bypass grafts is suggested by: a) improved segmental wall motion during exercise following aortocoronary bypass (13); b) improved myocardial perfusion both at rest and during isoproterenol infusion using the xenon-133 clearance technique (14); and c) measurements of blood flow in bypass grafts many months following surgery using video densitometry (15).

Finally, we have demonstrated that perfusion scintigrams are improved following aortocoronary bypass surgery. In our study, the postoperative perfusion scintigrams were improved in 19 of 23 patients, and returned to normal in nine. Other investigators have made similar observations (16). All of these studies strongly support the concept that the clinical improvement following aortocoronary bypass is normally due to improved perfusion of ischemic myocardium.

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LETTERS TO THE EDITOR

Gallium Accumulation in the Stomach: A False-Positive Scan Suggesting Abscess

Gallium has been used successfully to locate abscesses, particularly in the subdiaphragmatic region where other diagnostic procedures are often less reliable (1-3). Because tissue uptake and retention of gallium is not specific for abscess, awareness of circumstances that could falsely suggest gallium uptake is necessary for meaningful scan interpretation.

Recently we observed the intraluminal presence of gallium in the stomach 18 hr after the administered dose. Intraluminal gastric retention led initially to the false impression of a left subdiaphragmatic abscess in this patient, who had a past history of laparotomy. To our knowledge this has not been reported previously. Intraluminal accumulation in the stomach, although rare, should be added to the list of situations leading to false-positive gallium scans simulating subdiaphragmatic abscess or tumor.

Case report. In January, 1978, a 24-year-old woman with biopsy-proven focal nodular hyperplasia involving most of the right lobe of the liver was seen for reevaluation after discontinuation of contraceptive medication. She was free of symptoms. A sulfur-colloid liver scan showed normal uptake in the region of the known tumor. As part of an investigational protocol and after informed consent, a gallium scan was performed 18 hr after i.v. administration of 5 mCi of Ga-67 citrate. This was done with an LFOV gamma camera with triple-window facilities to include the upper three peaks of the gallium spectrum.

The gallium scan revealed an unexpected area of focal gallium accumulation in the left upper quadrant region of the stomach. Since laparoscopy had been performed about 1 yr before her presentation, a left subdiaphragmatic abscess was considered in the differential diagnosis. However, because of the absence of any history, signs, or symptoms suggesting sepsis or gastric disease, this finding was further evaluated by imaging the stomach after 1 mCi of Tc-99mTcO4· was given orally with a glass of water. Computer-processed images (4) made with gallium and Tc-99m (stomach) showed superimposition of activity, indicating

FIG. 1. (A) Gallium scan before oral dose of Tc-99m shows left subdiaphragmatic accumulation. (B) Same region after two glasses of water (with Tc-99m), demonstrating that gallium has left the stomach. Both images were obtained with triple-window setting, including upper three energy peaks of Ga-67, but excluding Tc-99m peak.
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that the gallium activity was located near the stomach. After another glass of water was taken, the stomach was imaged again, using the upper three gallium peaks and thus excluding the Tc-99m energy. This showed that the gallium activity was no longer present in the stomach (Fig. 1). Gallium and Tc-99m were seen on the oscilloscope to enter the small bowel. An image taken 30 min later did not show any recurrent uptake in the stomach.

Discussion. Gallium is excreted through the intestinal wall of almost the entire gastrointestinal tract and in small amounts through the liver and biliary tract (5, 6). Orally administered Tc-99m has been used in our laboratory (7, 8) and in other nuclear medicine facilities (9), along with computer-assisted subtraction techniques (4), to help in recognizing this normal, intraluminal uptake. Secretion of gallium into the stomach is not recognized as a common excretory pathway (5, 6), and gallium is not observed in the stomach, even when scans are performed as early as 6 hr after administration of the dose.

Our patient had no clinical or laboratory evidence suggestive of gastric or proximal gastrointestinal disease. The uptake of gallium in the liver and its appearance in the lower intestinal tract were normal on scans.

Uptake of gallium in the stomach has been associated with diseases of the stomach, particularly gastric lymphoma. In these cases, however, gallium is considered to be localized intramurally within the pathologic lesion, and not intraluminally, as was true in our case.

Experience suggests that gallium rarely accumulates in the stomach. Such an accumulation may lead to a false diagnosis of a left subdiaphragmatic abscess or lymphoma of the stomach. We suggest that, before a left subdiaphragmatic accumulation of gallium is considered to represent an abscess or tumor, an image should be made after the ingestion of one or two glasses of water.

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The Validity of Performing a Ventilation Study after the Perfusion Lung Scan

Coates and Garnet (1) suggest that there are problems when the ventilation lung scan using Xe-133 gas is performed after the perfusion scan because of Tc-99m scatter background in the 80-keV window of Xe-133. Craddock and Driedger (2) feel this objection can be removed, in institutions where data processing is available, by the use of computer-assisted background subtraction. We disagree. Background subtraction is not necessary. The interpretation of Xe-133 ventilation studies following a perfusion scan suffers very little from the background of scattered Tc-99m photons.

In 23 consecutive cases of suspected pulmonary embolism, the diagnostic value of film was compared with that of computer-displayed images with and without technetium background subtraction. The perfusion image was obtained using 2 mCi of Tc-99m MAA. The ventilation study used a concentration of about 1.6 mCi of Xe-133 gas per liter.

Our experimental protocol was as follows:

1. For film:
   a) one perfusion image (maximum information density of 1000 counts/cm² (ID of 1000): b) six ventilation images: first two of washin (ID of 1000), the third of equilibration (ID of 1000), and the last three of washout (1 min each).

2. For computer images (stored in a 64 × 64 matrix):
   a) one 2-min perfusion image:
   b) one 30-sec image of Tc-99m background in the Xe-133 window;
   c) eighteen images of 30 sec each during the ventilation phases of washin, equilibration, and washout.

The film and computer images were interpreted by one of us (RM). To reduce bias, each image modality was reviewed separately in a single session with a different sequence for each modality. To enhance computer analysis, macros were written to generate 10 parametric images of pseudo V/Q ratios, and dynamic playback of the ventilation study. Two sets of macros were written, one with and one without background subtraction.

Table 1 summarizes our results. The diagnosis made from images on film, and on computer with background subtraction

| TABLE 1. COMPARISON OF DIAGNOSIS MADE USING DIFFERENT RECORDING AND ANALYSIS METHODS |
|-----------------|-----------------|-----------------|
| Comparison made | COLD + PE        | COLD PE         |
| F - C           | 17 (74%)        | 19 (83%)        |
| F - GS          | 20 (87%)        | 21 (91%)        |
| C - F           | 18 (78%)        | 19 (85%)        |
| F - FD          | 18 (78%)        | 19 (85%)        |
| C - FD          | 14 (61%)        | 17 (74%)        |
| CS - FD         | 16 (70%)        | 18 (78%)        |

COLD = chronic obstructive lung disease
PE = pulmonary embolism
F = diagnosis made from film
C = diagnosis made from computer images without Tc-99m background subtraction
CS = diagnosis made from computer images with Tc-99m background subtraction
FD = final patient diagnosis
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