of fasting reported by Dr. Gropler. However, evidence of heterogeneity in normal subjects following longer, yet still physiologic, fasting periods is still lacking. Thus, at the present time there is no evidence for rejecting the use of protocols based upon overnight fasting when metabolic conditions appear to be more stable.

Finally, based upon the above considerations and the results of Dr. Gropler's studies, it is evident that at the present status of knowledge the FDG method can be properly used only in subjects with normal carbohydrate metabolism.

REFERENCES

1. Gropler RJ, Siegel BA, Lee KJ, et al. Nonuniformity in myocardial accumulation of fluorine-18-fluorodeoxyglucose in normal fasted humans. *J Nucl Med* 1990;31:1749–1756.
2. Schwaiger M, Hicks R. Regional heterogeneity of cardiac substrate metabolism [Editorial]. *J Nucl Med* 1990;31:1757–1760.
3. Camici P, Ferrannini E, Opie LH. Myocardial metabolism in ischemic heart disease: basic principles and application to imaging by positron emission tomography. *Prog Cardiovasc Disease* 1989;23:217–238.
4. Hicks RJ, Herman WH, Kalff V, Wolfe E, Kuhl DE, Schwaiger M. Effect of insulin and free-fatty acid levels on myocardial glucose metabolism demonstrated by PET-derived FDG kinetics. *J Nucl Med* 1990;31:802.
5. Gray RS, Scarlett JA, Griffin J, Olefsky JM, Kolterman OG. In vivo deactivation of peripheral, hepatic, and pancreatic insulin action in man. *Diabetes* 1982;31:929–936.
6. Howard BV, Mott DM, Fields RM, Bennett RH. Insulin stimulation of glucose entry in cultured human fibroblast. *J Cell Physiol* 1979;101:129–138.
7. Neely JR, Morgan HE. Relationship between carbohydrate and lipid metabolism and the energy balance of heart muscle. *Ann Rev Physiol* 1974;36:413–459.
8. Randle PJ, Kerbey AL, Espinal J. Mechanisms decreasing glucose oxidation in diabetes and starvation: role of lipid fuels and hormones. *Diabetes Metab Rev* 1988;4:623–638.
9. Hartree W, Hill AV. Regulation of the supply of energy in muscular contraction. *J Physiol* 1921;55:133–138.

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REPLY: We appreciate the thoughtful comments of Dr. Fragasso and his colleagues with regard to our study recently published in the *Journal* (*1*). We concur with many of the points made by the authors. However, certain comments are in order.

1. We agree that various levels of fasting (with subsequent changes in the pattern of myocardial substrate utilization) can occur and can influence the myocardial uptake of ^{18}F-fluorodeoxyglucose (FDG). The aim of our study was to demonstrate that regional myocardial FDG accumulation differed in the fasted and fed state, but we obviously could not study all possible levels of substrate availability. Our observations have recently been corroborated by others, where similar patterns of heterogenous myocardial accumulation of FDG were observed in normal humans subjected to a more prolonged fast (i.e., >12 hr) (*2*).
2. Occult myocardial disease or regional differences in myocardial contractility certainly would be potentially confounding variables. However, as outlined in our paper, we felt these were unlikely explanations for the differences we observed in regional FDG accumulation. All the subjects studied were under 30 yr of age and healthy, and thus, had a very low likelihood of having occult myocardial disease. Because the regional differences in myocardial accumulation of FDG were sensitive to the pattern of substrates presented to the heart, it would have to be postulated that regional contractile performance is sensitive to levels of serum substrates as well. There is no evidence in the literature to support this hypothesis. Finally, our observations that myocardial oxidative metabolism (based on the measurement of ^{11}C-acetate tissue kinetics) was regionally homogeneous speak against the presence of regional differences in myocardial contractile performance. Although, Fragasso and colleague's observation of mild mitral regurgitation with slight prolapse of the posterior leaflet in three of their subjects demonstrating relatively increased myocardial uptake of FDG localized to the free wall is interesting, without the echocardiographic evaluation of all of their subjects (those with and without localized myocardial accumulation of FDG), the significance of these findings cannot be ascertained.

Finally, as our understanding of myocardial carbohydrate metabolism, under both normal and pathologic conditions, continues to evolve, so will our understanding of myocardial FDG kinetics. We share the concern expressed by Fragasso et al. regarding the accurate interpretation of patterns of myocardial accumulation of FDG in relation to cardiac pathophysiology. However, we believe unique insights into myocardial metabolism can be obtained with this tracer, provided that the relationship of myocardial uptake of FDG to substrate availability is appreciated and that such studies are performed under conditions where the substrate environment is controlled.

REFERENCES

1. Gropler RJ, Siegel BA, Lee KJ, et al. Nonuniformity in myocardial accumulation of fluorine-18-fluorodeoxyglucose in normal fasted humans. *J Nucl Med* 1990;31:1749–1756.
2. Berry JJ, Pieper KS, Hoffman JM, Coleman RE. Glucose loading significantly alters myocardial PET FDG/blood-pool activity, glucose, insulin and free-fatty acid levels in normal volunteers [Abstract]. *Am Coll Cardiol* 1991;17:379A.

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ART: Ambiguous Radioimaging Terminology

TO THE EDITOR: I am awed by your vanity in proposing a new acronym for the already historic term PET, which was coined by a prominent PET pioneer many years ago. I also disagree that the term PET is any more misleading than the term you suggest—ART (*1*). It is true that positrons are not imaged during PET. However your substitution of annihilation radiation is ill conceived because of its ambiguity. You see there are many types of

annihilation radiation that arise whenever anti-matter equivalents capture each other. Positron-electron annihilation pairs are unique to that process, and the term positron in PET at least specifies the process that produced them.

In addition, ART is an acronym utterly familiar to any electrical engineer, signifying the algebraic reconstruction technique algorithm for image reconstruction from projection data. Thus, ART is doubly ambiguous. I think PET is a fine term and comes closer to meeting your own criteria than ART does. By the way, SPECT permits tomographic reconstruction in any orientation—not just the transaxial, as you imply. Try again Dr. Strauss!

REFERENCE

1. Strauss HW. The ART of PET. *J Nucl Med* 1991;32:3A.

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REPLY:

EDITOR'S NOTE: *A rose by any other name . . . .*

(continued from page 1812)

SELF-STUDY TEST
Gastrointestinal Nuclear Medicine
ANSWERS

veniently classified according to age groups. Despite the fact that 50% of symptomatic patients with Meckel's diverticula present before the age of 2 yr, it is the most frequent cause of severe lower intestinal bleeding in all pediatric age groups.

Although Meckel's diverticula usually contain ileal mucosa, ectopic tissue including gastric, duodenal or colonic mucosa, and pancreatic tissue also may be present. The prevalence of gastric mucosa is estimated to be between 30% and 50%. Because hemorrhage results from mucosal ulceration in the diverticulum or adjacent ileum caused by the secretion of hydrochloric acid and pepsin, nearly all diverticula responsible for bleeding contain ectopic gastric mucosa.

The sensitivity with which ectopic gastric mucosa is detected depends, to a large extent, on the imaging technique. Patients should be studied after a 4-hr fast, to prevent the rapid emptying of [^{99m}Tc]pertechnetate from the stomach into the small bowel, which can obscure the field of interest. It is best to discontinue medications such as laxatives for 2–3 days, because these may cause hyperemia of the bowel with resultant increased accumulation of [^{99m}Tc]pertechnetate.

Although it is true that there is significant thyroidal uptake of [^{99m}Tc] pertechnetate, premedication with potassium perchlorate should not be performed. This not only will block thyroid uptake, but also will inhibit gastric uptake, in addition to that by salivary glands and choroidal plexus. It is useful to administer percholorate after completion of the study to facilitate washout of the tracer from the thyroid gland.

A review of 226 [^{99m}Tc]pertechnetate imaging studies with surgically proven diagnoses showed the sensitivity to be 85% and the specificity 95%. In another review there were 30 positive scans in 270 children. It was felt that the [^{99m}Tc]pertechnetate scan should detect 80%–90% of Meckel's diverticula, whereas a negative study excludes the diagnosis in over 90% of patients.

References

1. Boyle JT. Gastrointestinal bleeding. In: Fleischer G, Ludwig S, eds. *Textbook of pediatric emergency medicine*. Baltimore: Williams and Wilkins; 1983: 159–169.
2. Cooney DR, Duszynski DO, Camboa E, Karp MP, Jewett TC. The abdominal technetium scan (a decade of experience). *J Pediatr Surg* 1982;17:611–619.
3. Sfakianakis GN, Conway JJ. Detection of ectopic gastric mucosa in Meckel's diverticulum and in other abberations by scintigraphy: II. Indications and methods—a 10-year experience. *J Nucl Med* 1981;22:732–738.

ITEMS 14–18: Carbon-14-Xylose Breath Testing

ANSWERS: 14, F; 15, F; 16, F; 17, T; 18, F

King and Toskes have reviewed the ideal characteristics of a breath test for the diagnosis of bacterial overgrowth. Several factors favor the use of ^{14}C-xylose. It is primarily absorbed in the small bowel; thus, little normally reaches the colonic bacteria. There is no normal host tissue metabolism of xylose and no increase in endogenous CO_2 output will occur after administration of 1 g of xylose. In contrast, endogenous CO_2 output may increase with the bile-salt breath test. Sensitivity is greater with the xylose test because it is catabolized by Gram-negative aerobes, whereas the bile acid breath test depends on the presence of anaerobes, which may or may not be present in the overgrown flora.

King and Toskes report that many patients with malabsorption from bacterial overgrowth will have a positive xylose breath test and negative intestinal culture. These patients will show reversal of malabsorption following antibiotic therapy. Thus, the xylose breath test appears to be a more reliable functional indicator of bacterial overgrowth than the intestinal biopsy.

Reference

1. King CE, Toskes PP. The use of breath tests in the study of malabsorption. *Clin Gastroenterol* 1983;12:591–610.

Note: For further in-depth information, please refer to the syllabus pages included at the beginning of *Nuclear Medicine Self-Study Program I: Part I.*