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Therapeutic Relevance of F-18 FDG PET Scanning for Staging in Patients With Non-Small Cell Lung Cancer



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About 96% of the approximately 172.000 new cases of pulmonal tumors in North America und 39.000 in Germany every year are bronchogenic carcinoma, 80% of them non-small cell lung cancer. Therapy of this entity strongly depends on the local extent of the cancer and distant metastasis.

Purpose

Aim of this prospective interdisciplinary study was the evaluation of therapeutic relevance of F-18 FDG PET scanning for the preoperative staging of non-small cell lung cancer. Main point of interest was the differentiation of curatively resectable N2-disease with ipsilateral lymph node metastases from N3-disease with contralateral lymph node metastases and the exclusion of M1-disease with distant metastases.

Patients suspected of having or with histological proven, clinical operable non-small cell lung cancer were eligible for this study. Patients were excluded, if they had hyperglycemia with a serum glucose level of more than 180 mg per deciliter before the PET study or had undergone a neoadjuvant chemotherapy.

Methods and materials

All patients were evaluated by means of anamnesis, physical examination, complete blood status, abdominal ultrasound, MRI of the brain, test of lung function, bronchoscopy and spiral-CT of the chest including the upper abdomen. In case of symptoms suggestive for distant metastasis appropriate additional imaging tests and biopsies were performed.

Diagnostic course

If no distant metastases could be found and verified by above methods, PET scanning was performed.

Each imaging study was evaluated separately by two experienced radiologists in consensus. No histopathologic data were available at the time of interpretation. Nodal stations were localized according to the American Thoracic Society mapping system.

Patients with a clinical stage up to T3N2M0 respectively III A underwent thoracotomy with extensive lymph node sampling. In case of discordance of CT und PET lymph node staging between N2 and N3, mediastinoscopy was performed. If mediastinoscopy revealed N2-disease, the patient was operated. All other patients were treated conservatively.

Therapeutic course

PET and CT findings were correlated with histopathologic results on a station-by-station basis. The difference was evaluated by Chi²-test.

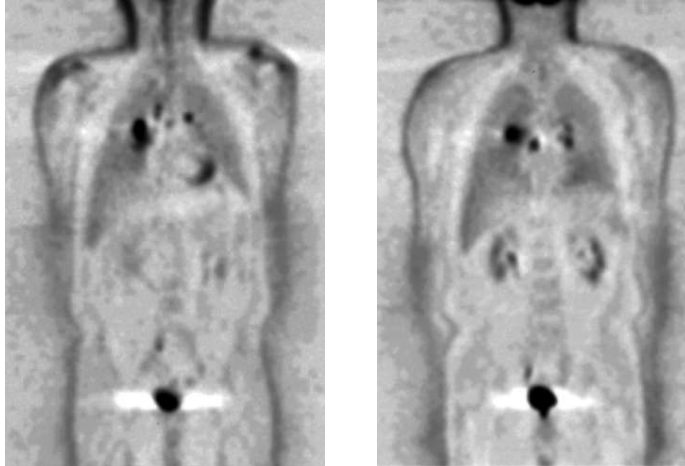
Results

- 4 PET correctly identified nature of all primary lesions.
- 4 PET correctly staged all Patients with N3-disease, no under- or overstaging occurred.
- 4 PET found one primary unknown distant metastasis, which was with histopathological proven, and prevented thoracotomy of this patient.

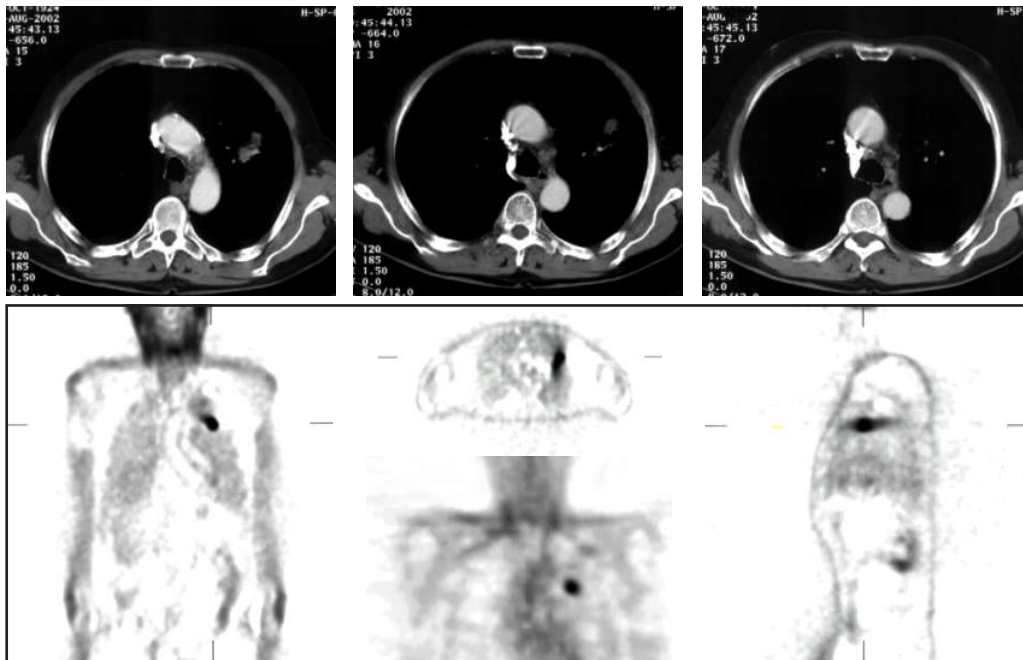
3 Patients with N2-disease were overstaged as N3-disease with CT because of unspecific lymph node enlargement. On the other hand 2 Patients with N3-disease were understaged with CT!

Over all sensitivity of PET for the staging of hilar and mediastinal lymph nodes was 91%, sensitivity of CT 62%; specificity was 98% and 80%, respectively. Difference between N staging with PET and with CT is statistically significant ($p < 0.005$)

This is a PET-scan of a Patient with N3 – disease:
Right pulmonary tumor with mediastinal and hilar lymph node metastases on both sides!



PET and CT-scans of this patient show the primary tumor in the left upper lobe, on CT lymph nodes in the aortopulmonary window are enlarged, while PET is negativ. This was proven by thoracotomy and histopathologic examination – no lymph node metastases were found!



Conclusion

- 4 F-18 FDG PET scanning is superior to spiral CT for staging of non-small cell lung cancer.
 - 4 PET has the potential to determine the therapeutic course because of the correct differentiation between N2 and N3 disease and the sensitive proof of distant metastasis.
 - 4 CT trends to overstage because of unspecific lymph node enlargement. Therefore operation as the only potential curative therapy may not be refused because of N3-disease staged by CT!
 - 4 Correct diagnosis of all benign tumors by PET facilitates the operative procedure and reduces invasiveness!
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