Multiple meningiomas: a long-term review

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Ten cases of multiple meningiomas seen over a 34-year period have been reviewed. The total case load from which these cases were selected was 566. The incidence of multiple meningiomas found prior to the introduction of computerized tomography (CT) in this series was 1.1%. The incidence since the introduction of CT was 8%. In eight cases all the tumors were found at the initial presentation and surgery; in the other two cases new tumors were discovered 1 and 4 years later. In only one case was von Recklinghausen’s disease known to be present, and this patient developed new tumors. Six cases have been followed for 5 or more years, two for 16 years. Tumor recurrence has not been seen. All the patients were females. There was a higher proportion than usual of the whorling psammomatous type of tumor; papillary, angioblastic or malignant forms were not noted. The possibility of multiple meningiomas being a forme fruste of von Recklinghausen’s disease is considered.

KEY WORDS • meningioma • multiple tumors • von Recklinghausen’s disease

Multiple meningiomas were first described by Anfimow and Blumenau1 in 1889. Heuer and Dandy12 described successful surgery for this disease in 1916. In 1938, this entity was defined by Cushing and Eisenhardt,3 who used the term to refer to a condition in which the patient had more than one meningioma and less than a diffusion of them, without signs of neurofibromatosis.

Cases are rare, with an accepted incidence of 1% to 2%, although Horrax13 indicated that they were more common (6.7%). Most reports in the literature have contained only a small number of cases,1-5,6,8,11,14,18,20,22,24,28,32,33 and the reports of long-term follow-up review have been few5,14,20 each describing only a small number of cases. This communication reviews 10 patients who were all treated surgically, with a maximum review period of 16 years.

Summary of Cases

Clinical Material

Ten cases were found among a consecutive series of meningiomas treated over a 34-year period. Cases 1 to 6 were selected from the 517 meningioma cases managed by Professor V. Logue from 1948 to 1977,19 and Cases 7 to 10 from the 49 meningioma cases managed by one of us (H.A.C.) between 1977 and 1982. All the patients except Case 7 were treated at The National Hospital for Nervous Diseases, London. Clinical information was obtained from a review of the patients’ records, operation notes, out-patient records, and follow-up correspondence with the patients or family members. The histological reports were obtained from the records, and in all cases the slides were reviewed.

Presentation and Distribution of Tumors

The personal details, clinical features, and location of tumors are summarized in Table 1. All the patients were female, with a mean age at the time of their initial neurosurgical procedure of 50 years (range 32 to 72 years). None had undergone previous cranial irradiation or trauma, and only one patient had evidence of neurofibromatosis (Case 7). The patients presented with progressive focal neurological deficit, headache, or epilepsy. The average duration of symptoms was 1½ years, with a range from 6 months to 6 years. In eight cases all the tumors were noted at the initial presentation and surgery. In four cases the tumors were hemicranial, and in two there were tumors above and below the tentorium without tentorial involvement. Four patients harbored more than five tumors, with one or two lesions much larger than the others. There were no spinal meningiomas in the series.

Radiological Findings

Hyperostosis, bone erosion, increased vascular markings, and calcification were noted in varying combina-
TABLE 1
Clinical data in 10 patients with multiple meningiomas

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs), Sex</th>
<th>Year of Presentation</th>
<th>Follow-Up (yrs)</th>
<th>Clinical Presentation</th>
<th>Description of Meningiomas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33, F</td>
<td>1951</td>
<td>16</td>
<td>headache, rt inferior homonymous quadrantanopsia</td>
<td>8 large parietal &amp; parasagittal, 5 small temporal, lt convexity</td>
</tr>
<tr>
<td>2</td>
<td>55, F</td>
<td>1957</td>
<td></td>
<td>epilepsy, Foster-Kennedy syndrome</td>
<td>1 large lt inner third sphenoid wing, 1 small lt orbital roof</td>
</tr>
<tr>
<td>3</td>
<td>32, F</td>
<td>1963</td>
<td>6</td>
<td>headache, Foster-Kennedy syndrome</td>
<td>1 large lt parafalcine, 3 small left convexity, 1 small at lt optic foramen &amp; 1 small on rt olfactory tract</td>
</tr>
<tr>
<td>4</td>
<td>56, F</td>
<td>1964</td>
<td>16</td>
<td>1st: headache, rt hemiparesis 2nd, 1 yr later: epilepsy, lt hemiparesis</td>
<td>large lt posterior falx, rt posterior frontal, not in continuity with original lesion</td>
</tr>
<tr>
<td>5</td>
<td>64, F</td>
<td>1969</td>
<td>10</td>
<td>headache, rt anosmia &amp; optic atrophy</td>
<td>1 large rt olfactory groove, 1 small suprasellar</td>
</tr>
<tr>
<td>6</td>
<td>58, F</td>
<td>1975</td>
<td>7</td>
<td>rt hemiparesis</td>
<td>1 low parietal convexity, 5 cm in diameter &amp; multiple small convexity</td>
</tr>
<tr>
<td>7</td>
<td>46, F</td>
<td>1977</td>
<td>5</td>
<td>1st: previous surgery for peripheral neurofibromas; lt hemiparesis &amp; headache 2nd, 4 yrs later: epilepsy &amp; increasing hemiparesis</td>
<td>multiple large rt parietal</td>
</tr>
<tr>
<td>8</td>
<td>64, F</td>
<td>1981</td>
<td>½</td>
<td>headache, lt leg weakness, dizziness, tinnitus, lt sensorineural deafness</td>
<td>multiple falxine &amp; tentorial</td>
</tr>
<tr>
<td>9</td>
<td>34, F</td>
<td>1981</td>
<td>½</td>
<td>rt deafness for 6 years, ataxic gait for 4 mos, bilat papilledema</td>
<td>1 4-cm lt cerebellopontine angle, 1 6-cm rt posterioparietal</td>
</tr>
<tr>
<td>10</td>
<td>72, F</td>
<td>1982</td>
<td>½</td>
<td>hydrocephalus with increasing ataxia &amp; dementia</td>
<td>1 6-cm rt cerebellopontine angle, 1 lt frontal &amp; 1 small rt parietal &amp; occipital</td>
</tr>
</tbody>
</table>

TABLE 2
Summary of histological findings in 10 cases of multiple meningiomas

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Histological Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>whorling</td>
</tr>
<tr>
<td>2</td>
<td>psammomatous (whorling)</td>
</tr>
<tr>
<td>3</td>
<td>psammomatous (whorling)</td>
</tr>
<tr>
<td>4</td>
<td>syncytial</td>
</tr>
<tr>
<td>5</td>
<td>psammomatous (whorling)</td>
</tr>
<tr>
<td>6</td>
<td>syncytial &amp; fibroblastic (whorls rare)</td>
</tr>
<tr>
<td>7</td>
<td>syncytial, fibroblastic</td>
</tr>
<tr>
<td>8</td>
<td>whorling (occasional psammoma body)</td>
</tr>
<tr>
<td>9</td>
<td>psammomatous (whorling)</td>
</tr>
<tr>
<td>10</td>
<td>not known</td>
</tr>
</tbody>
</table>

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Treatments in eight cases (Figs. 1 and 2). Cerebral angiography demonstrated the major lesions in all cases. Since the introduction of computerized tomography (CT), all the lesions have been demonstrated, and small unexpected lesions are no longer encountered at craniotomy.

Treatment

All the patients underwent surgery as described by Logue.19 In Cases 3 and 8, radical surgical removal of the lesions was achieved; however, in Cases 2, 4, and 5, this was not possible because of tumor attachment to the carotid artery, to a patent posterior superior sagittal sinus, and to the skull base, respectively. In Cases 1 and 6, small nodules in the convexity dura beyond the operative field were not removed at the time of radical clearance of the major lesions. In Case 7, extensive involvement of the falx and tentorium prevented radical removal. In Case 9, the large posterior fossa lesion was removed, but three asymptomatic small supratentorial lesions are still in place. In Case 10, a ventriculoperitoneal shunt was inserted; the patient, aged 72 years, had a severe cardiopulmonary disorder which prevented induction of anesthesia for removal of her clival lesion. Only Case 2 subsequently received postoperative irradiation. The patients in whom small asymptomatic lesions were left have been subject to close review.

Histological Diagnosis

The histological findings are summarized in Table 2. A higher proportion than usual of the whorling psammomatous type of tumor was noted. No papillary, angioblastic, or malignant forms were found.

Recurrence and Development of New Tumors

The follow-up periods are tabulated in Table 1. Six cases have been followed for 5 years or more, and two for 16 years. Tumor recurrence has not been seen. In eight patients, all the tumors were evident at the initial presentation. In Case 4, a further tumor was noted 1 year following the original presentation, and in Case 7, further tumors were noted 4 years after the initial presentation; this patient has neurofibromatosis.
Multiple meningiomas

Discussion

The lack of symptoms produced by many of these lesions may explain the low incidence reported originally in the literature, and also the unexpected discovery of multiple tumors in five of the 10 cases described, who were investigated before the introduction of CT scanning. The incidence in this series is 1.1% prior to CT scanning and 8.0% since its introduction. It is likely that the incidence of multiple meningiomas will increase, and approach the 16% found by Wood, et al., in their review of 100 intracranial meningiomas found incidentally at necropsy. Lusins and Nakagawa noted an incidence of 8.9% based on their experience since the introduction of CT scanning. A hemicranial distribution of meningiomas has been noted by Cushing and Eisenhardt in this condition, and was present in four of our cases. An association with spinal meningiomas has been described by Zervas, et al., but was not noted in this series.

In this series, most of the tumors were noted at the initial presentation and in only two cases were new tumors detected subsequently. These new tumors developed 1 and 4 years following primary surgical management, and one of the patients had neurofibromatosis. The longest period reported in the literature between the initial presentation and the subsequent return of the patient with a separate tumor was found by Memon to be 20 years. In Cases 1 and 6, small nodules were noted on the dura distal to the operative field during their primary operations. These patients have not returned with new tumors.

A female predominance has been noted in multiple meningiomas; all our patients were females. Schnegg, et al., studied hormone receptors in 10 meningioma cases, and demonstrated progesterone receptors in four cases, androgen receptors in two cases, and no sex hormone receptors in the remaining four cases in their study. Donnell, et al., found estrogen receptors in meningiomas of two premenopausal women. Further endocrinological assessment of meningiomas will be needed to determine the significance of these findings. The 3:2 female to male ratio of intracranial meningiomas is well established. Only further endocrinological, genetic, and epidemiological studies will explain the significance of our series being exclusively female. The fact that all our patients are female might support the view that hormonal influence could modify the distribution and development of the lesions.

The term "multiple meningioma" in practice includes elements of meningiomatosis. Cushing and Eisenhardt noted that the distinction between meningioma and meningiomatosis with von Recklinghausen's neurofibromatosis was not clear. In Cases 1 and 6, multiple small convexity nodules were noted beyond the major tumors. There were no signs to suggest neurofibromatosis in these two cases. The number of meningiomas can be so considerable as to render the distinction between multiple meningiomas and meningiomatosis impossible. Neurofibromatosis is inherited as a Mendelian dominant with variable penetrance. The association of multiple meningiomas/ meninomiasis with multiple neuroectodermally derived tumors is well established in von Recklinghausen's disease, and was described first by Wishart in 1822. Meningiomas have been described in members of the same family with no evidence of neurofibromatosis. Multiple meningiomas have been described in a grandmother, mother, and daughter. The mother was, however, unilaterally deaf and may have suffered from von Recklinghausen's disease. It may be that...
multiple meningiomas are a variant of neurofibromatosis, or that neurofibromatosis genetically predisposes to the development of the condition. The actual number of lesions may be due to other influences.

Distinct abnormalities of nerve growth factor have been observed in central and peripheral neurofibromatosis. Preliminary evidence suggests that nerve growth factor may also influence differentiation of mesodermal tissue in vitro. Studies of levels and activity of nerve growth factor in multiple meningiomas and meningiomatosis may suggest a unifying mechanism in the etiology of these disorders.

Winkelman has described the presence of meningioma cells in the subarachnoid space and ventricular system of a patient who 4 years previously had had a sphenoid ridge meningioma removed. As most multiple meningiomas are well developed at the time of presentation, dissemination via the cerebrospinal fluid would not appear to play a major role. Venous transmission is another possible mechanism of the development of multiple tumors; Simpson has noted 21 instances of extracranial metastasis in his review of 332 meningiomas. Again, this would not explain the distribution and presentation of the patients described here.

A review of the histology of these lesions has not revealed any malignant forms. There was a preponderance of whorling and psammomatous body formation, but in one patient (Case 7) who was known to have neurofibromatosis, the histology was a syncytial-fibroblastic pattern. Russell and Rubinstein found a preponderance of the fibroblastic type of histology in meningiomas associated with neurofibromatosis.

The recurrence rate of excised lesions has been no higher than for single lesions. It is suggested that optimal surgical management is the removal of symptomatic and accessible lesions in the healthy patient, and that a conservative approach with out-patient review, and CT scanning as indicated, is the management preferred for asymptomatic lesions in elderly patients.

Conclusions

This paper reports 10 cases of multiple meningiomas, all in female patients. The average age at presentation was the same as for cases with single tumors. Most of the tumors were noted at the initial presentation. A higher than usual incidence of the whorling-psammomatous type of histology was noted. The recurrence rate of excised lesions was no higher than for single lesions. The reported incidence of multiple meningiomas is likely to increase now that CT scanning is generally available. In elderly asymptomatic patients, a conservative approach does not appear to be hazardous.

Acknowledgments

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References


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32. Worster-Drought C, Dickson WEC, McMenemey WH: Multiple meningeal and perineural tumors with analogous changes in the glia and ependyma (neurofibromatosis). Brain 60:85–117, 1937

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