

# CASE REPORT

J Korean Neurosurg Soc 39: 374-377, 2006

## Cerebellar Glioblastoma Presenting as a Cerebellar Hemorrhage in a Child

Young Il Joung, M.D., Jin Hwan Cheong, M.D., Ph.D.,  
Koang Hum Bak, M.D., Ph.D., Choong Hyun Kim, M.D., Ph.D.

Department of Neurosurgery, Hanyang University Guri Hospital, College of Medicine, Guri, Korea

Cerebellar hemorrhage in adults is a well-described condition, but rarely occurs in children. Such hemorrhages in children are commonly results from arteriovenous malformations, trauma, infection or hematological abnormalities; a neoplastic origin is rare. We report a case of cerebellar hemorrhage as the initial manifestation of cerebellar glioblastoma in a child with review of literature.

**KEY WORDS :** Cerebellar hemorrhage · Child · Glioblastoma.

### Introduction

Cerebellar astrocytoma accounts for approximately 10% of all pediatric brain tumors, and 27% of all pediatric posterior fossa tumors<sup>1,2)</sup>. Primary glioblastoma (GBM) of cerebellum is an extremely rare tumor in children. This tumor appears insidiously with symptoms related to increased intracranial pressure or signs of tumor infiltration into contiguous structures; spontaneous cerebellar hemorrhage due to glioblastoma has rarely been reported<sup>8)</sup>, but none was in children.

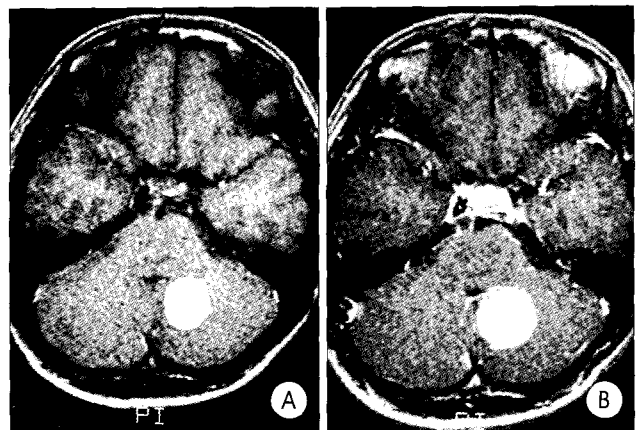
Spontaneous cerebellar hemorrhage in the pediatric population is an uncommon event, usually arising from arteriovenous malformations, trauma or hematological abnormalities<sup>2,12)</sup>. We present a case of GBM with spontaneous cerebellar hemorrhage in a child.

### Case Report

A 15-year-old boy presented with a 9-day history of headache associated with nausea and vomiting. Results of neurological examination were normal including normal cerebellar function. A pre-enhanced brain magnetic resonance imaging (MRI) study was obtained (Fig. 1A) which revealed a 2 × 3 × 3cm round hemorrhagic mass lying within the left cerebellar hemisphere causing compression and deviation of

the fourth ventricle to the right and mild hydrocephalus and the mass was suspiciously enhanced in gadolinium-enhanced MRI (Fig. 1B). Cerebral angiography showed no feeding vessels, evidence of arteriovenous malformation or aneurysm in this location.

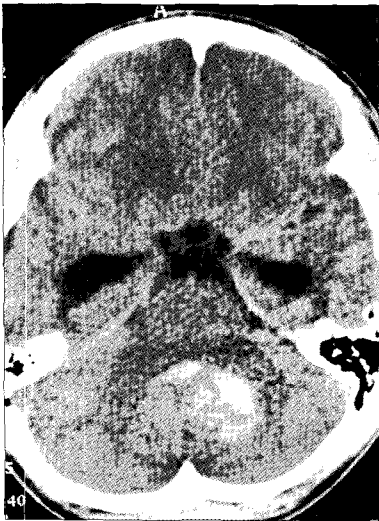
Five days after admission, he became stuporous. Tone was increased in all extremities, and muscle stretch reflexes were hyperactive throughout, with clonus at the knees and ankles;



**Fig. 1.** Preoperative pre- and gadolinium-enhanced magnetic resonance (MR) image. A : Pre-enhanced MR image showing a 2 x 3 x 3cm round mass lying within the left cerebellar hemisphere causing compression and deviation of the fourth ventricle to the right. B : Gadolinium-enhanced MR image showing that the mass is suspiciously enhanced.

• Received : August 30, 2005 • Accepted : December 5, 2005

• Address for reprints : Jin Hwan Cheong, M.D., Ph. D., Department of Neurosurgery, Hanyang University Guri Hospital, College of Medicine, 249-1 Gyomun-dong, Guri 471-701, Korea Tel : +82-31-560-2324, Fax : +82-31-560-2327, E-mail : cjh2324@hanyang.ac.kr



**Fig. 2.** Computed tomography reveals a hemorrhage into the cerebellum, more in the left cerebellar hemisphere and also shows dilatating temporal horn of the lateral ventricle.

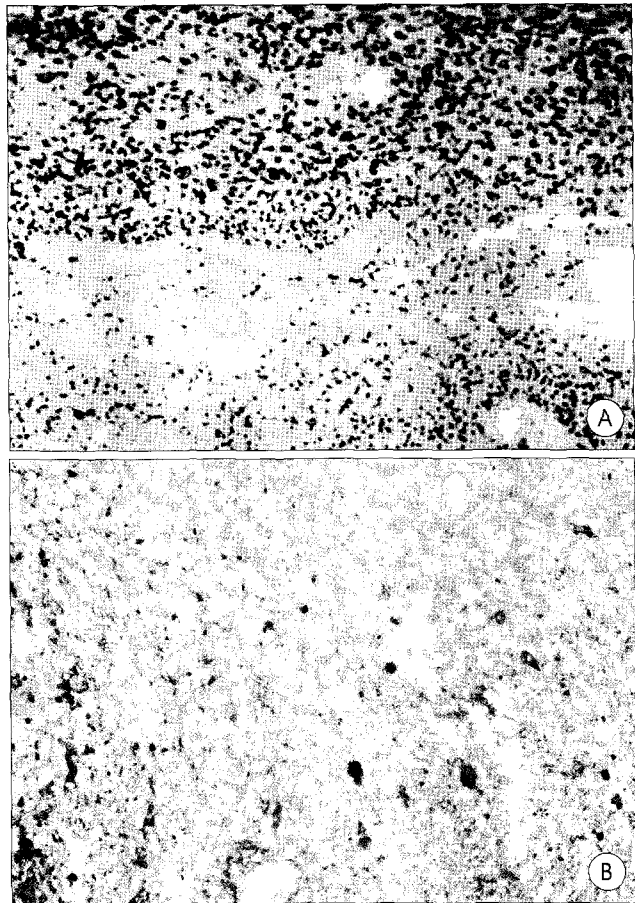
both Babinski signs were present. Mannitol and dexamethasone were given intravenously, and computed tomography (CT) (Fig. 2) revealed re-bleeding into the cerebellum, more in the left cerebellar hemisphere. An emergency suboccipital craniectomy was performed, and areas of abnormal-appearing tissue were seen on the surface of the left cerebellar hemisphere and vermis. Although most of the hematoma was able to be removed with ease, that on the medial side was not. At the medial side of hematoma, 0.5 to 1 cm of grayish and friable tissue was found and removed completely. Pathological examination of this tissue revealed a fairly characteristic GBM with large amount of blood and small nests of neoplastic cells infiltrating in the cerebellar tissue. The tumor cells appeared primitive and some were large pleomorphic round polygonal cells with hyperchromatic nuclei (Fig. 3A, B), and on immunohistochemical staining (Fig. 3C), the tumor cells are positive for GFAP (glial fibrillary acidic protein) in their cytoplasm. The patient did well postoperatively, and made a good functional recovery. Postoperatively, the patient underwent a course of radiotherapy (54Gy).

Patient was readmitted four months after the operation for stuporous mentality. Axial gadolinium-enhanced brain MRI study was obtained (Fig. 4). It revealed that a heterogenous enhancing left cerebellar mass which filled the fourth ventricle and extended into the foramen Luschka. The patient's condition was worsened after a few days and he was discharged without further treatment.

## Discussion

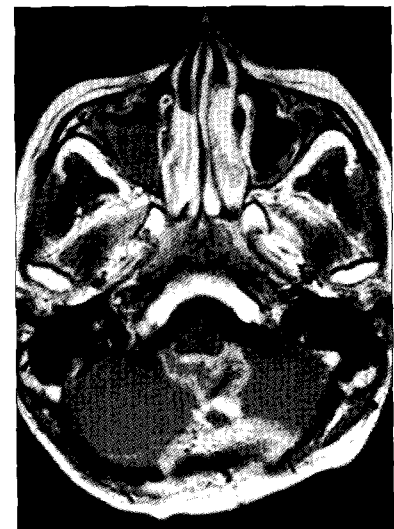
Acute cerebellar hemorrhage in adults constitutes approximately 10% of all intraparenchymal hemorrhages and is associated primarily with hypertension or anticoagulation therapy<sup>7</sup>. In children, acute cerebellar hemorrhage due to neoplastic origin is extremely rare. A review of the literature revealed only 8 cases of posterior fossa tumors presenting as acute cerebellar hemorrhages<sup>6</sup> (Table 1); of these, none was cerebellar GBM<sup>3,10</sup>.

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**Fig. 3.** A : Microscopic examination showing large amount of blood and small nests of neoplastic cells infiltrating in cerebellar tissue (Hematoxylin and eosin, original magnification x40). B : On immunohistochemical staining, the tumor cells are positive for GFAP in their cytoplasm (Original magnification x400).

A brain tumor is an uncommon cause of spontaneous ICH. Certain histologic types of intracranial metastatic tumors are more frequently associated with ICH than others : Choriocarcinoma, melanoma, and bronchogenic carcinoma are the most common. ICH is a more common complication of metastatic tumor to the brain than glioma. It is not clear why certain tumors are prone to undergo spontaneous



**Fig. 4.** Axial gadolinium-enhanced brain magnetic resonance imaging study at 4 months after operation reveals a heterogenous enhancing left cerebellar mass which filled the fourth ventricle and extended into the foramen Luschka.

**Table 1.** Spontaneous cerebellar hemorrhage in pediatric posterior fossa tumors

Report	Number of cases	Patient age/sex	Cerebellar location	Histology	Outcome
Mauersberger et al. 1977	2	10y/M, 10y/F	Vermis	Spongioblastoma	A
Vincent et al. 1980	1	14y/F	Vermis, Right hemisphere	Pilocytic astrocytoma	D
Fogelson et al. 1980	1	9y/F	Vermis	Pilocytic astrocytoma	A
Young. 1980	1	8m/?	Fourth ventricle, vermis Right hemisphere	Ependymoma	A
Harada et al. 1986	1	15y/M	Left hemisphere	Fibrillary astrocytoma	A
Specht et al. 1986	1	8y/M	Vermis, Right hemisphere	Mixed glioma	A
Mesiwala et al. 2001	1	13y/M	Vermis	Pilocytic astrocytoma	D
Present case	1	15y/M	Vermis, Left hemisphere	Glioblastoma	A

\*y = years, m = months, M = male, F = female, \*\*A = Alive over 12months after surgery, D = Death within 12months after surgery due to progression of the disease

hemorrhage. Speed of tumor growth, vascular invasion, infarction, and necrosis may all be the contributing factors<sup>8)</sup>. Previous authors have noted that blood seepage occurs in the large brain tumors, most likely due to the high degree of vascular proliferation in certain types. The site of fastest growth of a neoplasm is often in the peripheral zone and brain tissue in this area often undergoes necrosis or infarction; together with the blood supply, brain here is stretched, causing it to bleed<sup>5)</sup>.

Additionally, vascular invasion by tumor aggregates may cause luminal obstruction, infarction or necrosis of the tumor, and associated hemorrhage into the neoplasm<sup>6)</sup>. In addition, factor associated with hemorrhage into neoplasm includes fibrinolysis resulting from thromboplastin activity of brain tissues<sup>8)</sup>. Similar factors may be present in childhood neoplasms, but hemorrhage into gliomas has been seen infrequently. Of tumors of neuroepithelial origin, GBMs and oligodendrogliomas are often reported to be associated with hemorrhage<sup>4,9)</sup>. Kondziolka, et al., reported that 24 cases of mixed oligodendroglioma-astrocytoma were associated with seven cases of gross bleeding<sup>4)</sup>. However, no reports of cerebellar hemorrhage were made in 24 cases in that study.

The rarity of GBMs in the cerebellum has been explained by the lower tendency of cerebellar astrocytes to undergo anaplasia in comparison with the cerebral ones<sup>3,12)</sup>. We suggest that this rarity may be the reasoning to support that spontaneous cerebellar hemorrhage due to GBM is extremely rare in children.

In general, suspicion of intracerebral hemorrhage associated with a tumor may be suggested by the findings on CT. A hematoma surrounded by edema may be visualized on noncontrast enhanced CT. An enhanced scan may demonstrate

typical tumor enhancement, in addition to the presence of the associated hematoma. In the current case, we suggest that spontaneous cerebellar hemorrhage may be resulted from a neoplastic mass or vascular anomaly because preoperative MR images demonstrated suspiciously enhancing mass lesion without surrounding edema in pediatric age.

Spontaneous cerebellar hemorrhage in children remains an unusual, but clinically an emergent event. Prompt evaluation and stabilization of the patient, followed by identification of the underlying structural abnormality is of critical importance. While vascular anomalies, trauma, infection and hematological abnormalities are most likely the etiologies of such a bleed, an underlying cerebellar neoplasm must remain in the differential diagnosis. The treatment is without doubt surgical removal, and radiotherapy is indicated in spontaneous cerebellar hemorrhage, caused by GBM.

## Conclusion

It is important to remember that sometimes neoplasms may be hidden behind an ICH. The causes of intracerebellar hemorrhage are various. However, if cerebellar hemorrhage is present in a child, neurosurgeon must consider that there is a possibility of tumor bleeding. If there is a suspicion for a tumor related ICH, additional neuro-imaging such as MRI or digital subtraction angiography(DSA) should be performed.

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