Rare metastasis to paranasal sinuses from triple-negative breast cancer
A case report and literature review

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Abstract
Rationale: Breast cancer, the most common form of cancer among women, rarely metastasizes to the head and neck region. To date, there have been only 6 similar cases in the literature, and most patients in these reports had very poor prognosis.

Patients concerns: We report a 61-year-old female presented pain and numbness on the right side of the face 5 years after being diagnosed with triple-negative breast cancer.

Diagnosis: Magnetic resonance imaging (MRI) revealed a tissue mass in the sphenoid sinus. The tissue biopsy confirmed metastasis of breast cancer.

Intervention: The patient received initial chemotherapy and radiotherapy plus 10 cycles of maintenance chemotherapy

Outcomes: The patient got long-term progression-free survival time. The total time to progression was 32 months.

Lessons: Although breast cancer rarely metastasizes to the head and neck region, awareness should be raised when breast cancer patients experience headache or have sinus-related symptoms. Chemotherapy and radiotherapy may be effective to treat paranasal sinus metastasis of triple-negative breast cancer, and patients may achieve long-term survival.

Abbreviations: CT = computed tomography, ER = estrogen receptor, HER-2 = human epidermal growth factor receptor 2, IMRT = intensity-modulated radiotherapy, MRI = magnetic resonance imaging, PET = positron emission tomography, PR = progesterone receptor.

Keywords: metastasis, paranasal sinuses, triple-negative breast cancer

1. Introduction
Breast cancer is the most common malignant tumor among Chinese women.1 The typical breast cancer metastatic sites are regional lymph nodes, bones, lung, liver, and brain. Metastasis to the head and neck region is extremely rare, with only 6 reported cases in the literature.2–7 In these cases, most patients did not receive any systemic treatment and had a very poor prognosis. Here, we present a recent case of triple-negative breast cancer, the most malignant type of breast cancer, metastasis to the sphenoid sinuses. This patient received initial chemotherapy and radiotherapy plus 10 cycles of maintenance chemotherapy and achieved long-term and progression-free survival. Additionally, we reviewed the current literature regarding the presentation, investigation, diagnosis, management, and prognosis of this rare condition.

2. Case report
In early 2014, a 61-year-old woman experienced numbness and pain on the right side of her face, accompanied with impaired vision in the right eye. Magnetic resonance imaging (MRI) revealed a soft tissue mass measuring 5.0 × 4.3 × 6.1 cm spreading both sides of the sphenoid sinus, with extension to the ethmoid sinus, cranial base, base of the middle cranial fossa, and the adjacent right temporal lobe parenchyma (Fig. 1). Incisional exploration and biopsy were performed under local anesthesia for an accurate diagnosis. Biopsy results indicated that the mass was a poorly differentiated adenocarcinoma (Fig. 2).

The review of medical history found that the patient was diagnosed with a 35 mm intraductal carcinoma in the left breast in 2009 and treated with radical mastectomy and axillary node clearance. Eleven axillary lymph nodes were removed, and none of them was positive for breast carcinoma. The carcinoma was classified as histological grade 3 and staged as pT2N0M0 according to the Tumor, nodes and metastasis staging system. Further analysis revealed the cancer specimen was negative for estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER-2), indicating that the malignancy was triple-negative breast cancer. Following primary mastectomy, the patient underwent chemotherapy with the FAC regimen (fluorouracil, doxorubicin, and cyclophosphamide) for 4
cycles. The patient remained asymptomatic and was free of recurrence during routine follow-up care for 4 years.

The sphenoid sinus specimen was processed for immunohistochemical staining. The results showed the lesion was positive for CK7 and negative for CDX2, CK20, TTF-1, villin, ER, PR, and HER-2. The histology sections of the primary breast lesion of this patient were obtained from the hospital where the patient underwent mastectomy and compared with the sphenoid sinus sections. The specimen from the sphenoid sinus demonstrated similar morphological and immunophenotypic features to the primary breast cancer tissue. This evidence proved that the mass in the sphenoid sinus was metastasized from the primary breast carcinoma. Further examinations, including bone scan and computed tomography (CT) of the chest, abdomen, and pelvis confirmed the absence of other distant metastases.

The patient was treated with the docetaxel and cisplatin (DP) regimen (docetaxel 75 mg/m² and cisplatin 100 mg/m²) for 4 cycles, followed by radiotherapy with concurrent weekly 40 mg/m² cisplatin treatment. A total of 54 Gy intensity-modulated radiotherapy (IMRT) was administered to the metastatic sites. After the chemotherapy and radiotherapy, the pain was reduced, and MRI evaluation of the maxillofacial region indicated that the tumor size was stabilized. The patient subsequently received maintenance chemotherapy of a single drug docetaxel (75 mg/m²) for 10 cycles. The follow-up MRI examination did not find any radiological progression until October 2016, when the patient was diagnosed with vertebral and liver metastases. The total time to progression was 32 months.

All the procedures were performed after obtaining informed consent, and the patient provided a written informed consent for this case report. A retrospective patient case report which is not conducted with patients to evaluate new medical treatment does not require ethics committee or institutional review board approval according to our guideline.
and the arterial vessels of the head and neck. Batson\[9\] suggested the possible route of hematogenous spread to the sinuses is initial radiological investigation of choice and should examine imaging techniques, are required for an adequate diagnosis. CT is the history review, neurological examinations, and advanced imag-

Therefore, various diagnostic interventions, such as medical

accurate diagnosis based on these nonspecific symptoms. Therefore, various diagnostic interventions, such as medical

headache or sinus symptoms. Chemotherapy and radiotherapy may be effective to treat paranasal sinus metastases,
and patients can achieve long-term survival. To the best of our knowledge, this is the first report of the metastasis of triple-negative breast cancer to the head and neck region, and the first time that the systemic treatment of this type of cancer is discussed in the literature.

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