# Residual Mass and Negative Gallium Scintigraphy in Treated Lymphoma

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Two patients with treated lymphoma demonstrated a residual mass on CT following treatment. In both cases gallium-67 ($^{67}$Ga) scintigraphy demonstrated increased uptake in the original tumor mass and no uptake in the mass after treatment. In both cases the entire residual tumor mass was resected and found to contain no cancer tissue. This is further evidence of the role $^{67}$Ga scintigraphy may play in monitoring response of lymphoma patients to treatment. In contrast, other imaging modalities such as ultrasound, plain film x-rays, or CT only show the presence of a mass but not its nature.

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Residual masses after treatment of lymphoma constitute a common and difficult diagnostic problem. Ultrasound, plain film x-ray, and computed tomography (CT) show the mass but do not contribute towards understanding its nature (*1–7*). Biopsies, which can hardly be used routinely, are invasive and, considering tumor heterogeneity, may be misleading. The mass cannot usually be totally resected, and it is often difficult to obtain samples from all regions of the tumor. Gallium-67 ($^{67}$Ga) studies in animals, where it is possible to examine the entire tumor, suggest that $^{67}$Ga is an indicator of tumor viability (*8*). We report here two cases in which it was possible to obtain the entire tumor mass remaining in patients after treatment and to correlate its histology with the results of $^{67}$Ga scintigraphy.

## MATERIALS AND METHODS

Gallium-67 studies were performed 48 and 72 hr after the intravenous (i.v.) injection of 5 to 7 mCi of $^{67}$Ga. Scintigraphy was performed using an Elscint digital SPECT camera (Apex 415 ECT, Elscint), with a medium-energy collimator (APC-5). Both the 91-93 and 184 keV energy peaks were used. Anterior, posterior and, when necessary, lateral views were obtained: 500,000 counts were accumulated for each view. A 360-degree SPECT study was performed. The Nyquist frequency was used as a cutoff point for the Hanning filter. Homogeneity was corrected for each study using a prerecorded point source. Computed tomography was performed using an Elscint 2400 E scanner. Computed tomography of the thorax was done with a sequential dynamic method. Rapid, consecutive scans were performed at a rate of 10 per minute following a bolus injection of 80–100 cc of Meglumine Ditriazoate 60%. Slice width and increment were 10 mm each. Computed tomography of the abdomen was performed following ingestion of ~ 60 cc of dilute Gastrografin. Intravenous contrast medium was given only when deemed necessary. Ten-millimeter thick slices were performed every 15 mm.

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## CASE REPORTS

### Case 1

A 24-yr-old woman presented with severe weight loss during a three-year period and a left upper quadrant abdominal mass. Computed tomography of the abdomen showed the mass to consist of enlarged mesenteric and retroperitoneal lymph nodes (Fig. 1A). Gallium-67 scintigraphy (Fig. 1B) demonstrated a large area of abnormal uptake in the left upper quadrant. Laparotomy and biopsy showed that the tumor was a high grade non-Hodgkin's lymphoma of the diffuse large cell immunoblastic type. The patient was treated with MACOP-B (methotrexate, adriamycin, cyclophosphamide, oncovin, prednisone, and bleomycin) chemotherapy. Three weeks after initiation of treatment, no abdominal mass could be palpated and $^{67}$Ga scintigraphy was normal. A CT scan performed after 12 wk of treatment (Fig. 1C) demonstrated mildly enlarged mesenteric lymph nodes while the $^{67}$Ga scan (Fig. 1D) was again normal. The patient did not show any other evidence of disease. Laparotomy was performed and the lymph nodes resected in order to determine if active disease was still present in the enlarged nodes. On histologic examination of the mesenteric lymph nodes, only fibrosis and necrosis could be detected. Treatment was discontinued and the patient has been well without any evidence of disease during a follow-up period of 13 mo after completing therapy. This patient apparently achieved complete remission as shown on $^{67}$Ga scintigraphy. Histology of the enlarged glands indicated that the abnormal CT was falsely positive.

### Case 2

A 66-yr-old man presented with severe abdominal pain. Physical examination revealed a large mass in the upper abdomen. Gastroscopy showed malignant infiltration of the

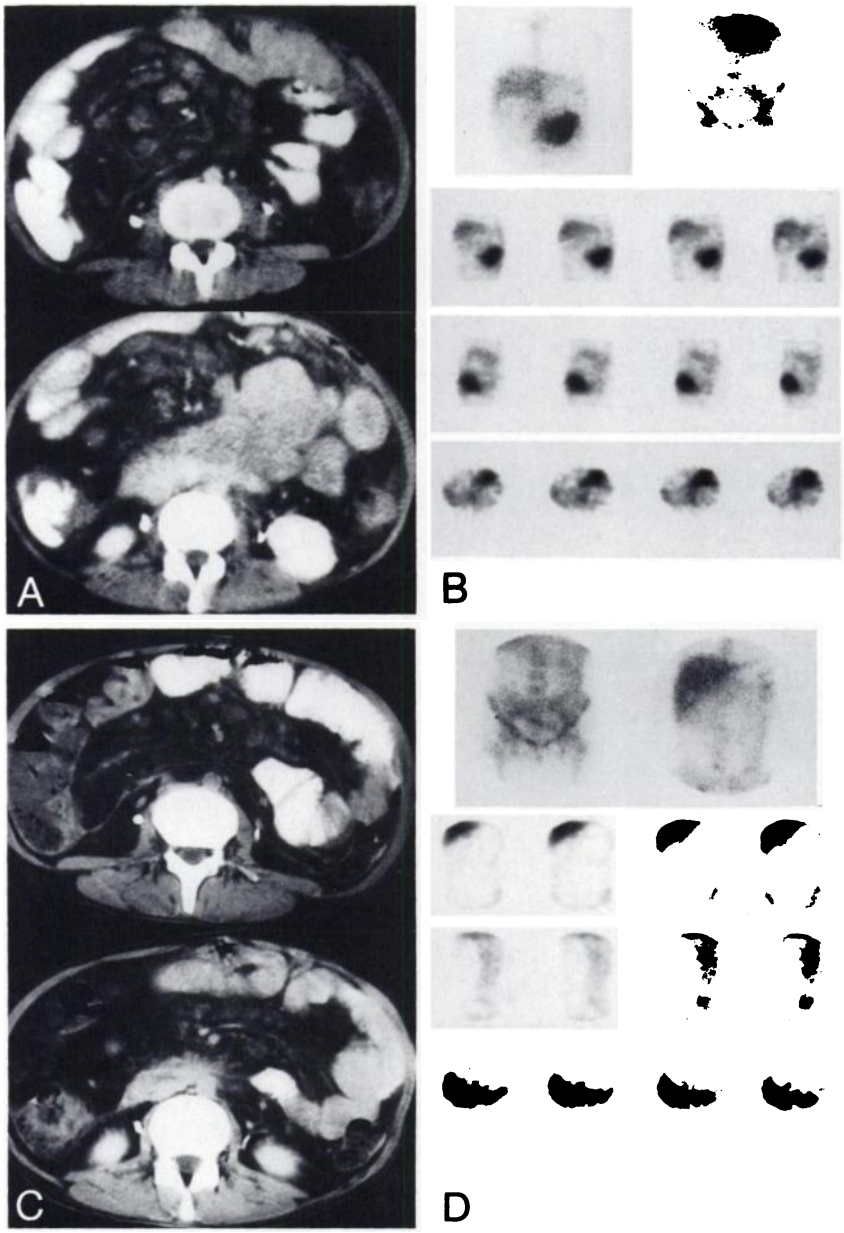


**FIGURE 1.** Case 1: High grade non-Hodgkin's abdominal lymphoma, diffuse immunoblastic type. (A) Midabdominal CT showing massive mesenteric and retroperitoneal lymphadenopathy. (B) Gallium-67 planar and SPECT scintigraphy in the coronal, sagittal, and transaxial planes showing anterior left paramedian abnormal uptake. (C) Midabdomen CT after treatment showing residual mesenteric lymphadenopathy. There is a complete regression of retroperitoneal nodes and residual mesenteric lymphadenopathy. (D) Gallium-67 planar and SPECT scintigraphy after therapy showing no abnormal uptake.

lesser curvature of the stomach. Exploratory laparotomy showed a nonresectable diffuse large cell non-Hodgkin's lymphoma, predominantly noncleaved. Computed tomography revealed (Fig. 2A) massive infiltration of the gastric wall and abnormal gastrohepatic lymph nodes. Gallium-67 scintigraphy (Fig. 2B) showed a large area of abnormal uptake in the region of the stomach and no other areas of pathologic activity. The patient was treated with three courses of CHOP (cyclophosphamide, adriamycin, oncovin, and prednisone). A repeat CT (Fig. 2C) showed marked improvement, but there was still a significant residual thickening of the gastric wall, mainly in the region of the antrum. A repeat $^{67}$Ga scan was normal (Fig. 2D). The patient underwent a second laparotomy and gastrectomy. Histologic examination revealed no tumor. The postoperative course was normal, and no evidence of disease has been found during a follow-up period of 11 mo.

## DISCUSSION

There has been growing evidence that radiologic methods such as chest x-rays and CT are not suitable methods to monitor lymphoma response to treatment (*1–7*). Patients may be in complete remission after successful therapy even though a large mass still exists. This residual mass may disappear spontaneously in the course of several months without any treatment. Clinical criteria are used in such cases to evaluate treatment response. The patient appears in complete remission and does not show evidence of recurrence in a follow-up period. The diagnosis of complete remission at the end of the protocol treatment when a mass lesion still remains on chest x-rays or CT is, however, very difficult.

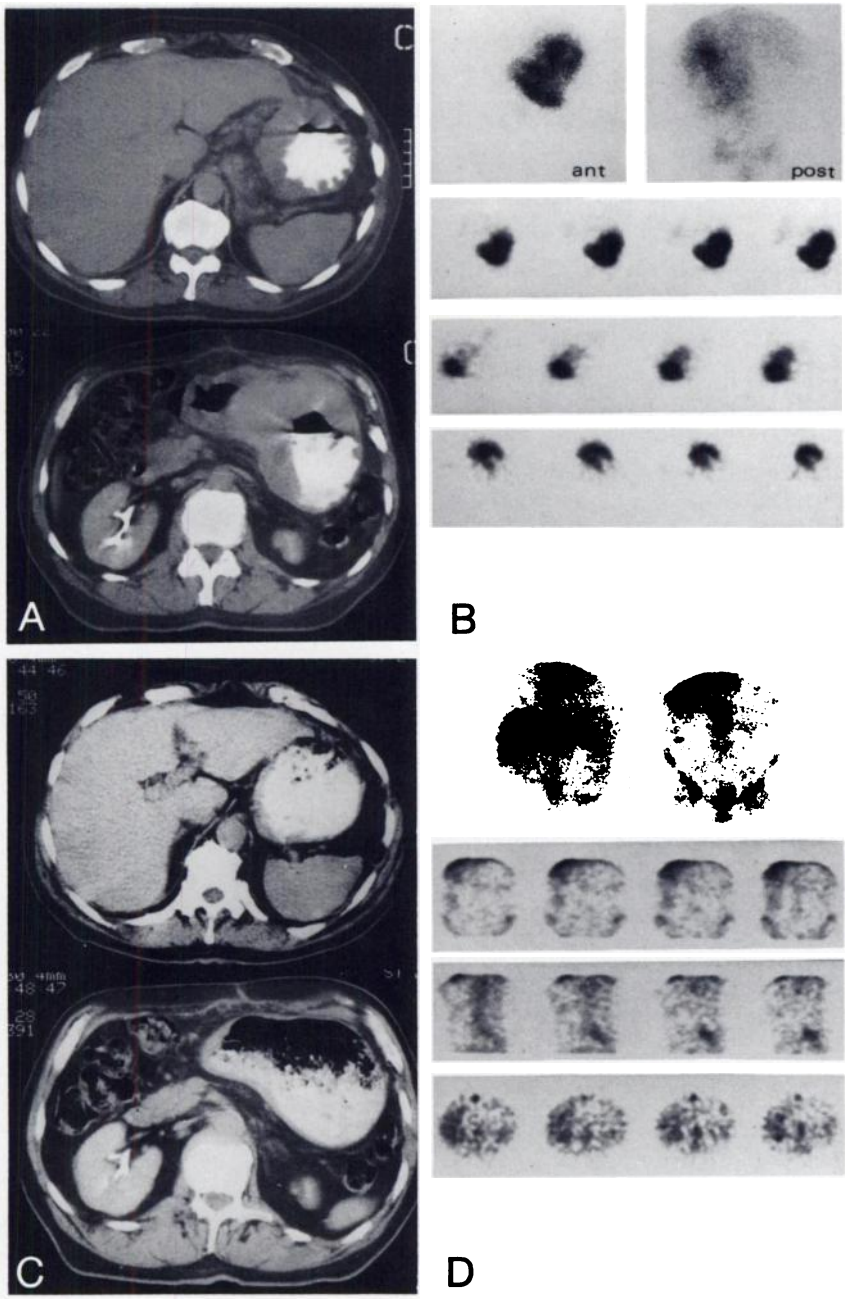


**FIGURE 2.** Case 2: Diffuse, large cell, predominantly noncleaved, non-Hodgkin's lymphoma of the stomach. (A) CT scans at the level of the upper and lower part of the stomach showing a diffuse thickening of the gastric wall. There is also gastrohepatic lymphadenopathy. (B) Gallium-67 planar and SPECT scintigraphy in the coronal, sagittal, and transaxial planes showing abnormal uptake in the gastric wall. (C) Post-treatment CT scans at the same levels as in (A), showing residual thickening of the gastric wall. (D) Gallium-67 planar and SPECT scintigraphy after therapy showing no abnormal uptake in the stomach. Superficial focal uptake is seen in the postoperative scar tissue.

Magnetic resonance imaging may have some potential in differentiating residual tumor from fibrosis (*9*), but this has still to be clinically proven. When a residual mass exists the patient often receives further treatment even though he appears clinically to have responded favorably and shows no other evidence of disease.

The assessment of response is critical since patients in complete remission need no further treatment and have a possibility of cure. Those who have achieved only a partial response have a poor prognosis and need noncross resistant chemotherapy, radiotherapy, or possible high dose therapy and autologous bone marrow transplantation to improve their survival (*10*). Evaluation of response in patients with a residual mass is possible only when the whole mass is resected. This, in practice, can be achieved only rarely.

There are indications that $^{67}$Ga scintigraphy could be used in the evaluation of this group of patients. In animals $^{67}$Ga appears to be a true indicator of tumor viability (*8*). Preliminary results in humans (*11,12*) suggest that $^{67}$Ga scintigraphy could be used to assess tumor response. In these studies, however, response is based on clinical criteria. Since total resection of residual tumor after treatment is not done routinely, the role of $^{67}$Ga scintigraphy for monitoring response to treatment will depend on reports based on clinical follow-up (*11*) or on anecdotal reports such as that of the present two cases.

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