

Scalp Metastasis After Breast Cancer Surgery: A Case Report

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Abstract: Breast cancer is one of the most common malignant tumors affecting women worldwide. Breast cancer is a complex disease characterized by abnormal growth of cells in the breast tissue. Metastasis, the spread of cancer cells from the primary tumor site to distant organs, is a major challenge in the management of breast cancer. Although metastasis to distant sites is a well-known feature of breast cancer, scalp involvement is relatively rare. The occurrence of scalp metastasis signifies an advanced stage of the disease. The 51-year-old female discovered a firm, painless mass in her right breast that had been there for two years. It had been pricking for a month, and the biopsy revealed that the mass was invasive carcinoma of the right breast. Imaging tests suggested that the tumor was malignant. Adjuvant endocrine therapy and postoperative adjuvant chemotherapy were administered following a modified radical resection for breast cancer. Eleven months later, radiation treatment and replace endocrine therapy was used. 32 months following surgery, a scalp tumor was discovered; a pathology biopsy verified the origin of the breast cancer; three months later, bone, brain, and visceral metastases were discovered. After that, she received oral capecitabine treatment and was admitted into the hospital for advanced rescue treatment. She is currently in the disease stability state, her disease is effectively managed, and no new metastatic lesions have been discovered.

Keywords: breast cancer, scalp metastasis, chemotherapy, radiotherapy, endocrine therapy, case report

Case Report

There was a 51-year-old woman received treatment in the First Affiliated Hospital of Kunming Medical University because of a hard lump at her right breast, which has found for two years and felt it tingling for a month. After a medical examination we found that there was no change in the breast skin, the lump was hard, painless and boundaryless. In addition, the diameter was 3 cm. She used to have hypertension level 2 and undergone surgery of breast fibroadenoma and CINI. She took nifedipine orally every day so that her blood pressure was well controlled. The mammography suggested the lump was malignant tumor (Figure 1). The MRI also suggested a malignant tumor (Figure 2). After core needle biopsy the histopathological examination indicated a invasive ductal carcinoma and the estrogen receptor was 80% positive, the progesterone receptor was 3% positive, Her-2 was negative, and KI-67 was 10% positive (Figure 3). It was confirmed as type Luminal B breast cancer. We performed radical mastectomy and axillary sentinel lymph nodes biopsy, while the result of intraoperative freezing suggested no cancer metastasis in the axillary sentinel lymph nodes (Figure 4); at the same time, we found a malignant tumor on the part of the surface of the pectoralis major muscle intraoperatively, and a few of hard swollen axillary lymph nodes. Eventually, we removed the grade I and II axillary lymph nodes and part of the tumor-infiltrated pectoral major muscle. Postoperative pathological suggested: The tumor size was 2.6×2.2×2.0cm. It is an invasive ductal carcinoma, grade WHO II, the estrogen receptor was 90% positive, the progesterone receptor was 90% positive, Her-2 was negative, and KI-67 was 40% positive (Figure 5). It is confirmed as type Luminal B breast cancer, the same as before surgery. Its peripheral margin, skin, nipple, and basal margin were all negative, and no

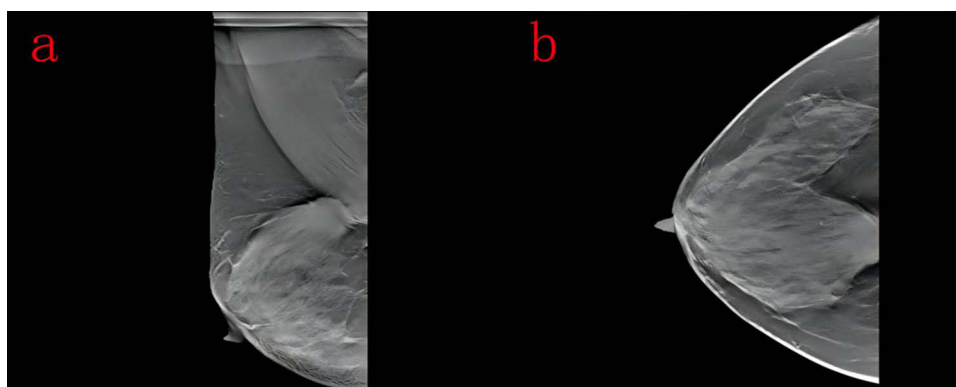


Figure 1 The upper portion of the right breast, with the mass, is out of shape. The edges characterized by spicule signs and architectural distortion, blood vessels thickened, and adjacent posterior gaps disappeared. There were no abnormal axillary lymph nodes. (a) MLO; (b) CC.

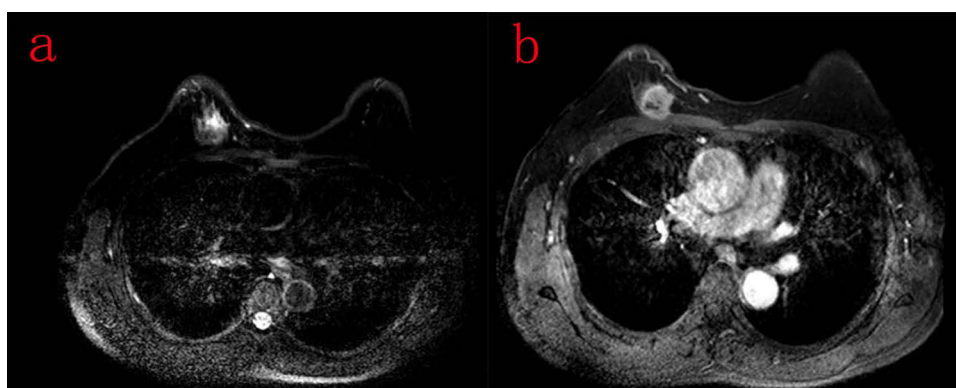


Figure 2 The upper quadrant back zone of the right breast showed a class of circular abnormal signals, with multiple “burr signs” at the boundaries, lesion size 2.4×2.7×2.7cm, Cooper ligament has been pulled and displacement, no apparent skin thickening, the unclear demarcation between the lesion and the pectoralis major muscle fascia, and no significantly enlarged lymph nodes in the bilateral axilla. (a): T2 sequence; (b): enhancement.

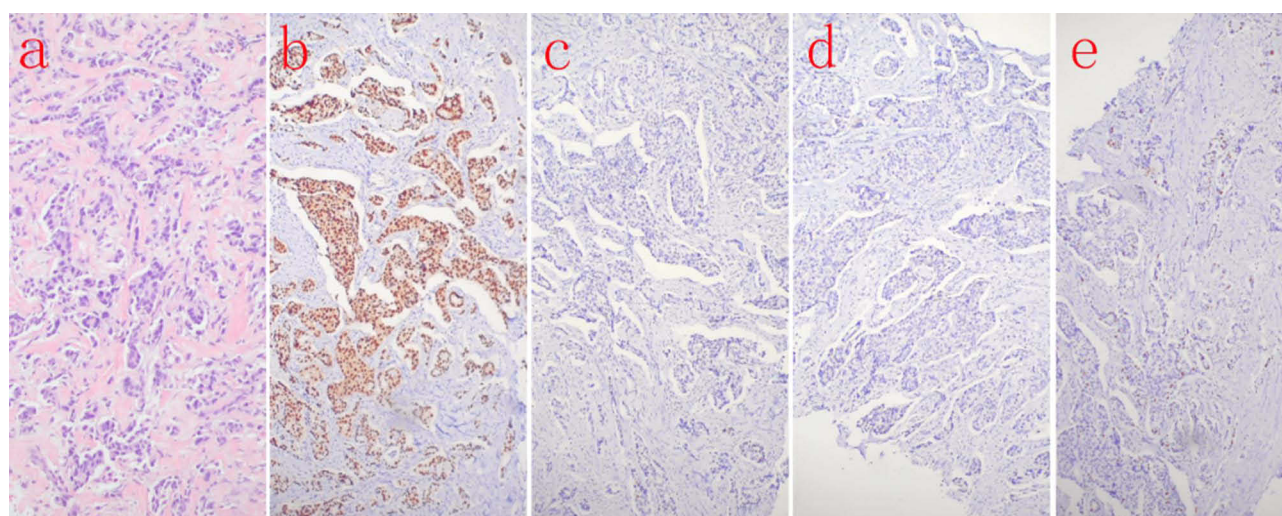


Figure 3 Preoperative puncture confirmed: Invasive ductal carcinoma of the right breast. (a) HE stains; (b) Immunohistochemistry of the estrogen receptor (ER) suggested a positive rate of 80%; (c) Immunohistochemistry of the progesterone receptor (PR) suggested a positive rate of 5%; (d) Immunohistochemistry of the human epidermal growth factor receptor-2 (Her-2) were indicated as negative; (e) Immunohistochemistry of Ki-67 showed a positive rate of 10%.

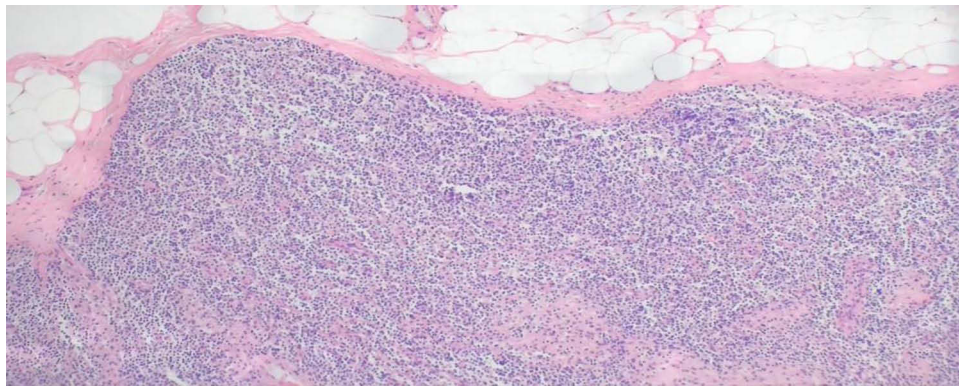


Figure 4 Frozen during surgery confirmed: No tumor metastasis in the axillary sentinel lymph nodes.

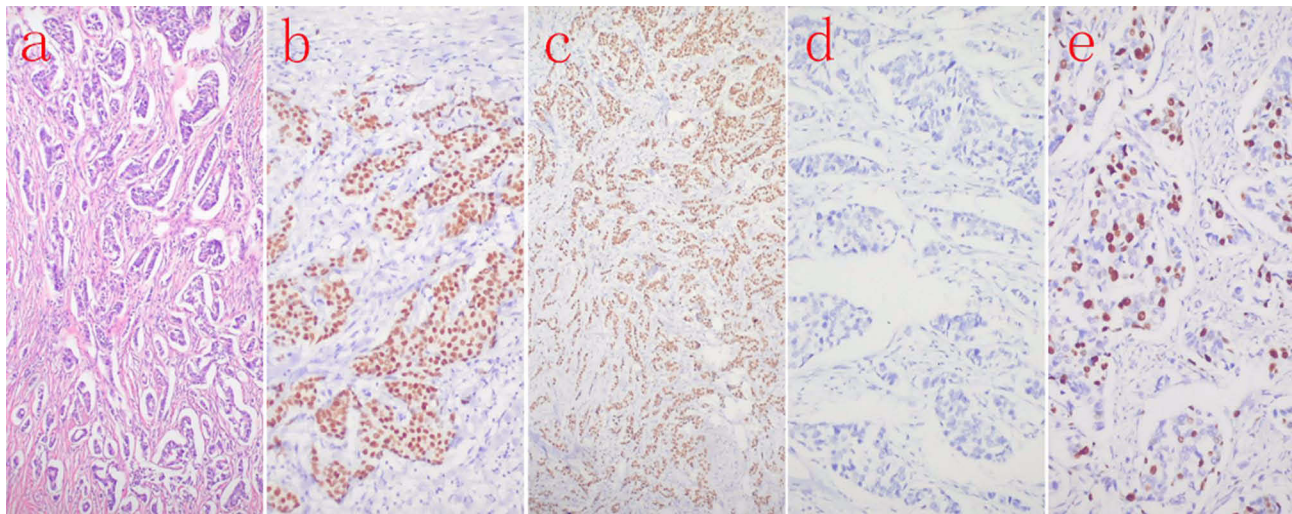


Figure 5 Postoperative tumor histological examination: invasive ductal carcinoma, NST, 2.6×2.2×2.0cm, nerve invasion, found 14 axillary lymph nodes, no tumor metastasis. (a) HE stains; (b) Immunohistochemistry of the estrogen receptor (ER) suggested a positive rate of 90%; (c) Immunohistochemistry of the progesterone receptor (PR) suggested a positive rate of 9%; (d) Immunohistochemistry of the human epidermal growth factor receptor-2 (Her-2) were indicated as negative; (e) Immunohistochemistry of Ki-67 showed a positive rate of 40%.

nerves or vas were violated, and simultaneously there was no cancer cell found in the resected axillary lymph nodes. After one month recovery, she started adjuvant chemotherapy (docetaxel combined with cyclophosphamide four-cycle). Thereafter she started endocrine therapy (oral tamoxifen) for eight months, in the meantime she conducts regular reviews. She found erythema on the right chest wall in the 11th month after operation. Color Doppler ultrasound imaging of the node suggested that the subcutaneous solid nodule could be a recurrence of breast cancer (Figure 6). The MRI suggested that there was a annular enhancing nodule outside the right breast surgery area, which was almost 1.3cm (Figure 7). Part of chest wall tissue was harvested for biopsy, and then the pathological findings suggested it was a malignant epithelial tumor, the estrogen receptor was 80% positive, the progesterone receptor was 50% positive, Her-2 was negative, and Ki-67 was 50% positive (Figure 8), and been confirmed it came from breast cancer. Six rounds of radiotherapy were given immediately. As she was in a postmenopausal state, it was changed to oral anastrozole. In the 32nd month after surgery, a mass was found in her scalp (Figure 9). She performed a pathological biopsy of the scalp mass. Result prompted that it was metastatic breast cancer, the estrogen receptor was 10% positive, the progesterone receptor was negative, and Ki-67 was 20% positive. In order to excluded other site metastasis, she underwent systemic bone imaging, skull and upper abdominal magnetic resonance examination, and the results suggested that there were multiple bone metabolic active lesions in the skull, left clavicle, left scapula, left iliac bone, and right sub femoral segment, tubercle of abnormal signals in the right cerebellar hemisphere, the left adrenal gland was significantly thickened and there was a round occupation of the right lower kidney, which could be considered metastasis (Figure 10). She was brought for late

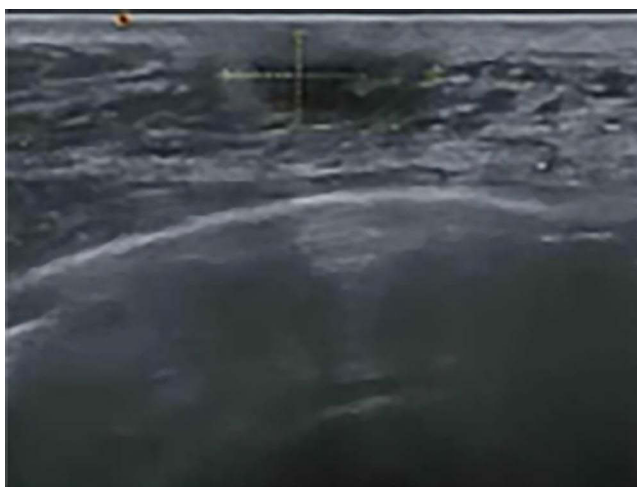


Figure 6 Recurrence of the chest wall: A hypoechoic nodule, 10.9×5.4mm.

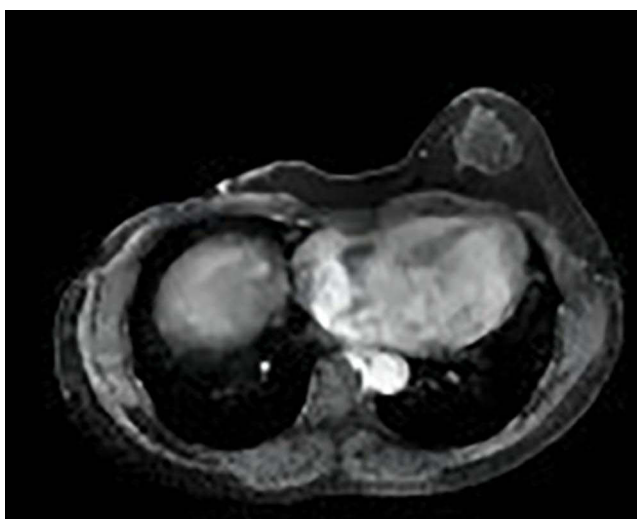


Figure 7 Breast MRI: The right chest wall annular enhancing nodule outside the right breast surgery area was approximately 1.3cm in diameter.

rescue therapy after taking capecitabine for a month. She received radiation treatment for bone metastases in March 2023. Currently, the chemotherapy protocol consisted of albumin-paclitaxel. When we followed up this patient, her illness had not worsened, and her health and drug tolerance to chemotherapy were both good.

Discussion

Breast cancer metastasis can occur not only in common clinical sites such as the bones, lungs, liver, and brain but also in locations like the skin, small intestine, bladder, stomach, peritoneum, pituitary gland, and meninges, among others.^{1–9} Treatment approaches for metastasis vary depending on the site. Achieving a cure for recurrent metastatic breast cancer is challenging, necessitating the selection of optimal first-line treatment, with consideration for maintenance therapy in responsive patients. Effective treatment for this subset of patients requires consideration of factors such as the site of metastasis, molecular subtype of metastatic lesions, metastatic burden, and patient tolerance to treatment. Systemic therapies, including chemotherapy, anti-HER2 targeted therapy, and/or endocrine therapy, are the mainstay of treatment for distant metastasis. The role of local therapy remains contentious, typically reserved for patients at risk of impending complications such as skin ulceration, bleeding, fungal infection, and pain.¹⁰ Some studies suggest that local therapy may delay breast cancer progression and improve local symptoms, but its impact on patient prognosis remains unclear.¹⁰

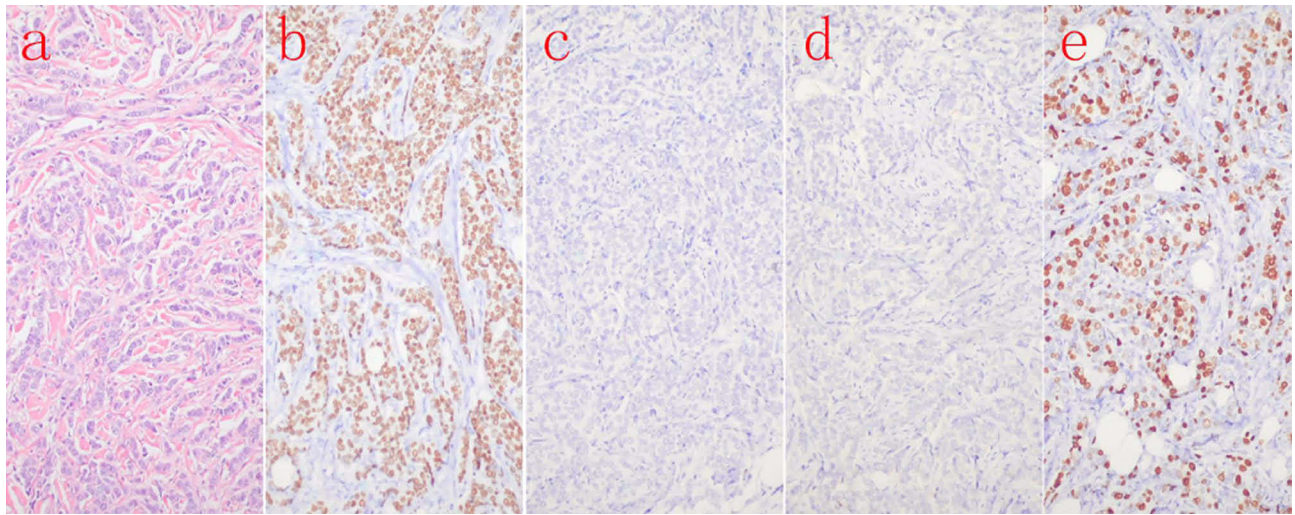


Figure 8 Chest wall biopsy suggested: Malignant tumor, derived from breast cancer. (a) HE stain; (b) Immunohistochemistry of the estrogen receptor (ER) suggested a positive rate of 80%; (c) Immunohistochemistry of the progesterone receptor (PR) suggested a positive rate of 50%; (d) Immunohistochemistry of the human epidermal growth factor receptor-2 (Her-2) were indicated as negative; (e) Immunohistochemistry of Ki-67 showed a positive rate of 50%.



Figure 9 The patient was found with a scalp mass in May 2022.

Retrospective studies and meta-analyses indicate potential benefits of local therapy in certain subgroups of breast cancer patients.¹⁰ However, these findings vary, influenced by selection biases and other confounding factors. Therefore, the necessity of local therapy warrants further investigation through clinical trials and research endeavors. The skin or scalp metastasis of breast cancer refers to the process in which primary breast cancer cells form metastatic lesions in the skin or scalp tissues. This condition may occur when primary breast cancer cells enter the skin or scalp tissues through lymphatic vessels or blood vessels, forming metastatic tumors. Such metastasis typically occurs in advanced stages of breast cancer, indicating that the disease has progressed to a more serious stage. Scalp metastasis from breast cancer is relatively rare, occurring in less than 1% of patients. It typically indicates an advanced stage of the disease and is associated with poor

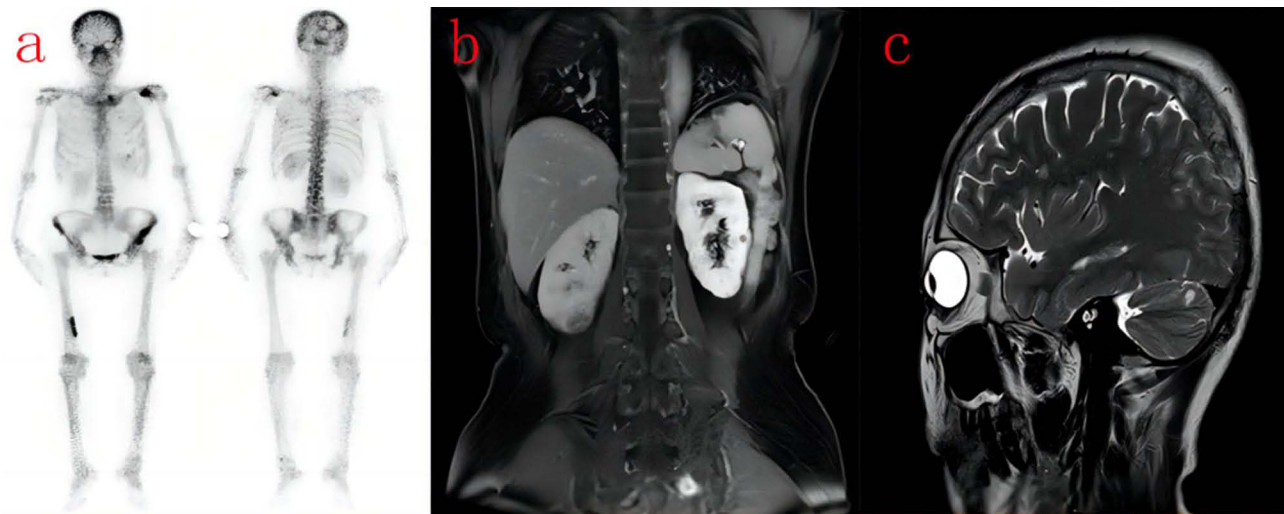


Figure 10 (a) Systemic bone imaging (b) Upper abdominal magnetic resonance (c) Cranial magnetic resonance. Suspected metastases were suggested at multiple sites.

prognosis. The presence of scalp metastasis may lead to symptoms such as pain, ulceration, bleeding, and cosmetic disfigurement. Treatment options include surgery, radiation therapy, systemic therapy, and palliative care, depending on the extent of disease and patient's overall condition. Lesions typically manifest as flesh-colored, pink-red, or violaceous nodules or plaques that might resemble various dermatologic illnesses,¹¹ with the chest and scalp being the most common sites. This distribution is consistent with the lymph nodes' drain and their vascularization of the primary tumors.¹¹ The current mechanism considering that the occurrence of metastasis is the circulating tumor cells' hematogenous dispersion causes cancer to spread metastatically (CTCs).¹² There were very few cases of isolated sites of relapse for scalp metastases.¹³ The occurrence of scalp metastasis in breast cancer often indicates that the disease has progressed to an advanced stage, with a prognosis typically worse than that of the primary breast cancer. The presence of metastatic lesions is usually associated with an accelerated disease progression, diminished treatment response, and shortened survival period. For patients with skin or scalp metastasis of breast cancer, treatment strategies typically require adjustment. This may involve adopting more aggressive treatment modalities such as surgical excision of skin metastases, radiation therapy, or chemotherapy to control the disease and extend survival. Additionally, there may be a need to modify drug treatment regimens, such as switching or increasing the types or doses of anticancer medications, to enhance treatment efficacy. In addition, different types of tumor skin metastasis are different.¹⁴ Studies have shown that adenocarcinoma is more prone to occur in skin metastasis than squamous and undifferentiated carcinoma, which may be related to the blood supply of skin tissue, tissue microenvironment, and different metastatic factors and receptors required for skin metastasis. There may be a specific relationship between the size of the primary tumor, metastasis of regional lymph nodes, and the time of skin metastasis. The time from breast cancer diagnosis to skin metastasis detection ranges from 3 to 192 months. In other words, skin metastases of breast cancer are more likely to occur during this period. Early-onset skin metastasis was more prone to occur in patients with primary tumors > 5cm.¹⁵ Breast cancer scalp metastases generally present as one or more inflammatory or nodular lesions, telangiectasias, or irregularly shaped skin lesions that are flesh or reddish, making them difficult to identify from other skin carcinomas. Scalp metastases may develop ulcers or develop an infection lesion. Histopathology is crucial for the diagnosis. The degree of systemic involvement can be seen using imaging techniques, particularly positron emission tomography-computed tomography.¹⁶ Since palliative therapies comprise the most available therapeutic alternatives, this poor prognosis seems to touch with a low survival rate.¹⁷ Moreover, a study has proved that elderly patients at initial diagnosis face a higher risk of post-metastasis mortality.¹⁸ Hormonal treatment of endocrine-sensitive metastatic breast cancer was the first therapy in oncology. We rely on immunohistochemistry (IHC) of the hormone receptors and re-consider a biopsy of a metastatic lesion should the protein expression have shifted since primary disease. Cutoffs of positivity have often been changed based on technical approaches and academic definitions, but clinically any hormonal receptor expression >10% of tumor

cells is considered positive and warrants antihormonal treatment.¹⁹ Palma et al published a Phase II randomized trial in patients with oligometastatic malignancy. Treating all sites of visible metastatic disease (1–5 metastases) compared to standard-of-care systemic therapy with stereotactic ablative radiotherapy improved the 5-year overall survival of 25%.²⁰ So, this is a treatment modality that can try. The negative sentinel lymph node biopsy but still axillary lymph node dissection was explained as follows. Before surgery, we conducted staining tracing of sentinel lymph nodes using methylene blue. The lymph nodes stained during intraoperative freezing did not reveal metastasis. According to the 2024 NCCN guidelines (Version 2), negative sentinel lymph node biopsy results should exempt patients from axillary lymph node dissection. However, findings from the “NSABP B-32 randomized Phase III” study, as indicated in the 2024 CBCS guidelines,²¹ suggest a false negative rate of 9.8% for sentinel node biopsy in cN0 patients. Furthermore, there exists the possibility of leapfrog metastasis in axillary lymph nodes. Notably, multiple axillary lymph nodes with suspected metastasis were palpated during the operation, and the tumor invaded the pectoralis major, classifying it as locally advanced breast cancer. To ensure complete lesion removal and minimize the risk of recurrence and metastasis, we performed grade I and II axillary lymph node dissection during the operation. In addition, we found another interesting issue: the progesterone receptor changes from positive to negative when a scalp transfer occurs. Receptor conversion in distant non-bone breast cancer metastases occurs, is relatively uncommon for ER and HER2, and is more frequent for PR.²² From the pathological examination images, we can observe that the estrogen progesterone receptor and Ki-67 all showed nucleus positive, while Her-2 showed envelope positive. Fang Zhaet al suggested that receptor transformation is more likely to occur between primary lesions and metastases but less frequently between primary lesions and axillary lymph nodes and is more likely to occur in hormone receptors.²³ Shen Rui et al reported a case of breast cancer postoperative skin metastasis patients, which is also the metastatic receptor transformation. It may indicate that there is heterogeneity. There are multiple clones, and only some clonal cancer cells can appear in skin metastasis; skin tissue is not the ideal metastatic tissue for breast cancer cells. Only some relatively advantageous clonal tumor cells can colonize and grow in the skin tissue, forming metastatic cancer.²⁴ Some researchers have proved that Chronic stress and concomitant sympathetic hyperactivation have shown to accelerate the progression of the disease and the metastases incidence.¹⁷ However, patients with skin metastasis of breast cancer have a better prognosis than metastasis in other sites, although it portends a poor prognosis.¹⁵ In any case, we should provide accurate and personalized treatment for metastatic breast cancer to minimize patient pain. For rare cases of scalp metastasis, we should accumulate experience and find the best treatment method.

Conclusion

This case report highlights the occurrence of scalp metastasis in a patient with advanced breast cancer. Early detection and appropriate management strategies are crucial for improving outcomes in such cases. A multidisciplinary approach, including systemic chemotherapy, radiation therapy, and palliative care, is essential to address the complex needs of these patients. Further research is warranted to explore optimal treatment approaches and prognostic factors related to scalp metastasis in breast cancer.

Ethics Approval and Consent to Participate

Institutional approval was not required to publish the case details. The patient has entrusted the patient’s legal guardian to the treatment of the disease and the details of the case report. Therefore, we provided written informed consent forms from the patient’s legal guardian regarding the details of the case report that will be published after obtained the consent from the patient’s legal guardian. The patient’s legal guardian has also agreed to the publication of this article to informing the medical profession or the general public about characteristics of Breast Cancer with Scalp Metastasis, surgery methods, results, issues, trends, concerns and similar matters.

Consent for Publication

All authors approved the publication of the manuscript.

Funding

This work was funded by National Natural Science Foundation of China (No.82060538, 82060543), Middle-aged and Young Academic and Technical Leader Reserve Talent Program of Yunnan Province Science and Technology Department (202205AC160008) to WC, 535 Talent Project of First Affiliated Hospital of Kunming Medical University (2023535D10) to FG.

Disclosure

The authors report no conflicts of interest in this work.

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