

Thallium-201: The Elusive Radionuclide

During the past year, interest in the clinical applications of thallium-201 myocardial perfusion imaging (MPI) has diminished. Unquestionably, this has resulted from the high cost, lack of ready availability, and need of specialized image-processing equipment. The question of early redistribution and interobserver variability, however, has also contributed to this trend. A more important reason, we submit, is the clinician's reluctance to order the test because of the lack of well-defined indications. In light of current thinking (1), many feel that MPI should be employed as a screening test for the detection of coronary-artery disease. The clinical series of Bailey et al. (2) and of Ritchie et al. (3) suggested such to be the case. Other indications for thallium-201 imaging—myocardial infarct imaging, diagnosis of cardiomyopathies and idiopathic hypertrophic subaortic stenosis, and pulmonary hypertension—are much less well accepted.

The article of Verani et al. in the July issue of the *Journal* (4) will receive widespread attention by many clinicians. These authors addressed the role of MPI as an adjunct to the exercise electrocardiogram (GTX). They used surprisingly unsophisticated imaging techniques. No background subtraction, gating, cinematic display, or spatial count-rate normalization was applied. Instead, a gamma camera fitted with a LEAP collimator was used and exercise imaging with a count density of 1,500–2,000 counts/cm² in the region of the myocardium was performed. Their patient population was limited to symptomatic patients suspected of having ischemic heart disease. Asymptomatic patients with positive GTX were not studied. In patients with coronary-artery disease, the sensitivity of MPI was 79%; when GTX and MPI were combined, this was increased to 94%. However, the combination of GTX and MPI decreased specificity because of the large number (24%) of falsely positive GTX tests. Interobserver variation (5) was considered only briefly.

In this era of accountability and alarming increase in cost of medical care, it becomes imperative to define cost-effectiveness of diagnostic procedures. A major implication of the study of Verani et al. is that MPI is the most cost-effective adjunct of GTX in the diagnosis of ischemic heart disease. We submit, and in the past have pleaded for, specific clinical research to define whether the screening of symptomatic patients with ischemic heart disease should be GTX + MPI or GTX + exercise radionuclide angiography (6). It is evident that GTX + MPI + exercise radionuclide angiography would be least cost-effective. A decision must be made for the screening of patients with ischemic heart disease, patients with chest pain and normal coronary arteries, and asymptomatic patients with abnormal GTX. We strongly encourage clinical research in this field.

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Pertechnetate Demonstration of a Barrett's Esophagus Involving the Length of the Esophagus

In a Barrett's esophagus, the mucosa of the lower esophagus is lined with columnar epithelium of the gastric type rather than the normal stratified squamous epithelium. Frequently gastric mucosa extends to the middle esophagus and occasionally to the upper thoracic segment. In a review of the literature we found two cases with involvement of the cervical esophagus (1,2). This report describes a patient with extension of the columnar epithelium to the upper cervical esophagus. An abnormal barium esophagogram initiated a request for a pertechnetate radionuclide study.

The 61-year-old man with a history of alcoholism had a trans-thoracic hiatus hernia repair in 1964 for increasing "heartburn". Esophagoscopy at that time showed gastric reflux to the cervical esophagus. He was first seen at our institution in September 1976, for frequent episodes of hematemesis, black stools, dysphagia, "heartburn," upper epigastric pain, and iron-deficiency anemia. An upper GI series showed stenosis of the immediate proximal portion of the cervical esophagus (Fig. 1), irregular mucosa and thick folds in the lower esophagus, a hiatus hernia (Fig. 2), and gastroesophageal reflux.



FIG. 1. (Left) Stricture in cervical esophagus at C5 level. Dysplastic gastric mucosa extended to lower margin of stricture.



FIG. 2. (Right) Thick folds in esophagus, especially its lower portion.

The fasting patient was given 5 mCi of [^{99m}Tc] pertechnetate intravenously, without perchlorate. Scintigrams were obtained of the stomach and esophagus with the gamma camera at 10, 15, 45, and 50 min postinjection, in AP and lateral upright projections to minimize possible gastroesophageal reflux. We used a scintillation camera with a diverging collimator, and acquired images with 300,000 cts. Cephalad to the dense uptake of the characteristic stomach configuration there was tracer uptake throughout the length of the esophagus.

At esophagogastrosocopy, the mucosa proximal to the cervical stenosis appeared normal. Distal to the stenosis the mucosa was diffusely reddened and friable, with multiple islands of small

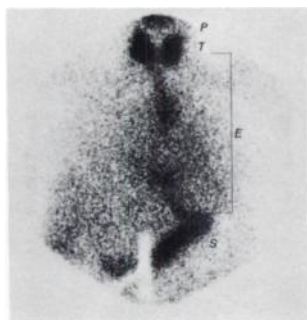


FIG. 3. (Left) Anterior scintigram taken at 45 min. Pertechnetate uptake noted in stomach (S), entire esophagus (E), thyroid (T), and salivary glands (P).



FIG. 4. (Right) Lateral view of patient taken at 50 minutes post injection. Tracer uptake throughout the entire esophagus. (Thyroid uptake not seen on the lateral view.)

patchy nodules. The cervical and midthoracic esophagus showed gastric mucosal dysplasia. (No parietal cells were found.) Well-differentiated adenocarcinoma was encountered at the other biopsy sites in the proximal and lower esophagus, as well as within the hiatus hernia.

As described by Barrett in 1950 (3), the gastric type of epithelium contains goblet and enterochromatine cells, and parietal cells are seen only in about half of the cases. Columnar metaplasia is considered an irreversible acquired process secondary to chronic gastroesophageal reflux and carcinomatous degeneration of columnar epithelium has been frequently reported (4).

Such patients typically present with a history of dysphagia, "heartburn," and regurgitation, with frequent episodes of hematemesis. Roentgenologically, the diagnosis is suspected in the presence of a combination of a hiatus hernia, gastroesophageal reflux, stricture, mucosal irregularities, and esophageal ulcers. In 1973, Berquist et al. (5) described the application of radionuclide scanning in the diagnosis of patients with Barrett's esophagus, based on the principle of selective uptake of pertechnetate by ectopic gastric mucosa (6). Autoradiographic studies by Berquist demonstrated that the pertechnetate is taken up not only in the parietal cells but also in the surface epithelial cells of all types of gastric mucosa of intra- or extragastric location (7).

It is suggested that patients with a suspicious clinical history and barium esophagogram undergo a pertechnetate scintigram as a useful supporting test. The diagnosis should be confirmed by endoscopy with biopsy. Once the diagnosis of Barrett's esophagus has been firmly established, careful followup with cytology and biopsy is indicated because of the premalignant nature of Barrett's esophagus.

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Accepted Articles to Appear in Upcoming Issues

Comparison of the Distribution of Diagnostic and Thyroablative I-131 in the Evaluation of Differentiated Thyroid Cancers. Accepted 2/10/78.

Jan Nemec, Svatopluk Rohling, Vaclav Zamrazil, and Dagmar Pohunkova

Evaluation of Peritoneo-Venous Shunt (Letter to the Editor). Accepted 2/21/78.

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Comments on Equilibrium, Transient Equilibrium, and Secular Equilibrium in Serial Radioactive Decay. Accepted 7/11/78.

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