

Treating Dural Metastases Mimicking Intracranial Hypotension

In this letter, we describe a patient with metastatic breast cancer who experienced dural metastases that mimicked intracranial hypotension. Cranial radiation therapy (RT) improved the patient's symptoms and helped palliate the epidural and intracranial periosteal thickening.

Case

A 42-year-old premenopausal woman presented with right-sided inflammatory breast cancer in 2002. Core biopsies of the right breast confirmed the diagnosis of an infiltrating ductal carcinoma with involvement of overlying skin lymphatics; the tumor was estrogen receptor positive and progesterone receptor and HER2/*neu* negative. Though her staging was negative, she declined all medical therapies offered. In March 2004, she presented with painful bone metastases and evidence of lymphangitic tumor spread to the lungs. She was treated with palliative radiation to the thoracic spine, with good clinical response. She began therapy with tamoxifen and monthly pamidronate until March 2005, when she elected to discontinue any further systemic treatments despite medical advice.

In November 2005, she presented to the emergency room with a two-week history of orthostatic headache, confusion, drowsiness, nausea and polydipsia. Her general condition deteriorated in the days prior to admission, with increasing confusion, slurred speech, fluctuating level of consciousness, and deteriorating performance status (Eastern Cooperative Oncology Group [ECOG] status of 3). Examination revealed a patient who appeared unwell and drowsy, disoriented to time and place. Her vital signs revealed a blood pressure of 176/78 mm Hg, heart rate of 80, respiratory rate of 16, and normal temperature. She was noted to have a prominent forehead bilaterally with two subcutaneous, mobile,

tender nodules on the scalp. Neurologic exam did not reveal focal motor or sensory deficits, and cranial nerve examination was within normal limits. Lumbar puncture was recommended, but the patient refused it.

Magnetic resonance imaging (MRI) revealed no parenchymal brain metastases or leptomeningeal disease; however, the image did show crowding of intracranial structures affecting the brainstem. The midbrain appeared compressed in transverse dimensions and also elongated. There was mild compression of the superior pons with partial effacement of the fourth ventricle as well as compression of the cerebral aqueduct; effacement of the suprasellar, interpeduncular, and prepontine cisterns with the cerebellar tonsils extending to the level of the foramen magnum; and bilateral subdural collections with appearance of subdural effusions (Figure 1). These findings were consistent with intracranial hypotension.

The patient was started on steroids without significant clinical improvement. After a multidisciplinary discussion of the case and a literature search, the health-care team concluded that her symptoms

were due more likely to dural metastases than to intracranial hypotension, as she had no risk factors for the latter. Whole-brain irradiation was commenced (after no response to 8 days of steroids) to a total dose of 2,000 cGy in 5 fractions. Following the second day of RT, the patient had a prompt improvement in her mental status and headaches, and by the end of the treatment, she was almost asymptomatic, with an ECOG performance status of 1. She was discharged from the hospital on a tapering dose of steroids, 2 days after completing RT.

The patient was seen 40 days after completion of cranial RT as an outpatient, at which point she had completely recovered and was able to carry on with her usual daily activities. A new MRI scan revealed a dramatic reduction in the size of the epidural and intracranial periosteal thickening, as well as a reduction in volume and normalization of the subarachnoid cisterns and cerebellar tonsils. The "squeeze" of the brainstem and posterior fossa was no longer present (Figure 2).

In February 2006, 2.5 months following completion of RT, the patient was admitted to the emergency room with progressive respiratory distress. She declined all investigations and treatments and passed away a few days later from metastatic breast cancer.

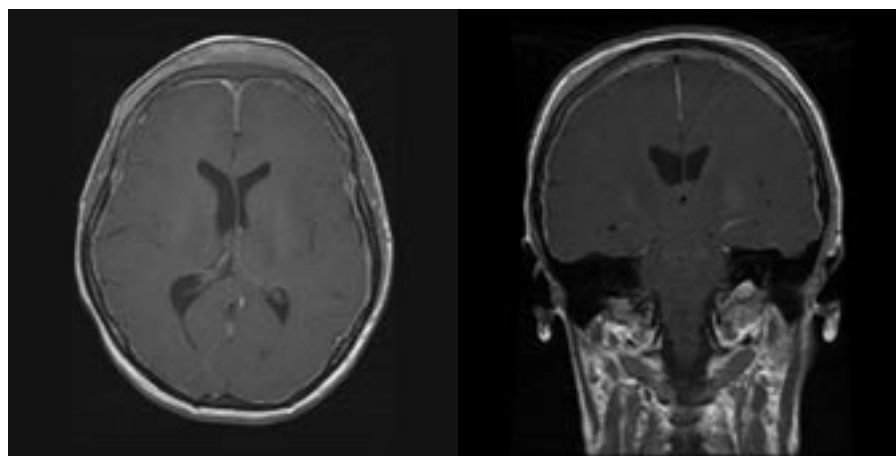


Figure 1 Magnetic Resonance Imaging Displaying Crowding of Intracranial Structures

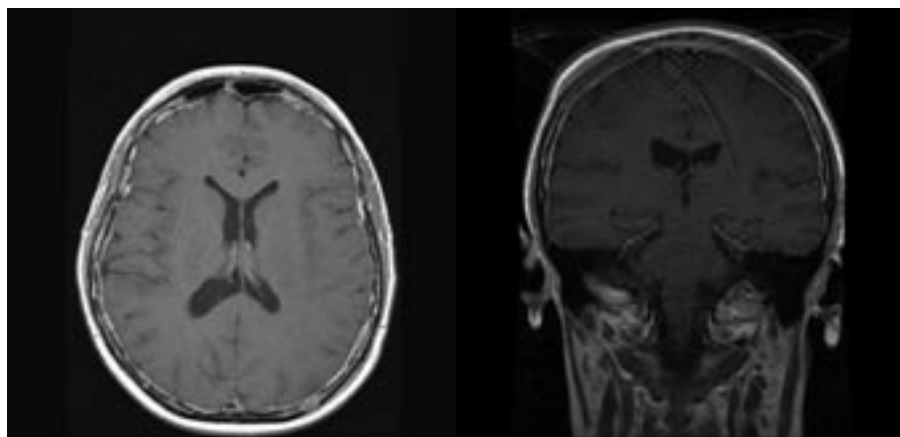


Figure 2 Magnetic Resonance Imaging 40 Days After Cranial Radiotherapy

Discussion

Spontaneous intracranial hypotension was the initial working diagnosis for this patient. Reports of this disorder indicate that typical symptoms (eg, orthostatic headaches, nausea, vomiting, pain, and anorexia) are related to the effects of the intracranial hypotension and attempts within the craniospinal axis to maintain volume homeostasis in the face of cerebrospinal fluid leakage.¹ Medical causes of intracranial hypotension include dehydration, diabetic coma, uremia, and severe systemic illness. Typical findings on MRI with gadolinium enhancement are diffuse thickening of the pachymeninges, engorgement of venous sinuses, subdural fluid collections, enlargement of the pituitary gland, and downward displacement of the brain.² The treatment ranges from conservative approaches including bed rest, intravenous or oral caffeine, and theophylline to epidural blood patches and infusion of saline²; some patients may also experience clinical improvement with the use of glucocorticoid or mineralocorticoid treatment.

In our case, the patient did not demonstrate any improvement after the use of corticosteroids. Although her symptoms and radiologic appearance were compatible with intracranial hypotension, there was no explanation as to why she would have developed it, and response to RT eventually led us to conclude that her

symptoms and MRI appearance were due to dural metastases.

Dural metastatic disease is one of the least frequent and least studied of all the patterns of intracranial cancer spread. Dural metastases are found in 8%–9% of patients with advanced systemic cancer and arise by either direct extension from skull metastases or hematogeneous spread.³ Despite the recognition that metastatic tumor can spread to all craniospinal compartments, dural disease has seldom been the focus of attention. Meyer and Reah⁴ reported that 20% of their cases with diffuse dural metastases had coincident leptomeningeal carcinomatosis and nearly half were associated with subdural hemorrhage.

Posner and Chernik⁵ studied intracranial metastases in 2,375 patients with systemic cancer who underwent autopsy and reported that dural metastases were identified in 9% of their cases; in 4% of these patients, metastases to the dura were isolated and represented the only site of intracranial tumor involvement. Kleinschmidt-DeMasters³ published a retrospective study on 27 patients with dural metastases from an autopsy series. Most of the patients had systemic bony disease with calvarial metastases. Coexisting brain parenchymal metastases were found in less than half of cases (13). Diffuse studding of dura was seen primarily with breast and prostate can-

cers; five cases presented with subdural hemorrhage.

Surgery is the most commonly described treatment for dural metastases, with few studies reporting the role of RT. Small surgical series⁶ describe patients who underwent surgery for solitary metastatic brain tumors with dural extension; the most common primary tumor was breast cancer, and the median patient survival following resection was 11 months.

We could find no report on the role of RT for dural metastases. Given the palliative benefit of RT for leptomeningeal and parenchymal brain metastases, we proceeded with palliative radiation in this patient and were impressed with the prompt clinical benefit. This symptom complex should be considered in patients with advanced breast cancer who present with headaches and neurologic disturbances, particularly in patients with bone metastases to the skull.

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