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Primary lung carcinoma metastatic to a solitary fibrous tumor

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Abstract We report the case of a 78-year-old man with a 2 month history of newly diagnosed metastatic lung adenocarcinoma, who presented with a left gluteal soft tissue mass. Histological examination of the mass revealed a solitary fibrous tumor containing metastases from adenocarcinoma.

Keywords Pelvis · Metastasis · Solitary fibrous tumor, MRI

Introduction

Solitary fibrous tumor (SFT) is a rare spindle cell neoplasm originally described by Klemperer and Rabin in 1931 [1] as a pleural-based lesion. Due to this location, SFTs were thought to be of mesothelial origin. However, subsequent ultrastructural and immunohistochemical studies have shown the neoplastic cells to be fibroblastic or myofibroblastic in nature [2, 3]. Cases occurring outside the pleura have been reported in virtually all organs, including soft tissues, upper respiratory tract, ovary, orbit, liver, and retroperitoneum [2, 3, 4, 5, 6, 7, 8]. We report an unusual case of a SFT of soft tissue that contained intravascular metastases from the patient's known lung adenocarcinoma.

Case report

The patient was a 78-year-old man with a 2 month history of newly diagnosed adenocarcinoma of the upper lobe of the left lung. An 18-fluoro-2-deoxyglucose positron emission tomography (FDG-PET) scan revealed an area of increased metabolic activity in the region of the left iliac wing (Fig. 1). Several foci of bony metastatic disease were also seen. All these regions were asymptomatic. An MRI examination was performed which showed a large heterogeneous mass measuring 13 cm×8 cm×8 cm (Fig. 2). The lesion showed heterogeneous low signal on T1-weighted images. With T2-weighting, inhomogeneous high signal was seen. The mass was interposed between the left gluteus maximus and minimus muscles, abutting the cortex of the left posterior iliac wing. There was no evidence of bony invasion on MRI or CT (Fig. 3).

A CT-guided core biopsy was performed. Histological examination disclosed a neoplasm composed of bland spindle cells with adjacent dense collagen. Small to medium-sized branching (so-

Fig. 1 FDG-PET scan showing a large focus of increased metabolic activity in the region of the left buttock (*arrow*)

Fig. 3 CT image obtained for core biopsy localization (note markers on skin). The mass abuts the ilium, but does not invade it

Fig. 2 Axial fat-suppressed T2-weighted FSE image (5980/92) shows the heterogeneous nature of the lesion (*). Focal areas appear to contain fluid, surrounded by tissue of only modestly increased signal intensity. Note the additional metastatic lesion in the right iliac wing (*arrow*)

Fig. 4 H&E-stained photograph showing a solitary fibrous tumor, with hyper- and hypocellular areas and branching small to medium-sized blood vessels (*arrowhead*). Within two vessels, clusters of metastatic carcinoma are seen (*arrows*)

called staghorn) vessels were prominent. Areas of increased cellularity alternated with hypocellular areas in a “patternless” pattern (Fig. 4). These features, together with immunohistochemical stains showing the spindle cells to be positive only for CD34, were consistent with a SFT.

Additionally, there were intravascular clusters of malignant epithelial cells, focally forming neoplastic glands similar to those

seen in the patient’s primary lung adenocarcinoma. By immunohistochemistry, the malignant glands were positive for cytokeratin 7 and negative for cytokeratin 20 and CD34 (Fig. 5). These results were supportive of metastatic lung adenocarcinoma, and were identical to those seen in the primary tumor.

Metastases to the patient’s vertebral column and pelvis were also identified. The patient received radiation for these, but developed recurrent pneumonias and was placed under palliative care. He died approximately 5 months after the initial diagnosis.

Fig. 5 **A** Immunohistochemical staining demonstrates CD34 positivity in spindle mesenchymal cells and endothelium, while the metastatic carcinoma cells are negative. **B** In contrast, the metastatic carcinoma cells show strong cytoplasmic positivity for cytokeratin, while the mesenchymal cells are negative. In both photographs, arrows indicate intravascular carcinoma

Discussion

SFT is a rare mesenchymal neoplasm that arises in diverse anatomical sites. It is characterized by a prominent “staghorn” vascular pattern, bland spindle cells, variable collagen deposition, and marked variation in cellularity, often referred to as a “patternless” pattern. Tumor cells are typically positive for CD34, while negative for keratin, desmin, actin, and S-100 [3, 5, 8, 9, 10].

Given the presence of a spindle cell and glandular component, a biphasic synovial sarcoma could enter into the differential diagnosis. This diagnosis was excluded in this case for the following reasons: (1) the malignant glandular component was intravascular (endothelial-lined spaces confirmed by CD31 and CD34 staining); (2) the spindle cells were strongly and diffusely positive for

CD34, whereas the spindle cells in synovial sarcomas are virtually always negative for this marker; (3) the spindle cells were negative for a number of epithelial markers, including EMA and several cytokeratins, that are typically positive in synovial sarcomas. Cytogenetic analysis disclosed several non-clonal abnormalities; however, the (X;18) translocation characteristic of synovial sarcoma was not present.

SFTs may be divided broadly into intra- and extrathoracic neoplasms, which reflects the true diverse presentation of this tumor. Recent papers report SFTs in the orbit [5], meninges [5], parotid and submandibular glands [6], lung [10], mediastinum [9], stomach and ileum [10], kidney [5], and skin [4, 6], among other locations. SFTs are often asymptomatic, though large lesions may present with nonspecific clinical symptoms such as abdominal fullness or discomfort [8, 11]. In one recent large series, extrathoracic SFTs were more commonly symptomatic (83% of cases) than were intrathoracic SFTs (23% of cases) [11]. Painless masses are characteristic of more superficial SFTs [8].

Although both intra- and extrathoracic SFTs generally pursue a benign clinical course, approximately 10% of cases in both locations recur locally or metastasize [8, 11]. Unfortunately, histology is a poor predictor of clinical course. Mitoses numbering greater than 4 per 10 high-power fields, nuclear atypia, hypercellularity, necrosis, and size greater than 10 cm have been associated with local recurrence or distant metastases [8, 11]. Positive microscopic margins have been significantly associated with an aggressive clinical course, and there is a trend toward an association between large tumors (>10 cm) and positive microscopic margins [11]. It is important, however, to emphasize that small SFTs with no atypical histological features and with negative surgical margins have been reported to recur locally or metastasize [8, 11]. It is therefore unwise to consider any SFT unequivocally benign.

Imaging characteristics include a highly attenuating mass on contrast-enhanced CT because of the highly vascular nature of the lesion. MRI findings consist of a low to intermediate signal intensity on T1-weighted images and intermediate to high signal intensity on T2-weighted images with brisk enhancement after Gd-DTPA administration [11].

Metastasis of one neoplasm to another is a rare phenomenon. One potential difficulty is in the definition of tumor-to-tumor metastasis and the detection of a distinct metastatic carcinoma in the setting of a primary benign tumor. In 1984, Pamphlett proposed a set of basic criteria to be met for diagnosing tumor-to-tumor metastasis: (1) a primary metastasizing carcinoma must be proven to exist; (2) the metastatic malignant cells must be enclosed in a benign, histologically distinct, host neoplasm; and (3) histochemical and immunohistochemical characteristics of the metastasis must correspond to those

of the primary neoplasm [12]. Theoretically, any malignant carcinoma may metastasize to another tumor; however, a case of carcinoma metastasizing to a SFT has not been previously described. The case we present fulfills

the criteria described by Pamphlett and we believe it is the first case of metastasis of a primary carcinoma to a soft tissue tumor.

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