Spontaneous Intraventricular Hemorrhage Caused by Lateral Ventricular Meningioma
—Case Report—

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Abstract
A 39-year-old female presented with acute intraventricular hemorrhage manifesting as sudden onset of headache associated with gradually progressing somnolence and left oculomotor nerve paresis. Intraventricular hemorrhage occurred from a meningioma of the lateral ventricle. Computed tomography and magnetic resonance (MR) imaging revealed intraventricular hemorrhage and a mass in the right trigone. The tumor was totally removed. Her postoperative course was uneventful except for left homonymous hemianopia. The histological diagnosis was fibroblastic meningioma. The MR imaging was highly suggestive of hemorrhage from the tumor periphery.

Key words: intraventricular hemorrhage, lateral ventricle, magnetic resonance imaging, meningioma

Introduction
Certain malignant brain tumors, such as glioblastomas, metastatic carcinomas, and choroid plexus papillomas, are recognized as common tumor sources of intracranial hemorrhage. The natural history of meningiomas is well known, but meningiomas which present with intracranial hemorrhage, such as acute intraventricular hemorrhage in patients with lateral ventricular meningiomas, is considered exceedingly rare.

We describe a patient with trigone meningioma who presented with lateral ventricular hemorrhage.

Case Report
A 39-year-old female was admitted to our hospital on October 25, 1994, after suffering sudden onset of severe headache and vomiting followed by loss of consciousness. Her family and medical history were noncontributory. At admission, she was assessed as Glasgow Coma Scale 15, but was confused. Her blood pressure was 128/80 mmHg. Neurological evaluation disclosed meningismus, complete left homonymous hemianopia, and left oculomotor nerve paresis with intact pupillary reflex.

Skull roentgenography showed an abnormal, round calcification, approximately 2.5 cm in diameter, located in the right trigone (Fig. 1). Computed tomography revealed an intraventricular hemorrhage and a high-density mass in the right trigone.

Fig. 1 Skull radiographs on admission disclosing an abnormal, round, calcified mass located in the right trigone.
Intraventricular Hemorrhage by Lateral Ventricular Meningioma

T₁- and proton-weighted magnetic resonance (MR) imaging 4 days later showed a mass in the lateral ventricle as a moderately low-intensity area, with homogeneous enhancement after Gd-DTPA administration (right). Hemorrhage from the tumor periphery is suggested.

T₁- and proton-weighted magnetic resonance (MR) imaging 4 days later showed a mass in the lateral ventricle as a moderately low-intensity area, with homogeneous enhancement after the administration of gadolinium-diethylenetriaminepenta-acetic acid (Gd-DTPA) (Fig. 2). T₂-weighted MR imaging showed the lesion as a high-intensity area adjacent to the hematoma within the right lateral ventricle. Both T₁- and T₂-weighted imaging showed low-intensity areas within the tumor consistent with calcification. The periphery of the tumor was high intensity on T₁-weighted images and low intensity on T₂-weighted images, suggesting the presence of deoxyhemoglobin in the hematoma. These findings suggested that the tumor had hemorrhaged from the periphery into the lateral ventricle. Cerebral angiography failed to disclose any vascular malformation. Right carotid and left vertebral injections showed the tumor fed primarily by the right anterior choroidal artery and the right lateral posterior choroidal artery. The venous phase shows tumor staining in the region of the right trigone.

On November 4, 1994, the tumor was totally removed from the right lateral ventricle using a middle temporal gyrus approach through a right lateral temporoparietal craniotomy. The tumor was embedded in the clot, and was relatively soft and well-demarcated with solid calcification on its rostral side. The feeding arteries were carefully coagulated.

Histological examination of the tumor specimen showed psammoma bodies and whorl formations. The tumor cells were flattened and spindle-shaped,

**Fig. 2** Axial T₁-weighted MR images revealing a large mass in the right lateral ventricle appearing as a moderately low-intensity area in the right trigone, surrounded by a thin ring of high-intensity hematoma (left), and with homogeneous enhancement after Gd-DTPA administration (right). Hemorrhage from the tumor periphery is suggested.

**Fig. 3** Right carotid (upper row) and left vertebral (lower row) angiograms showing enlarged feeding arteries from the right anterior choroidal artery and the right lateral posterior choroidal artery. The venous phase shows tumor staining in the region of the right trigone.

**Fig. 4** Photomicrograph showing the tumor specimen composed of psammoma bodies and whorl formations. The tumor cells appear flattened and spindle-shaped, and the nuclei are narrow and elongated in a storiform pattern. No cell atypia or mitotic figures are visible. These findings are consistent with fibroblastic meningioma. HE stain, ×100

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and the nuclei were narrow and elongated. No cell atypia or mitotic figures were observed (Fig. 4). The histological diagnosis was fibroblastic meningioma.

Her postoperative recovery was uneventful, and no residual intraventricular mass was found on follow-up examination. She was discharged on November 30, 1994 with persistent left homonymous hemianopia.

Discussion

Meningiomas causing intracranial hemorrhage are infrequent, and hemorrhage from a lateral ventricular meningioma seems to be even rarer. Only five previous cases of a lateral ventricular meningioma presenting with hemorrhage have been described (Table 1). All six tumors were located in the trigone, and only one associated with expansive intracranial hematoma. The hemorrhage affected females more than males (male:female 2:4), which is a similar predominance to that found in meningioma in other locations. These patients were also younger (range 14–64 years old, mean 41 years old) than most patients with meningiomas. Four of the tumors occupied the left trigone for unexplained reasons, like nonhemorrhagic intraventricular meningiomas. Fibroblastic meningioma is the most frequent histology seen in lateral ventricle meningiomas, and four of these six cases were also fibroblastic meningiomas, whereas the others were endotheliomatous meningiomas. Analysis of possible hemorrhagic ventricular meningiomas with diagnosis based on hemorrhagic or xanthochromic cerebrospinal fluid (CSF) or meningeal signs observed following an apoplectic attack suggests that the frequency of bleeding from lateral ventricular meningiomas may be greater than previously considered.

The mechanism of hemorrhage associated with a clinically silent meningioma of the lateral ventricle has not yet been clarified, but may be similar to that of hemorrhagic malignant neoplasms, in which endothelial obliteration leads to necrosis, and pathological vascular proliferation results in newly formed, thin-walled vessels which easily rupture. Pituitary apoplexy occurs when the pituitary adenoma becomes ischemic because it has outgrown its blood supply or compressed its own feeding vessels, which results in necrosis and hemorrhage. The events leading to or contributing to hemorrhage of meningiomas may be as follows: 1) sudden disruption of congested, tortuous vessels surrounding the meningioma which are less resistant to blood pressure changes, 2) rupture of new vessels with softened and thin vascular walls located in the peritumoral zone, 3) bleeding from enlarged and weakened feeding arteries which corresponds to demand for increased blood supply, and 4) anticoagulation therapy or systemic disorders such as hypertension or atherosclerosis. The intraventricular location of these pathological vessels presumably favors apoplectic rupture. A slow-growing meningioma in the ventricular space may be clinically silent for a longer period than meningiomas in other regions, which may account for the increased occurrence of apoplectic hemorrhage in such meningiomas as neovascularization or compression of tortuous blood vessels has more time to develop. Close histological examination of specimens and neuroimaging studies can confirm the presence of hypervascularization. Preoperative MR imaging suggested that hemorrhage from the tumor periphery depended on the mechanisms described above.

None of the patients in Table 1 required decompression such as ventricular drainage or shunt placement for obstructive hydrocephalus, although the hemorrhage did involve the ventricular space. This suggests that these hemorrhages may be of venous origin that would be insufficient to obstruct the CSF flow. Surgical resection resulted in the death of two patients in the 1960s. Since then, patients with intraventricular meningiomas treated surgically have achieved a good recovery. Hemorrhage from a clinically silent meningioma can influence the prognosis of the patient, so surgical treatment appears to be the optimal treatment for this rare disease.

Table 1 Patients presenting with hemorrhage due to a lateral ventricular meningioma

<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Age/Sex</th>
<th>Side</th>
<th>Histological type</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Askenasy and Behmoaram (1960)</td>
<td>34/F</td>
<td>lt</td>
<td>endotheliomatous</td>
<td>dead</td>
</tr>
<tr>
<td>Goran et al. (1965)</td>
<td>38/F</td>
<td>lt</td>
<td>fibroblastic</td>
<td>dead</td>
</tr>
<tr>
<td>Smith et al. (1975)</td>
<td>55/M</td>
<td>rt</td>
<td>endotheliomatous</td>
<td>PND</td>
</tr>
<tr>
<td>Lang et al. (1985)</td>
<td>14/F</td>
<td>lt</td>
<td>fibroblastic</td>
<td>GR</td>
</tr>
<tr>
<td>Present case</td>
<td>64/M</td>
<td>lt</td>
<td>fibroblastic</td>
<td>PND</td>
</tr>
</tbody>
</table>

GR: good recovery, PND: persistent neurological deficit.

References


3) Cushing H, Eisenhardt L: Meningiomas: Their Classification, Regional Behavior, Life History, and Surgical End Results. Springfield, Ill, Charles C Thomas, 1938, 785 pp


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