

USE OF PET SCAN IN LUNG CANCER

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PET scanning has increased dramatically in recent years. PET scan is an acronym for Positron Emission Tomography. It is basically a non-invasive test other than a needle stick in a peripheral vein that uses 18-F fluoride - oxyglucose as a tracer to evaluate people commonly to determine potential extent of cancer. PET scans are usually performed by radiology departments.

A variety of different types of scanners are now available and they are often being used to detect extent of disease (usually cancers) as well as to determine the nature of nodules - cancer versus non-cancer - seen on x-rays and CT scans. Thus, it is used to help physicians learn more about shadows seen - and sometimes not seen in more conventional radiologic imaging.

X-rays and CT scans show images of structures while PET scans help tell us the nature of the area. Also, PET scans sometimes find abnormalities not seen by CT scan. This helps determine the extent of disease.

Some studies have suggested that PET scanning is more accurate in determining the extent of lymph node involvement in lung cancers than CT scan alone. It is probably best when used together with CT scan.

PET scans can also show distant sites of cancer, which may not be evident by CT scanning. It has been said that in 60% of cases a PET scan influences the staging or extent of disease and 25% of patients are up-staged or have more extensive cancer than could be seen by CT scanning.

It is estimated that in early stage lung cancer, that PET scan shows unsuspected metastases in about 10% of patients. In a study led by MacManus et al, an evaluation was done for patients with Stage III non-small lung cancer to determine the role of treatment. Small cell lung cancer is a particular type seen under the microscope. Non-small cell refers to essentially all other types of lung cancer and usually includes squamous cell, adenocarcinoma, large cell and others.

In this current evaluation published in the prestigious International Journal of Radiation Oncology Biology Physics, the physicians were impressed with a high rate of unsuspected distant metastases in Stage III lung cancer. To accurately determine the extent of disease is important. If unsuspecting areas may contain metastatic cancer, then the stage or extent of cancer is more extensive and surgery (a local treatment), for example, may or may not play a role in those patients.

PET scan should be able to define the extent of disease so that more accurate treatment and, hopefully, more effective strategies can be undertaken for each particular patient.

Thus, as a prospective study, staging including PET scan was performed for patients with non-small cell lung carcinoma. The authors reported that lung cancer surgery is not performed at their facility and, therefore, inoperable cases are often seen. Apparently, this is because operative patients would be sent elsewhere for surgery.

What studies were done for part of the staging process? In addition to PET scanning, contrast-enhanced CT scans of the chest and upper abdomen were performed as well as bone scans.

Also, the physicians were said to have performed biopsies of accessible lesions to resolve discrepancies between different imaging techniques before treatment was undertaken. The authors reported in the first year of the study, extensive sites of disease seen on PET scan did not influence treatment approaches.

As PET scanning became more important, physicians found it inappropriate to ignore PET scan findings. Thus, other patients received palliative therapy - meaning treatment intended not to cure but to improve symptoms - instead. Most patients received radiation therapy to the tumor bulk in the chest area. Survival was measured from the date of the PET scanning.

It should be noted that a biopsy of every PET lesion was not performed. PET scan lesions were thought to be progressive if there was independent confirmation of tumor - by CT scan, MRI, bone scan or other radiographic testing.

Curative therapy was offered to patients with Stage I or Stage II disease. This would be a patient with more limited extent of cancer than Stage III. Patients, who were felt to be inoperable for medical reasons or to have too extensive disease for surgery, were given radiation with concurrent Cisplatin chemotherapy.

Thus, prospective PET scan studies were done in 167 patients with non-small cell lung cancer between December 1996 and July 1997. Eight patients underwent surgery. Radiation or chemotherapy/radiation was the treatment for 156 patients and pre-operative chemotherapy/radiation was given in 3 patients. The time interval between the PET scan and the CT scan used for comparison was 13 days.

One hundred fifty patients who were thought to be candidates for radical radiation underwent PET scanning while 71 patients received radiation without PET scan staging because of the limited access to the PET scanner. So, PET scanning was performed in 68% of the radical radiation patients.

Of the 39 patients with Stage I lung cancer, 3 patients were found to have metastases by PET scan. In 28 patients with Stage II cancer, 5 (18%) were found to have metastases by PET scan. In 100 patients with Stage III disease, 24 (24%) had metastases. Statistical analysis confirmed that there was an increased chance of distant metastases in patients with increasing stage.

It was reported that the most common site for unsuspected PET scan-detected metastases was in the abdomen with 17 such cases. Adrenal gland metastases occurred in 7 patients, the liver in 4 patients and other areas in 6 patients. There were 10 patients with lung metastases and 6 patients with bone metastases.

In 29 of 32 patients (91%), there was confirmatory evidence of metastatic disease at time of last follow-up. This confirmation was either the site of PET scan abnormality or in another metastatic site. Seventeen patients had progression by CT scan or MRI with a mass developing where PET scan showed probable metastases. In 5 of 6 cases where PET scan showed bone abnormality, subsequent bone scans or x-rays showed bone abnormalities consistent with metastases. In 3 patients, there was no confirmation of PET scan-detected metastatic cancer or other evidence of metastatic cancer at four months, two years and 2.5 years after PET scanning.

The authors noted that while many focused on Stage I and Stage II lung cancer, PET scanning may make even more sense in Stage III since a higher proportion of patients were found to have metastatic cancer, thus making the test highly important. Others might argue that in advanced stage lung cancer the survival is not as favorable as earlier stage cancer so that in earlier stage cancer, surgery might not be undertaken if there are metastases. Obviously both sets of patients may well benefit from better staging PET scanning. It should be noted that some people get tired of staging procedures and decline them. That is part of the Informed Consent process.

About chemotherapy, radiation and surgery, the authors write, "Because these treatments are associated with high rates of toxicity, we do not believe that they should be offered routinely to patients with incurable metastatic disease who generally be better served by palliative therapies alone. Nevertheless, a strong case can be made for the administration of moderately intensive

local/regional therapies to patients with limited metastatic disease to treat established symptoms and delay disease progression, although in these patients the intentional therapy is palliation and prolongation of survival but not cure. With the recognition of patients with PET scan-detected solitary metastases, there is scope for radical treatment of both primary and metastatic disease with curative intent although our own treatment strategy for these patients has generally stressed palliation, unless both primary and metastatic lesions are respectable. It is well known that a small proportion of patients with solitary brain or adrenal metastasis may experience prolonged survival with aggressive treatment of both primary and metastatic cancer."

There are other considerations as well. Will PET scanning improve survival rates for Stage III lung cancer by extracting out patients who truly do not have Stage III but, in fact, Stage IV lung cancer? The authors state, "The use of PET staging is particularly likely to be cost effective in patients with Stage III non-small lung cancer who are considered suitable for curative radiotherapy on the basis of conventional staging, both because the rate of detection of previously unrecognized metastases is relatively high and because palliative radiation, which is used in the majority of patients with incurable non-small cell lung cancer is significantly less expensive than high dose radiation, particularly when the latter is combined with chemotherapy. Quite apart from economic considerations, it is inappropriate to subject patients with incurable non-small cell lung cancer to treatments that may have virtually no prospect for cure but are time-consuming and may be associated with high morbidity."

"After PET, patients with radical therapies for non-small cell lung cancer may expect superior survival compared to historical controls because of stage migration. The removal of poor prognosis patients from radically treated cohorts after PET may falsely suggest a benefit from novel treatment strategies when none exists if comparison is made with non-PET stage historic controls. Nevertheless, it is likely that improved treatment planning for radical radiation is likely to benefit a significant percentage of PET-staged patients. Additionally, patients considered unsuitable for radical therapies on the basis of PET-detected extensive disease may represent a relatively favorable subset and may experience longer survival than patients with conventional-staged extensive disease. Caution is also required when interpreting promising results, new therapies for advanced non-small lung cancer when PET has been used in patient selection. When future clinical trials for inoperable non-small cell lung cancer are planned, provision should be made for stratification by PET."

"In conclusion, FDG PET scanning detected previously unrecognized systemic metastases in a high proportion of patients with locally advanced non-small cell lung cancer who were candidates for potentially curative therapy. Evidence of distant metastases on PET was very strongly correlated with ultimate progression with metastatic disease. The low rate of PET-detected metastases in Stage I is further evidence that this high rate of PET-detected metastases in Stage III is not a false positive finding. Our data suggests that PET may have an even greater impact on patient selection for radical radiation than on selection for surgery."