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.

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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.

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.

Discussion

This is an unusual case because haemorrhage associated with an intracranial neoplasm is a rare event.² Mutlu, *et al*³ reported a 0.9% (2 of 225 cases) incidence of intracerebral haemorrhage secondary to brain tumour, and Yasargil⁴ 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

Fig 3 Photomicrograph of transitional meningioma removed from our patient. H & E $\times 320$.

Cushing and Eisenhardt⁵ (313 cases), and Hoessly and Olivecrona⁶ (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.⁷ Haphazard endothelial proliferation and tumour necrosis within glioblastomas may be factors which cause this haemorrhagic tendency.⁸ 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.⁷ Factors responsible for haemorrhage within benign intracranial tumours, such as meningiomas, are less obvious. Angioblastic meningiomas characteristically are composed of abnormal blood vessels⁹ and meningiomas of other cell types can contain foci of abnormal vessels; this abnormal

vascularity could be related to tumour-associated haemorrhage.¹⁰ 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.¹¹ It has also been postulated that cerebral oedema and venous obstruction, which are commonly associated with meningiomas, can cause infarction and subsequent haemorrhage.^{10, 12}

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

Reference	Age (yr)	Sex	Haemorrhage type*	Tumour site†	Tumour histology‡	Patient's outcome§	Operation	Symptom onset¶
Present Case	77	M	IT	R parasag	Transitional	Morb	Resection	Slow
Askenasy and Behmoaram, 1960 ¹¹ 1	34	F	SA	L lat vent	Syncytial	Died	Resection	Sudden
2	38	F	SA	L lat vent	Fibrous	Died	Resection	Sudden
3	32	M	IV	R lat vent	Transitional	Morb	Resection	Slow
Bilodeau and Beraud, 1966 ¹³	46	M	IC, IT	R convex	Syncytial	Died	Evacuation	Slow
Bingas and Meese, 1966 ¹⁴	65	F	SD	R convex	Syncytial	NI	Resection	Sudden
Budny <i>et al</i> , 1977 ¹⁵	60	M	IC, IT	R convex	Malignant	Died	Resection	Slow
Cusick and Bailey, 1972 ¹⁶	47	F	SD	R convex	Nonspecified	Died	None	Slow
El-Banhawy and Walter, 1962 ¹²	20	M	SA	L parasag	Syncytial	Morb	Resection	Slow
Everett <i>et al</i> , 1979 ¹⁷	65	M	IC, IT, IV	R convex	Syncytial	Died	Resection	Sudden
Flynn and Karpas, 1971 ¹⁸	78	F	IT, SA	L convex	Nonspecified	Died	None	Slow
Goran <i>et al</i> , 1965 ¹⁹ 1	65	M	IC, IT	R convex	Syncytial	Died	Evacuation	Sudden
2	68	F	IT, SA	R sphenoid	Syncytial	Died	Resection	Sudden
3	46	M	IT	R parasag	Syncytial	Died	None	Slow
4	55	M	IC, SA	R lat vent	Malignant	Morb	Resection	Sudden
5	42	F	IT	L convex	Syncytial	Died	None	Sudden
Gruszkiewicz <i>et al</i> , 1969 ¹⁰	18	M	IC, SA	R convex	Fibrous	Morb	Resection	Sudden
Hung <i>et al</i> , 1972 ²⁰	42	F	IT	L convex	Fibrous	Morb	Resection	Slow
Modesti <i>et al</i> , 1976 ²¹ 1	59	M	IC, SA, SD	L sphenoid	Syncytial	NI	Resection	Sudden
2	49	F	IC, SA, SD	L parasag	Syncytial	Morb	Resection	Slow
3	72	F	SA, SD	L parasag	Angioblastic	Died	Resection	Slow
4	69	M	SD	L convex	Syncytial	NI	Resection	Slow
Moore, 1954 ²² 1	72	M	SA	Bilat parasag	Fibrous	Died	None	Sudden
2	66	F	IV, SA	R convex	Angioblastic	Died	None	Slow
Nakao <i>et al</i> , 1977 ⁹	21	M	IC, SA	R convex	Angioblastic	Morb	Resection	Slow
Nassar and Correll, 1968 ²³	34	M	IV, SA	Spinal	Angioblastic	Died	None	Slow
Ohaegbulam, 1977 ²⁴	40	M	SA	L sphenoid	Fibrous	Died	None	Sudden
Rosenberg <i>et al</i> , 1975 ²⁵ 1	44	M	SA	R Meckel's Cv	Angioblastic	Morb	Resection	Slow
2	48	F	SA	L Meckel's Cv	Nonspecified	Morb	Resection	Slow
Smith <i>et al</i> , 1975 ²⁶	14	F	SA	L lat vent	Fibrous	NI	Resection	Sudden
Walsh <i>et al</i> , 1977 ²⁷	77	F	IT, SD	Bilat convex	Syncytial	Died	Resection	Slow
Yasargil and So, 1976 ²⁸ 1	50	F	IT, SA, SD	L post fossa	Transitional	Morb	Resection	Sudden
2	47	F	IT, SA	L post fossa	Nonspecified	Morb	Resection	Slow
Skultety, 1968 ²⁹	58	M	IC, IT, SA, SD	R sphenoid	Fibrous	—	Resection	Slow
Fukumitsu <i>et al</i> , 1973 ³⁰	49	F	IC	Parasag	Syncytial	—	—	—
Therkelsen, 1961 ³¹	—	—	SD	Convex	Nonspecified	—	Nonspecified	—
Locksley <i>et al</i> , 1966 ³²	—	—	SA	Parasag	Nonspecified	—	—	—
Globus and Sapirstein, 1942 ⁸	—	—	SA	—	Nonspecified	—	—	—
McLaurin and Helmer, 1962 ³³	—	—	SA	—	Angioblastic	—	—	—
Russell and Rubinstein, 1977 ³⁴ 1	—	—	IC, SD	—	Nonspecified	—	—	—
2	—	—	IC	—	Nonspecified	—	—	—
Zimmerman, 1963 ³⁵ 1	—	—	IC	—	Angioblastic	—	—	—
2	—	—	IC	—	Angioblastic	—	—	—
Drake and McGee 1961 ³⁶	—	—	—	—	Nonspecified	—	—	—

* IC—intracerebral; IT—intratumoral; IV—intraventricular; SD—subdural; SA—subarachnoid.

† 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 patient had more than one type of haemorrhage 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 completely and all these patients had had tumour resection. 52% of these patients died. Interestingly, those patients who had no surgery or only haematoma 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 tendency" for a given histological type of tumour. Angioblastic meningiomas comprise 8% of the 1197 surgically verified intracranial and intraspinal

Table 4 *Relative bleeding tendency of meningiomas according to tumour location*

Location	Distribution of bleeding meningiomas*	Distribution of meningiomas†	Approx relative bleeding index
Parasagittal	8(22)	194(16.5)	1.3
Convexity	15(40)	460(38.5)	1
Sphenoid	4(11)	107(9)	1.2
Posterior Fossa	2(5)	90(7.5)	0.7
Ventricular	5(14)	6(0.5)	27
Meckel's Cave	2(5)	none	—
Spinal	1(3)	208(17)	0.16
Others	none	132(11)	—
TOTAL	37	1197	—

* Present series.

† Jellinger and Slowik (1975)³⁷

Percentages in parentheses

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 meningiomas 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 meningioma 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 association 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 benign 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 meningioma has been documented by serial CT scans. CT scans may allow earlier diagnosis of a haemorrhagic 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.

Table 2 *Correlation of patient outcome versus type of operation performed*

Patient outcome	Operation performed		
	Resection	Evacuation	None
Died	7	2	8
Morbidity	12	0	0
Normal	4	0	0

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

Histology	Distribution of bleeding meningiomas*	Distribution of meningiomas†	Approx relative bleeding index
Angioblastic	8(18)	97(8)	2
Transitional	3(7)	255(21)	0.3
Syncytial	14(32)	749(63)	0.5
Fibrous	7(16)	82(7)	2
Malignant	2(4)	14(1)	4
Unspecified	10(23)	—	—
TOTAL	44	1,197	—

* Present series.

† Jellinger & Slowik (1975).³⁷

Percentages in parentheses

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