ELSEVIER SAUNDERS

POSITRON EMISSION TOMOGRAPHY

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Preface

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Guest Editor

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Positron emission tomography (PET) is now an important cancer-imaging tool, both for diagnosis and staging, as well as offering prognostic information based on response. PET is the gold standard in the evaluation of an indeterminate solitary pulmonary nodule (SPN) or mass, where PET has proved to be significantly more accurate than computed tomography (CT). PET is significantly more accurate than CT in the evaluation of metastatic spread to locoregional lymph nodes, so that invasive surgical staging may be omitted in many patients with negative mediastinal PET images. Invasive surgical staging remains mandatory in patients with positive mediastinal PET images because of the possibility of false-positive findings owing to inflammatory nodes or granulomatous disorders. PET is a useful adjunct to conventional imaging in the search for metastatic spread. This may be due to the finding of unexpected metastatic lesions or the exclusion of malignancy in lesions that are equivocal on standard imaging. However, at this time, PET does not replace conventional imaging.

The evaluation of SPNs was one of the first Centers for Medicare and Medicaid Services approved and widespread Fluorodeoxyglucose-PET oncologic applications. Collectively, more has been published on the use of FDG-PET in evaluation of SPNs and staging of non–small-cell lung cancer (NSCLC) than any other clinical PET application. The evaluation of lung cancer probably represents the most common application of FDG-PET in most clinical departments.

Lung cancer is currently the leading cause of cancer deaths among both men and women in the United States, with statistical estimates of 169,400 new diagnoses and 154,900 cancer deaths in 2002.

In editing this issue of *Positron Emission Tomography Clinics* on lung cancer, I have endeavored to incorporate the perspectives of a number of specialists who are typically involved in the diagnosis, treatment, and management of patients with lung cancer. Contributions are presented from the perspective of the pulmonary radiologist, the interventional radiologist, the respiratory medical oncologist, the radiation therapy oncologist, and

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nuclear medicine/PET specialists. Two articles were written by individuals who have special additional expertise and experience in medical economics and cost–benefit, cost-effectiveness analysis (CEA).

The article on the diagnosis of lung cancer from the perspective of the pulmonary radiologist is presented by Drs. Teague and Conces. This article is a superb summary of the radiographic features of lung cancer that is very well illustrated with excellent examples of the radiographic features of both benign and malignant nodules and masses. The roles of transthoracic needle biopsy and bronchoscopic biopsy are also discussed.

In their article on staging of lung cancer, Drs. Wynants et al. provide an excellent overview of lung cancer staging as well as detailed information on the N-, T-, and M-factors. They also discuss the impact of FDG-PET in the workup of lung cancer, with emphasis on the valuable role of PET in guidance for invasive procedures. An example of the beneficial impact of PET on overall stage and patient management is the substantial reduction in the number of futile thoracotomies observed when PET is incorporated into the workup.

Dr. Michael Mac Manus provides an entire article devoted to the role of PET in radiation therapy planning. He presents a detailed summary and review of the role of imaging in radiation oncology, with special emphasis on PET and PET/CT. The results of the use of PET for selection of patients for radical radiation therapy and the impact of PET on patient outcomes are also discussed. It is clear that PET is transforming the way that radiation oncologists approach the treatment of lung cancer. The use of PET for selection of patients for radical therapy alone has already improved the apparent success rate with radiation therapy.

In the first article on the cost-effectiveness of FDG-PET, Drs. Hoekstra et al. detail their experience with the introduction of PET in the Netherlands, together with the design of parallel cost-effectiveness studies from their institution and other hospitals in their region. Techniques and designs for decision modeling and clinical value studies are described in detail, along with the intrinsic problems of implementation. The authors define reasonable outcome measures for randomized clinical trials (RCTs) that employ diagnostic imaging procedures, ie, the extent to which appropriate therapy is applied as a result of the diagnostic intervention. The results of their PET in lung cancer staging (PLUS) multicenter study are presented as an example of a well-designed RCT with FDG-PET as the imaging modality, where the use of PET resulted in a 50% reduction in futile thoracotomies.

A more specific example of cost-effectiveness studies in imaging is presented in an article on the cost-effectiveness of PET for characterizing SPNs by Dr. Michael Gould. This article introduces the topic of CEA with a very clear and understandable discussion of CEA compared with other types of economic evaluations. The author also provides the reader with a concise guide to interpreting the results of a CEA. The results of several CEA studies on FDG-PET in SPN are reviewed, with comments and critiques regarding strengths and weaknesses of study design. As the author points out, payers will likely require evidence of cost-effectiveness when making future coverage decisions as health care costs continue to increase in this country.

An important treatise on the accuracy of dual-modality FDG-PET/CT imaging in the staging of NSCLC compared with FDG-PET alone, as well as FDG-PET and CT read side by side, is presented in the article on anato-metabolic imaging by Drs. Freudenberg et al. These authors discuss the value and limitations of software versus hardware imaging fusion in FDG-PET/CT. The results of several recent large studies indicate a definite advantage for hardware dual-modality imaging fusion, inasmuch as the combined modality is able to detect significantly more lesions and has a larger impact on change/modification of patient management. As a bonus, the article provides the reader with an excellent summary of features designed to optimize FDG-PET/CT imaging protocols.

Many thanks are extended to all of the authors who contributed to this issue of *Positron Emission Tomography Clinics* for their diligence and support.

A variation on the ancient Chinese proverb/curse is offered to all: "May we continue to live in interesting times."