Metastasis of prostatic carcinoma to intracranial meningioma

Case report

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A surgically treated metastasis of a prostatic adenocarcinoma to an intracranial meningioma is reported. Literature review and discussion of such rare occurrences are presented.

KEY WORDS • cerebral metastasis • meningioma • prostatic carcinoma • neoplasm-to-neoplasm metastasis

REPORTS of a tumor metastasizing to an intracranial meningioma are exceedingly infrequent; however, during the past decade their incidence has more than doubled. 1-3,5,8,10,14,17,19,20,23,24,30,31,33-35,37,38 While there are two recent autopsy reports of prostatic adenocarcinoma within intracranial meningioma, 5,8 this report is the first known surgically documented case. A brief review of the literature and discussion follow this case report.

Case Report

This 55-year-old black man was hospitalized following a 2-week history of progressive left hemiparesis, predominantly of the lower extremity. He described an intermittent, dull headache of the right frontal area of 3 to 4 years duration, with a recent onset of associated morning nausea. His family noted a subtle personality change. Two years earlier, adenocarcinoma of the prostate was diagnosed following episodes of urinary retention and bone pain in the pelvic area. Laboratory results revealed an elevated acid phosphatase level, and a radionuclide bone scan suggested metastatic lesions to the spinal column, cranium, sternum, and ribs. He was begun on a course of diethylstilbestrol (DES) hormonal therapy, and subsequently underwent orchiectomy. Because of progressive low back pain, local radiation therapy to the sacrum was recommended and achieved excellent palliation.

Examination. The patient appeared indifferent to his mild hemiparesis. No papilledema was seen, and the remainder of the neurological examination was unremarkable. Computerized tomography (CT) revealed a calcified globoid mass with increased density at the right parasagittal region, which enhanced with contrast material. A rim of edema and a minimal shift of the midline were noted. The findings were interpreted as representing a parasagittal meningioma. Cerebral angiography was not performed.

Operation. A right frontoparietal craniotomy was carried across the midline. Abnormally hypervascular bone was revealed overlying dural infiltration by tumor extending to the falx. A firm well circumscribed gray nodular mass was attached at the superior sagittal sinus. Frozen-section biopsy was consistent with meningioma. The tumor was easily separated from the underlying cortex, which appeared indented but not invaded. Where necessary, the dura and falx were excised or coagulated.

Postoperative Course. The patient's postoperative course was uncomplicated and, following histological verification, whole-brain irradiation was begun. The patient continued to show improvement, and 6 months later was able to walk without assistance. He was readmitted with evidence of multiple bone and pulmonary metastases. A CT scan showed no evidence of intracranial involvement. The patient suffered pulmonary collapse and died; autopsy was refused.
Prostatic carcinoma metastatic to meningioma

Pathological Examination. The surgical specimen consisted of a single gray mass, 3 × 3.5 × 2 cm in size, which when bisected was found to contain a thin yellow-white nodule of soft tissue and multiple areas of focal necrosis. Microscopic examination disclosed two distinct tissue types: a dense fibrous and endotheliomatous meningioma (Fig. 1 left), and a moderately well differentiated adenocarcinoma (Fig. 1 right) reminiscent of the earlier prostatic biopsy. Necrotic and hemorrhagic centers were noted, and the malignant tumor appeared to insinuate between the meningeal cells in some areas. Other sharply demarcated islands of gland-like structures were present, as were rare psammoma bodies. These findings were interpreted as demonstrating a prostatic adenocarcinoma metastasizing to a rostral falx meningioma.

Discussion

This histologically documented adenocarcinoma within a symptomatic falcine meningioma appears to be unique. Reports of tumor-to-tumor metastasis have appeared; the phenomenon of spread from a malignant to a benign tumor is slightly more frequent than cancer-to-cancer metastasis. Specific reports of metastasis to meningioma as well as to other intracranial and spinal tumors remain infrequent. With an overall incidence of cerebral metastasis approaching 10% of all intracranial tumors, and that of meningioma almost twice as high, one would anticipate an appreciable rate of coincidental tumors.

Adenocarcinoma of the prostate is the second most common cancer in males in the United States, with an estimated incidence of 30% in men over 50 years of age; however, metastasis to the cerebrum is exceptionally rare (reported in some series as less than 1%). Metastases to the cerebellum are somewhat more common. Adenocarcinoma of the prostate commonly spreads by direct extension, but distant metastasis is not rare. Central nervous system (CNS) involvement is usually limited to the vertebrae and is believed to involve the perineural and capsular lymphatic system as well as Batson’s venous plexus. Twenty-five cases of all types of metastasis to intracranial meningioma have been described, two with prostatic adenocarcinoma (Table 1). In contrast to this report, both of these lesions were unsuspected intracranial tumors that were clinically silent and found at autopsy. It is significant that, in major series of meningiomas, no metastases were noted. Review of the literature is difficult because of the variation in interpretation; furthermore, exiguous documentation precludes direct comparison in some cases. Chambers, et al. recently tabulated reported cases of metastasis to the CNS. Table 1 isolates only those cases involving primary intracranial meningiomas and details several additional reports. Neurological symptoms were present in only 60% of reported cases, with the most common primary sites of lung, breast, and kidney. The incidence of meningioma is higher in women, and may contribute to the greater occurrence of metastasis to meningiomas in females. In addition, adenocarcinoma of the lungs and breast are much more common implants.

In many ways, this patient resembles those cases described by Schaerer and Whitney and by Fink of prostatic metastasis to the falx cerebri simulating a meningioma. Although the radiological and clinical findings appeared characteristic of meningioma, those authors were surprised to find a prostatic metastasis. Even with more sophisticated neuroradiological studies, the clinical distinction between metastasis and primary brain tumor can be quite difficult.

It is most likely that the meningioma caused the chronic headache and led to the personality changes in this patient; however, the rapid course of hemiparesis may have been a result of the metastasis causing an acute increase in tumor bulk with consequent new symptoms. Although the tumor appeared
histologically to lie within the meningioma, the collision theory cannot be excluded if the metastasis arose as an abutting lesion at the meninges (an earlier brain scan suggested calvarial metastasis although no gross change was noted at time of surgical exposure). A tumor within the substance of the meningioma would suggest tumor-to-tumor metastasis.

The histological features of meningioma in reported cases have varied, with no apparent common denominator. Scarcity of psammoma bodies has been suggested as a factor attracting metastatic carcinoma deposits to preexisting meningioma. Gyori\textsuperscript{14} speculated that psammoma bodies conferred some degree of protection from implants. Bernstein\textsuperscript{2} first presented this hypothesis of "resistance" to malignant tumor seeding implantation by psammomas, and this case is consistent with that hypothesis. Many cases of tumor-to-tumor metastasis have been related to a highly vascular metastatic site. The usual hypervascularity of meningioma has been considered a factor for hematogenous spread of metastasis, although the preponderance of occurrence of meningiomas over the more vascular intracranial host tumors would suggest that a rich blood supply and ease of expansile growth are not the major factors in the capacity of a neoplasm to accept metastasis. There does appear to be a propensity for adenocarcinoma rather than other types of cancer to metastasize to primary brain tumors. A close biological affinity between adenocarcinoma and meningial tissue has been described.

At present, there is no satisfactory explanation for the ability of neoplasms to accept or reject metastasis. While this case remains a medical curiosity, the current trend for surgical treatment of solitary cerebral metastasis, even with disseminated disease,\textsuperscript{11} may reveal this occurrence more frequently.

**Acknowledgments**

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**References**


**TABLE 1**

Summary of reported metastasis to primary intracranial meningiomas

<table>
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<tr>
<th>Authors &amp; Year</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Donor Tumor Type</th>
<th>Location</th>
<th>Mode of Diagnosis</th>
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