Gallium-67 Scanning at 6 Hr in Active Inflammatory Bowel Disease: Case Report

Lawrence R. Kaplan, Robert J. Griep, Michael D. Schuffler, and Rebecca A. Silliman

University of Washington and U.S. Public Health Service Hospital, Seattle, Washington

Gallium citrate scanning at 6 hr was used to evaluate a patient with active ulcerative colitis. The localization of ^{67}Ga in the colon correlated with the extent of the inflammatory process. When either colonoscopy or radiographic contrast studies are contraindicated, ^{67}Ga scanning at 6 hr may prove useful in the evaluation of active inflammatory bowel disease.

J Nucl Med 18: 448–449, 1977

The localization of ^{67}Ga-citrate in neoplastic and inflammatory tissue has stimulated clinical use of this nuclide for diagnostic purposes. Gallium scanning has proved a valuable aid in the location of occult abscesses (*1–6*) and malignancies (*7–9*). The application of ^{67}Ga scanning to the study of intra-abdominal disease has been hindered by difficulty in differentiating a disease process from a normal focal collection of ^{67}Ga excreted into the gastrointestinal tract. Intestinal activity frequently interferes with scan interpretation when ^{67}Ga scintigraphy is performed at the customary 24–72 hr after intravenous injection.

Recently, however, Hopkins et al. correctly localized 18 of 20 abdominal and retroperitoneal abscesses with ^{67}Ga scintiscans obtained 6 hr after injection (*10*). At 6 hr, when target-to-background ratios proved sufficient for early abscess detection, the authors noted little interference from gut activity. The observation that ^{67}Ga fails to localize significantly within the intestinal lumen at 6 hr after injection suggests that early visualization of the bowel may represent intramural disease. This report presents a case of inflammatory bowel disease studied with ^{67}Ga scintigraphy at 6 hr and comments on its potential clinical application.

CASE REPORT

A 61-year-old woman was in good health until she developed abdominal cramps and bloody diarrhea 2 weeks before admission. She denied previous gastrointestinal disease, antibiotic therapy, and foreign travel.

On admission the patient was afebrile. Her abdomen was distended, and she had mild left lower quadrant tenderness. The remainder of her physical examination was unremarkable. Routine laboratory tests and abdominal films were within normal limits. Her stools were negative for enteric pathogens, ova, and parasites. Sigmoidoscopy revealed an erythematous friable mucosa without ulcerations or pseudomembranes. Rectal biopsies showed numerous crypt abscesses and a moderate number of inflammatory cells within the lamina propria. A diagnosis of idiopathic ulcerative colitis was made.

The patient was treated with intravenous prednisolone and hydrocortisone enemas. Her condition remained stable until the 15th hospital day when she began to spike fevers to 39.2°C and to experience severe abdominal cramps with frequent bloody stools. An abdominal film revealed an edematous transverse colon without dilatation. The following day a ^{67}Ga scan was obtained to evaluate the extent of the patient's colonic disease. The image at 6 hr showed activity in the entire colon, with an abrupt cutoff at the ileocecal valve (Fig. 1). Repeat 24- and 48-hr scans showed a similar distribution of activity.

On the 19th hospital day the patient finally consented to proctocolectomy, but she died during the operation from a massive pulmonary embolus. Gross

Received Nov. 15, 1976; revision accepted Dec. 6, 1976.

For reprints contact: Robert J. Griep, Dept. of Medicine, U.S. Public Health Service Hospital, P.O. Box 3145, Seattle, WA 98144.

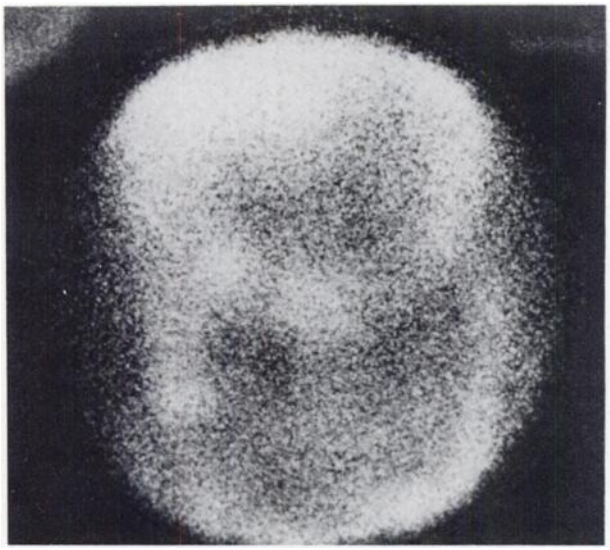

FIG. 1. Anterior scintillation-camera view of abdomen at 6 hr after intravenous injection of 3 mCi of ^{67}Ga-citrate. Radioactivity is concentrated throughout inflamed colon. Hepatic concentration in right upper quadrant is normal.

examination of the surgical specimen showed a shortened colon with diffusely edematous hemorrhagic mucosa. Microscopically, the lamina propria contained a large number of plasma cells and polymorphonuclear leukocytes. Abundant crypt abscesses and widespread superficial ulcerations were identified throughout the large bowel. No fissures or granulomas were present. The small bowel was free of inflammatory disease.

COMMENT

The mechanism of ^{67}Ga localization in inflammatory tissue has not been clearly defined. Experimental data suggest, however, that ^{67}Ga is bound by inflammatory cells, primarily polymorphonuclear leukocytes, present in the area of inflammation (*11,12*). For instance, granulocyte depletion results in impaired localization of ^{67}Ga in septic lesions (*13*).

A characteristic feature of acute inflammatory bowel disease is the extensive infiltration of the intestinal wall by inflammatory cells. These cells may bind ^{67}Ga, thereby permitting visualization of the diseased bowel. In a recent report of a patient with pseudomembranous colitis, gallium scanning revealed diffuse activity within the entire colon (*14*). Biopsy specimens were counted in a scintillation counter to prove that the activity came from the wall of the inflamed mucosa and pseudomembranes. In our patient, ^{67}Ga concentration correlated with the extent of the inflammatory process. Unfortunately, the colectomy specimen of our patient was not counted. It is conceivable, therefore, that the colon image obtained was the result of rapid luminal accumulation of ^{67}Ga from leaking vessels in a diffusely inflamed colon, rather than the result of ^{67}Ga uptake by inflammatory cells in the colonic wall.

Regardless of the mechanism involved, ^{67}Ga scanning at 6 hr may prove useful in the evaluation of active inflammatory bowel disease. This report should stimulate further evaluation of ^{67}Ga scanning in diagnosing inflammatory bowel disease, in assessing the extent of involvement, and in following the course of known disease.

REFERENCES

1. SILVA J, HARVEY WC: Detection of infections with gallium-67 and scintigraphic imaging. *J Infect Dis* 130: 125–131, 1974

2. LITTENBERG RL, TAKETA RM, ALAZRAKI NP, et al.: Gallium-67 for localization of septic lesions. *Ann Intern Med* 79: 403–406, 1973

3. DEYSINE M, ROBINSON R, RAFKIN H, et al.: Clinical infections detected by ^{67}Ga scanning. *Ann Surg* 180: 897–901, 1974

4. BLAIR DC, CARROLL M, SILVA J, et al.: Localization of infectious processes with gallium citrate GA-67. *JAMA* 230: 82–85, 1974

5. KUMAR B, COLEMAN RE, ALDERSON PO: Gallium citrate Ga-67 imaging in patients with suspected inflammatory processes. *Arch Surg* 110: 1237–1242, 1975

6. HARVEY WC, PODOLOFF DA, KOPP DT: ^{67}Ga scanning in 68 consecutive infection searches. *J Nucl Med* 16: 2–4, 1975

7. EDWARDS CL, HAYES RL: Scanning malignant neoplasms wtih gallium 67. *JAMA* 212: 1182–1190, 1970

8. HIGASI T, NAKAYAMA Y, MURATA A, et al.: Clinical evaluation of ^{67}Ga-citrate scanning. *J Nucl Med* 13: 196–201, 1972

9. HABIBIAN MR, STAAB EV, MATTHEWS HA: Gallium citrate GA-67 scans in febrile patients. *JAMA* 233: 1073–1076, 1975

10. HOPKINS GB, KAN M, MENDE CW: Early ^{67}Ga scintigraphy for the localization of abdominal abscesses. *J Nucl Med* 16: 990–992, 1975

11. ARSENEAU JC, AAMODT R, JOHNSTON GS, et al.: Evidence for granulocytic incorporation of ^{67}Ga in chronic granulocytic leukemia. *J Lab Clin Med* 83: 496–503, 1974

12. BURLESON RL, JOHNSON MC, HEAD H: Scintigraphic demonstration of experimental abscesses with intravenous ^{67}Ga citrate and ^{67}Ga labeled blood leukocytes. *Ann Surg* 178: 446–452, 1973

13. GELRUD LG, ARSENEAU JC, MILDER MS, et al.: The kinetics of ^{67}gallium incorporation into inflammatory lesions: Experimental and clinical studies. *J Lab Clin Med* 83: 489–495, 1974

14. TEDESCO FJ, COLEMAN RE, SIEGEL BA: Gallium citrate Ga-67 accumulation in pseudomembranous colitis. *JAMA* 235: 59–60, 1976