Clinical PET: Its Time Has Come

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Commentary: Clinical PET: Its Time Has Come..................Page 561

The Clinical Role of Metabolic Imaging of the Heart by Positron Emission Tomography
Cardiac energy metabolism represents the link between oxygen delivery and contractile performance. Initially, these measurements provided estimates of global myocardial substrate extraction only. The introduction of metabolic tracer techniques made direct evaluation possible. Presently, PET combined with various metabolic radiopharmaceuticals allows for the unique evaluation of cardiac substrate metabolism. ..................Page 565

PET Perfusion Imaging and Nuclear Cardiology
Cardiac PET accurately identifies and assesses the severity of coronary artery stenosis and myocardial viability as a basis for choosing and following the effects of interventions, including risk factor management, pharmacologic agents, PTCA, thrombolysis, and bypass surgery. ..................Page 579

Editorial: The Clinical Role of Positron Emission Tomography for Cardiology in the 1990s and Beyond..................Page 606

PET as a Clinical Tool in the Evaluation of Pituitary Adenomas
In over 400 examinations of patients with pituitary adenoma, PET’s ability (with 11C-methionine) to depict viable tumor tissue in contrast to fibrosis, cysts, and necrosis proved a valuable complement to efforts in diagnosing these tumors..................Page 610

Clinical Application of PET for the Evaluation of Brain Tumors
PET provides important information for the evaluation of brain tumor metabolism, blood flow, and blood-brain barrier permeability. Positron-emitting radionuclides can be incorporated into metabolically important substrates, physiologically important compounds, and therapeutic agents so that many aspects of brain tumors can be characterized..................Page 616

The Applications of PET in Clinical Oncology
A summary of current clinical applications of PET in oncology is presented, with special attention to colorectal, lung, and intracranial neoplasms. A variety of radiopharmaceuticals currently included in clinical tumor imaging protocols are described..................Page 623

Editorial: Commentary on “The Applications of PET in Clinical Oncology”..................Page 649

Epilepsy
Methods for noninvasive localization of epileptogenic foci are becoming increasingly important. Detection of focal brain metabolic or flow abnormalities is now recognized as an essential step in presurgical patient evaluation. PET scanning, when used in concert with a total clinical evaluation, is a valuable tool. Metabolic PET studies also offer insights into the pathophysiologic mechanisms of epilepsy..................Page 651

Commentary: Hurdles to Technology Diffusion: What are Expectations for PET?
Regulatory and economic hurdles to the introduction and the diffusion of expensive new medical instrumentation have changed substantially over the past decade. PET is not an exception. The mechanics of these hurdles and their impact on the availability of PET are examined..................Page 660

Use of the Metabolic Tracer Carbon-11-Acetate for Evaluation of Regional Myocardial Perfusion
A good correlation was observed between the regional uptake of 11C-acetate and perfusion determined with 13N-ammonia in 15 patients. ..................Page 665

Metabolic Activity in the Areas of New Fill-in After Thallium-201 Reinjection: Comparison with Positron Emission Tomography Using Fluorine-18-Deoxyglucose
Changes seen on stress/redistribution/reinjection thallium SPECT scans of 18 patients were compared with PET using [18F]FDG..................Page 673

Regional Wall Thickening of the Left Ventricle Evaluated by Gated Positron Emission Tomography in Relation to Myocardial Perfusion and Glucose Metabolism
In 26 patients with coronary artery disease, the standardized percent count increase from end-diastole to end-systole was calculated as an index of wall thickening using gated PET. ..................Page 679

The Use of FDG-PET in the Detection and Management of Malignant Lymphoma: Correlation of Uptake with Prognosis
Twenty-one patients with untreated malignant lymphoma of the head and neck were evaluated with PET using [18F]FDG. In patients with poor prognosis, higher TCRs and glucose utilization rates were observed than in a patient with low-grade malignancy..................Page 686

Measurements of Glucose Phosphorylation with FDG and PET Are Not Affected by Diphosphorylation of FDG-6-Phosphate
Biologic constraints were imposed on the deoxyc glucose model with and without diphosphorylation coefficients of FDG-6-phosphate. The constraints included constant transport and phosphorylation ratios and a common partition volume for tracer [18F] and glucose..................Page 692
Estimation of Absorbed Doses in Humans Due to Intravenous Administration of Fluorine-18-Fluorodeoxyglucose in PET Studies

Time-activity curves obtained from dynamic PET scans were used to calculate cumulative activity by the MIRD method. Page 699

Radiation Dose to the Bladder Wall from 2-[18F]Fluoro-2-deoxy-D-glucose in Adult Humans

Radiation dose to the bladder wall from injected 2-[18F]FDG was estimated from data on 302 adult subjects using both a dynamic bladder model and the conventional MIRD model. Page 707

D2 Dopamine Receptor-Specific Measurement of Carbon-11-L-Methionine-09151-2 Binding in the Canine Brain by PET: Importance of Partial Volume Correction

After administering various doses of the ligand in nine experiments, regional uptake was followed by repeated PET scanning for up to 80 min. D2 dopamine receptor density (Bmax) and affinity (Kd) in canine striatum were estimated by Scatchard analysis. Page 713

Regional Lung Water Measurements with PET: Accuracy, Sensitivity, Linearity, and Reproducibility

PET scans of lung water concentration and pulmonary blood flow were obtained in 10 animals before and after oleic acid-induced lung injury. Changes in lung water were underestimated unless a separate attenuation measurement was made at baseline and after injury. Page 719

Innovative Approach in the Diagnosis of Gliomatosis Cerebri Using Carbon-11-L-Methionine Positron Emission Tomography

Carbon-11-L-methionine accumulation in the diffusely infiltrative tumorous area defined the lesion extent more precisely than conventional x-ray computed tomography or magnetic resonance imaging. Page 726

Noninvasive Measurement of Lung Carbon-11-Serotonin Extraction in Man

Utilizing the double-indicator diffusion principle, a positron camera, 11C-serotonin as the substrate, and 11C-erythrocytes as the vascular marker, a noninvasive technique to measure lung serotonin uptake in man was developed. Page 729

Parametric Images of Myocardial Metabolic Rate of Glucose Generated from Dynamic Cardiac PET and 2-[18F]Fluoro-2-deoxy-D-glucose Studies

Serial images of FDG uptake and a Patlak graphical analysis of the image data were used to generate images of myocardial metabolic rates. The parametric images improved myocardial contrast relative to non-parametric images. Page 733

Cardiac Beta-Adrenergic Receptor Density Measured In Vivo Using PET, CGP 12177, and a Graphical Method

Five closed-chest dogs were injected with trace amounts of a myocardial beta-adrenergic receptor, followed 40 min later with a second injection of radioligand with a low specific activity. An additional injection of an excess of unlabeled CGP 12177 was administered after 90 min to allow an estimation of the dissociation rate constant. Page 739