



DOI: 10.19187/abc.201853144-147

A Breast Cancer Patient Presenting for the First Time With a Meningioma-like Intracranial Mass

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ARTICLE INFO

Received:
23 June 2018
Revised:
17 July 2017
Accepted:
20 July 2017

Key words:
Breast cancer,
meningioma,
extradural metastasis

ABSTRACT

Background: Breast cancer metastases to the central nervous system are more commonly multiple intracranial lesions. Rarely, in the case of single extradural metastasis, it is clinically and radiologically challenging and important to differentiate other solitary extradural masses such as meningioma. Moreover, according to the literature, it seems that there is a relationship between breast cancer and meningioma.

Case Presentation: We report a 54-year-old female presenting with a sudden onset of headache and seizure whose MRI showed an extra-axial intracranial mass in her brain. The patient underwent operative removal of the tumor with the clinical and radiologic diagnosis of meningioma. The pathological finding was suspected to be breast cancer metastasis. Future evaluation of her breast showed tissue distortion in the left breast and the pathologic diagnosis of the breast lesion was invasive ductal carcinoma. In a follow-up CT scan, there were multiple liver and lung metastases.

Conclusion: It is crucial for physicians with various specialties to be aware of different possibilities in the setting of a single extra-axial brain mass.

Introduction

Meningioma, as the most common meningeal tumor, is an extra-axial, nonglial neoplasm that originates from meningocytes. It constitutes up to 20% of primary brain tumors. There is a female predominance, and it usually occurs in the fifth and sixth decades of life—similar to the peak incidence age for breast cancer.¹ The incidence of meningioma is 1.57 to 1.90 times greater in breast cancer patients compared with the healthy population. A hormonal relationship between breast cancer and meningioma is suggested.^{2,3}

Breast cancer metastases to central nervous system usually present as multiple intra-axial masses, but sometimes isolated dural tumors may be misdiagnosed as meningioma.⁴ In cases without the diagnosis of primary breast tumor, isolated enhancing mass in skull base is in favor of meningioma rather than isolated brain metastasis, but, in the presence of primary breast cancer, metastasis from primary tumor should also be considered as differential diagnosis.

Generally, intracranial metastasis is seen in approximately 17% of patients with malignant primary tumor; however, with improved cancer treatments and the resultant prolonged survival rates, this number will increase. While 25% of intracranial metastases have some degree of meningeal involvement, isolated meningeal metastasis is seen in 1%. In addition, in cases without known clinical evidence of primary cancer, it is even rarer.⁵ Here we report a case of a patient with a single extra-axial dural-based mass of unknown origin in the brain.

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Case Presentation

A 54-year-old woman referred to Imam Khomeini Hospital of Tehran University of Medical Science with a chief complaint of a sudden onset of headache and seizure. Her brain MRI showed an extra-axial intracranial mass (Figure 1). She underwent surgery and was clinically diagnosed with meningioma. On pathologic examination, sheets of atypical epithelial cells with pleomorphic vesicular nuclei and eosinophilic cytoplasm occasionally arranged in tubular structures were identified. Comedo-type necrosis and frequent mitotic figures, all in favor of metastatic carcinoma, were also seen. Immunohisto-chemistry revealed positive reactions with CK7, GATA3, GCDFP-15, and HER2 (3+). Tests for ER, PR, CK20, CDX2, TTF1, and Napsin-A were negative. Ki67 showed 30% proliferative

activity. Overall findings were compatible with metastatic carcinoma of breast origin (Figure 2). We were consulted for breast evaluation. She did not have a family history of breast cancer and had a breast ultrasound with the benign result from 3 months ago. In our evaluation, we found a tissue distortion in the central upper part of the left breast and lymph nodes with a pathologic appearance in left axilla (Figure 3). We performed core needle biopsy of breast distortion, and the result of pathology was indicative of invasive ductal carcinoma with the hormonal profile the same as a metastatic brain tumor.

The patient underwent brain radiotherapy. After a while, her thoracic and abdominal computed tomography (CT) scan showed multiple lung and liver metastases.

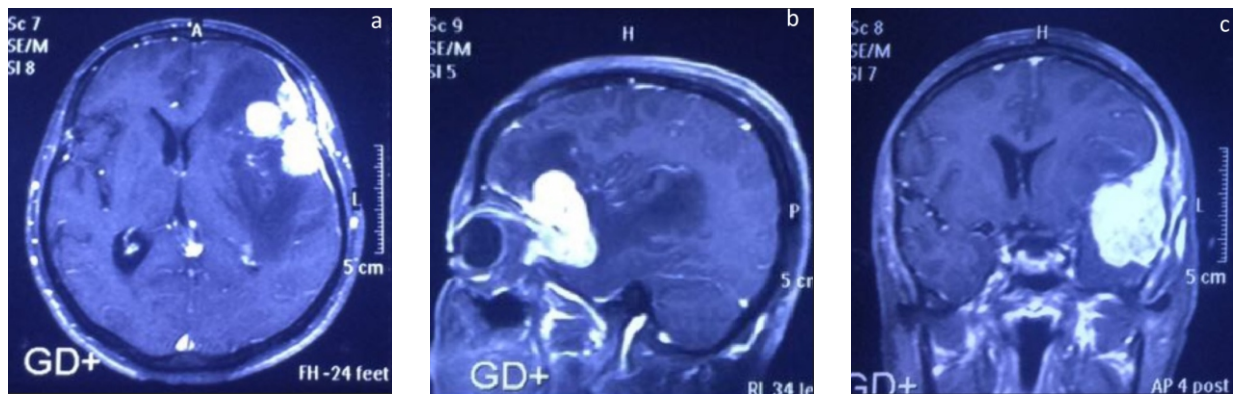


Figure 1. Brain MRI with contrast injection in the patient with a sudden onset of headache and seizure 1a (axial), 1b (sagittal), and 1c (coronal) images show an extra-axial dural-based avid, homogenous, enhancing mass in left side anterior skull base accompanied by a dural tail, compression on nearby parenchyma, and edema.

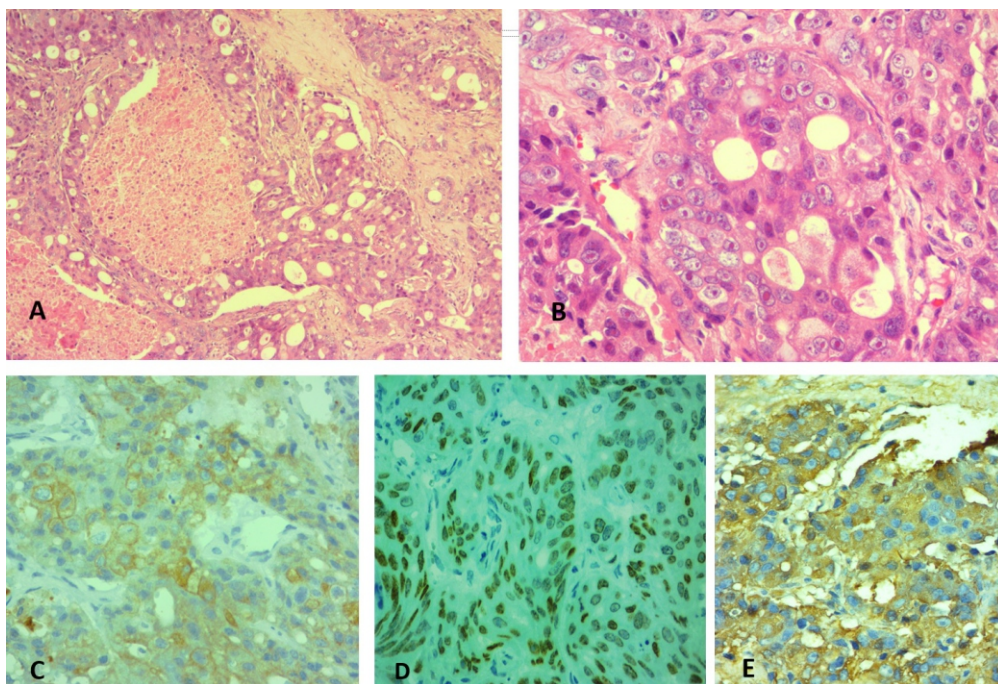


Figure 2. (A) and (B), microscopic examination of hematoxylin- and eosin-stained sections reveals sheets of neoplastic epithelial cells with eosinophilic cytoplasm and pleomorphic vesicular nuclei occasionally arranged in glandular structures. Central comedo-type necrosis is also seen. Immunohistochemistry reveals positive immune reaction with CK7(C), GATA3 (D), and GCDFP15 (E).

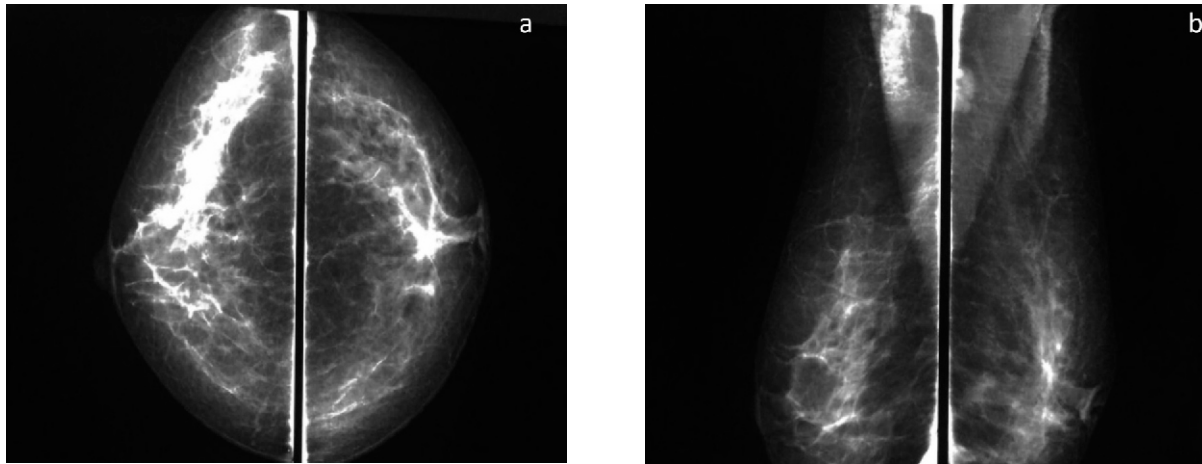


Figure 3. Mammography with craniocaudal (3a) and mediolateral oblique (3b) views taken in another imaging center, with suboptimum quality. It shows a subtle distortion in the upper central part of the left breast and a prominent left axillary lymph node. Core needle biopsy of the left breast reveals invasive ductal carcinoma.

Then, chemotherapy was started for her by the oncology team, which is continued till now.

Discussion

When dealing with an extra-axial intracranial mass lesion, it is crucial to consider differential diagnoses like metastases to the skull or dura other than more common primary masses such as meningioma, or subdural hematoma or collection. In imaging, dural-based metastatic masses may present as nodular or even elongated and plaque-like lesions. The surrounding cerebral cortex may be compressed, and edema incited in the underlying parenchyma. Dural tail sign (the enhancement of the meninges adjacent to tumor) on CT scan and MRI was once considered as a specific sign for meningioma; however, it is known that this sign also can be present in meningeal metastases.^{3,6}

Meningioma is benign and curable and accounts for up to 20% of all intracranial tumors, while brain metastases from breast cancer have an ominous prognosis despite surgery, radiation, and chemotherapy.⁴

As the physical appearance of these tumors can be quite similar, surgeons may not distinguish a metastasis from meningioma during surgery, as was the case for our patient, and pathology will lead to diagnosis.⁵

It has been reported that breast cancer is the second most common cause of intracranial metastasis after lung cancer.² Metastatic pulmonary carcinoma was excluded in our case immunohistochemically. Most patients with breast cancer metastasis to the central nervous system either have synchronous multiple organ metastatic disease or soon develop it.⁶

The role of hormones in meningioma has been already proposed since meningiomas enlarge during pregnancy and express estrogen and progesterone receptors.²

Schmidt *et al.* reported two women with breast

carcinoma who presented with clinical presentations of sphenocavernous syndrome with MRI that was misdiagnosed as basal skull meningioma, but who were found to have metastatic breast carcinoma following biopsy of the lesions. Like our patient, those cases had no history of breast malignancy.⁶

Interestingly, some patients are reported in the literature with metastasis of breast carcinoma to meningioma. It is reported that HER2-positive breast cancer cells preferentially like to deposit in the patient's meningioma. This may be due to the high vascularity, low metabolic rate, and hormonal status of meningioma.⁷⁻⁹ However, in such cases, there is usually a known history of breast cancer.

Seckin *et al.* reported a 72-year-old woman presenting with nausea and vomiting, headache, reduced mentation, and amnesia initially misdiagnosed as meningioma. In this case, however, the patient also had a history of breast mass leading to metastasis.¹⁰

Computed tomography, MRI, and angiography may be somewhat beneficial for the differentiation of metastasis from other lesions. A hematoma or collection does not enhance and has a related history most of the times. A meningioma is dural based and shows homogenous avid enhancement, whereas a metastatic tumor is not homogeneously enhanced. Gadolinium-enhanced MRI is known as the most sensitive imaging technique for the diagnosis of neural axis metastases and enhanced MRI is even superior to the enhanced CT for both brain parenchymal and leptomeningeal diseases due to its higher soft tissue contrast, higher sensitivity to the contrast enhancement, the direct multiplanar capability, and the lack of the artifacts related to the bone. It particularly helps to reveal the lesions in the posterior fossa and brainstem, where the presence of beam-hardening artifacts may be problematic in CT scan. The MRI is also superior to the CT scan for identifying multiple lesions, which is useful in differential diagnosis. Sometimes other advanced



techniques like magnetic resonance perfusion imaging are needed to differentiate between lesions. Dural metastases and meningiomas have different vasculature and perfusion characteristics which are assessed using dynamic perfusion MRI.⁶

As Conclusion, It is important for physicians to be aware of different diagnosis in the setting of a single extra-axial brain mass

Conflict of Interest

The authors have nothing to declare

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