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CASE REPORT

A case of renal cell carcinoma metastasizing to invasive ductal breast carcinoma



Tai-Di Chen, Li-Yu Lee*

Department of Pathology, Chang Gung Memorial Hospital and Chang Gung University College of Medicine, Guishan Township, Taoyuan County, Taiwan, ROC

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KEYWORDS

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Tumor-to-tumor metastasis is an uncommon but well-documented phenomenon. We present a case of a clear cell renal cell carcinoma (RCC) metastasizing to an invasive ductal carcinoma (IDC) of the breast. A 74-year-old woman with a past history of clear cell RCC status after radical nephrectomy underwent right modified radical mastectomy for an enlarging breast mass 3 years after nephrectomy. Histological examination revealed a small focus with distinct morphological features similar to clear cell RCC encased in the otherwise typical IDC. Immunohistochemical studies showed that this focus was positive for CD10 and vimentin, in contrast to the surrounding IDC, which was negative for both markers and positive for Her2/neu. Based on the histological and immunohistochemical features, the patient was diagnosed with metastasis of clear cell RCC to the breast IDC. To the best of our knowledge, this is the first reported case of a breast neoplasm as the recipient tumor in tumor-to-tumor metastasis.

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Introduction

The phenomenon of tumor-to-tumor metastasis was first documented in 1902 by Berent.¹ Although not as rare as previously believed, tumor-to-tumor metastasis is still an uncommon occurrence. Only 165 cases have been reported in the English-language literature. The most common recipient

tumor is renal cell carcinoma (RCC, 38.8%), followed by meningioma (25.4%), and the most frequent donor tumor is lung cancer (55.8%). Breast neoplasms have been reported as the tumor donor in 21 (12.7%) cases, but they never had been reported as a recipient site of tumor-to-tumor metastasis. Here, we report a case of clear cell RCC metastasizing to invasive ductal carcinoma (IDC) of the breast.

Case report

A 74-year-old woman presented to our outpatient department with a progressively enlarging nontender right breast mass. She had a past history of stage III (pT3pN0cM0) grade 2 clear cell RCC after right radical

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* Corresponding author. Department of Pathology, Chang Gung Memorial Hospital, No. 5, Fuxing St., Guishan Township, Taoyuan County 333, Taiwan, ROC.

E-mail address: r22068@cgmh.org.tw (L.-Y. Lee).

nephrectomy in 2006. No additional intervention was given after the nephrectomy, and there was no evidence of recurrence or metastasis after 1 year follow-up. At this time, breast sonography revealed a solid mass measuring 3.75 cm × 3.72 cm × 3.22 cm with an irregular margin at 9 o'clock, 4 cm from the right nipple. Core needle biopsy revealed ductal carcinoma *in situ*. At the same time, a small nodular lesion measuring 2.2 cm in greatest dimension was found in the right upper lobe of her lung, which was shown to be metastatic clear cell RCC after computed tomography-guided biopsy and immunohistochemical confirmation [CD10(+), vimentin(+), estrogen receptor (ER)(-), progesterone receptor (PR) (-), and thyroid transcription factor-1(-)]. No local recurrence at the previous nephrectomy site was found by imaging. The patient then underwent modified radical mastectomy for the breast tumor.

On gross examination, the removed breast tissue measured 23.0 cm × 17.5 cm × 4.0 cm. On sectioning, a single solid and circumscribed mass lesion measuring 3.5 cm × 3.5 cm × 2.0 cm with a hemorrhagic area was noted; this lesion had a firm consistency and brown-tan appearance. Microscopically, the tumor was composed of solid sheets of malignant cells with stromal invasion. More than 75% of the tumor cells throughout the tumor had ductal differentiation (score 1). Multiple areas of hemorrhage were found, but there was no evidence of necrosis or calcification. The tumor cells were moderately atypical (score 2) with a low mitotic rate (score 1). These features were consistent with a score 4 (1 + 2 + 1) grade I IDC. There was no lymph node metastasis and no evidence of distant metastasis. A combined pathological and clinical stage IIA, pT2pN0cM0 tumor was diagnosed.

However, there was a small distinct focus measuring 2 mm × 2 mm in dimensions found mostly circumscribed by the IDC (Fig. 1A). The cells composing the focus were arranged in a small nest pattern with delicate fibrovascular septa. The cells exhibited clear cytoplasm with moderate nuclear atypia and conspicuous nucleoli. When encountering a clear cell tumor in the breast, differential diagnoses from primary breast tumors to metastasis from nonmammary malignant neoplasms should be considered (Table 1). Of all these differentials, clear cell RCC was first

considered according to the patient's history and the striking morphological similarities upon hematoxylin and eosin staining (Fig. 2A). Immunohistochemistry showed that this distinct focus was positive for CD10 and vimentin but negative for ER, PR and Her2/neu. In contrast, tumor cells within the IDC region were negative for CD10, vimentin and ER, but they were focally positive for PR and equivocally positive (2+) for Her2/neu (Fig. 2B–D). Primary breast tumors of ductal differentiation were generally excluded based on the triple negative for ER, PR and Her2/neu, and with positive staining for CD10 and vimentin. The possibilities of adenomyoepithelioma and metastatic malignant lymphoma were further eliminated by negative staining for myoepithelial markers (calponin and smooth muscle actin), and melanocytic marker (HMB-45). It is worth noting that although S-100 protein is a sensitive marker for detecting melanoma, it is also positive in 69% and 70% of primary and metastatic clear cell RCC, respectively.² Thus, S-100 protein positivity alone, without other supportive evidence, has no benefit in differential metastatic clear cell RCC and metastatic melanoma. Based on the histological and immunohistochemical results noted above, the patient was diagnosed with metastatic clear cell RCC to IDC of the breast.

Discussion

The diagnosis of tumor-to-tumor metastasis requires the fulfillment of criteria originally described in 1968 by Campbell et al.³ First, the patient must have at least two different tumors, and the recipient tumor must be a true neoplasm. Second, the metastatic neoplasm must be a true metastasis, not a contiguous growth such as a "collision tumor" or an embolism. Third, cases should be excluded if tumors metastasize to the lymphatic system that had contained a primary lymphatic malignancy. In 1984, Pamplett⁴ established three additional criteria: (1) the metastatic nidus must be at least partially enclosed by a rim of histologically distinct primary tumor tissue; (2) the existence of the primary carcinoma must be proven; and (3) the metastatic tumor must be compatible with the primary carcinoma by morphological or immunohistochemical

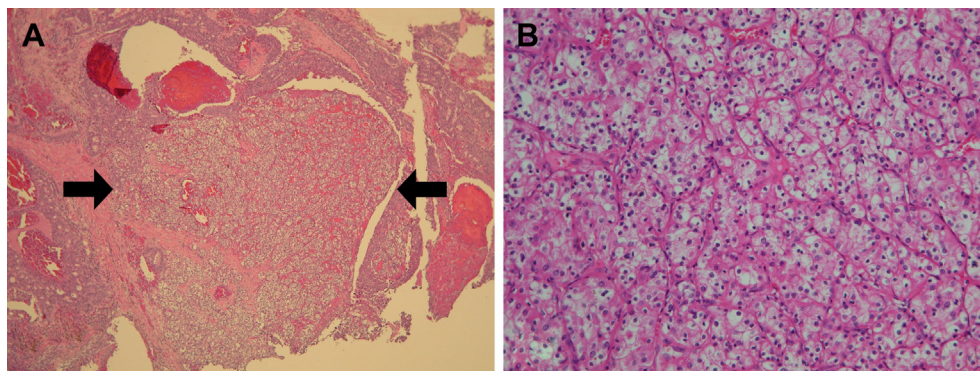


Figure 1 (A) A low-power view of the breast tumor showing a focus morphologically similar to clear cell RCC (arrow) almost entirely encased by the typical invasive ductal carcinoma. Original magnification 20×, H&E. (B) Comparing Fig. 2A with the grade II clear cell RCC in 2006 in the same patient shown in this figure, striking morphological similarity is evident. Original magnification 200×, H&E. H&E = hematoxylin and eosin; RCC = renal cell carcinoma.

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