PET/CT imaging in small cell lung cancer

Barbara Malene Fischer

This PhD dissertation was accepted by the Faculty of Health Sciences of the University of Copenhagen, and defended on December 4, 2006.

Official opponents: Inge-Lis Kanstrup, Olfred Hansen and Per Wolmer, Sweden.

Correspondence: Barbera M. Fischer, Slettensvej 262, Lumby, 5270 Odense, Denmark.

E-mail: bjerregaard-fischer@get2net.dk

Dan Med Bull 2007;54:71

ABSTRACT

This PhD dissertation, performed at Rigshospitalet Copenhagen University Hospital, assesses the usability of PET/CT imaging in small cell lung cancer (SCLC), which accounts for 15-20% of all lung cancer cases. Accurate and fast staging is mandatory for planning the optimal treatment strategy, but current staging procedures are time consuming and lack sensitivity and sometimes also specificity.

The dissertation comprises a review and four manuscripts, based on the following studies:

In-vitro experiments were performed in order to assess how many malignant cells are required for a tumour to be detected by PET. The detection limit of PET was found to be 105 to 106 malignant cells, depending on setting and cell type. This equals a tumour of app. 1 mm. *Expression of glucose transporters and Hexokinase-II* in SCLC was examined by immunohistology and correlated to FDG-retention measured by PET. High expression of glucose transporter-1 (Glut-1) and Hexokinase-II was seen in 72% and 57% of the specimens, respectively. Significant correlations were found between the expression of Glut-1 and FDG-retention, and between Hexokinase-II and stage of the disease. *A prospective study* examined the role of combined PET/CT in staging of patients with SCLC. Twenty-nine patients received initial PET/CT. PET/CT caused stage migration in 17% of the patients. Diagnostic accuracy of PET/CT was higher than standard staging, but the difference was not significant. *Assignment of early and final response* was compared between PET, PET/CT, and CT in 20 patients with SCLC recruited from the above study. All measurements of FDG-uptake were significantly correlated to size and changes in size as measured by CT. A significant difference in relative change in tumour FDG-uptake and volume was found between responding and non-responding patients. At final response evaluation major disagreement between PET, PET/CT and CT was observed in 2 of 19 patients (11%).

The present findings indicate that PET/CT may simplify the current staging procedure in SCLC. Response evaluation of SCLC by PET/CT is feasible, but it is uncertain whether this adds further information to evaluation by CT. These studies are the first to examine PET/CT in a SCLC population, but larger trials are needed before the clinical usability can be finally established.