Haemorrhage associated with meningioma: a case report and review of the literature

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SUMMARY A case of haemorrhage into a parasagittal meningioma treated by surgical resection is presented. A review of the literature found 43 additional cases of meningioma associated with haemorrhage. By correlating these cases with those from another large series of meningiomas classified by histological type and location, an estimation of the "relative bleeding tendency" of certain classes of meningiomas was made. Haemorrhage associated with meningioma is a serious complication and proper treatment consists of evacuation of the haematoma with resection of tumour.

Although much is known about the natural history of meningiomas, the behaviour of such tumours in a given patient depends on many factors: location, size, histology, and cytology.1 There is little information about haemorrhage associated with meningiomas and the influence of such haemorrhage upon patient outcome. We present a patient who bled into a parasagittal meningioma, and review the available literature on haemorrhage associated with meningiomas.

Case report

The patient is a 77 year old Filipino male who presented to the Palo Alto Veterans Administration Medical Center in April, 1978, complaining of the sudden onset of weakness of the left leg. Five years before he had been admitted to the hospital for a similar left hemiparesis which had resolved. Neurological evaluation on admission revealed an alert, oriented patient with left hemiparesis and hyperreflexia which was greater in the lower extremity. Sensation was intact and there was no papilloedema. A right parasagittal mass, which was faintly seen on a non-contrast CT scan, exhibited marked contrast enhancement (fig 1a and 1b). Angiography revealed a faint blush in the same area. All studies indicated a parasagittal meningioma. The patient refused surgery and was followed closely as an outpatient.

Over the next three months his hemiparesis improved but not completely.

In July, 1978, the patient had a sudden exacerbation of the left hemiparesis associated with headache. Neurological evaluation demonstrated only left hemiparesis and hyperreflexia. The leg was more involved than the arm and was more impaired distally than proximally. A repeat CT scan without contrast showed a diffuse high density lesion consistent with the presence of blood within the previously demonstrated tumour mass (fig 2). Progression of the left hemiparesis led to surgical exploration.

At surgery an egg-shaped tumour was found attached to the falx. The superior sagittal sinus was patent. Tissue necrosis and yellow discoloration due to previous haemorrhage were found within the tumour capsule. The adjacent motor cortex was atrophic, but there was no evidence of either recent or old intracerebral or subdural haemorrhage. Approximately 95% of the necrotic tumour was resected, leaving only a small portion attached to the falx at its inferior aspect next to the corpus callosum. The tumour was a transitional meningioma with prominent vascularity, but no histological features of malignancy (fig 3). None of the tiny tumour fragments submitted contained haemosiderin or old red blood cells.

Postoperatively the patient had a profound left hemiparesis which improved over the next four months. At discharge he had distal left lower extremity paresis but was able to walk. A CT scan 12 months postoperatively showed no evidence of residual or recurrent tumour.

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Fig 1 a and b  CT scans of patient in April 1978, showing the right parasagittal mass. 1a is without contrast enhancement; 1b is with contrast enhancement.

Fig 2  Noncontrast CT scan of patient in July 1978, showing a high density lesion consistent with blood within the previously demonstrated mass.

Fig 3  Photomicrograph of transitional meningioma removed from our patient. H & E x 320.

Discussion

This is an unusual case because haemorrhage associated with an intracranial neoplasm is a rare event. Mutlu, et al reported a 0·9% (2 of 225 cases) incidence of intracerebral haemorrhage secondary to brain tumour, and Yasargil reported a 1–2% incidence of brain tumour in patients presenting with subarachnoid haemorrhage. Intracranial haemorrhage in association with meningioma is very infrequent as is demonstrated by examination of two large series of meningiomas collected by Cushing and Eisenhardt (313 cases), and Hoessly and Olivecrona (280 cases of parasagittal meningioma). Neither series reported any case of massive haemorrhage. By contrast, in our case a transitional cell parasagittal meningioma underwent spontaneous, symptomatic, intratumoral haemorrhage.

Mechanisms responsible for haemorrhage within tumours are not completely understood. Glioblastoma multiforme and oligodendroglioma are the primary brain tumours which bleed most
frequently. Haphazard endothelial proliferation and tumour necrosis within glioblastomas may be factors which cause this haemorrhagic tendency. Hypernephroma and malignant melanoma are the metastatic brain tumours which bleed most frequently, and the incompletely formed, friable blood vessels associated with the rapid growth of metastatic tumours may be responsible for their bleeding tendency. Factors responsible for haemorrhage within benign intracranial tumours, such as meningiomas, are less obvious. Angioblastic meningiomas characteristically are composed of abnormal blood vessels and meningiomas of other cell types can contain foci of abnormal vessels; this abnormal vascularity could be related to tumour-associated haemorrhage. It is possible that blood vessels supplying a meningioma undergo compensatory enlargement with weakening of their wall and create the potential for tumour associated haemorrhage. It has also been postulated that cerebral oedema and venous obstruction, which are commonly associated with meningiomas, can cause infarction and subsequent haemorrhage.

Only 43 other cases of haemorrhage associated with meningioma were found in a review of the literature; these cases as well as our case are tabulated in table 1. The type of tumour most frequently associated with haemorrhage was the

Table 1  Data on 44 patients with meningioma associated haemorrhage

<table>
<thead>
<tr>
<th>Reference</th>
<th>Age (yr)</th>
<th>Sex</th>
<th>Haemorrhage type†</th>
<th>Tumour site‡</th>
<th>Tumour histology‡</th>
<th>Patient's outcome§</th>
<th>Operation</th>
<th>Symptom onset¶</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Case</td>
<td>77</td>
<td>M</td>
<td>IT</td>
<td>R parasag</td>
<td>Transitional</td>
<td>Morb</td>
<td>Resection</td>
<td>Slow</td>
</tr>
<tr>
<td>Askena and Behmoaram, 1960¹</td>
<td>34</td>
<td>F</td>
<td>SA</td>
<td>L lat vent</td>
<td>Syncytial</td>
<td>Died</td>
<td>Resection</td>
<td>Sudden</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>F</td>
<td>SA</td>
<td>L lat vent</td>
<td>Fibrous</td>
<td>Died</td>
<td>Resection</td>
<td>Sudden</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>M</td>
<td>IV</td>
<td>R lat vent</td>
<td>Transitional</td>
<td>Morb</td>
<td>Resection</td>
<td>Slow</td>
</tr>
<tr>
<td>Bilodeau and Beraud, 1966¹³</td>
<td>42</td>
<td>M</td>
<td>IC, IT</td>
<td>R convex</td>
<td>Syncytial</td>
<td>Died</td>
<td>Resection</td>
<td>Sudden</td>
</tr>
<tr>
<td>Bingas and Meese, 1966⁴</td>
<td>65</td>
<td>F</td>
<td>SD</td>
<td>R convex</td>
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<td>NI</td>
<td>Resection</td>
<td>Sudden</td>
</tr>
<tr>
<td>Budny et al, 1977¹⁵</td>
<td>60</td>
<td>M</td>
<td>IC, IT</td>
<td>R convex</td>
<td>Malignant</td>
<td>Died</td>
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<td>Resection</td>
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<tr>
<td>Cusick and Bailey, 1972¹⁶</td>
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<td>SD</td>
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<td>None</td>
<td>Died</td>
<td>None</td>
<td>Slow</td>
</tr>
<tr>
<td>El-Banawy and Walter, 1962¹²</td>
<td>20</td>
<td>M</td>
<td>SA</td>
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<td>Morb</td>
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<tr>
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<td>M</td>
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<tr>
<td>Goran et al, 1965,¹⁹</td>
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</tr>
<tr>
<td></td>
<td>68</td>
<td>F</td>
<td>IT, SA</td>
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<td>Sudden</td>
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<tr>
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<td>IT</td>
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</tr>
<tr>
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<td>L convex</td>
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<td>Died</td>
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<tr>
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<td>M</td>
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<tr>
<td>Hung et al, 1972²⁰</td>
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<td>L convex</td>
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<td>Morb</td>
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<tr>
<td>Modesti et al, 1976²¹</td>
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<td>NI</td>
<td>Resection</td>
<td>Sudden</td>
</tr>
<tr>
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<td>Morb</td>
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<td>72</td>
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<td>Resection</td>
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<tr>
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<td>69</td>
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<tr>
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<td>SA</td>
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<td></td>
<td>48</td>
<td>F</td>
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<td>L Meckel's Cv</td>
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<td>Morb</td>
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<td>Resection</td>
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<tr>
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<td>Fibrous</td>
<td>Died</td>
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<td>Sudden</td>
</tr>
<tr>
<td>Fukumitsu et al, 1973³₀</td>
<td>49</td>
<td>F</td>
<td>IC</td>
<td>Paragang</td>
<td>Syncytial</td>
<td>—</td>
<td>—</td>
<td>Slow</td>
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<tr>
<td>Therkel, 1961³¹</td>
<td>—</td>
<td>—</td>
<td>SD</td>
<td>Convex</td>
<td>Noneplified</td>
<td>—</td>
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<td>Sudden</td>
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<tr>
<td>Lockley et al, 1963³²</td>
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<td>—</td>
<td>SA</td>
<td>Paragang</td>
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<td>—</td>
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<td>None</td>
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<td>—</td>
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<td>Resection</td>
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<td></td>
</tr>
<tr>
<td>Russell and Rubinstein, 1977³⁴</td>
<td>—</td>
<td>—</td>
<td>IC, SD</td>
<td>Convex</td>
<td>Noneplified</td>
<td>—</td>
<td>—</td>
<td>Sudden</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>—</td>
<td>IC</td>
<td>Paragang</td>
<td>Noneplified</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Zimmerman, 1963³⁵</td>
<td>—</td>
<td>—</td>
<td>IC</td>
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<td>Morb</td>
<td>Resection</td>
<td>Slow</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>—</td>
<td>IC</td>
<td>—</td>
<td>Angioblastic</td>
<td>Morb</td>
<td>Resection</td>
<td>Slow</td>
</tr>
<tr>
<td>Drake and McGee, 1961³⁶</td>
<td>—</td>
<td>—</td>
<td>IC</td>
<td>—</td>
<td>None</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* IC—intracerebral; IT—intratumoral; IV—intraventricular; SD—subdural; SA—sphenoid.
† Convexity refers to tumours located on either the frontal, parietal, temporal or occipital lobes.
‡ Classification according to Russell and Rubinstein (1977).
§ Morbidity—any permanent neurologic deficit; Normal—complete recovery.
¶ Resection refers to total or subtotal resection of tumour and evacuation of hematoma; Evacuation refers to only evacuation of hematoma.
¶¶ Slow refers to symptoms relating to the tumour and/or hematoma being present more than 24 hours prior to hospitalization; Sudden refers to symptoms being present less than 24 hours prior to hospitalization.

———.
syncytial meningioma (32%), followed by angio-
blastic (18%). The greatest number of meningiomas
were located on the convexities, but were also found
infratentorially, intraventricularly, and in the spinal
canal. Tumours occurred with equal frequency on
the right and left sides. Clinical data revealed that
the average age at the time of haemorrhage was
50 years, and there was an equal sex incidence.
Symptoms from the haemorrhage were slow in
onset in just over 50% of patients; in the others
the event was rapid in onset and usually catastrophic.
Many patients had more than one type of haem-
orrhage associated with their meningioma; however,
the most frequently occurring haemorrhage was
subarachnoid (35%). Of the 35 patients where
operative data is available, 24 had craniotomy for
resection of tumour. Of the 33 patients where
outcome is known, only 4 (1%) recovered com-
pletely and all these patients had had tumour
resection. 52% of these patients died. Interestingly,
those patients who had no surgery or only haema-
toma evacuation (10 cases) all died, whereas the
outcome was more favourable when tumour
resection was accomplished at the time of the
craniotomy (table 2).

By relating data from this series of meningiomas
associated with haemorrhage to data obtained
from a large series of meningiomas which reports
the incidence of histological types, it is possible to
calculate an approximate "relative bleeding ten-
dency" for a given histological type of tumour.
Angioblastic meningiomas comprise 8% of the 1197
surgically verified intracranial and intraspinal

Table 2 Correlation of patient outcome versus type of
operation performed

<table>
<thead>
<tr>
<th>Patient outcome</th>
<th>Operation performed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resection</td>
</tr>
<tr>
<td>Died</td>
<td>7</td>
</tr>
<tr>
<td>Morbidity</td>
<td>12</td>
</tr>
<tr>
<td>Normal</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3 Relative bleeding tendency of meningiomas to
tumour histology calculated by relating the present series
with Jellinger and Slowik (1975)37

<table>
<thead>
<tr>
<th>Histology</th>
<th>Distribution of bleeding meningiomas*</th>
<th>Distribution of meningiomas†</th>
<th>Approx relative bleeding index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angioblastic</td>
<td>(818)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transitional</td>
<td>3(7)</td>
<td>255(21)</td>
<td>0.3</td>
</tr>
<tr>
<td>Syncytial</td>
<td>14(32)</td>
<td>749(63)</td>
<td>0.5</td>
</tr>
<tr>
<td>Fibrous</td>
<td>7(16)</td>
<td>82(7)</td>
<td>2</td>
</tr>
<tr>
<td>Malignant</td>
<td>20(4)</td>
<td>14(1)</td>
<td>4</td>
</tr>
<tr>
<td>Nonspecified</td>
<td>10(23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>44</td>
<td>1197</td>
<td></td>
</tr>
</tbody>
</table>

* Present series.
† Jellinger & Slowik (1975).37 Percentages in parentheses

malignant meningiomas reported by Jellinger and Slowik;37
however, 18% of the meningiomas associated with
haemorrhage reported in the present study were
angioblastic. This suggests that angioblastic men-
ingiomas have a tendency to bleed more than two
times more frequently than all other meningiomas
combined. By using the same method of calculation,
the relative bleeding tendency for transitional
meningioma is 0-3, for syncytial, 0-5, for fibrous, 2,
and for malignant meningioma, 4 (table 3). If
tumour location is considered, the greatest relative
bleeding tendency is 27 for intraventricular menin-
gioma and the least, 0-16 for spinal meningioma
(table 4). Parasagittal, convexity, sphenoid, and
posterior fossa meningiomas all have a relative
bleeding tendency of approximately 1. While the
small number of cases of haemorrhage in associ-
ation with meningioma does not allow one to place
great significance on these calculations, if they are
applied to our patient, his meningioma had a relatively
low bleeding potential because of location (parasagittal)
and histology (transitional). His recovery with
minimal morbidity relates both to the type of
haemorrhage (intratumoural only) and to the
fact that he had definitive surgery. However, his
good clinical course must be considered somewhat
unusual because among the conclusions which can
be drawn from this literature review are that
haemorrhage associated with a meningioma is a
very serious event and is associated with a high
mortality. To our knowledge, the present case is
the first reported where haemorrhage into a menin-
gioma has been documented by serial CT scans.
CT scans may allow earlier diagnosis of a haemor-
hagic event in association with a benign intracranial
tumour and thus improve the ultimate prognosis
in patients with these tumours. From our study it is
apparent that definitive surgery with combined
evacuation of the haematoma and tumour resection
provides the best chance for recovery with the least
morbidity.
Haemorrhage associated with meningioma: a case report and review of the literature

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References

35. Zimmerman HM. Personal communication in Goran, et al.18
Haemorrhage associated with meningioma: a case report and review of the literature.
T L Helle and F K Conley

*J Neurol Neurosurg Psychiatry* 1980 43: 725-729
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