
The Journal of Nuclear Medicine

JNMM

Volume 32, Number 1 • January 1991

1 Metabolism and Membrane Integrity in Clinical Myocardial Infarction by PET

16 Methionine Uptake by Growing Human Brain

151 Radionuclide Cisternography for CSF Liquorrhea

A Full Table of Contents Begins on Page 4A, Annotations on Pages 7A-8A



The Official Publication of
The Society of Nuclear Medicine, Inc.

THE JOURNAL OF NUCLEAR MEDICINE (ISSN 0161-5505) is published monthly by The Society of Nuclear Medicine, Inc., 136 Madison Avenue, New York, NY 10016-6760. Second Class Postage paid at New York, NY and additional mailing offices. *Postmaster*, send address changes to *The Journal of Nuclear Medicine*, 136 Madison Avenue, New York, NY 10016-6760.

EDITORIAL COMMUNICATIONS should be sent to the Editor: H. William Strauss, MD, The Journal of Nuclear Medicine, Room 5406 MGH-East, Bldg. 149, 13th St., Charlestown, MA 02129 (617) 726-5786. *Books and monographs* covering the use of nuclear medicine and its allied disciplines will be reviewed as space is available. *Send review copies to the Editor.*

BUSINESS COMMUNICATIONS concerning advertising, subscriptions, change of address, and permission requests should be sent to the publisher, The Society of Nuclear Medicine, 136 Madison Avenue, New York, NY 10016-6760 (212)889-0717. Advertisements are subject to editorial approval and are restricted to products or services pertinent to nuclear medicine. Advertising rates are available from the publisher. Closing date is the first of the month preceding the date of issue.

SUBSCRIPTION RATES for 1991 calendar year are \$120 within the United States; \$130 for Canada and Pan American countries; \$160 elsewhere. Student subscriptions are \$70 (with proof of student status). Single copies \$10.00; foreign \$11.00; convention issue (May) \$12.00; foreign \$13.00. Make checks payable, in U.S. dollars drawn on U.S. banks, to The Society of Nuclear Medicine. Notify the Society of change of address and telephone number at least 30 days before date of issue by sending both the old and new addresses.

COPYRIGHT © 1991 by The Society of Nuclear Medicine, Inc. All rights reserved. No part of this work may be reproduced or translated without permission from the copyright owner. Because the copyright on articles published in *The Journal of Nuclear Medicine* is held by the Society, each author of accepted manuscripts must sign a statement transferring copyright. See Information for Authors for further explanation.

Doubt

I don't know what you believe in, but I don't think you believe in yourself.

STEVEN COONTZ—in *Flight of the Intruder*

The important thing is not to stop questioning.

ALBERT EINSTEIN

An act requires three phenomena to occur: willingness, energy, and direction. Self-confidence helps provide all three. Doubt removes the confidence necessary to act.

This is not the doubt of scientific skepticism. The "I don't believe it" mentality is healthy; it is important for progress. Skeptics may be so knowledgeable that the errors are obvious, or so naive that their incomplete understanding allows a totally new vision of the problem. Both reexamine the facts. As more minds mull the matter, additional analyses are performed, faults are found, our understanding of the problem is improved, and the frontiers are pushed a little further ahead. Most skeptics have strong egos. They are not embarrassed to ask, nor are they afraid of the answer.

Lack of self-confidence is destructive. It leads to a sense of worthlessness. It brings uncertainty, inaction, and depression. While doubt can be constant, it is more often episodic, usually associated with error. When the mistake is recognized, there is a sense of remorse, accompanied by doubt. It is difficult to succeed with doubt looking over your shoulder. Frequently, doubt can be treated with simple maneuvers—a few deep breaths, some time for reflection, and the ability to reach back into memory for the parental smile that said: "You can do it!" When doubt is replaced by a sense of cautious confidence, the willingness to try reemerges.

Some doubt is healthy. It leads to a need to try harder: to make it that much better, to enhance the likelihood of success. No doubt leads to complacency: the problem is not important enough to worry about. The relationship of doubt to behavior is like the Starling curve—people operate best with some—but too much leads to failure.

It is a new year. Time to implement those resolutions about self-improvement. We at the *Journal* will do our best to leave little doubt about the role of nuclear medicine in health care.

H. William Strauss
Editor, *The Journal of Nuclear Medicine*

Myocardial Metabolism of Fluorodeoxyglucose Compared to Cell Membrane Integrity for the Potassium Analogue Rubidium-82 for Assessing Viability and Infarct Size in Man by PET

Forty-three patients with evolving myocardial infarction had PET scans using FDG and the potassium analogue ⁸²Rb. The percentage of heart showing FDG defects and ⁸²Rb washout was visibly assessed and then quantified by automated software. Infarct size determined by ⁸²Rb clearance correlated with the FDG images. Page 1

Editorial: Myocardial Viability—What Is the Definition? Page 9

Indium-111-Labeled Leukocyte Scan in the Detection of Synthetic Vascular Graft Infection: The Effect of Antibiotic Treatment

Of 41 consecutive labeled leukocyte scans, 23 were performed in patients treated with antibiotics. The average duration of antibiotic therapy was 21 days. Twelve positive and 11 negative scans for graft infection were observed for a sensitivity of 100% with 85% specificity. Page 13

L-Methionine Uptake by Human Cerebral Cortex: Maturation From Infancy to Old Age

Seventeen patients, 1.8–71 yr, had PET scans with [¹¹C]L-methionine at baseline and after competitive inhibition of uptake with L-phenylalanine or an i.v. infusion of amino acids. Page 16

Editorial: Imaging Human Brain Development with Positron Emission Tomography Page 23

Long-term Follow-up in Toxic Solitary Autonomous Thyroid Nodules Treated with Radioactive Iodine

Fifty-two patients treated with ¹³¹I were followed for 10±4 yr. Recurrent hyperthyroidism was noted in 2%. The incidence of hypothyroidism was not related to the dose per gram of nodular tissue. Page 27

Editorial: The Autonomously Functioning Thyroid Nodule Page 30

Bone Scanning in the Early Assessment of Nasal Bone Graft Viability

Twenty patients had three-phase bone scanning of the facial region performed between 2 and 15 wk after rhinoplasty. A comparison was made between the results of clinical assessment and X-ray findings 3 mo after surgery. Page 33

Clinical Validation of a Miniature Nuclear Probe System for Continuous On-line Monitoring of Cardiac Function and ST-Segment

Ejection fraction measurements in 77 patients were compared with gated equilibrium radionuclide ventriculograms. Background was measured manually and automatically. There was good correlation between probe and gamma camera ejection fraction. Use of the gamma camera did not significantly alter the results. Correlation between probe stroke counts and thermodilution-derived stroke index was satisfactory. Page 37

Editorial: Continuous Radionuclide Monitoring of Left Ventricular Function: Has the Time Come? Page 44

Quantification of Hepatobiliary Function as an Integral Part of Imaging with Technetium-99m-Mebrofenin in Health and Disease

The feasibility of integrating hepatobiliary imaging with hepatic extraction fractions (measured by deconvolution analysis) and excretion T-1/2 values (by non-linear least-square's fit) was evaluated in 18 control patients. Page 48

Sensitivity of Measurements of Regional Brain Activation with Oxygen-15-Water and PET to Time of Stimulation and Period of Image Reconstruction

The authors investigated 10 controls with ¹⁵O-water and PET during baseline and stroboscopic light stimulation. Sequential scans were taken, varying the time of stimulus presentation. Images were reconstructed during uptake, washout, and total-activity phases. Page 58

Comparison of Oxine and Tropolone Methods for Labeling Human Platelets with Indium-111

The studies results indicate that careful handling of platelets should give acceptable and comparable results, irrespective of the chelate utilized. Page 62

Indium-111-Chloride and Three-Phase Bone Scintigraphy: A Comparison for Imaging Experimental Osteomyelitis

Eleven dogs were serially imaged by radiography, three-phase ^{99m}Tc-MDP, and ¹¹¹In-Cl scintigraphy following experimental infection of the tibia. Page 67

In Vitro and In Vivo Characterization of 4-[¹²⁵I]Iododexetimide Binding to Muscarinic Cholinergic Receptors in the Rat Heart

There was high accumulation in vivo of iododexetimide in the rat atrium and ventricle, which could be blocked by preinjection of atropine. Accumulation of the radiolabeled stereoisomer iodolevetimide was 63% lower and was not blocked by atropine. Data indicate that 4-[¹²⁵I]iododexetimide binds potentially to rat muscarinic cholinergic receptors. Page 76

20-[¹⁸F]Fluoromibolone, a Positron-Emitting Radiotracer for Androgen Receptors: Synthesis and Tissue Distribution Studies

Fluoromibolone was synthesized in eight steps from 7-a-methyl-19-nortestosterone, with fluorine introduced in the penultimate step by

fluoride ion displacement on a spirocyclic sulfate..... Page 81

Radioimmunodetection of Degranulated Human Eosinophils in Mice: A Potential Model for Imaging Hodgkin's Disease and Other Pathologic Conditions

Adult mice were injected intravenously with radiolabeled EOS antibody or with similarly labeled normal mouse IgG before receiving an intramuscular injection of homogenized human eosinophils adsorbed to latex microspheres..... Page 89

Selective 2-[¹⁸F]Fluorodopa Uptake for Melanogenesis in Murine Metastatic Melanoma

The relationship between 2-[¹⁸F]FDOPA uptake and melanogenesis was studied using mice bearing two B16 melanomas. Whole-body autoradiography clearly discriminated in the two melanomas..... Page 95

Dosimetric Estimates for Clinical Positron Emission Tomographic Scanning after Injection of [¹⁸F]-6-Fluorodopamine

After injection of 1 mCi of [¹⁸F]FDA, this study suggests the dose would be highest to the wall of the urinary bladder, due to accumulation of radioactive metabolites of [¹⁸F]FDA in urine..... Page 102

Sensitivity of Technetium-99m-d,l-HMPAO to Radiolysis in Aqueous Solutions

After sensitivity testing of ^{99m}Tc-HMPAO in radiolytically-induced dissociation in aqueous solutions, the authors conclude that radiolytically produced intermediates limit the in vitro stability of ^{99m}Tc-HMPAO..... Page 111

Antigen-Binding Site Protection During Radiolabeling Leads to a Higher Immunoreactive Fraction

Antibodies were radiolabeled at several iodine/antibody molar ratios under conditions protecting the combining site. They were then compared for immunocompetence

and charged with antibodies radiolabeled without protection..... Page 116

Editorial: The Advantage of Protecting the Antigen-Binding Site During Antibody Labeling..... Page 122

Comparison of Shunt Fraction Estimation Using Transcolonic Iodine-123-Iodoamphetamine and Technetium-99m-Per technetate in a Group of Dogs with Experimentally-Induced Chronic Biliary Cirrhosis

An apparent inability to accurately assess high shunt flows suggests that the quantitative aspects of per technetate may be of limited use in studies of patients with severe portosystemic shunting..... Page 124

Clinicopathologic Conferences: Detection of Myocardial Viability with Positron Emission Tomography in a Patient with Ischemic Cardiomyopathy..... Page 130

Bronchobiliary Fistula Detected by Cholescintigraphy

A patient developed biliptysis 18 mo after undergoing a right hepatic lobectomy and resection of the common bile duct for cholangiocarcinoma..... Page 136

Microvascular Right-to-Left Pulmonary Shunt Demonstrated by a Radionuclide Method

A 37-yr-old man with angiolymphoid hyperplasia, treated unsuccessfully for asthma, was investigated due to a decrease in arterial oxygen saturation. Right ventricle catheterization and angiography of the pulmonary artery failed to demonstrate any right-to-left shunts..... Page 139

Validation of the Circular Harmonic Transform Algorithm for Quantitative SPECT

Volumes of fillable organs within a tissue-equivalent anthropomorphic phantom were determined using a threshold technique. The CHT algorithm incorporates the energy-

distance relationship (EDR), minimizing the degrading effects of attenuation and scatter..... Page 141

Intestinal Activity Visualized on Radionuclide Cisternography in Patients with Cerebrospinal Fluid Leak

Three surgically proven cases of cerebrospinal fluid leak were detected by intestinal activity following administration of ¹¹¹In-DTPA for radionuclide cisternography..... Page 151

Validation of Simultaneous PET Emission and Transmission Scans

A point source, masked into a fan beam of annihilation photons, orbits the patient section being studied. Coincident events are sorted into two buffers, or rejected, based on source position. Both static and dynamic frames of independent and simultaneous studies are compared..... Page 154

A Segmented Attenuation Correction for PET

This technique segments the transmission image into anatomical regions by thresholding the histogram of the attenuation values corresponding to different regions..... Page 161

Editorial: Symbiotic Developments in PET and SPECT to Quantify and Display Myocardial Tomography..... Page 166

Radiation Safety Considerations for Post-Iodine-131 Hyperthyroid Therapy

External exposure rates were measured on 59 patients using an ionization survey instrument in the upright position. Exposure rates were measured at 20 min and 2-11 days post-dose administration at 1, 0.6, and 0.3 meters from the patient's thyroid..... Page 169

Continuing Education: Therapeutic Radionuclides: Production and Decay Property Considerations..... Page 174