicking Convexity Meningioma with Early Anaplastic Transformation: A Case Report

Jung Hwan Lee<sup>1</sup>, Soon Ki Sung<sup>2</sup>, Chang Hwa Choi<sup>1</sup>

<sup>1</sup>Department of Neurosurgery, Pusan National University Hospital, Busan, Korea

<sup>2</sup>Department of Neurosurgery, Pusan National University Yangsan Hospital, Yangsan, Korea

**Received** April 10, 2017

**Revised** July 1, 2017

**Accepted** July 18, 2017

## Correspondence

Chang Hwa Choi  
Department of Neurosurgery,  
Pusan National University Hospital,  
179 Gudeok-ro, Seo-gu,  
Busan 49241, Korea  
**Tel:** +82-51-240-7257  
**Fax:** +82-51-244-0282  
**E-mail:** chwachoi@pusan.ac.kr

Meningiomas and pilocytic astrocytomas are benign intracranial tumors. Pilocytic astrocytomas arises frequently at the posterior fossa in childhood. Meningiomas have several image findings, such as a dural tail sign, bony erosion, and sunburst appearance on angiography. However, pilocytic astrocytomas with these findings have been rarely reported. In this report, we describe a mass with typical image findings of a meningioma, but diagnosed as a supratentorial pilocytic astrocytoma with early anaplastic transformation.

**Key Words** Astrocytoma; Meningioma; Radiography; Anaplasia.

## INTRODUCTION

Pilocytic astrocytomas are the most common glial cell neoplasms in children and the most common pediatric cerebellar tumor [1]. Generally, they originate from the cerebellum, brainstem, and optic nerve [1,2]. However, lobar tumors have been reported rarely [1]. Most pilocytic astrocytomas are benign, and anaplastic or malignant transformation is uncommon unless there is a history of radiation exposure [3].

Meningiomas are benign tumors originating from arachnoid cap cells [2]. They exhibit homogeneous enhancing masses on magnetic resonance imaging (MRI). They have typical image findings known as a dural tail sign [4]. It is a homogeneously enhanced thickening of the dural margin with peripheral tapering [4,5]. Sunburst patterns (radial divergence of feeder arterial branches) on angiography and bony erosion on computed tomography (CT) scans are included in typical

imaging findings of meningiomas [5]. The incidence of cystic meningiomas varies from 1.6% to 10% of all meningiomas, and the commonest location is the cerebral convexity, particularly the frontal and parietal regions [6].

In this article, we describe a case of a supratentorial pilocytic astrocytoma with early anaplastic transformation, strongly suspected to be a cystic meningioma in radiographic findings. This case study was approved by the Ethics Committee of the Pusan National University Hospital.

## CASE REPORT

A 28-year-old female visited our institute because of headache for a month. The consciousness level was alert and motor grades of the extremities were normal. However, she had repeated vomiting for several days. This symptom was likely due to increased intracranial pressure, and therefore brain imaging was performed. The brain CT scan showed abnormal low density on the right frontal lobe and bony thinning on the right frontal bone (Fig. 1D). Brain MRIs revealed cystic and enhancing mass on the right frontal lobe (Fig. 1A and B). Dural enhancement suspected to be the dural tail sign was identified

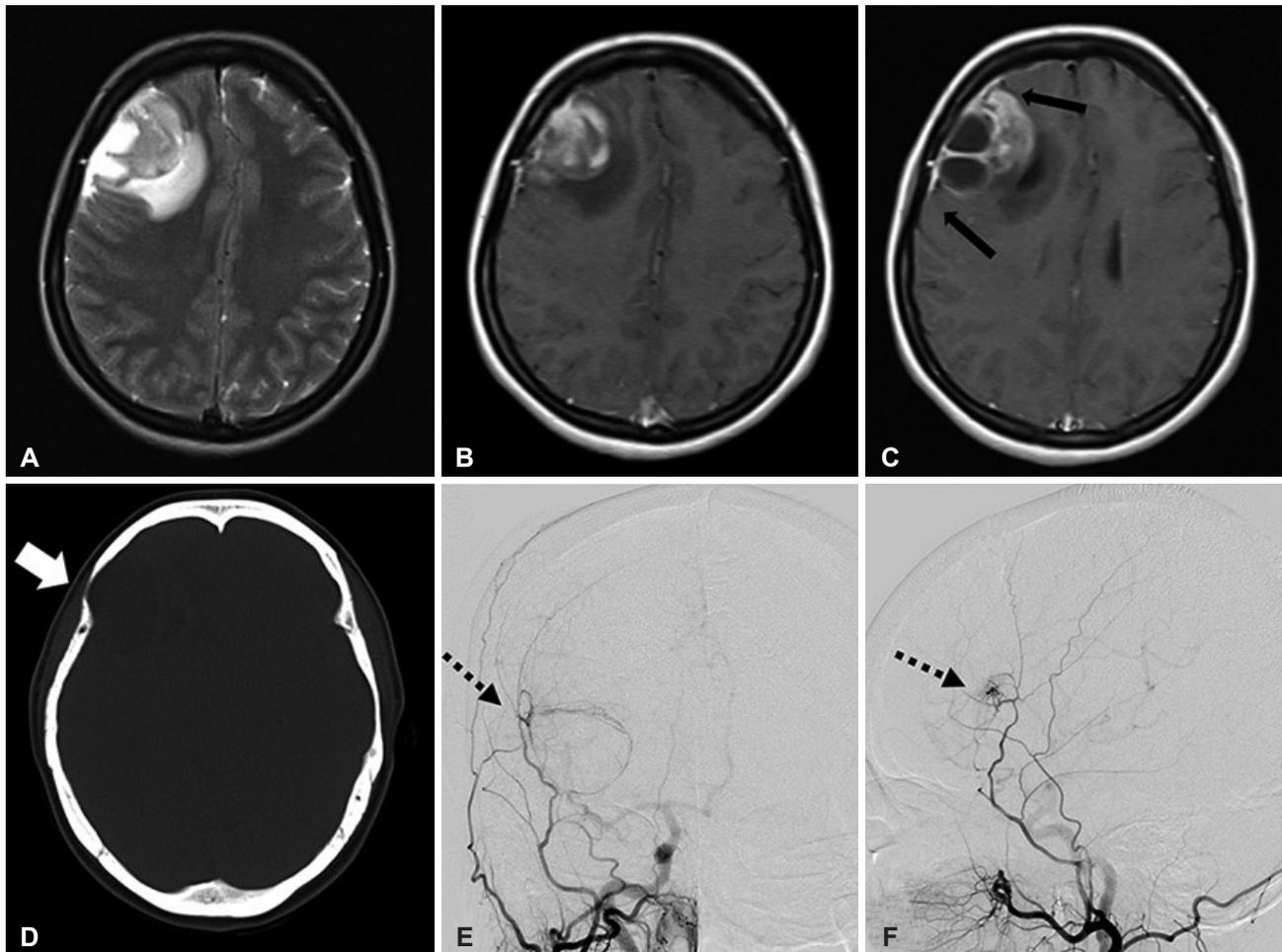
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Copyright © 2017 The Korean Brain Tumor Society, The Korean Society for Neuro-Oncology, and The Korean Society for Pediatric Neuro-Oncology

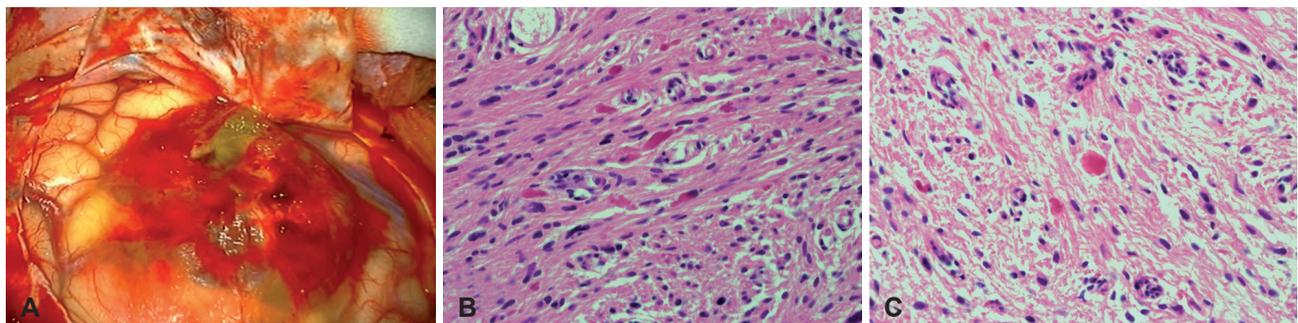
(Fig. 1C). Conventional angiography was performed and sunburst appearance through the right middle meningeal artery was confirmed (Fig. 1E and F). These radiographic findings suggested a diagnosis of a cystic meningioma.

A surgical excision was performed. Intraoperatively, the

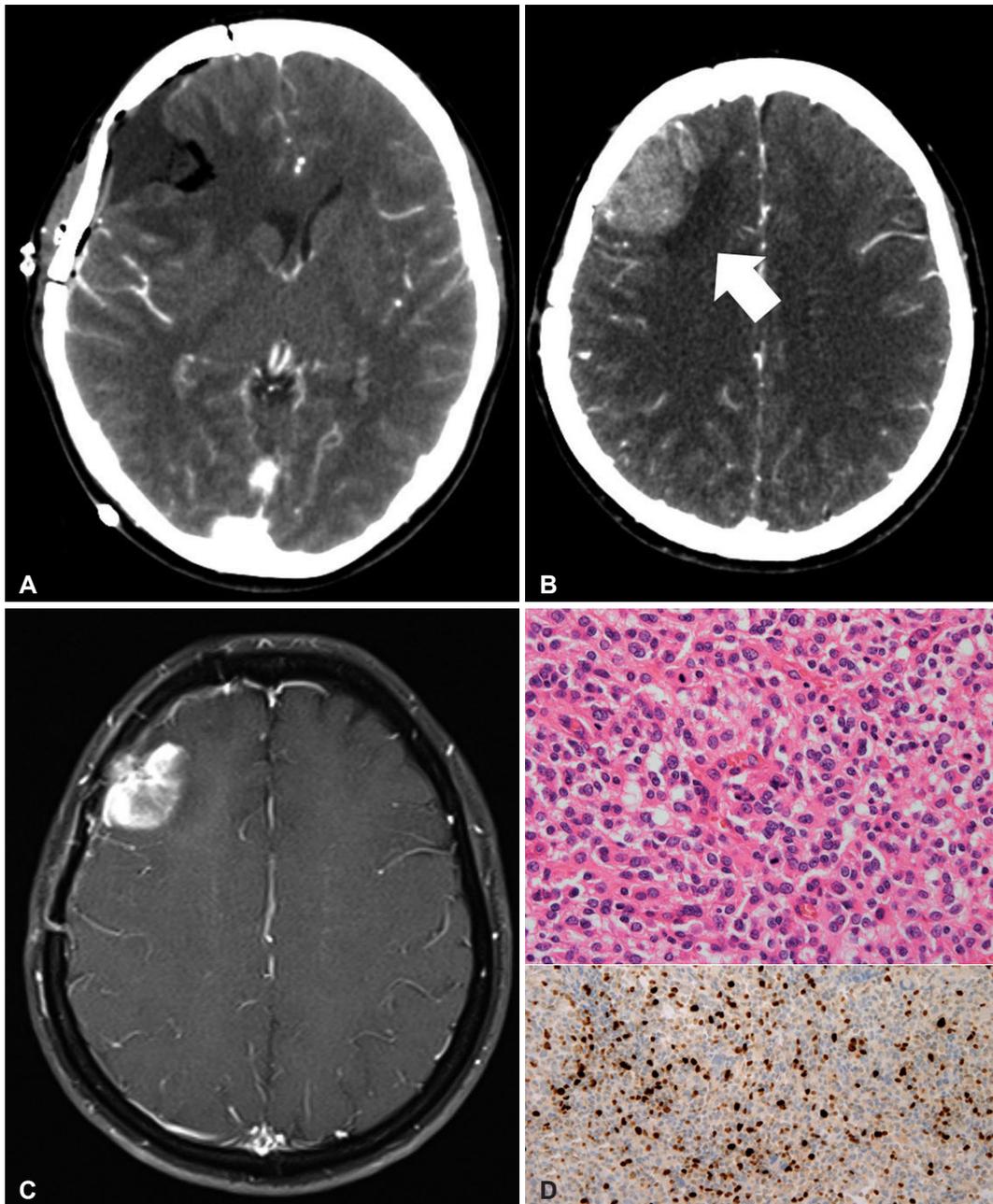
dura was intact and there was no abnormal findings at the craniotomy eroded bone site. The mass had a well-defined arachnoid plane. Also, there was no dural attachment or adhesions (Fig. 2A). A biopsy was taken and sent to the pathologist for intraoperative diagnosis, and the result of the frozen biopsy



**Fig. 1.** Preoperative radiographic images. A: T2 weighted MRI showing a mass with multiple cystic portion and peritumoral edema. B: MRI with gadolinium reveals a well-enhancing mass with large dural base on the right frontal convexity area. C: Dura tail signs (black arrows) are identified on MRI with gadolinium. D: Bony thinning on right frontal bone (white arrow) is revealed on computed tomography scans. E: The angiographic image demonstrates sunburst appearance (dotted arrow). F: Sunburst appearance also shows on the lateral image (dotted arrow). MRI, magnetic resonance imaging.



**Fig. 2.** Intraoperative photograph (A) reveals a non-dural based and cystic mass. Photomicrograph of tumor shows Rosenthal fibers (B) and eosinophilic granular bodies (hematoxylin-eosin stain,  $\times 200$ ) (C).



**Fig. 3.** Postoperative radiographic and pathologic findings. A: No remnant mass is identified on postoperative enhanced CT scans. B: Follow-up CT scans after 9 months shows a mass lesion suspicious of tumor recurrence (white arrow). C: Magnetic resonance imaging with gadolinium reveals a new well-enhancing mass on previous operative site. D: Pathologic findings shows increased cellularity, increased nuclear pleomorphism, and some mitoses (3 mitoses/10 high power field). There was no necrosis. Ki-index was about 30% (hematoxylin-eosin stain,  $\times 200$ ). CT, computed tomography.

was a glioma. After cyst fenestration, the mass was totally removed. The final pathology findings described a proliferation of piloid glial cell with Rosenthal fibers and eosinophilic granular bodies (Fig. 2B and C). Biphasic pattern was also identified. The Ki-67 was 1%. However, some scattered mitotic figures were identified. A maximum of 3 mitoses per 10 high power field showed that it was difficult to diagnose the patient as an anaplastic astrocytoma. Also, slightly increased cellularity

was also shown, but there was no necrotic tissue. Therefore, the histologic findings confirmed a diagnosis of pilocytic astrocytoma with transformation to a more cellular and mitotically active lesion.

Postoperatively, enhanced CT scans revealed that the tumor was totally removed. The symptoms improved and there were no abnormal neurologic signs. Additional treatment such as radiation was not performed because pilocytic astrocytoma

are known to be benign. There were no specific symptoms during follow-up. However, CT scans after nine months for routine follow-up showed a mass-like lesion. An MRI with gadolinium was performed, and the tumor recurrence was identified (Fig. 3). The recurrent mass was removed surgically. Pathologic diagnosis was an anaplastic astrocytoma (Fig. 3D). Postoperative radiation therapy of 60 Gy was performed. After radiation, there was no tumor recurrence for 3 years.

## DISCUSSION

The MRI findings of this mass showed a well enhancing lesion which included cystic portions, and the lesion seemed to communicate with the dura. These findings coincided with a dural tail sign. Classically, the MRI findings of a cystic meningioma have been described as an extra-axial lesion with enhancement of solid portion and presence of a dural tail [6,7]. This findings were very similar to this mass. Therefore, we believed that this mass was a cystic meningioma. Furthermore, there were other image findings that correlated with a meningioma, such as thinning of the involved skull on CT scans, and sunburst sign on angiography.

Typical radiographic findings of pilocytic astrocytomas are well known. Typical MRI findings of pilocytic astrocytomas are usually an enhancing mass with a non-enhancing cystic component [1,8]. Also, in general pilocytic astrocytomas are well-circumscribed and round [2]. These findings are similar to those of cystic meningiomas [6]. However, there is little information about the incidence and biologic behavior of supratentorial pilocytic astrocytomas [9]. There are also few reports related to radiographic findings of these tumors. Chourmouzi et al. [8] reviewed radiologic findings for all types of pilocytic astrocytomas, including supratentorial pilocytic astrocytomas. They classified supratentorial pilocytic astrocytomas into three categories: chiasmatic/hypothalamic, optic and hemispheric area. According to this classification criteria, this case belonged to the hemispheric area. The most characteristic imaging finding of the hemispheric area was same as the typical infratentorial pilocytic astrocytoma, similar to a cystic meningioma [8]. Therefore, preoperative prediction was difficult.

Several supratentorial pilocytic astrocytomas mimicking other intracranial tumors have been reported. Skipworth et al. [1] reported three suprasellar pilocytic astrocytomas mimicking a craniopharyngioma. A review of the literature revealed only one other case of supratentorial pilocytic astrocytoma mimicking a meningioma on preoperative imaging. Hong et al. [2] reported a case of pilocytic astrocytoma mimicking a clinoidal meningioma. On preoperative MRI, there was an extra-axial mass in the right clinoid region with homogeneous enhancement and a dural tail sign [2]. They concluded

that this was a right clinoidal meningioma radiologically. However, the final pathologic diagnosis was pilocytic astrocytoma.

Pilocytic astrocytomas are known to have a clinically benign course after total surgical resection, and there are many reports that report supratentorial pilocytic astrocytomas also have relative good outcomes [9]. On the other hand, this case was an early transformed to anaplastic astrocytoma after nine postoperative months. Only two cases of supratentorial pilocytic astrocytomas with spontaneous anaplastic or malignant change have been reported [10,11]. The period of anaplastic change was about 3 years [11]. We repeatedly reviewed the pathologic findings and consulted other institutes due to the unusual behaviors of this case. Nevertheless, no error was found in the pathologic diagnosis process.

Anaplastic transformation of pilocytic astrocytomas are described in the World Health Organization classification (WHO blue book) of tumors of the central nervous system [12]. Unlike glioblastomas, the prognosis of this tumor is not known to be uniformly grim [12,13]. Therefore, the WHO blue book recommend that the diagnosis of a pilocytic astrocytoma with anaplasia is preferable, although grading criteria and nomenclature are yet to be defined [12]. Pilocytic astrocytomas with anaplasia are known to be associated with radiation therapy, however, they have also occurred in patients without radiation [3,13]. In our case, there was no previous irradiation.

In conclusion, we describe a rare case of supratentorial pilocytic astrocytoma with early anaplastic transformation with similar radiologic findings of convexity meningiomas. Although there are many reports that supratentorial pilocytic astrocytomas are clinically benign, there is still a lack of information regarding accurate prognosis. Therefore, short-term and regular follow-up imaging is needed after surgical resection of supratentorial pilocytic astrocytomas. Also, a well-enhancing mass with a dural tail sign is not always representative of meningiomas. So, physicians must consider a supratentorial pilocytic astrocytoma in their differential diagnosis of a well-enhancing mass with a dural tail sign on the frontal and parietal convexity areas.

## Conflicts of Interest

The authors have no financial conflicts of interest.

## Acknowledgments

This work was supported by 2-year Research Grant of Pusan National University.

## REFERENCES

1. Skipworth JR, Hill CS, Jones T, Foster J, Chopra I, Powell M. Pilocytic astrocytoma mimicking craniopharyngioma: a case series. *Ann R Coll Surg Engl* 2012;94:e125-8.
2. Hong CS, Lehman NL, Sauvageau E. A pilocytic astrocytoma mimick-

- ing a clinoidal meningioma. *Case Rep Radiol* 2014;2014:524574.
3. Shibahara I, Kawaguchi T, Kanamori M, et al. Pilocytic astrocytoma with histological malignant features without previous radiation therapy--case report. *Neurol Med Chir (Tokyo)* 2011;51:144-7.
  4. Qi ST, Liu Y, Pan J, Chotai S, Fang LX. A radiopathological classification of dural tail sign of meningiomas. *J Neurosurg* 2012;117:645-53.
  5. Watts J, Box G, Galvin A, Brotchie P, Trost N, Sutherland T. Magnetic resonance imaging of meningiomas: a pictorial review. *Insights Imaging* 2014;5:113-22.
  6. Guan TK, Pancharatnam D, Chandran H, Hooi TK, Kumar G, Ganesan D. Infratentorial benign cystic meningioma mimicking a hemangioblastoma radiologically and a pilocytic astrocytoma intraoperatively: a case report. *J Med Case Rep* 2013;7:87.
  7. Fortuna A, Ferrante L, Acqui M, Guglielmi G, Mastronardi L. Cystic meningiomas. *Acta Neurochir (Wien)* 1988;90:23-30.
  8. Chourmouzi D, Papadopoulou E, Konstantinidis M, et al. Manifestations of pilocytic astrocytoma: a pictorial review. *Insights Imaging* 2014; 5:387-402.
  9. Brown PD, Buckner JC, O'Fallon JR, et al. Adult patients with supratentorial pilocytic astrocytomas: a prospective multicenter clinical trial. *Int J Radiat Oncol Biol Phys* 2004;58:1153-60.
  10. Krieger MD, Gonzalez-Gomez I, Levy ML, McComb JG. Recurrence patterns and anaplastic change in a long-term study of pilocytic astrocytomas. *Pediatr Neurosurg* 1997;27:1-11.
  11. Otero-Rodríguez A, Sarabia-Herrero R, García-Tejeiro M, Zamora-Martínez T. Spontaneous malignant transformation of a supratentorial pilocytic astrocytoma. *Neurocirugia (Astur)* 2010;21:245-52.
  12. Louis DN, Ohgaki H, Wiestler OD, Cavenee WK. WHO Classification of Tumours of the Central Nervous System, Revised. 4th ed. France: International Agency for Research on Cancer; 2016.
  13. Rodriguez FJ, Scheithauer BW, Burger PC, Jenkins S, Giannini C. Anaplasia in pilocytic astrocytoma predicts aggressive behavior. *Am J Surg Pathol* 2010;34:147-60.