

Gastric Uptake of Gallium-67 in AIDS

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We describe gastric localization of ^{67}Ga in 13 patients with acquired immunodeficiency syndrome (AIDS) among 148 referred primarily to rule out *Pneumocystis carinii* pneumonia (PCP). Endoscopic biopsies in five of the patients indicated cytomegalovirus (CMV) infection in one, gastritis in two, and normal tissue in two. Other associated, but nongastric, infections in these 13 patients included esophageal candidiasis, PCP, *Mycobacterium avium-intracellulare* (MAI) complex, coccidioidomycosis, toxoplasmosis and *Isospora belli*. Only six of the patients exhibited gastric symptoms, and even fewer proved to have gastric pathology. Although gastric ^{67}Ga uptake in a patient with AIDS may not require specific treatment, opportunistic infections as a possible cause of gastritis should be considered.

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Occult malignancies of the stomach, particularly lymphoma, have been revealed by gastric uptake of ^{67}Ga in patients with acquired immunodeficiency syndrome (AIDS) (1). Additionally, McNeill and Llauro have described "innocent" intramural gastric uptake in one patient with AIDS (2). In this report, we describe 13 cases of gastric radiogallium uptake in AIDS patients without lymphoma.

PATIENTS AND METHODS

Between January 1988 and December 1989, 949 ^{67}Ga scans were performed at this institution for a wide spectrum of indications. Of these, 148 patients with AIDS were referred to search for infections, particularly *Pneumocystis carinii* pneumonia (PCP). Among these, 13 patients with HIV+ AIDS (9%) showed well-defined gastric accumulation of ^{67}Ga on both planar and SPECT images. The medical records of all 13 patients were reviewed 1 yr after imaging to examine all data pertaining to clinical diagnostic measures and outcome.

All scintiscans were obtained using a large field of view gamma camera (Starcam 400 series, General Electric Medical Systems, Milwaukee, WI) fitted with a medium-energy collimator. The images were obtained 48-72 hr following injection of 5-10 mCi (185-370 MBq) of ^{67}Ga -citrate (Dupont-Merck, N. Billerica, MA). Twenty percent windows centered over the 93, 184, and 296 keV photopeaks were used for both planar and SPECT

imaging. One million count images were obtained in multiple projections for the planar images. SPECT images were reconstructed from 64 projections at 25 sec each in 360°. SPECT and planar images were reviewed in detail by two observers. The results of computed tomography (CT), upper GI series and/or histologic examination were reviewed when available.

RESULTS

The outstanding feature of these scans was the accumulation of radiotracer in the fundus of the stomach in 13 patients. Two scans also showed tracer uptake in the body of the stomach, and two showed accumulation of gallium throughout the entire stomach.

Figure 1 demonstrates ^{67}Ga uptake in the stomach of a 30-yr-old female with AIDS who had a history of fever, shortness of breath, cough, diarrhea, and symptoms of gastritis. An upper GI series was negative, and endoscopy revealed a normal stomach but evidence of esophagitis.

Occasionally the distinction of gastric from colonic ^{67}Ga uptake requires careful evaluation of successive tomographic sections (Fig. 2). The young male patient in Figure 2 had an upper GI series and an abdominal CT scan (Fig. 3) that showed mucosal thickening and prominent gastric folds. A biopsy showed chronic gastritis with viral cytopathologic changes and histochemical evidence for cytomegalovirus (CMV) infection; no lymphoma was seen.

Only 6 of the 13 patients had gastrointestinal symptoms (epigastric pain, vomiting, nausea, upper GI bleeding and/or diarrhea) (Table 1). Endoscopy and gastric biopsies were performed on five patients, showing one instance of CMV infection, two of gastritis, and two of normal mucosa. Three patients showed erosion and ulceration of

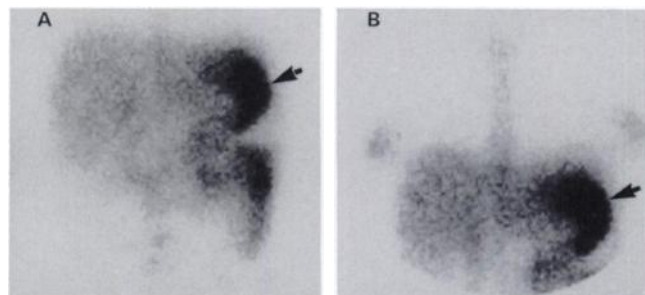


FIGURE 1. (A) Planar anterior ^{67}Ga scintigram of the abdomen shows stomach (arrow) and colon. (B) Planar anterior view of the chest and upper abdomen. Both the fundus and body of the stomach are prominently highlighted (arrow).

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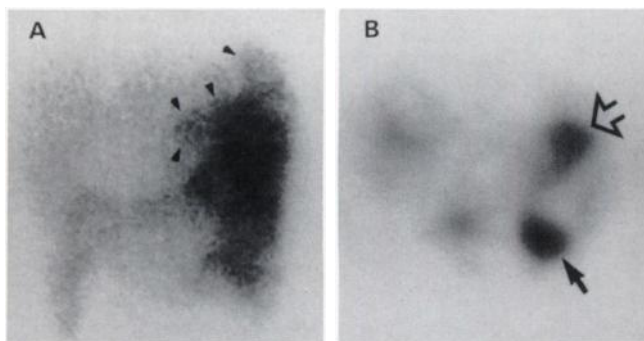


FIGURE 2. Planar scintigram (A) of the abdomen shows substantial and ill-defined radiogallium accumulation in the left upper quadrant. Small arrowheads indicate the probable location of the stomach. (B) A selected transaxial SPECT view serves to clarify the planar image. The open arrow identifies the stomach and a solid arrow shows the colon. Such cases require careful evaluation of projections in all three planes.

esophageal mucosa with a histological diagnosis of candida esophagitis. Biopsy of a rectal nodule in another patient revealed CMV infection. In addition to the patient cited above, CT showed gastric mucosal thickening in one other patient with gastric symptoms. Seven patients received zidovudine (AZT) treatment (Table 1). Thus, despite ^{67}Ga deposition in the stomach, most of these patients had neither symptoms nor pathology arising in the stomach.

Among the 135 patients *without* gastric gallium uptake, information about gastrointestinal symptoms or pathology at the time of scintigraphy was available for 112. We noted the following: nausea in 30%; vomiting in 31%; diarrhea in 39% and abdominal pain in 18%. Gastroesophageal endoscopy was done in 9% of these patients. These values are all slightly lower than the corresponding percentages for the 13 patients with gastric uptake of ^{67}Ga .

Involvement of other organs by opportunistic infections was common. Seven patients showed more than one infection, as summarized in Table 2.

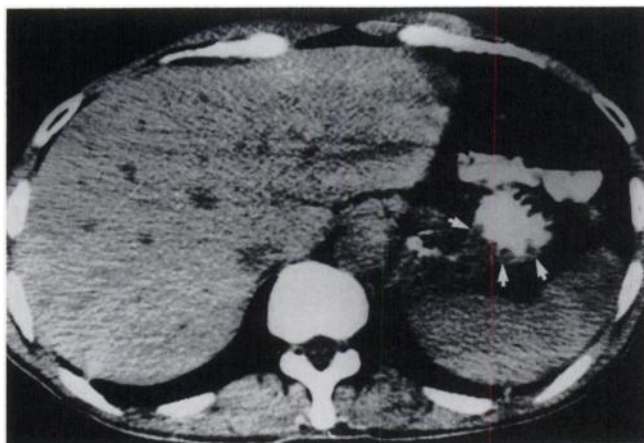


FIGURE 3. Abdominal CT scan identifies thickened mucosal folds (arrows) for the same patient shown in Figure 2.

TABLE 1
Clinical, Radiographic, and Histopathologic Features

Patient	Age (yr)	Gastric symptoms	UGI	CT	Endoscopy	Gastric biopsy	AZT therapy
1	41	P	+	+	+	+	Y
2	30	P	-	-	+	+	Y
3	38	A	N	N	N	N	Y
4	40	P	-	-	+*	-	Y
5	34	P	-	N	+†	-	N
6	32	A	N	N	N	N	N
7	26	A	N	N	N	N	N
8	30	P	N	N	N	N	N
9	40	A	N	N	N	N	N
10	52	A	N	N	N	N	Y
11	41	A	-	-	N	N	N
12	25	P	-	+	+‡	+	Y
13	30	A	N	N	N	N	N

* Ulceration of esophagus.

† Erosion of esophagus.

‡ Esophagitis.

P = present; A = absent; N = not done; Y = yes; + = abnormal; and - = normal

DISCUSSION

Gastrointestinal tract complications are second only to pulmonary disease as major causes of morbidity in patients with AIDS (3,4). Opportunistic infections are common: *Candida albicans* frequently invades the esophagus (5,6); *Cryptosporidium* species may involve the small bowel and occasionally the stomach, producing a prolonged secretory diarrhea (7,8).

CMV is one of the most prevalent gastrointestinal tract pathogens, seen primarily in the colon but also found both diffusely and focally throughout the upper gastrointestinal tract (3,4,9,10). Radiographic studies may identify the location of infection, but histopathological and histochemical analyses are necessary for explicit diagnosis.

Teixidor and coworkers (3) described a spectrum of radiologic findings in CMV infection involving the alimentary canal in 14 patients with AIDS. These included superficial or deep mucosal ulceration, perforation or fistula formation and rigidity and thickening of the stomach or intestinal wall. Soulen (8) described a patient who had

TABLE 2
Opportunistic Infections in 13 Patients with AIDS

Organism	Site	No. of Patients
<i>Pneumocystis carinii</i>	Lung	6
<i>Candida albicans</i>	Esophagus	5
<i>Toxoplasma gondii</i>	Brain	3
Cytomegalovirus	Rectum	1
	Stomach	1
<i>Coccidioides immitis</i>	Small bowel	1
<i>Isospora belli</i>	Small bowel	2
<i>Mycobacterium avium</i>	Lung	1

cryptosporidiosis and CMV infection of the gastric antrum initially detected by CT. Lower esophageal ulceration with CMV has been described in immunosuppressed patients without AIDS (10).

In contrast to diagnosing PCP, the precise role for ^{67}Ga scanning in detection of opportunistic GI tract infections in immunosuppressed patients is not clear. Eight of our 13 patients had no histopathological data by which to assess the significance of abnormal ^{67}Ga gastric uptake. In our institution, accumulation of ^{67}Ga by the stomach among patients undergoing radionuclide imaging for a wide variety of indications is not a common finding.

Intense concentration of ^{67}Ga in the left upper quadrant in HIV+ patients has been cited as a potential cause for interpretative uncertainty (11). In addition to opportunistic infections, such uptake may be associated with malignancy, specifically gastric lymphoma (1). MacMahon and coworkers (11) indicated that of 214 patients with lymphoma or lung carcinoma, only 10% (22/214) showed definite accumulation of ^{67}Ga by the stomach on at least one examination. Their study examined clinical and radiological records for evidence of inflammatory or neoplastic disease that might explain ^{67}Ga gastric uptake; no histological data were recorded in their report.

McNeill and Llauro (2) described a single patient with AIDS who showed marked uptake of ^{67}Ga by the stomach, regarded as intramural in location, with negative biopsy and culture. The case was quite similar to those described here and may represent the most common mode of scintigraphic presentation.

Yet another manifestation of the burden of gastrointestinal abnormalities in patients with AIDS is suggested by the report by Harriman et al. (12) of vitamin B-12 malabsorption in 8 of 11 men with AIDS and Kaposi's sarcoma. All eight patients had duodenal biopsies that showed chronic inflammation in the lamina propria. The authors reported also that 15% of 121 patients with AIDS had low serum vitamin B-12 levels, an exceptionally high prevalence. Possibly the gastric inflammatory process reflected in ^{67}Ga localization may also lead to impaired secretion of intrinsic factor or to anti-parietal cell or anti-intrinsic factor antibodies.

We believe a small fraction of patients with AIDS undergoing ^{67}Ga imaging will show gastric accumulation of the radiotracer. In our study, this was 13/148 or 9%, which is in close agreement with the 10% reported for unselected patients by MacMahon et al. (11). Only six (46%) of these patients had gastrointestinal symptoms, but 30%–39% of those without gastric ^{67}Ga deposition showed similar symptoms.

Thus, the clinical significance of gastric accumulation of ^{67}Ga is not clear, and we urge restraint in its interpretation. Opportunistic infections may be found in some of these patients. Because malignant processes, such as lymphoma or sarcoma are also possibilities, judgment needs to be exercised by clinicians whose patients exhibit ^{67}Ga accumulation in the stomach.

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