Development of Extracranial Metastases from a Malignant Astrocytoma in the Absence of Previous Craniotomy*†

Case Report

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The occasional development of extraneural metastases from an intracranial glioma is now well recognized. It is widely agreed, on clinical and experimental grounds, that the determining factor in this process is access of the tumor cells to the lymphatics, or to veins outside the nervous system.14,15 Surgical intervention, often in the form of repeated craniotomies, is presumed to play a decisive part in providing this access. Some 50 acceptable examples of glioma metastasizing outside the nervous system are now on record, but not a single well-documented case can be found in which some form of surgery did not precede this complication. Many of these reports point to the massive extracraniial encroachment of the growth through the operative defect as a probable important contributory factor in the development of distant deposits.

In 1959, a case was recorded of a metastasizing cerebellar medulloblastoma in which the pathway of extracranial extension and metastasis was demonstrably independent of the site of previous craniotomy.13 A large frontal secondary mass had excavated the orbit and the ethmoidal sinus, and this in turn had provided the route for blood-borne and lymphatic dissemination.

We are reporting a further example of malignant glioma that developed extraneural metastases through a pathway which had not been opened by an antecedent decompression. It is, to our knowledge, the first on record in which this complication, verified at postmortem, arose in the absence of any surgical procedure.

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scan on December 9 was again normal. In the subsequent 6 weeks, he developed blurring of vision, unsteadiness of gait, and dysphasia. By July 1965, the seizures had recurred with increasing frequency, and he was unable to work.

He was re-admitted on August 15 in a lethargic state, with a right-sided spastic hemiparesis affecting the leg more than the arm. There was some impairment of cortical sensibility on the right. On his last admission, on September 3, he was thin and pale, and complained of severe low-back pain. He pursued a steadily downhill course and developed bladder spasms. His hemoglobin dropped from 13.0 to 7.4 mg% in 2 months, and he died in coma on December 15, 1965, 17 months after the onset of symptoms.

Gross Postmortem Examination. The left cerebral hemisphere was enlarged and its convolutions flattened. The left medial frontoparietal region was occupied by an intracerebral tumor (Fig. 1) which measured 3X3.5X5 cm and extended to the surface, where it adhered to the thickened leptomeninges. Most of it was yellow and necrotic, soft, ragged, and focally hemorrhagic, but its peripheral portions were firmer, granular, grayish-white, and poorly demarcated from the adjacent white matter. At its rostral and caudal ends, the cortex of the superior, medial frontal, and parietal regions was broadened and pale, and showed complete loss of demarcation from the underlying white matter, suggesting diffuse replacement by an astrocytoma.

Tumor had invaded the dural leaflet along its medial convexity and spread along its inner surface, where it was firm, grayish, and granular. The superior longitudinal sinus was occupied by growth along its middle third (Fig. 2).

Behind this largely necrotic mass and laterally to it, the left centrum ovale at the level of the splenium was softened, sunken, waxy-yellow, and occasionally spotted with tiny hemorrhages, suggesting diffuse irradiation damage. No metastases were found in the ventricles or in the leptomeninges of the brain and the spinal cord.

Examination of the rest of the body revealed absence of red marrow in the bodies of the thoracic, lumbar, and sacral vertebrae, and replacement by grayish-yellow sclerotic growth (Fig. 3). A separate mass of firm grayish-white tumor, approximately 10 cm long by 1.5 cm thick, occupied the abdominal para-aortic region and had invaded the psoas muscle. Four enlarged pelvic, two enlarged inguinal, and one pancreatic lymph node were replaced by similar tumor. The lungs showed focal purulent bronchopneumonia. The spleen was slightly enlarged and weighed 260 gm. The kidneys were congested and flabby, and showed ill-defined red blotches throughout the medulla. The other organs were normal.

Microscopic Study. Sections from the intracerebral tumor revealed an extensively necrotic glioma displaying all the stages from a well-differentiated to a highly malignant astrocytoma. The cingulate cortex and white matter were diffusely infiltrated by small stellate glial cells forming microcysts in relation to which fine and coarse neuroglial fibrils were well demonstrated with Mallory’s phosphotungstic-acid hematoxylin (Fig. 4). In many other areas, considerable dedifferentiation was found, with increased cellular density, hyperchromatism of the nuclei, mitotic figures, and multinucleated giant-cell formation. The astrocytic character of the tumor was, however, often preserved (Fig. 5), and neuroglial fibrils remained demonstrable. No pseudopalisades were found. Anaplastic cells infiltrated the leptomeninges, transgressing the dura in places and extending beyond it. The lumen of the superior sagittal sinus was occupied by tumor mixed with thrombotic material, some of which was fresh, some organized and re-canalized.

In addition to the considerable necroses, widespread alterations were found in the tumor and the adjacent edematous white matter. These consisted of punctate hemorrhages, thromboses in small and large veins, some of which had a telangiectatic appearance, focal fibrinoid necroses of the blood vessel walls, and transudation of fibrinoid material throughout the brain parenchyma. There was also, in the surrounding cortex and white matter, marked astrocytic hyperplasia, spongy vacuolation of the subcortical bands, and multinucleation and giant-cell formation of scattered neuroglial elements with nuclear hyperchromasia and atypicality. These changes were interpreted as the result of irradiation.

The vertebral bone marrow was extensively