Two synchronous lung metastases from malignant melanoma: the same patient but different morphological patterns

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1. Introduction

Malignant melanoma is an aggressive cancer with high metastatic potential. From the primary site of origin, malignant melanoma can exhibit early and rapid spreading through the lymphatic system and blood vessels and can metastasize to multiple organs and structures (i.e., the lymph nodes, lung, liver, brain and bone) [1]. Among the multiple sites of metastatic disease, the lung is one of the most frequently involved sites [2]. The literature reports that approximately 18% of melanoma patients develop lung metastases during follow-up [3]. Typically, pulmonary metastases from malignant melanoma occur as a single or multiple solid nodules on CT images [3,4]. Rarely, pulmonary involvement in metastatic melanoma occurs as subsolid nodules.

The present article describes a case of a patient with malignant melanoma that developed two synchronous pulmonary metastases with two different morphologies on CT images (one solid and the other subsolid) and different morphological patterns on histologic images. The radiologic-pathologic correlation of these two patterns of presentation was also reported.

2. Case report

A nonsmoker 73-year-old white European male was referred to our radiology department to undergo a chest X-ray as part of a routine follow-up for a previous diagnosis of cutaneous melanoma of the trunk. The surgical removal of the melanoma with the excision of the sentinel lymph node occurred two years earlier (pT3aN0; Breslow thickness, 2.9 mm; mitotic rate, 34 mitosis/mm²; no skin ulceration).

The chest radiograph revealed two pulmonary opacities located in the upper and lower lobes of the right lung (Fig. 1). Based on the medical history of the patient (previous melanoma and nonsmoker), our provisional diagnosis was pulmonary metastases. Thus, a total-body multidetector CT (MDCT) scan was performed five days later. The MDCT imaging was performed with a second generation dual-source CT scanner (Somatom Definition Flash, Siemens, Forchheim, Germany) with the following parameters: collimation, 128 × 0.6 mm; pitch value, 0.6; rotation time, 0.5 s, tube voltage, 120 kVp; tube current-time product, 240 mAs with automatic dose modulation. The MDCT images were acquired in single-source mode before and after contrast medium administration (120 ml of a 370 mg/mL iodinate contrast agent) at a flow rate of 3.5 mL/sec. The abdomen was scanned in precontrast, late arterial and portal venous phases using the bolus-tracking technique. The rest of the body was scanned only in the venous phase.
The MDCT scan confirmed that there were two pulmonary nodules in the right lung. The nodule in the right upper lobe had a subsolid consistency (nonsolid nodule) and a maximum diameter of 15 mm (Fig. 2). The nodule located in the right lower lobe had a solid consistency (solid nodule), a well-defined margin and a maximum diameter of 19 mm (Fig. 3). The solid nodule also exhibited a significant contrast-enhancement (Fig. 3).

No other lesions were found in the rest of the body; in particular, nonpathological hilar and mediastinal lymph nodes were observed.

Despite the nonsolid density of the nodule in the right upper lobe, our provisional diagnosis remained pulmonary metastases.

Based on the side (right), the number of nodules (two) and the absence of other metastatic lesions, surgical resection was considered a viable diagnostic and therapeutic option. Ten days later, the patient underwent wedge resections of the pulmonary nodules with lymph node sampling.

Histological examination confirmed our provisional diagnosis of pulmonary metastases from melanoma. However, these two pulmonary nodules also had a different morphological pattern of presentation on histologic images (Fig. 4).

In the subsolid nodule, the neoplastic cells exhibited infiltrative growth that mainly occurred along the alveolar septa, with the partial sparing of the alveolar architecture (Fig. 4B and C). This histologic pattern of spread reflected the subsolid (nonsolid) appearance of the metastasis on CT images.

In the solid nodule, the neoplastic cells replaced the alveolar architecture with the complete effacement of the alveolar spaces (Fig. 4E and F). No lymph node metastases were found.

3. Discussion

The metastatic dissemination of cutaneous melanoma may be observed on the skin, in subcutaneous tissues, in locoregional lymph nodes or in distant organs or structures.

The lungs are the most common sites for distant metastases [2], and the prognosis in metastatic patients is very poor, with a 5-year survival
rate of less than 10% [9]. Pulmonary metastases from malignant melanoma may exhibit different morphologic patterns [4]. The solid nodular pattern is usually found in pulmonary metastatic disease [3,4]. Conversely, the subsolid nodular pattern is rarely observed [3,4]. However, the literature reports that the subsolid appearance of pulmonary metastases is most commonly found in melanoma patients [5–8].

The subsolid nodular pattern may be a manifestation of malignant or benign diseases [10,11]. Primary lung malignancies presenting as subsolid nodules usually represent in situ, minimally invasive or invasive adenocarcinoma with predominant lepidic growth [12]. Rarely, primitive pulmonary lymphomas may also exhibit a subsolid nodular pattern [13].

Subsolid pulmonary metastases from malignant melanoma typically exhibit a faster growth rate than primitive lung cancer [5–8].

To the best of our knowledge, this article reports the first case of the occurrence of two synchronous pulmonary metastases with two different morphological patterns in a melanoma patient.

In a literature search of the PubMed database for publications from the past 15 years, we found only four case reports in which the occurrence of subsolid pulmonary metastases from melanoma was observed (Table 1).

Other unusual CT patterns of pulmonary involvement from malignant melanoma include diffuse ground-glass opacities, “crazy-paving” patterns, the “halo sign”, endobronchial lesions, and cavitary nodules [4,14–16].

In our cases, the different morphological pattern of the two pulmonary metastases on CT images (Fig. 2, and 3) was clearly caused by the different growth patterns of the neoplastic cells that were observed on histologic images (Fig. 4). In the subsolid nodule, the neoplastic cells spread along the alveolar septa, with the partial effacement of the alveolar architecture (Fig. 4B and C). Conversely, in the solid nodule, the local spread of the neoplastic cells led to the complete effacement of the alveolar spaces (Fig. 4E, and F).

However, in both pulmonary metastases, the neoplastic cells had the same histologic characteristics (epithelioid malignant cells) (Fig. 4C and F). Therefore, it could be assumed that the two metastases were at different stages of development. In other words, the subsolid appearance of the metastasis in the upper lobe (Fig. 2), which was characterized by the partial effacement of the alveolar architecture, may reflect an early stage of cancer growth. Conversely, the solid appearance of the metastasis in the lower lobe (Fig. 3), which was characterized by the complete effacement of the alveolar architecture, may reflect a later stage of cancer growth.

4. Conclusion

The present article describes an unusual case of a patient with malignant melanoma that developed two synchronous pulmonary metastases during follow-up with two different morphological patterns on CT and histologic images. Although a subsolid nodular pattern is rare in pulmonary metastases from extrapulmonary malignancies, this CT pattern is most commonly found in melanoma patients. Therefore, lung metastases should be included in the differential diagnosis of a subsolid pulmonary nodule that is incidentally detected during the follow-up of a patient with previous melanoma. In addition, the radiologic-pathologic correlation observed in this case suggests that the subsolid nodular pattern observed in pulmonary metastases from melanoma may reflect an early stage of neoplastic growth in the lungs.

Declaration of Competing Interest

The authors declare no financial or other conflict of interest.
Pulmonary metastases from melanoma exhibit a subsolid nodular pattern.

Table 1

| Authors           | Year | Single or multiple subsolid nodules |
|-------------------|------|-------------------------------------|
| Okita et al [5]   | 2005 | Multiple                            |
| Kang et al [6]    | 2010 | Single                              |
| Mizuuchi et al [7]| 2015 | Single                              |
| Dal Piaz et al [8]| 2018 | Single                              |

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