Review: Positron emission tomography with 18-fluorodeoxyglucose is an accurate test for identifying malignant pulmonary lesions

QUESTION

What is the diagnostic accuracy of glucose analog 18-fluorodeoxyglucose positron emission tomography (FDG-PET) for malignant focal pulmonary lesions?

DATA SOURCES

Studies were identified by searching MEDLINE and CANCERLIT between January 1966 and September 2000, reviewing the reference lists of identified studies, scanning the abstracts from recent conference proceedings, and contacting investigators.

STUDY SELECTION

Studies were selected if they enrolled ≥ 10 patients with pulmonary nodules or masses, of which at least 5 of whom had malignant lesions, who were examined with FDG-PET or FDG with a modified gamma camera in coin-cidence mode for the diagnosis of focal pulmonary lesions, and if sufficient data were presented to calculate sensitivity and specificity.

DATA EXTRACTION

Data were extracted on study quality, patient characteristics, prevalence of malignancy, and sensitivity and specificity of the imaging test for malignancy.

MAIN RESULTS

40 studies met the selection criteria. The median prevalence rate of malignancy was 72.5%. For 1474 focal pulmonary lesions of any size, the maximum joint sensitivity and specificity (the upper left point on the receiver operating characteristic [ROC] curve at which sensitivity and specificity are equal) of FDG-PET was 91.2% (95% CI 89.1% to 92.9%). For pulmonary nodules, the maximum joint sensitivity and specificity was 90% (CI 86.4% to 92.7%). In current practice, FDG-PET operates at a point on the ROC curve that corresponds approximately to a sensitivity of 96.8% and a specificity of 77.8%. Diagnostic accuracy did not differ between pulmonary nodules and pulmonary lesions of any size ($P = 0.43$), between semi-quantitative and qualitative methods of image interpretation ($P = 0.52$), or between FDG-PET and FDG imaging with a modified gamma camera in coincidence mode ($P = 0.19$).

CONCLUSION

Positron emission tomography with 18-fluorodeoxyglucose is an accurate test for identifying malignant pulmonary lesions.

COMMENTARY

Although an array of clinical characteristics may help predict the malignant or benign nature of a pulmonary nodule, the final diagnosis has traditionally relied on histopathologic findings. The results of the meta-analysis by Gould and colleagues of FDG-PET for the diagnosis of coin and mass lesions show that FDG-PET has a high sensitivity and an intermediate specificity. FDG-PET may be even more accurate than transthoracic needle biopsy (1), although a valid head-to-head comparison is still lacking.

PET has gained wide acceptance in the investigation of solitary pulmonary lesions. Since January 1, 1998, U.S. Medicare has been reimbursing for PET in the diagnosis of lung lesions. Nevertheless, as of January 1, 2001, only 58 PET centers were officially registered at the U.S. Academy for Molecular Imaging, whereas 5 were in Canada. Professional organizations have even positioned PET as the initial step in the investigation of solitary nodules. Such diagnostic algorithms still must be validated.

In most clinical settings, given the limited availability of PET imaging, it would be rational to limit the procedure to patients presenting with a known malignant lung lesion that is apparently opera-ble after the usual methods of staging (2). In such circumstances, PET correctly identified 7 mediastinal and 11 distant metastases in 102 patients in whom the usual methods had found no metastases (3). Further cost-effectiveness studies are needed to determine whether PET, used as the initial step in the investigation of lung lesions, represents good value for the expense.

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References

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