Meningioma With Intracerebral, Cerebellar and Visceral Metastases

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The literature pertinent to extracranial metastases of primary intracranial meningiomas was comprehensively reviewed by Kruse in 1960. He concluded that there were 20 well documented cases, to which he added 2 of his own from a series of 808 cases at the Armed Forces Institute of Pathology.

We wish to report a further case which has several additional features of pathologic interest.

Case Report

A male, aged 57 years, 3 years before admission had the first of 3 transitory episodes of diplopia. Nine months before admission a moderately severe headache commenced, which became exacerbated in severity and frequency following trauma to the skull 3 months later. During the next 6 months there developed dizzy attacks, nausea, vomiting, aphasia, mental changes and a slowly progressive right hemiparesis.

Examination. On admission, the patient was euphoric and disoriented with abnormalities confined to the nervous system. Blood pressure was 150/95. Positive findings included ptosis of the right lid, weakness of convergence, and papilledema of 2–3 D. bilaterally, right central paresis of the 7th nerve, depression of the right corneal reflex, slight deviation of the tongue to the right and a moderately severe right hemiparesis. Reflexes were increased on the right.

Roentgenogram of the skull revealed decalcification of the dorsum sellae. Ventriculography disclosed a left parietal tumor with displacement of the septum pellucidum 1 cm. to the right. The ventricular fluid was pale yellow with a + Pandy reaction.

Operation. Left parietal craniotomy was performed. In the posterior parietal area, several cm. beneath the surface, a plum-sized, well demarcated, dark reddish-blue tumor, completely intracerebral, was easily enucleated (Fig. 1).

Microscopically, it was a very cellular meningioma, moderately polymorphic and with one to two mitoses per high-power field. There were areas of necrosis in some of which calcific granules were present. Typical whorling was infrequent and no psammoma bodies could be identified (Fig. 2).

Course. The patient died elsewhere 6 months after operation. At autopsy tumors were noted in the liver and in both lungs. Section of the brain (Figs. 3 and 4) revealed multiple intracerebral and intracerebellar tumors (57 were counted). They varied in size from several mm. to 2 cm. in diameter. Five tumors involved the gray or the gray and the white matter and were present on the surface. The remainder lay entirely within the nervous parenchyma having no connection with the ventricular system or subarachnoidal pathways.

Several of the tumors had associated areas of hemorrhage. No tumors were found in an extracerebral or extracerebellar location. Microscopic examination was made of the tumors in the lungs and liver, one in the cerebellum and of several in the cerebral hemispheres. All closely resembled the tumor previously removed by operation.

The tumors in the lungs and liver contained more areas of necrosis and calcification, and whorling was a more prominent feature. They were slightly less polymorphic and averaged from two to three mitoses per high-power field (Figs. 5–8).

Discussion

The tumors may represent the metastases of a single intracerebral meningioma, or one of multiple coexisting meningiomas within the brain may have produced visceral metastases. A more remote possibility is that they represent a case of multiple meningiomatosis analogous to, or associated with, von Recklinghausen’s disease, although there was no evidence of this disease in our patient.

The situation of the tumors, both within the cerebral hemispheres and cerebellum, points to an arterial embolization from the heart. The tumors were present in all regions of the brain, were about equal in number on both sides and predominantly affected the deep cortex and subjacent white matter.

The unequal size of a tumor is of little differential value since it may indicate either multiple primary tumors, episodic embolization or unequal rates of growth of metastases resulting from a single shower of emboli. The fact that there were no tumors in an extracerebral or extracerebellar intracranial location favors a metastatic rather than a primary origin. To explain the latter concept it would appear necessary to evoke the field theory of Willis.4

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Fig. 1. Tumor removed at operation.
Both multiplicity and an intracerebral location of meningiomas are rare. Cushing and Eisenhardt, in their classical review of 295 intracranial meningiomas, found multiplicity (extracerebral), in the absence of von Recklinghausen's disease, in 3 cases, and a primary intracerebral location in 2, both of which were considered to have arisen from deep leptomeningeal infoldings within the sylvian fissure.

Clinically and at autopsy, the patient had no evidence of von Recklinghausen's disease, and the existence of a condition analogous to it, a multiple meningiomatosis, presupposes the presence of visceral rests of cells of the arachnoidal cap, and the development of tumors from visceral nerves with subsequent meningiomatous transformation. The absence of cutaneous tumors would also seem to invalidate this supposition. Of the 22 cases analyzed by Kruse, metastatic lesions were present in the lungs and/or pleura in 17 and in the liver in 5. The primary tumors in these latter cases were all described "as fibrosarcomas or in terms suggesting histologic malignancy." All tumors examined microscopically in the present case could be similarly described.

The majority of authors have considered that involvement of the liver and kidney (2 cases) resulted from a previously established metastatic lesion in the lung. However, it would appear justifiable to assume that, as with other tumors, some or all emboli may by-pass the pulmonary circulation to reach the left side of the heart. The almost exact histologic similarity between all tumors examined in the present case, particularly with regard to areas of necrosis and deposition of cal-

**Fig. 2.** Photomicrograph of meningioma removed at operation. Hematoxylin and eosin, X 244.

**Fig. 3.** Photograph of brain showing multiple tumors.

**Fig. 4.** Another section of brain showing multiple tumors. In this may be seen the site of the tumor removed at operation.
cium, strongly suggests a simultaneous dissemination in all organs.

Dissemination as the result of surgical intervention would appear improbable in this case, because the tumor removed, though the largest (it was only slightly larger than one present in the right occipital lobe), was probably of metastatic nature itself, in view of the deep intracerebral location.

Access of an intracranial meningioma to the cerebral circulation may be achieved by invasion of the vascular spaces in the skull, by infiltration of the Virchow-Robin spaces or by direct extension through the wall of a blood vessel within, or adjacent to, the tumor.

Kruse made the interesting observation that infiltration of a dural sinus was not present in any reported case of metastatic meningioma, although

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**Fig. 5.** Photomicrograph of meningioma in the liver. Hematoxylin and eosin, X 140.

**Fig. 6.** Higher-power view of area in Fig. 5. Hematoxylin and eosin, X 560.
Simpson found such invasion in 14 per cent of a series of 235 meningiomas.

From the preceding discussion the present case may be explained in the following way. A primary intracerebral meningioma arising from the arachnoid, covering a superficial or deeply buried gyrus, gained access to the cerebral venous circulation, most probably by direct infiltration of the vessels, producing multiple emboli, some of which were arrested in the lungs and some of which simultaneously reached the left side of the circulation to be disseminated in the liver and nervous system.

More extensive microscopic examination may have revealed neoplastic cells in other viscera having no evidence of macroscopic infiltration. This case is the only one in more than 1000 meningiomas operated upon in this clinic in which visceral metastases have been detected. The true incidence is probably higher because of lack or incompleteness of autopsy studies.
Summary

A case of meningioma having widespread intracerebral, intracerebellar, pulmonary and hepatic metastases is presented. No similar case could be found in the previously reported 22 cases of metastatic meningioma.

References