Recurrence of intracranial meningiomas: the role played by regional multicentricity

Part 2: Clinical and radiological aspects

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Globular single meningiomas are generally regarded as benign tumors that can be completely removed. Nevertheless, after a total macroscopic resection including the insertion zone (Grade 1 operation according to Simpson’s classification), the incidence of recurrence ranged from 9% to 14% at the 5-year follow-up review. The authors have shown that single meningiomas represent only the visible predominant growth in the midst of a wide neoplastic field in the dura mater. Regional multiplicity in meningiomas would thus seem to be the rule. With this in mind, the authors propose to divide recurrences after Grade 1 operations into 1) true local and 2) false regional. A local recurrence is defined as a regrowth within the limits of the previous dural flap. Regional recurrence is when new growth develops outside the previous craniotomy site; this should not be considered as a recurrence but as a new primary site. These regional recurrences might explain some unexpected late tumor growth occurring after a Grade 1 operation. Five illustrative cases in which regional recurrence was detected by computerized tomography are presented. The authors also propose to add a supplementary grade to Simpson’s surgical grading: Grade 0. This operation would entail a wide resection of the dura around the attachment zone of the meningioma. The authors hope that with a Grade 0 operation the incidence of recurrence might be reduced.

KEY WORDS • brain tumor • meningioma • multicentric tumors • tumor recurrence

WELL-CIRCUMSCRIBED globoid meningiomas are generally regarded as benign tumors that can be completely removed together with their insertion zone, depending on their location. A system of grading according to the scope of the resection of meningiomas was presented in 1957 by Simpson.23 He identified five different grades. Grade 1 signified a macroscopic total resection of the tumor including its dural insertion and infiltrated bone. Leading neurosurgical textbooks stress that the dural incision should be made along the margin of the globoid tumor, thus preserving the dura mater beyond the apparent dural attachment of the meningioma.3,11,12,15,18 In Grade 2 operations, the dural attachment area of the meningioma is cauterized because it cannot be safely resected. The other three grades denote variants of progressively incomplete resections.

After a total resection as assessed by the naked eye (Simpson’s Grade 1), the rate of recurrence of solitary meningiomas is surprisingly high and increases with time: 10% at 5 years, 22% at 10 years, and 55% at 20 years.2 We have previously reported that single meningiomas might represent only the apparent growth in the midst of a regional neoplastic field extending about 4 cm around their insertion zone.5 Based on this finding, we propose that some recurrences may be local (true recurrences), but others may in fact be new primary tumors (regional new growth). The latter group would originate in the surrounding dura which has not been included in the resection of a Grade 1 operation. The following cases illustrate this point and emphasize the potential clinical importance of regional multiplicity in the recurrence of meningiomas.

Summary of Cases

Thirty-seven patients suffering from recurrent meningiomas were admitted for treatment in our neurosurgical department between January, 1978, and July,
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1985. Histological studies revealed that 56.8% of cases were meningotheliomatous and transitional, 13.5% were fibroblastic, 16.2% were angioblastic or hemangiopericytic, 5.4% were microcystic, and 8.1% were meningeal sarcomas. The distribution closely followed that of the primary cases, except that the incidence of the angioblastic and hemangiopericytic group more than doubled in the recurrent group as compared to the primary group (Table 1). This correlates well with the results of other authors.7,10,19,23 Psammomatous meningiomas are the least likely to recur.

Recurrent meningiomas were located most commonly in the falx-parasagittal region (51.3%), followed by the anterior basal region (27%) and the convexity (19%). Table 2 shows the significant incidence of falx-parasagittal and anterior basal recurrence as compared to the highest incidence of convexity meningiomas among the primary cases. This also correlates well with the findings of other authors.6,16,20,21,23

Illustrative Cases

**Case 1**

This 66-year-old man underwent a Grade 1 operation in 1976 for a large convexity meningioma of the right parietal region. He returned in 1985 with recurrent symptoms. A computerized tomography (CT) scan revealed two contiguous tumors in the right parieto-occipital region just outside the previous craniotomy site (Fig. 1A).

**Case 2**

This 40-year-old man underwent a Grade 2 operation in 1969 for a left parietal convexity meningioma. In 1971 and 1977, he was treated for tumor recurrence with Grade 1 operations. On his readmission in 1979, a CT scan revealed two independent primary tumors; one was located in the frontal falx and the other just posterior to the craniotomy site. No local regrowth was seen (Fig. 1B).

**Case 3**

This 63-year-old man was treated in 1974 for a left frontal convexity meningioma by a Grade 2 operation. Five years later he underwent a Grade 1 operation for a local recurrence. His symptoms returned, and a CT scan in 1981 showed a contiguous tumor growing posterior to the previous craniotomy site (Fig. 1C).

**Case 4**

This 31-year-old woman was operated on in 1947 for a right frontoparietal convexity meningioma which was...
totally removed. When she was admitted to our department in 1980 with recurrent symptoms, a CT scan revealed a large posterior parietal convexity meningioma. The dural insertion of this lesion was just posterior to and outside the previous craniotomy site (Fig. 1D).

Case 5
This 50-year-old man underwent surgery for the first time in 1971, when a Grade 2 operation was performed for the resection of a large parietal convexity meningioma. Eight years later a local recurrence was confirmed by CT scanning. A small independent nodule was noticed lying beside the main tumor mass (Fig. 2 left). This time a Grade 1 operation was performed but, to the surgeons’ surprise, the postoperative control CT scan showed that the small adjacent nodule had inadvertently been left in place (Fig. 2 right).

Discussion
Solitary meningiomas are regarded as benign tumors for which a Grade 1 operation (according to Simpson’s classification23) is frequently possible.2,16,17 This is especially true with convexity meningiomas. Thus, it is surprising and disturbing to find that after a Grade 1 operation even tumors in this location still have a high rate of recurrence (3% at 5 years17,23).

Previous reports showed that what appeared to be a single meningioma may be only the most evident growth in the midst of a wide dural neoplastic field.1,4,5,8,9,11,13,22-24 We have shown that this neoplastic field spreads for about 4 cm around the apparent insertion zone of meningiomas in the form of meningotheliomatous macroscopic dural nodules and microscopic intradural and fibrous-sheet cell clusters.5 These meningotheliomatous neoplastic foci were demonstrated in 100% of our cases.5

The macroscopic contiguous nodules may not be detected on CT scanning unless they are of sufficient size.14 Even when CT scanning suggests the presence of a small nodule independent from the main tumor mass, the nodule nevertheless can easily escape notice at surgery, as in Case 5 described above. Even a methodical intraoperative search for macronodules might prove useless in the end, in view of the existence of microscopic foci that are left behind with the contiguous dura not resected in a Grade 1 operation.2,6,11,12,13,17-19,23

With these facts in mind, we propose to divide recurrent meningiomas into: 1) true or local recurrences, when the new growth is either within the limits of the insertion area of the previously resected meningioma or, if outside this zone, in direct continuity with it (in practice, the recurrent tumor is usually within the limits of the previous craniotomy (Fig. 3)); and 2) false or regional recurrences, when the new growth is contiguous to but independent of the attachment surface of the primary meningioma and outside the previous craniotomy site (Figs. 1 and 2). These regional recurrences should be considered as new primary lesions originating from the multicentric tumor foci in the contiguous dura mater and the fibrous fringe. This pathological surrounding dura mater should be considered as part of the attachment surface of “solitary” meningiomas.

As a practical implication of this concept, we propose to add a supplementary grade to Simpson’s scale of surgical grading:23 Grade 0. This grade would include a wider dural exposure than in Grade 1 in order to remove, whenever possible, about 4 cm of dura mater around the periphery of the apparent dural attachment of “single” meningiomas. In most cases this will enable resection of the entire neoplastic dural field and of the tumorous fibrous sheet. We believe that, in spite of the opposing experience of Sheehy and Crockard,22 this approach might reduce the incidence of recurrence, especially the unexpected late recurrences after otherwise satisfactory Grade 1 operations, as illustrated above. It may be claimed that the greater hazard in--
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involved in a more extensive operation is not justified, and we stress that further long-term prospective studies are necessary to confirm our contention.

References


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