PET: Diagnosis and Staging of The Indeterminate Pulmonary Nodule

UNIVERSITY RADIOLOGY GROUP PC

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Lung cancer remains one of the leading causes of death in the U.S. Each year, 150,000 lives are lost to lung cancer and its prevalence is increasing. The overall five-year survival rate remains approximately 14%. Because of the high morbidity and mortality of this disease, better methods of detection are needed.

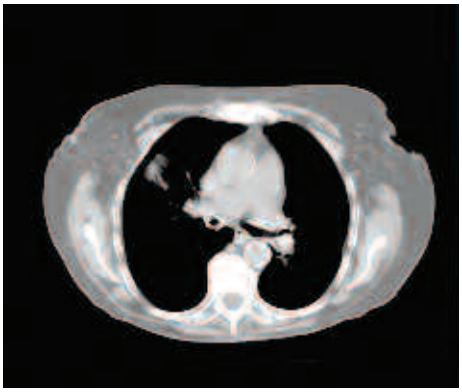
Many lung cancers initially present as a solitary pulmonary nodule found on chest radiograph or CT scan. Although plain radiography or CT provides anatomic information about size and morphology of these nodules, they are often unable to distinguish between benign and malignant lesions. This leads to many unnecessary lung biopsies and surgeries, which can be associated with further complications.

PET (Positron Emission Tomography) is a relatively new imaging modality which works on the basic principle that rapidly growing/dividing malignant cells have a higher rate of metabolism than normal tissue. PET imaging exploits these differences in metabolism by examining the relative uptake of the radiopharmaceutical F-18 fluorodeoxyglucose (FDG), whose uptake reflects glucose metabolism. The FDG is avidly taken up by malignant cells and phosphorylated to FDG-6-phosphate as part of its metabolism. This cannot be further broken down and becomes "trapped" in the malignant cells resulting in the relatively high conspicuity of the tumor cells with respect to background tissues.

PET scanning provides a safe, non-invasive technique for accurately distinguishing benign from malignant lesions in the evaluation of solitary pulmonary nodules. The efficacy of PET imaging has been demonstrated in a collection of seven independent studies performed since 1996 in which a series of pulmonary nodules ranging in size from 0.7 to 3 cm in diameter were studied with PET. PET scanning was found to have an average sensitivity of 95% and a specificity of 80% for detection of malignancy in this series.

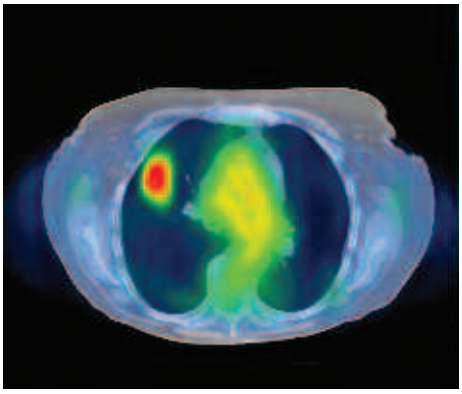
PET imaging can also provide prognostic information on lung cancer survivability based on the relative amount of FDG uptake within the tumor. PET scanning has also been shown to be substantially more accurate than CT in staging the mediastinum with sensitivities ranging from 66 to 100% and specificities of between 81 and 100%. There are some limitations in accurately diagnosing the presence of malignancy when lung nodule size is less than 7 mm, and for certain types of malignancy such as bronchoalveolar cell cancer, carcinoid tumors, and other non-small cell lung cancers.

In conclusion, PET imaging is a powerful modality in oncologic imaging, providing a safe, reliable, non-invasive method for accurately diagnosing and staging "indeterminate" pulmonary nodules seen on CT scan or chest X-ray.



CT demonstrates an approximate 1.5 cm opacity in the right upper lobe in follow up to an abnormal chest x-ray.

FDG PET scan demonstrates a hypermetabolic focus at the site of the patient's known RUL opacity, highly suspicious for malignancy. The hila and mediastinum as well as the remainder of the study are unremarkable.



PET/CT fused image demonstrates the hypermetabolic PET lesion to localize to the anatomic CT abnormality.

If you have any questions or comments, Dr. Feza Tunc would be happy to discuss them with you and can be reached by calling 732-390-0040.

Appointments for PET can be scheduled by calling 732-249-4410.