

Case Report

A Case of Solitary Lung Metastasis of Breast Cancer Successfully Treated with Stereotactic Body Radiotherapy after Chemotherapy

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Keywords

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Abstract

A 62-year-old woman with triple-negative breast cancer underwent breast-conserving surgery followed by adjuvant chemotherapy and radiotherapy to the breast. The patient developed a solitary lung metastasis at the left hilum 44 months after the operation. The lung metastasis responded partially to capecitabine chemotherapy, but showed regrowth in 7 months. The patient received second-line oral cyclophosphamide (CPA) chemotherapy, resulting in marked tumor regression without new lesions for 10 months. To further control the lung metastasis, stereotactic body radiotherapy (SBRT; 5.1 Gy ×10 fractions) under breath holding without a localization device was given to the regressed lung metastasis after CPA therapy. Positron emission tomography at 24 months after the completion of SBRT did not show any recurrences, and the patient has been well for 100 months without any recurrences. Breast oncologist should take SBRT into consideration to treat lung oligometastasis of breast cancer especially locating at the lung hilum with curative intent.

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Introduction

With the advent of various effective new anticancer agents, prognosis of metastatic breast cancer has dramatically improved in the past three decades [1]. The purpose of the treatment of metastatic breast cancer, however, still remains to improve or prevent breast

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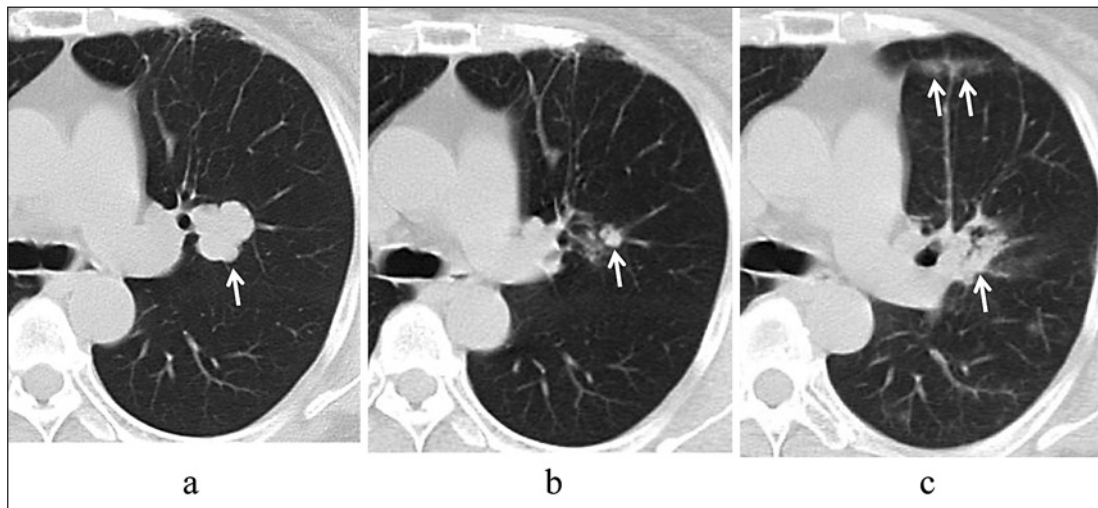


Fig. 1. Computed tomography of the affected lung. **a** A lobulated mass (arrow) stuck to the segmental bronchus was located near the left main pulmonary artery. **b** Second-line cyclophosphamide chemotherapy brought about marked regression of the tumor (arrow). **c** Stereotactic body radiotherapy brought about complete response of the tumor, presumably accompanied by radiation-induced fibrosis and/or partial atelectasis (arrow), and a faint radiation-induced fibrosis in the left lung (arrows).

cancer-induced unpleasant symptoms and prolong survival of the patients. In other words, metastatic breast cancer should be treated not with curative intent, but with palliative intent. Based on this concept, Hortobagyi [2] proposed that metastatic breast cancer should initially be treated with endocrine therapy for estrogen receptor-positive breast cancer, chemotherapy alone or chemotherapy plus bevacizumab [3] for triple-negative breast cancer (TNBC) [4], chemotherapy plus anti-human epidermal growth factor receptor type 2 (HER2) agent(s) [5, 6] for HER2+ breast cancer, chemotherapy plus or rarely endocrine therapy plus anti-HER2 agent(s) for double-positive breast cancer, and chemotherapy for luminal breast cancer with life-threatening metastases.

Oligometastatic breast cancer [7] is currently recognized as a distinct clinical entity, being an exciting target for multidisciplinary therapy with systemic therapy and some type of local therapies including surgery [8], nonsurgical ablation [9], and stereotactic body radiotherapy (SBRT) [10]. To date, various local therapies have been reported as promising therapies for metastatic breast cancer, but lack large-scale prospective randomized trials, leading to the idea that favorable clinical outcome of the patients treated with each local therapy depends simply on selection bias. Multidisciplinary therapy, therefore, still remains out of standard measures to treat oligometastatic breast cancers.

We herein report a case of TNBC with solitary lung metastasis locating at the hilum of the lung treated successfully with multidisciplinary therapy including SBRT.

Case Report

A 62-year-old woman with TNBC underwent breast-conserving surgery and sentinel node biopsy followed by anthracycline-containing chemotherapy and radiotherapy (50 Gy) to the conserved breast. Follow-up computed tomography (CT) showed a solitary lobulated nodule 28 × 18 mm in size at the hilum of the left lung 44 months after the operation (Fig. 1a).

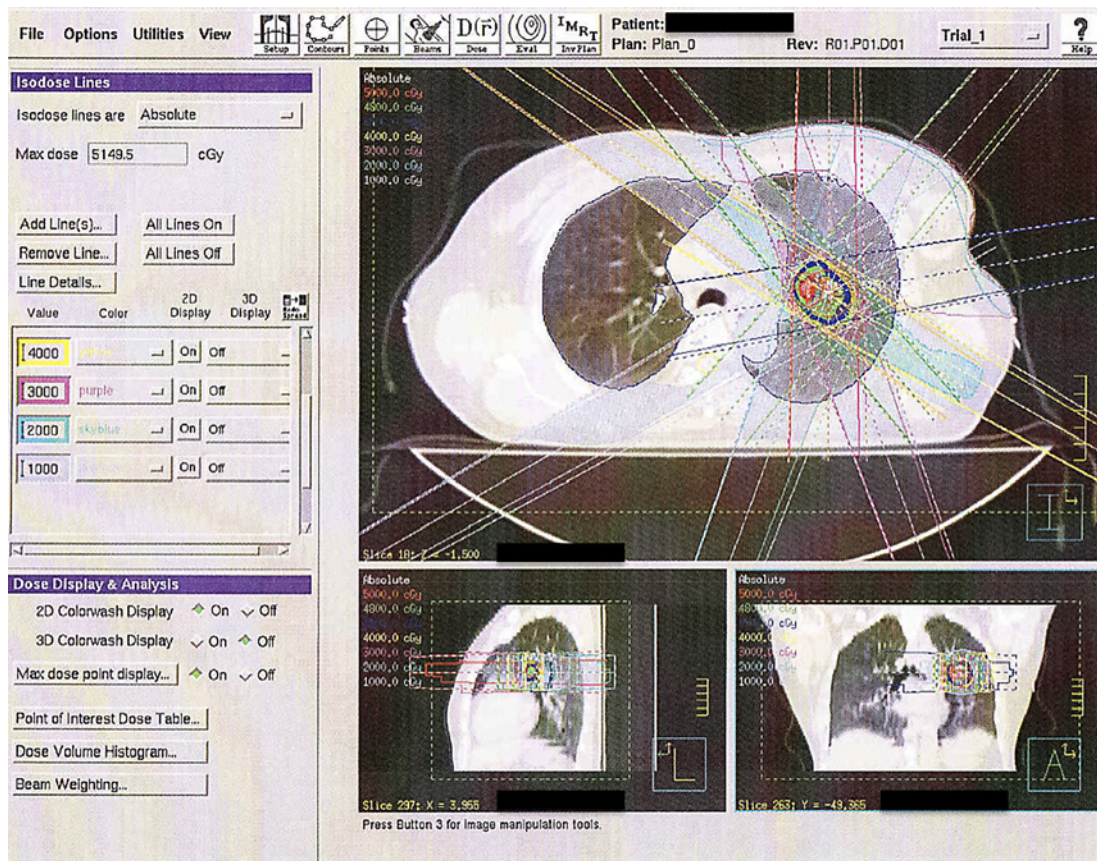


Fig. 2. Isodose lines and dose volume histogram. Gray, blue, pink, and yellow lines indicate 1,000, 2,000, 3,000, and 4,000 cGy, respectively.

The patient refused to receive transbronchial lung or CT-guided transcutaneous biopsy of the nodule to avoid biopsy-induced complications such as massive hemorrhage and pneumothorax. CT at 28 months after the initial operation, i.e., 16 months before the detection of the pulmonary nodule, showed no masses at the left hilum. Under the diagnosis of a presumed solitary lung metastasis of breast cancer, we initially planned to treat the patient with taxane chemotherapy because of the prior exposure to adjuvant anthracycline chemotherapy. However, due to the patient's preference to avoid alopecia, the patient decided to receive capecitabine chemotherapy, resulting in tumor regression for 7 months followed by regrowth of the tumor. The patient again preferred to receive oral cyclophosphamide (CPA) therapy (100 mg/day), leading to a marked regression of the lung nodule (Fig. 1b) without tumor regrowth and any new cancer foci for 10 months. Both to further obtain complete local control and to maintain pulmonary function, we implemented SBRT (51 Gy; equivalent to approximately 80 Gy of conventional radiotherapy; Fig. 2) under breath holding without a localization device to the presumed lung metastasis. The patient received additional CPA therapy for 3 months after the completion of SBRT, and was followed up with semi-annual CT thereafter. Positron emission tomography at 24 months after the radiotherapy showed neither recurrence in the irradiated area nor any new lesions. CT taken 36 months after the completion of SBRT (Fig. 1c) showed no regrowth of the nodule with a faint radiation-induced fibrosis in the left lung. The patient has been well without any cancer recurrence and respiratory dysfunction for 100 months after SBRT.

Discussion

Pulmonary metastasis of TNBC in this case has been well controlled for over 8 years with multidisciplinary therapy including SBRT [10]. Due both to no further treatment after SBRT and short-term CPA administration and to the aggressive biology of TNBC itself [4], long-term clinical complete response of the presumed lung metastasis in this case should strongly suggest a cure of the oligometastatic breast cancer.

We initially planned to treat the presumed pulmonary metastasis with metastasectomy [8]. Metastasectomy, however, needed a lobectomy to secure a sufficient safety margin, or might result in poor local control after enucleation and segmentectomy due to their narrow surgical margins. Nonsurgical ablation, e.g., radiofrequency ablation [11], has become an important alternative to surgery for specific patients with primary lung cancer or metastatic lung tumor(s) who have comorbid disorders or refuse surgery. Radiofrequency ablation as a local therapy, however, seemed impractical in this case due to the tumor location very close to the pulmonary artery and bronchus, suggesting possible massive hemorrhage and penetration/perforation of the bronchus. Therefore, effective and safer radiotherapy, i.e., SBRT [10], seemed to be the best local therapy with sufficient safety margins to control the tumor in this case. However, SBRT of 51 Gy, equivalent to approximately 80 Gy of conventional radiotherapy, needs a careful and longer follow-up both of the pulmonary function and recurrence in the irradiated area.

The ideal candidates for multidisciplinary therapy of breast cancer oligometastasis remain uncertain. The emerging subtype concept has made us treat breast cancers in a markedly different manner compared to the era when invasive breast cancer of 1 cm or larger should be treated with some kind of adjuvant chemotherapy [11]. Especially in the treatment of metastatic TNBC, breast oncologists should always take the therapeutic strategy how to manage the disease over a long period of time into account. In other words, unless prior treatment(s) cannot bring about pathological complete response to the target tumor, inevitable regrowth of the tumor leads to endless chemotherapy or a shift from active treatment to best supportive care. Clinical complete response, therefore, is much more important in the treatment of metastatic TNBCs than that of luminal and/or HER2+ metastatic breast cancers which often show favorable response to less toxic endocrine agent(s) or maintenance anti-HER2 drug(s) for a long time. Oligometastatic TNBCs, therefore, should be good candidates when prior systemic treatment(s) does not lead to clinical complete response, for multidisciplinary treatment including local therapy such as surgery or SBRT, if applicable.

Clinical outcomes should be evaluated cautiously because of the absence of histological confirmation of the target lesion and the unusual systemic therapies administered in this case. Primary lung cancer and metastatic lung tumor of unknown origin should be excluded. CT findings of the pulmonary nodule, however, were well compatible with a metastatic lung tumor of breast cancer and the presumed lung metastasis showed good response to one of the key anticancer drugs, i.e., CPA, in the treatment of breast cancer. In addition, PET scan showed no positive findings except for the lung nodule. These findings highly suggest that the nodule originated from breast cancer. Concerning systemic therapy, it seems more important what response can be obtained than what agent(s) should be used.

In conclusion, systemic therapy plays an essential role in the treatment of breast cancer oligometastasis to the lung. However, multidisciplinary treatment including some type of local therapy is a reasonable option to treat lung oligometastasis that responds well to the systemic therapy for a prolonged time. SBRT on an outpatient basis may be a feasible alternative to surgery in the treatment of lung oligometastasis, especially locating at lung hilum, of breast cancer in some cases.

Statement of Ethics

We have reported this case in compliance with the Declaration of Helsinki. Informed consent was obtained from the patient for the publication of the clinical data.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All authors contributed equally to this work.

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