

Imaging the Bowel with Technetium—And Aid in Gallium Studies

Owen Van Kirk, Neil Chafetz, Steven Cooke, Andrew Taylor, Jr., and Steven M. Larson

Veterans Administration Hospital, Seattle, Washington, University of Oregon, Portland, Oregon, and University of California, San Diego, California

Three cases are presented to demonstrate the usefulness of oral or rectal technetium-99m preparations in locating the stomach and bowel in relation to abnormal accumulation of gallium-67 within the abdomen. In this way, the concentration of gallium in an abscess or a tumor may be distinguished from its physiologic excretion into the bowel.

J Nucl Med 19: 69–70, 1978

Experience has shown Ga-67 citrate to be useful in the diagnosis and management of abscesses (1) and a variety of tumors (2), particularly lymphoma and bronchogenic carcinoma. Among the factors that limit the usefulness of Ga-67 citrate in the abdomen is its physiologic excretion into the small and large bowels. The use of laxatives or enemas before scanning—or repeat scanning at 24-hr intervals—are frequently only partially successful, and leave many cases equivocal. In addition, it may be useful to know the anatomic relation of a particular lesion to the stomach or bowel. We have found that repeat imaging after the oral or rectal administration of technetium preparations is useful in locating the bowel in relation to the superimposed gallium images.

CASE REPORTS

Case 1. An 80-year-old woman was found to have poorly differentiated lymphoma, stage 1A, involving the left upper extremity. Eighteen months later she was readmitted because of recurrent symptoms, and restaging was undertaken. A scan performed following the i.v. injection of 3 mCi of Ga-67 citrate showed increased activity in the left upper quadrant of the abdomen. In order to determine the relationship of this increased activity to the gut, 3 mCi of [^{99m}Tc] pertechnetate were administered orally and the scanning immediately repeated. Superposition of the gallium and technetium scans showed the abnor-

mal gallium activity to be intimately related to the lesser curvature of the stomach. Subsequent endoscopy revealed a large submucosal mass in the lesser curvature of the antrum which had eroded into the gastric lumen. Biopsy specimens from this area revealed poorly differentiated lymphoma (Fig. 1).

Case 2. A 54-year-old man underwent subtotal gastrectomy for gastric carcinoma in July 1974. In April 1976, endoscopy revealed recurrent tumor in the gastric pouch. A metastatic workup was uninformative and he subsequently underwent total gas-

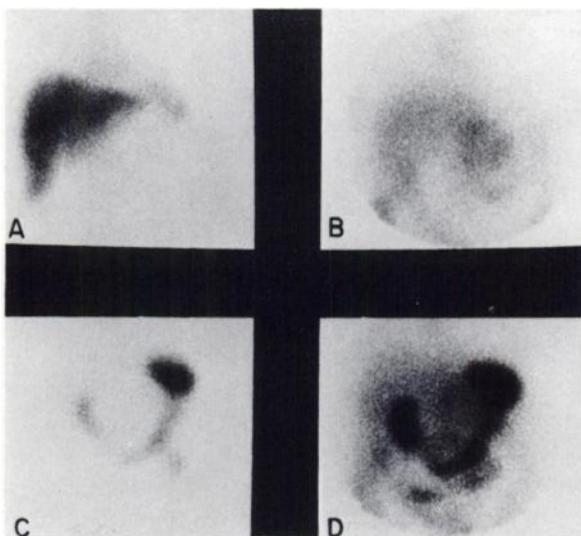


FIG. 1. (A) Normal liver scan with Tc-99m sulfur colloid. (B) Ga-67 scan, showing increased activity in left infrahepatic region. (C) Oral [^{99m}Tc] pertechnetate outlining stomach. (D) Superimposed Ga-67 and oral pertechnetate scans, showing lesion adjacent to stomach.

Received June 2, 1977; revision accepted Sept. 2, 1977.

For reprints contact: Steven M. Larson, Nuclear Medicine Sec., Veterans Administration Hospital, 4435 Beacon Avenue S., Seattle, WA 98108.

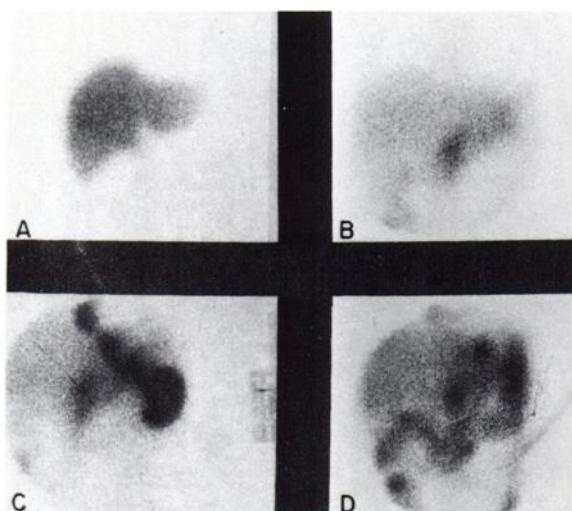


FIG. 2. (A) Normal liver scan, with Tc-99m sulfur colloid. (B) Ga-67 scan, showing increased activity in left upper quadrant. (C) Tc-99m sulfur colloid in proximal small bowel (post-gastrectomy). (D) Superimposed Ga-67 (B) and oral Tc-99m sulfur colloid (not shown) scans showing abnormal Ga-67 activity above transverse colon.

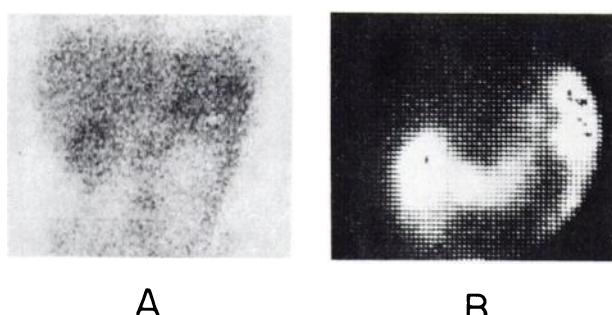


FIG. 3. (A) Ga-67 scan showing increased activity in right infrahepatic region. (B) Computer-generated image of Tc-99m HAM enema showing similar pattern.

trectomy with esophago-jejunostomy. Postoperatively he developed fever and left pleural fluid. Following gram stain and culture of the pleural fluid, he was started on antibiotic therapy. Despite this, the pleural fluid and fever persisted. An ultrasonic examination of the abdomen was compromised by intestinal gas. An upper GI series revealed no extravasation or abnormal mass effect. A scan performed with 3 mCi of Ga-67 citrate showed increased activity in the left upper quadrant. In order to determine whether or not that activity was within gut, 3 mCi of Tc-99m sulfur colloid was administered orally and scans were obtained at intervals thereafter to identify the location of both small and large bowel. Superposition of the technetium and gallium scans clearly demonstrated that the abnormal accumulation of gallium was outside the gut, lying above the transverse colon and beneath the left lobe of the liver. On the basis of that study, the patient was returned to surgery and

300 cc of purulent fluid drained from the left upper quadrant (Fig. 2).

Case 3. A 64-year-old man with multiple myeloma was admitted with a 4-day history of fever and chills. He was placed on ampicillin on the basis of a positive urine culture, but continued to exhibit a spiking fever. An extensive workup—including chest x-ray, upper GI series, barium enema, and i.v. pyelogram—was normal. A scan was performed following the i.v. injection of 5 mCi of Ga-67 citrate. This showed some increased activity in the right infrahepatic region. Three mCi of Tc-99m HAM in physiologic solution were then administered per rectum by means of an enema bag. Subsequent distribution of the technetium activity within the right colon coincided with the abnormal gallium activity (Fig. 3.)

DISCUSSION

Within the abdomen, it is often important to differentiate physiologic activity from an area of gallium concentration in an abscess or a tumor. It may also be useful to locate abnormal gallium activity relative to the GI tract. Repeat imaging following the oral or rectal administration of technetium locates the gut easily and effectively.

Oral pertechnetate and immediate imaging should provide adequate demonstration of the stomach and proximal duodenum. If imaging of the distal small bowel or colon is also desired, Tc-99m sulfur colloid or Tc-99m MAA is preferable to avoid possible absorption of the technetium. Delayed imaging at 16 hr successfully demonstrated the colon in our one patient so studied. Any of the three agents mentioned would presumably be adequate for rectal administration and immediate imaging of the colon.

The technetium images require 300,000 counts with a 20% window bracketing 140 keV. The gallium images were obtained with 100,000 counts, either before or after the technetium images, with a window spanning the 184- and 205-keV energies. To facilitate simple superposition of the images, the patient was not moved between the two procedures. The superposition provided a reliable method for determining the relative positions of the two nuclides within the abdomen. Although these techniques are probably not necessary in the majority of patients, they have been found useful in the occasional patient in whom standard procedures have failed to provide a definitive diagnosis.

REFERENCES

1. SILVA J, HARVEY WC: Detection of infections with gallium-67 and scintigraphic imaging. *J Infect Dis* 130: 125-131, 1974
2. EDWARDS CL, HAYES RL: Tumor scanning with ⁶⁷Ga-citrate. *J Nucl Med* 10: 103-105, 1969