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Case Report

Complete fatty replacement of lytic bone metastases following treatment. A case report, assessing response to treatment of bone metastases on CT imaging ☆

Adeola Omotade, FRCR, Anmol Malhotra, FRCR, Brian Holloway, FRCR*

Department of Radiology, Royal Free Hospital, Royal Free London NHS Trust, London, UK

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ABSTRACT

Bone is the most common site for breast cancer metastases, occurring in up to 70% of patients, who have metastatic disease. The treatment of advanced breast cancer with bony metastases has significant health and economic implications including the costs of imaging, systemic therapy, and hospital admission. Therefore, accurate interpretation of response to therapy in bone metastases on post-treatment computed tomography (CT) imaging is an essential role of the radiologist in daily practice. It is well recognized that lytic metastases become sclerotic in response to treatment, but it is less appreciated that lytic metastases can become fatty in response to treatment as in this index case. We present a case of post-treatment lytic bone metastases demonstrating an unusual finding of complete fatty replacement within the lesions indicating a response to treatment.

Introduction

Bone is the most common site for breast cancer metastases. Bone metastases occur when tumor cells originate from other tissues and spread to the bone. There are 3 patterns of bone metastasis: Lytic, sclerotic, or mixed lytic and sclerotic [1].

The treatment of advanced breast cancer with bony metastases has significant health and economic implications including the costs of imaging, systemic therapy, and hospital admission costs.

The RECIST (Response Evaluation Criteria in Solid Tumors criteria recommends the use of magnetic resonance imaging (MRI) and positron emission tomography–computed tomography (PET-CT) to assess treatment response in bone metastases for better characterization. However, these are second-line investigations, and in daily clinical practice, the assessment of bone metastases usually occurs at the time of CT staging [2–5].

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* Corresponding author.
E-mail address: adeola.omotade@nhs.net (A. Omotade).

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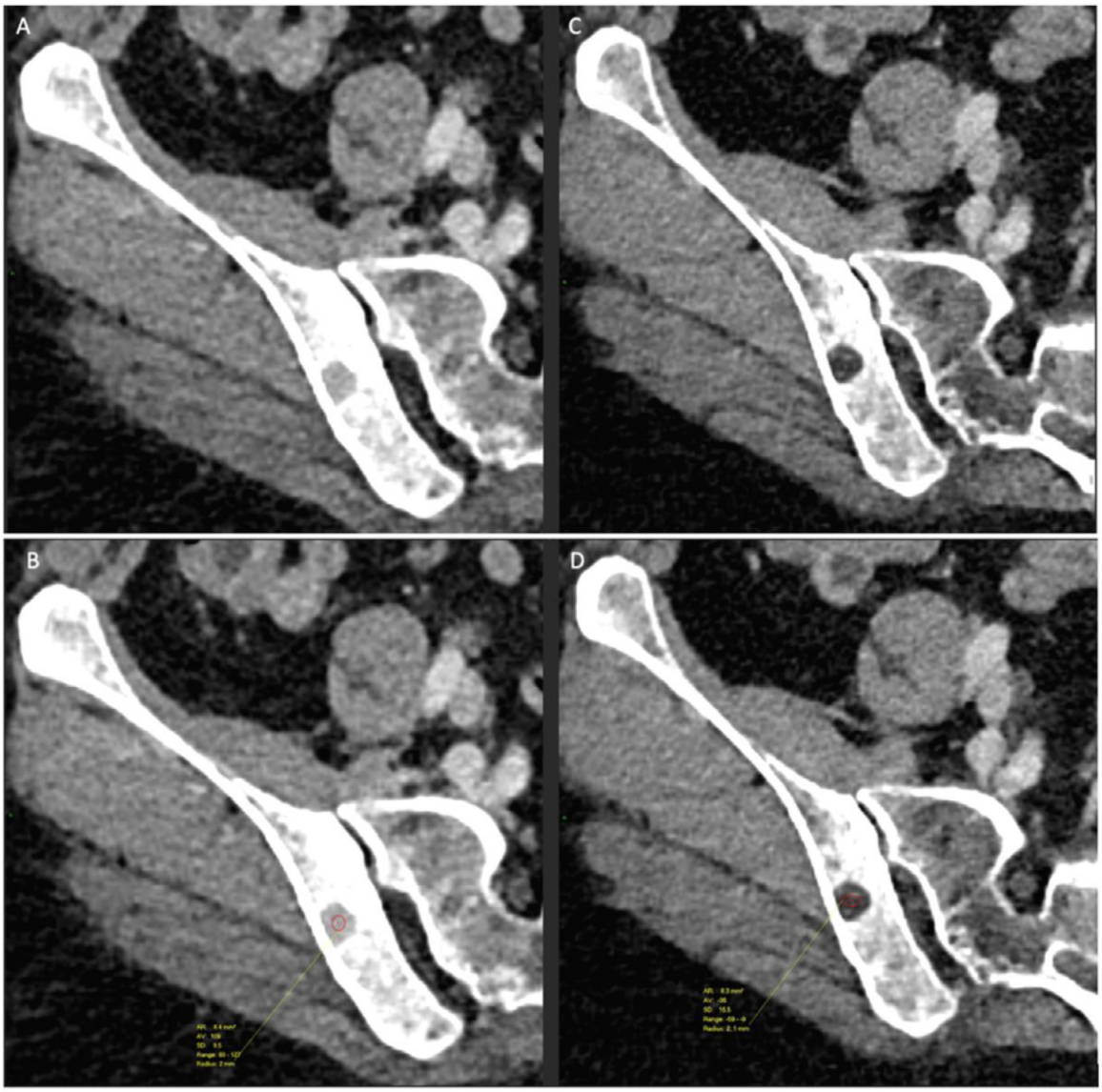

Fig. 1 – (A, B) Initial staging CT demonstrates a lytic bony lesion involving the right ilium with soft tissue component and mean CT attenuation threshold of 109 HU, appearances are consistent with lytic bone metastases. Images C and D show postsystemic treatment surveillance CT which shows the previous right iliac bony lytic lesion now demonstrating complete fatty replacement (measured Hounsfield unit -35) in keeping with response to treatment.

On CT, the sensitivity for detecting bone metastasis is 76%-100%, with excellent soft tissue and contrast resolution [6].

We report a case of post-treatment lytic bone metastases in a 73-year-old female demonstrating complete fatty replacement within the lesions indicating a response to treatment.

Case presentation

A 73-year-old female initially presented with several-month history of shortness of breath and underwent a CT thorax which demonstrated advanced right breast malignancy, axillary and mediastinal nodal disease, and lymphangitis carcinomatosis. Complete staging of the abdomen and pelvis revealed widespread liver and lytic bone metastases. The patient was commenced on palbociclib and letrozole systematic therapy and had a good response with significant improvement of lymphangitis carcinomatosis, liver and lytic bone metastases.

This case report in particular highlights the significant change in lytic bone metastases. The CT appearances of the bone lesions changed from soft tissue attenuation to fat attenuation (Figs. 1 and 2)

Discussion

Breast cancer is the most common cause of bone metastases. On CT imaging they can appear as lytic, sclerotic, or mixed lytic/sclerotic.

In patients undergoing systemic treatment therapy, several clinical trials have demonstrated reactive sclerosis as a

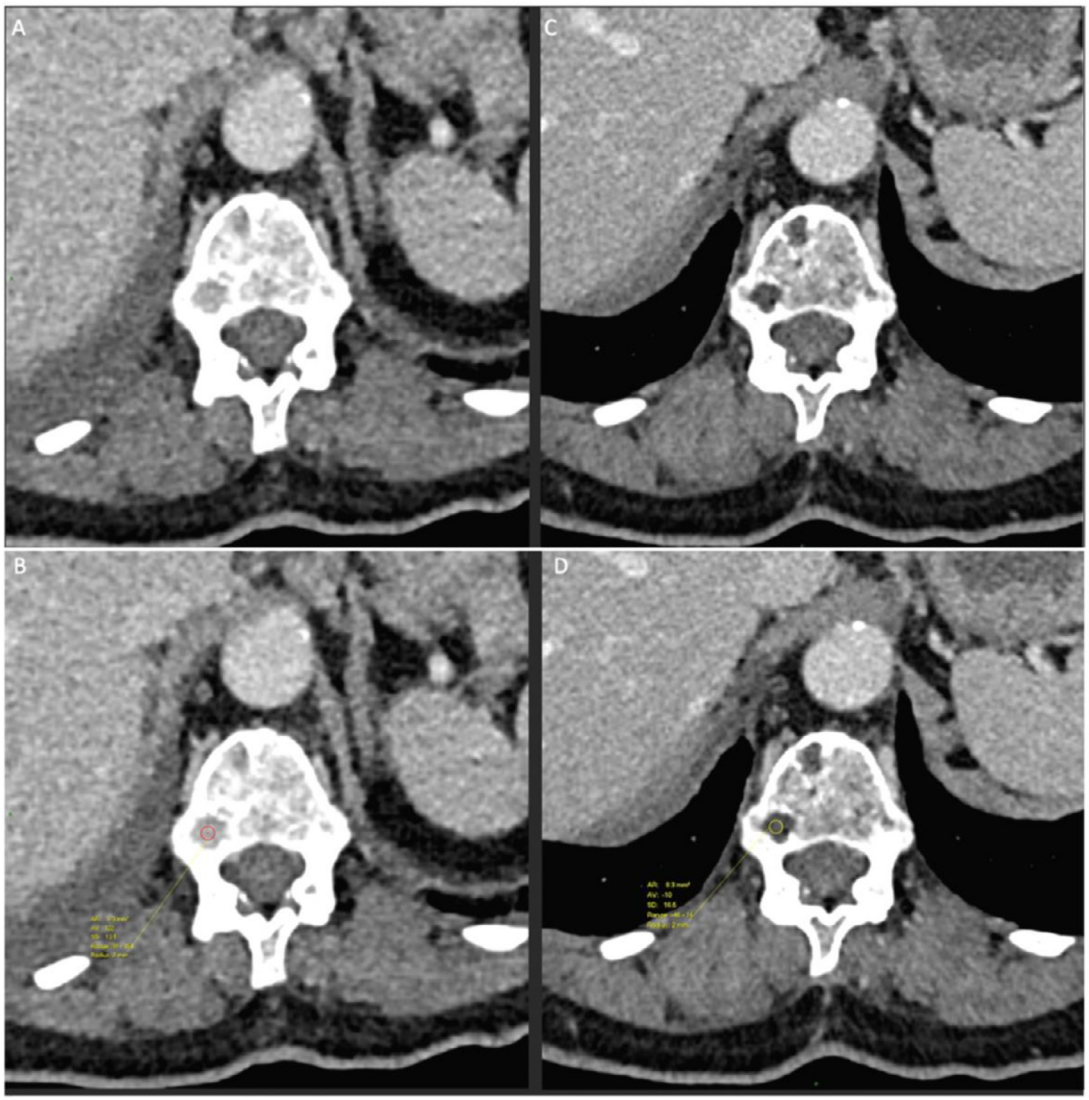

Fig. 2 – (A, B) Initial staging CT demonstrates 2 lytic bony lesions involving the L1 vertebral body with soft tissue component and mean CT attenuation threshold of 122 HU, appearances are consistent with lytic bone metastases. Images C and D show postsystemic treatment surveillance CT which shows the previous 2 lytic bony lesions involving the L1 vertebral body demonstrating complete fatty replacement (measured Hounsfield unit -10) in keeping with response to treatment.

marker of response to treatment on CT in post-treatment lytic bone metastases [7].

It is also important however to recognize the presence of post-treatment intralesional fatty content (PIFAT) in bone metastases as an indicator of healing. This phenomenon has been recently reviewed utilizing both MRI and CT [8].

In our particular case, the measurement of Hounsfield units in the post-treated lytic bone metastases demonstrated dramatic and complete fatty replacement within the lesions.

Therefore, in larger bony lesions where the Hounsfield unit can be accurately measured it is useful to assess post-treatment lytic lesions for fat replacement which may indicate response to treatment.

At present, the RECIST criteria recommend the use of MRI and PET/CT to assess treatment response in bone metastases as these techniques enable disease quantification through lesion signal characteristics and metabolic activity and better aid categorization of patients into partial/complete response, progression, or stable disease [2–5].

In clinical practice, however, the assessment of bone metastases usually occurs at the time of CT staging. Therefore, as radiologists, we must be aware of the imaging findings of treatment response on CT as it is common practice for patients to undergo single modality follow-up with CT alone.

Our case illustrates the importance of recognizing the presence of PIFAT as a phenomenon indicating treatment response in bone metastatic disease.

Learning points

1. This case illustrates the challenges of assessing post-treatment bone metastases in breast cancer patients on CT imaging

2. The importance of general radiologists reporting CT staging/restaging scans to be aware that intralesional fat replacement of lytic bony metastases on CT is a sign of treatment response
3. Where possible measure the CT attenuation Hounsfield unit of post-treatment lytic bone metastases as this may lead to changes in the patient management plan.

Patient consent

I have gained written, informed consent for the publication of their case

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