“Bubble-like” lung metastases in osteosarcoma patients

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Abstract

Purpose: Cavitary changes of pulmonary metastases have been reported by several authors either as a spontaneous phenomenon or as a consequence of chemotherapy. We present two cases, with this type of image in follow-up, and 20–45 months after the end of treatment. This was the first sign of pulmonary metastases.

Results: Two patients with osteogenic sarcoma developed radiological evidence of pulmonary “bubble-like” cavitation several years following completion of chemotherapy. In one patient the “bubble-like” cavitation transformed into a solid nodule. Both patients had surgical resections of all pulmonary lesions, and histology confirmed presence of viable osteosarcoma metastases.

Conclusion: The two cases suggest that onset of “bubble-like” cavitation in lung parenchyma of osteosarcoma patients may be the first sign of pulmonary metastases.

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1. Introduction

Surgical resection in management of lung metastases has improved 5-year overall survival rate to 20–50% [1,2]. In particular, in osteogenic sarcoma, which metastasizes mainly to the lung by hematogenous spread, a 39% 5-year overall survival was attained in a consecutive series of 314 patients.

Computed tomography (CT) is the method of choice for staging of this disease [3]. Usually the radiological aspect of metastases include multiple peripheral or hilar round nodules of different size. Metastases can be synchronous with the primary tumor or metachronous, arising during or after chemotherapy.

In case of metachronous metastases, chemotherapy can induce modifications which are sometimes responsible for different radiological appearances such as calcifications, pneumothorax or apparent complete regression [4].

We report two cases of unusual radiological aspects of lung metastases in patients affected by osteogenic sarcoma of the upper limb.

2. Case reports

2.1. Case 1

A 15-year-old male was admitted to hospital with a mass in the left arm. Histopathological evaluation of the biopsy specimen revealed an osteogenic sarcoma (OS). The patient underwent neoadjuvant chemotherapy followed by resection of the left proximal humerus plus reconstruction. Adjuvant chemotherapy was then administered. CT scans of the thorax before surgery and every 3 months after surgery were normal up to 20 months, at which time CT of the lung revealed a cavitation of the right superior lobe (Fig. 1a). The patient had two CT controls at 1 month intervals; the first time the same lesion was confirmed (Fig. 1b), but it was smaller and with a thicker wall, the second CT showed, in the exact same location, a nodule.
Fig. 1. (a) CT scan of the chest showing a “bubble-like” cavitation of the right superior lobe. (b) CT scan control after 1 month confirming the same lesion. The lesion has become smaller, but its wall is thicker. (c) CT scan control after 2 months showing its transformation into a nodule.

(Fig. 1c). Surgery consisted of wedge resection of the nodule of the right superior lobe.

Histological evaluation confirmed a viable metastatic nodule without necrosis.

2.2. Case 2

A 12-year-old female was admitted to hospital with a mass in the left forearm.

Histopathological evaluation of the biopsy specimen revealed an osteogenic sarcoma (OS). The patient underwent neoadjuvant chemotherapy followed by resection of the left distal radius plus reconstruction.

Adjuvant chemotherapy was then performed. After 2 years the patient required a forearm amputation due to local recurrence. CT scans of the thorax before surgery, and at 3-month intervals after surgery, were normal up to 45 months, when CT of the lung revealed a cavitation of the left inferior lobe (Fig. 2a). After 3 months CT showed the onset of another cavitation in the right superior lobe (Fig. 2b) together with another 3 new nodules (two in the left lung and one in the right). Surgery was then performed: a left inferior lobectomy plus 2 wedge resections of the right superior lobe were necessary.

Histological evaluation confirmed the presence of five completely viable metastases, two of which were cavitated (Fig. 2c).
3. Discussion

Typical aspects of lung metastases in osteosarcoma include peripherally located, solitary or multiple, round opacities of variable size, occasionally occurring with a thickening of the interstitium; or lung atelectasia due to bronchial obstruction when located centrally [5].

Detailed description of atypical radiologic features of lung metastases are important in assessing the patient’s after treatment. For osteosarcoma, calcification or ossification of the nodules can occur after therapy in a relevant percentage of patients. Calcified metastatic nodules have also been described at initial presentation, even before the administration of chemotherapy [6].

Chemotherapy can induce neoplastic cell necrosis, which may result in pneumothorax [7] or hemopneumothorax [8]. The absence of solid nodules with a subsequent appearance of “bubble-like” cavitation of the lung parenchyma as reported in the two cases, obliges strict follow-up with repeated CT scans, as these may well represent lung metastases with an atypical appearance, as presented herein.

Cavitations occurred 20–45 months after the end of chemotherapy, and therefore their mechanism is unlikely related to the necrotizing effects of chemotherapeutic agents. Another case of multiple cystic pulmonary metastases from osteosarcoma has been reported [9]. Multiple pulmonary cyst-like lesions appeared 9 months after the end of chemotherapy. Lesions had thin walls, and were full of fluid, with air-fluid levels on CT. The authors proposed progressive distension and rupture of the alveolar air sacs secondary to a ball-valve effect of tumor infiltration of the terminal bronchioles.

4. Conclusions

The appearance of “bubble-like” cavitations in lung parenchyma of an osteosarcoma affected patient, and/or its persistence in time may be the first sign of pulmonary metastases. Transformation of such lesions into a nodule, as seen in our first case, has, to the best of our knowledge, never been reported.

References