Solitary Pulmonary Nodule: Pleuropulmonary Synovial Sarcoma

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ABSTRACT

Pleuropulmonary synovial sarcoma (PPSS) is an extremely rare primary malignancy of the lung. We present a case of a middle-aged female with PPSS that was initially discovered as an incidental indeterminate nodule on chest radiograph. Following evaluation with computed tomography (CT), the patient went on to positron-emission tomography (PET)/CT for work-up of the solitary pulmonary nodule, which demonstrated mild FDG-avidity and no other evidence of FDG-avid disease. The patient then underwent thoracotomy and right upper lobectomy for definitive treatment. Only after evaluation of the gross pathology, histology, immunohistochemistry and cytogenetics was the diagnosis of synovial sarcoma made. Importantly, the preceding PET/CT, in addition to physical exam of the upper and lower extremities, helped exclude the more common extra-thoracic soft-tissue variety of synovial sarcoma, which frequently metastasizes to lung, carrying a worse prognosis. Discussion of synovial sarcoma and PPSS follows.

KEYWORDS: Solitary pulmonary nodule, Lung cancer, Synovial sarcoma, Sarcoma

CASE PRESENTATION

A 44-year-old female with a past medical history of hypertension and hyperlipidemia presented with an incidental, right, upper lobe, solitary pulmonary nodule identified on a chest radiograph performed for evaluation of chest pain (**Figure 1**). Given the small size and location of the lesion, the symptom of chest pain was considered unrelated. A chest radiograph performed eight months earlier for chest pain showed no evidence of the pulmonary nodule (**Figure 2).**

The recommended chest CT demonstrated a circumscribed 1.7 cm right, upper lobe, solitary pulmonary nodule containing a small peripheral focus of calcification (**Figure 3**). There was no evidence of emphysema (**Figure 4**), and there was no suspicious hilar or mediastinal lymphadenopathy. The subsequent PET/CT demonstrated mild FDG-avidity (maximum SUV of 2.3) associated with the nodule (**Figures 5 and 6**). Histologic correlation and surgical consultation was recommended for suspicion of malignancy.

The patient underwent right thoracotomy with right upper lobectomy and mediastinal lymph node dissection. The nodule was well-circumscribed and unencapsulated with areas of internal necrosis and foci of calcification. Gross pathology (**Figure 7**), histology (**Figure 8**), immunohistochemistry (**Figure 9**) and fluorescence in situ hybridization

Figure 1. PA chest radiograph demonstrates a solitary pulmonary nodule within the right upper lung (red arrows).

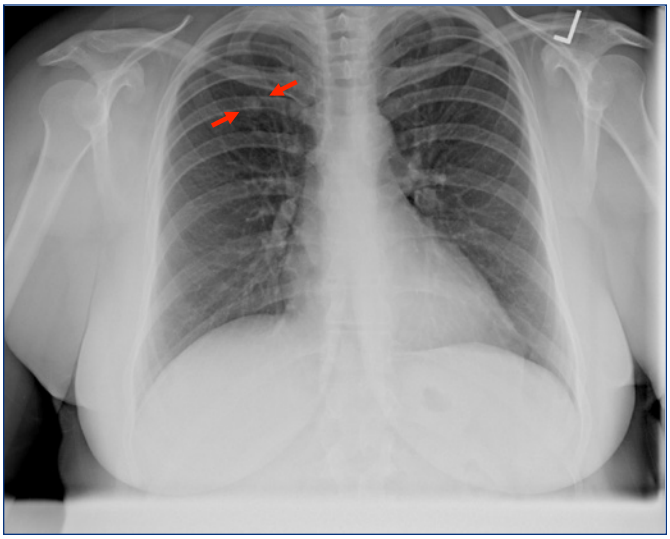


Figure 2. PA chest radiograph eight months earlier shows no evidence of the solitary pulmonary nodule seen in Figure 1.

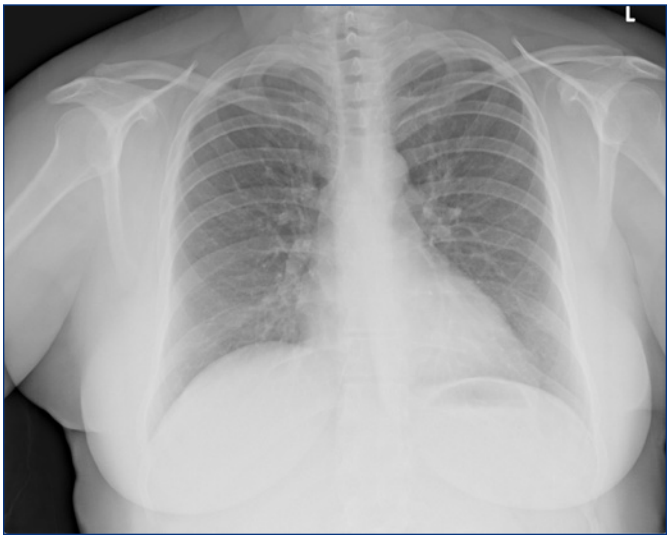


Figure 3. Axial non-contrast CT of the chest in soft tissue windows demonstrates a 1.7 cm right upper lobe pulmonary nodule with a focus of peripheral calcification (red arrow). There was no evidence of hilar or mediastinal lymphadenopathy.

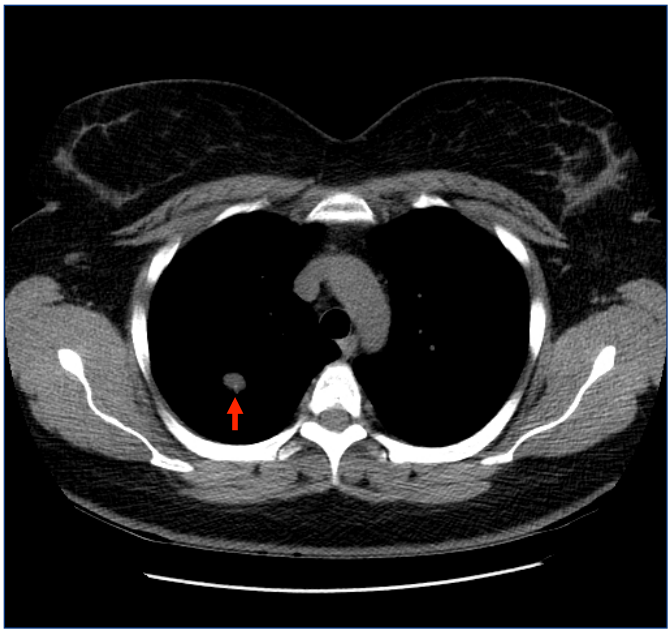


Figure 4. Axial non-contrast CT of the chest in lung windows re-demonstrates the 1.7 cm right upper lobe pulmonary nodule with circumscribed margins (red arrow). No evidence of emphysema.

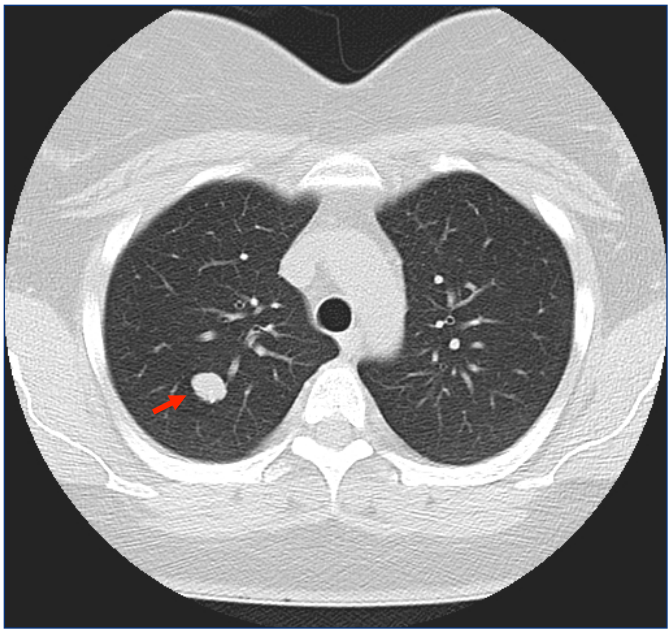


Figure 5. Fused axial PET/CT at the level of the great vessels demonstrates mild FDG-avidity (maximum SUV of 2.3) associated with the right upper lobe solitary pulmonary nodule (red arrow). There was no evidence of FDG-avid nodal or distant metastatic disease.

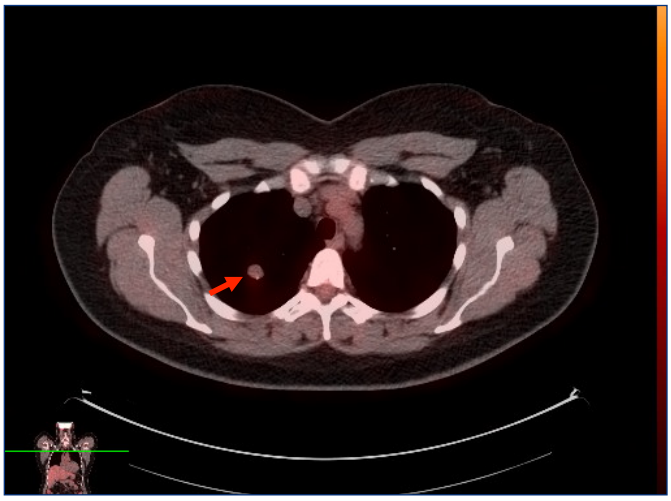
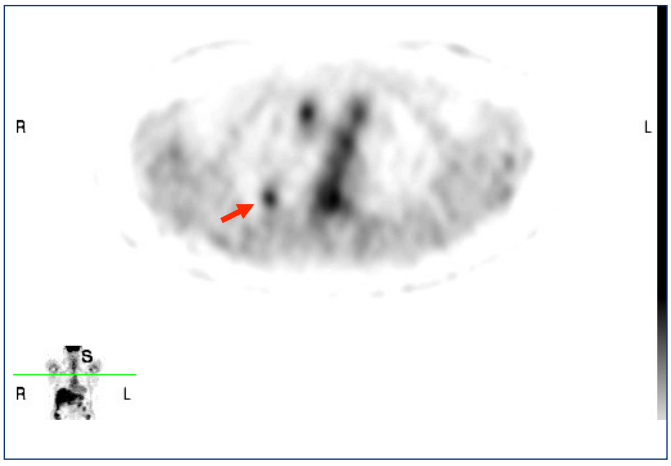


Figure 6. PET scan at the same location as Figure 5 demonstrates the FDG-avidity associated with the right upper lobe solitary pulmonary nodule to better advantage (red arrow). Also note physiologic FDG activity within the great vessels, esophagus and degenerative endplate change of the thoracic spine.



(FISH) results were consistent with synovial sarcoma of the monophasic spindle cell type. All sampled lymph nodes were negative for malignancy.

Although synovial sarcomas have been reported to occur as a primary malignancy in the pleuropulmonary region, soft tissue sarcomas are far more common. Because the patient had undergone a pre-operative PET/CT, which revealed no additional sites of FDG-avid disease, it was concluded the patient had the rare primary pleuropulmonary variety of synovial sarcoma.

Because this patient's tumor was identified early as an incidental finding, surgical resection was considered definitive therapy, and therefore, chemotherapy and radiation therapy were not pursued.

PLEUROPULMONARY SYNOVIAL SARCOMA

Historically, synovial sarcomas were thought to be associated with the synovium. The term synovial sarcoma first appeared in the German surgical literature in the 1865, where it was used to describe a complex multinodular lesion apparently arising from synovial tissue in the knee of an adult patient.[1] Nearly 120 years later, in 1984, pathologists definitively demonstrated that these neoplasms actually have no demonstrable relationship to synovial tissue.[2] Instead, they represent mesenchymal spindle cell tumors characterized by variable epithelial differentiation.[3] Thus, the term *synovial* sarcoma is a misnomer. Nonetheless, the name lives on.

Soft-tissue synovial sarcoma is far more common than pleuropulmonary synovial sarcoma (PPSS). Soft-tissue synovial sarcomas typically occur in juxta-articular locations of the extremities in young and middle-aged adults.[3] Synovial sarcomas account for 7%-10% of all soft-tissue sarcomas.[3] Pulmonary sarcomas, in general, constitute only 0.1%-0.5% of all primary lung malignancies.[3] The most frequently reported subtypes of sarcomas in the lung are leiomyosarcomas, malignant fibrous histiocytoma, fibrosarcoma, and PPSS, which is increasingly recognized as a subtype of sarcoma because of the relatively recent identification of a distinctive chromosomal translocation specific to synovial sarcoma.[4,5]

Relatively speaking, the occurrence of synovial sarcoma as an extra-thoracic soft-tissue primary tumor is relatively common compared to PPSS. Furthermore, distant metastases develop in 40%-50% of patients with extra-thoracic soft tissue synovial sarcoma; the lung is the most common site of metastatic disease, and massive pleuropulmonary metastases are the leading cause of death.[6] Because the morphologic features of primary and metastatic synovial sarcomas are similar, clinical and radiologic evaluation is essential to exclude the presence of tumor outside the thorax.

Patients with PPSS typically present with a cough, chest pain, or dyspnea.[3] Alternatively, PPSS may be found incidentally, as in the index case. PPSS typically appears as a sharply marginated mass with uniform opacity of chest radiographs.[7] CT images show a well-circumscribed heterogeneously enhancing lesion, and have been reported as lacking calcification,[7] in contradistinction to the index case. MRI provides superior demonstration of nodular soft tissue and multilocular fluid internal components, in addition

Figure 7. Gross pathology demonstrates a 1.4 cm tan to white, unencapsulated, homogeneous, well-circumscribed lesion. The pleural surface overlying the lesion is inked blue, and the staple line is inked orange. The surrounding lung tissue is unremarkable.

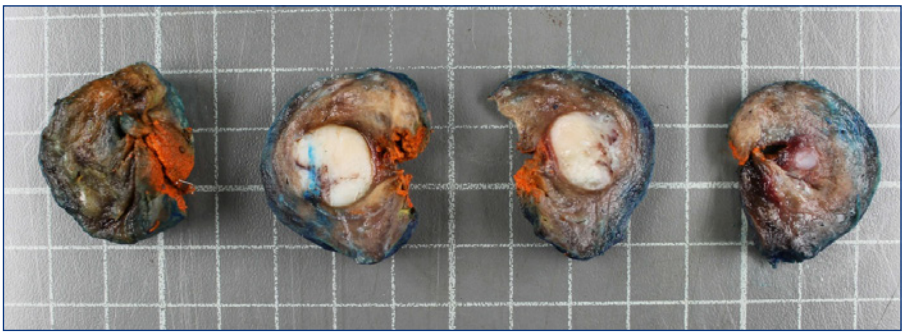


Figure 8 a/b. Hematoxylin and Eosin stain at 200x and 400x, respectively, demonstrate mitotic count of 10 mitoses/10 high-powered fields, approximately 20% necrosis, and foci of calcification.

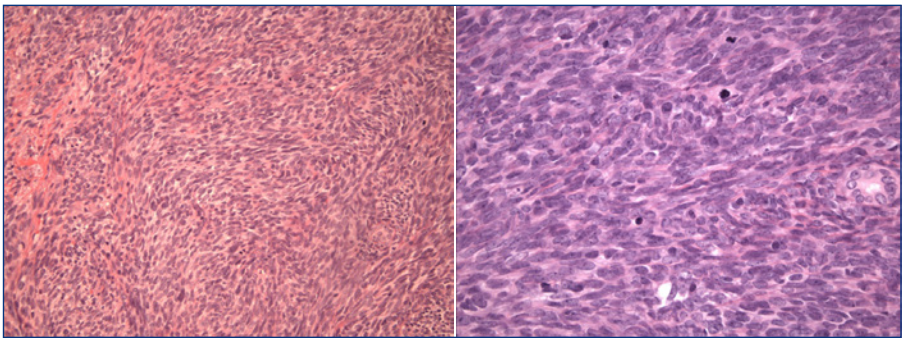
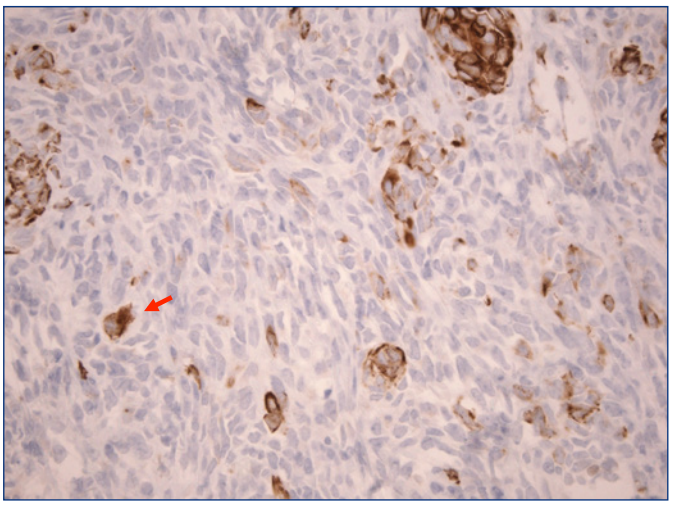


Figure 9. Immunohistochemistry cytokeratin cocktail at 400x demonstrates focal areas of positivity (e.g. red arrow). This finding along with diffuse strong BCL-2 positivity, and synaptophysin, EMA, Ewing's sarcoma, and Ki-67 positivity support the diagnosis of synovial sarcoma. FISH (not shown), demonstrated the SYT (18q11.21) rearrangement specific to synovial sarcoma.



to peripheral rim enhancement after administration of a gadolinium-based contrast material.[7]

Unfortunately, the radiographic manifestations of PPSS overlap significantly with those of many other lesions of the lung and pleura, including primary and metastatic lung neoplasms, localized fibrous tumor of the pleura, malignant mesothelioma, and other rare, primary, parenchymal sarcomas. The presence of significant adenopathy, however, argues against PPSS.[3]

Treatment typically consists of multimodality therapy for synovial sarcomas, including surgical resection, chemotherapy and radiation therapy.[8,9] However, no randomized studies in any age group have been reported to assess therapeutic approaches in patients with synovial sarcoma. There is no prognostic data for PPSS, but the broader and more long-term clinical experience of soft-tissue sarcomas has shown an overall 5-year survival rate of 50%-80%.[10] Poor prognostic factors include tumors greater than 5 cm, greater than 50% necrosis, the presence of hemorrhage, poorly differentiated subtypes, location other than extremities, and patients older than 40 years of age.[10,11]

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Disclosures

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