Cerebellar Gliomas with Exophytic Growth
—Three Case Reports—

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Abstract

Three patients presented with cerebellar hemispheric astrocytic tumors which showed an exophytic growth pattern. The neuroimaging appearances of these cases mimicked a cerebellopontine angle tumor in two cases, and a posterior fossa extra-axial tumor in the other, which arose from the left cerebellar hemisphere with exophytic extension into the left crus and quadrigeminal cistern and compressed the midbrain directly. All patients underwent surgical resection, and two patients also received adjuvant radiation therapy and chemotherapy. Intraoperative findings confirmed that the tumors had intramedullary origins from the cerebellar hemisphere, and extended exophytically into the subarachnoid space forming an extra-axial mass lesion. The histological diagnoses were mixed malignant oligo-astrocytoma (grade III), astrocytoma (grade II), and glioblastoma (grade IV). Cerebellar gliomas with exophytic growth to the cerebellopontine angle cistern should be considered in the differential diagnosis of cerebellopontine angle tumors.

Key words: cerebellar glioma, glioblastoma of cerebellum, exophytic growth

Introduction

Malignant astrocytic tumors are usually located in the deep white matter of the cerebral hemispheres, whereas benign astrocytomas, a common tumor in children, are usually located in the cerebellar hemisphere. The histological definitions of benign astrocytoma are pilocytic astrocytoma and astrocytoma (grade II). The growth pattern of gliomas depends mainly upon their localization and relationship to the surrounding normal structures as well as the biological behavior. Exophytic growth of glioma is extremely rare in the cerebral and cerebellar hemispheres, but brain stem gliomas sometimes grow exophytically into the fourth ventricle and the cerebellopontine angle. These tumors protrude dorsally into and occupy the fourth ventricle and frequently extend into the cisterna magna, breaking through the overlying ependyma. Extramedullary growth of brain stem glioma is also frequently seen in the final stage. Spinal cord gliomas with exophytic growth have also occasionally been reported. Gliomas of the cerebral and cerebellar hemisphere are also locally invasive tumors, but rarely grow and extend exophytically into the subarachnoid space as an extra-axial mass lesion. Several reported cases of cerebellar glioblastoma extending to the cortical surface indicate local leptomeningeal invasion rather than exophytic growth. We report three cases of cerebellar glioma with exophytic growth.

Case Reports

Case 1: A right-handed 71-year-old male was admitted with a 2-month history of dizziness and double vision on lateral gaze in June 1991. His past history was unremarkable.

On admission the patient was alert and responded cooperatively. Neurological examination found hearing impairment on the right, bilateral horizontal nystagmus, broad-based gait, and a lack of coordination of the right upper and lower extremities. The laboratory examination findings on admission were normal. Computed tomography (CT) revealed a fairly well-defined low density lesion in the right cerebellopontine angle with a marked mass effect which appeared as a thin, ring-like enhanced lesion after administration of contrast medium. T1-weighted mag-
Magnetic resonance (MR) imaging showed a well-defined, inhomogeneous low intensity lesion with ring enhancement after administration of gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) (Fig. 1A, C, D). T1-weighted MR image demonstrating a high intensity mass lesion with a low intensity rim, and peritumoral edema (B). Gadolinium-diethylenetriaminepenta-acetic acid-enhanced T1-weighted MR images showing ring enhancement (C, D).

Fig. 1 Case 1. T1-weighted magnetic resonance (MR) image showing a well-defined, inhomogeneous low intensity lesion (A). T1-weighted MR image demonstrating a high intensity mass lesion with a low intensity rim, and peritumoral edema (B). Gadolinium-diethylenetriaminepenta-acetic acid-enhanced T1-weighted MR images showing ring enhancement (C, D).

Histological examination of the formalin-fixed surgical specimens showed an increased cellularity of oligodendrocytes and astrocytes with considerable pleomorphism, scattered, large bizarre cells, and endothelial proliferation without areas of necrosis. The histological diagnosis was anaplastic mixed oligo-astrocytoma (grade III) (Fig. 2).

The patient had an uneventful postoperative course and was subsequently treated with radiation therapy and chemotherapy. He died 3 years later due to recurrence of the tumor. An autopsy was not performed.

Case 2: A 6-year-old boy was admitted with the chief complaint of headache beginning 3 months previously. Neurological examination on admission revealed bilateral horizontal nystagmus, and a lack of coordination of the left extremities. CT showed a low density mass lesion with marked nodular enhancement after administration of contrast medium at the left cerebellopontine angle. T1-weighted MR imaging showed a well-defined and inhomogeneous low intensity lesion with ring enhancement after administration of Gd-DTPA (Fig. 3A, C, D). T2-weighted MR imaging demonstrated the lesion as a high intensity mass with a low intensity rim and peritumoral edema (Fig. 3B). The arterial phase of left vertebral angiography showed the right anterior inferior cerebellar artery to be displaced posteriorly without tumor staining. The venous phase showed the right petrosal vein was stretched and displaced superiorly.

The grayish hypervascular tumor with intratumoral cyst was exposed through a retromastoid suboccipital craniectomy. The tumor arose from the semilunar lobule of the right cerebellar hemisphere, and extended exophytically into the cerebellopontine cistern to form an extramedullary mass lesion. Total resection of the tumor was achieved.

Histological examination of the formalin-fixed surgical specimens showed an increased cellularity of oligodendrocytes and astrocytes with considerable pleomorphism, scattered, large bizarre cells, and endothelial proliferation without areas of necrosis. The histological diagnosis was anaplastic mixed oligo-astrocytoma (grade III) (Fig. 2).

The patient had an uneventful postoperative course and was subsequently treated with radiation therapy and chemotherapy. He died 3 years later due to recurrence of the tumor. An autopsy was not performed.
cistern through a retromastoid suboccipital craniectomy. This tumor arose from the ventral part of left cerebellar hemisphere, and the solid part of the tumor extended exophytically into the cerebellopontine angle cistern. Total resection of the tumor was performed.

Histological examination of formalin-fixed surgical specimens showed increased atypical astrocytes without either pleomorphism or necrosis, which are the typical features of astrocytoma (grade II) (Fig. 4).

The patient had an uneventful postoperative course. He has continued to do well 5 year after surgery without any sign of tumor recurrence.

Case 3: A 61-year-old female developed a progressive gait disturbance associated with nausea and dizziness over a 1-month period. She was subsequently admitted to a local hospital in August 1995, where CT and MR imaging were performed. On admission, upward gaze palsy, bilateral horizontal nystagmus,
and an impaired ability to carry out finger-nose-finger testing and rapid alternating movement of the left hand were observed. Her gait was ataxic with a tendency to fall to the left when walking. CT scan revealed a poorly marginated, heterogeneous density lesion in the left cerebellar hemisphere and the quadrigeminal cistern, which was heterogeneously enhanced with a radiolucent center by contrast medium (Fig. 5). T1-weighted MR imaging showed a round, heterogeneous low intensity lesion in the left cerebellar hemisphere, part of which extended into the crural and quadrigeminal cisterns, and thus compressed the midbrain anteriorly (A, B). T2-weighted MR images demonstrating an inhomogeneous high intensity mass lesion (C, D).

Four days later, her condition deteriorated, and CT revealed marked progression of obstructive hydrocephalus.

She was then referred to our hospital and admitted as an emergency case in September 1995. On admission, she was drowsy but responded to verbal stimuli. The arterial phase of left vertebral angiography showed that the anterior culminate and superior vermian segments of the left superior cerebellar artery were displaced superiorly and anteriorly without any tumor staining.

A gray-reddish hypervascular solid tumor, originating from the left cerebellar hemisphere and extending exophytically into left crural and quadrigeminal cisterns, was removed subtotally through a suboccipital craniectomy.

Histological examination revealed proliferation of atypical astrocytes with moderate cellular pleomorphism, focal necrosis, and endothelial proliferation, which are all typical features of glioblastoma (grade IV) (Fig. 7).

Postoperatively, she underwent subsequent radiation therapy and chemotherapy. She died 1 year later due to regrowth of the tumor. An autopsy was not performed.

Discussion

Two of our patients harbored tumors with intramedullary origins from the ventral part of the cerebellar hemisphere, and extending exophytically into the cerebellopontine angle cistern. The CT and MR imaging appearances of these mass lesions were similar to a cerebellopontine angle tumor. A glial tumor originating from the gray-white matter junction near the brain surface and extending exophytically through the overlying epineurium could form...
an extra-axial mass lesion. Fourth ventricle ependymoma occasionally extends into the cerebellopontine angle cistern.\(^9,11\) None of the tumors in these two cases had any relationship to the fourth ventricle, and the histological diagnoses were mixed oligoastrocytoma (grade III) and astrocytoma (grade II). We would like to emphasize that cerebellar glioma with exophytic growth should be considered in the differential diagnosis of cerebellopontine angle tumors although such a finding is rare.

Our other patient harbored a glioblastoma (grade IV), which arose on the tentorial surface of the cerebellar hemisphere, and penetrated the brain surface and extended exophytically into the quadrigeminal and crural cisterns resulting in direct compression of the midbrain. Glioblastoma in the cerebellum is uncommon in both adults and children.\(^6\) There is no apparent reason why this tumor rarely occurs in the cerebellum, as opposed to its high incidence in the cerebrum.\(^1\) The incidence of cerebellar glioblastoma is about 1% of all intracranial glioblastomas.\(^8\) There are no characteristic CT and MR imaging findings of cerebellar glioblastoma, and thus it is hard to differentiate from metastatic brain tumors or malignant astrocytoma.\(^1,5,10,19\) Cerebellar glioblastoma is also both locally and regionally invasive, like cerebral glioblastoma, and is characterized by extension into the brain stem and adjacent leptomeninges.\(^8,10,12\) There are an increasing number of case reports on cerebellar glioblastoma, and there have also been several reviews.\(^3,9,10\) Several cases had cerebellar glioblastoma extending to the cortical surface (local leptomeningeal invasion), as demonstrated by either preoperative imaging\(^9,10\) or the operative findings,\(^4,14\) but no case of tumor spontaneously extending into the subarachnoid space as an exophytic mass lesion rather than subarachnoid dissemination has been reported previously. Cerebellar gliomas with exophytic growth should thus be considered in the differential diagnosis of posterior fossa tumors although the preoperative imaging may suggest an extra-axial mass lesion.

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**References**


