
Gallium-67 Imaging in Retroperitoneal Fibrosis: Significance of a Negative Result

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A patient with retroperitoneal fibrosis and right peritracheal and hilar lymphadenopathy was studied using gallium-67-citrate. No abnormal uptake was seen in the regions of retroperitoneal fibrosis, while there was avid uptake in chest lesions later shown to represent small cell lung carcinoma. Retroperitoneal fibrosis which does not show gallium uptake is most likely mature, with few inflammatory elements. In patients with multiple retroperitoneal and/or mediastinal masses, gallium imaging may be useful in identifying the most active sites of disease for possible biopsy and for subsequent monitoring of response to therapy.

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Retroperitoneal fibrosis is an uncommon condition of uncertain etiology which typically presents with the insidious onset of abdominal or back pain and nonspecific constitutional symptoms such as weight loss and malaise (1-4). Ultrasound (5), computerized tomography (CT) (5-8), and magnetic resonance imaging (MRI) (7,9,10) typically demonstrate extensive mass lesions encircling the abdominal aorta and often entrapping one or both ureters. Although suggestive of retroperitoneal fibrosis, such imaging findings can also be seen in association with malignancy and infection (2,5). A definitive diagnosis usually requires biopsy or surgery.

Several reports have described significant uptake of gallium-67 (^{67}Ga) in retroperitoneal fibrosis (8,11-14), but the role of this imaging method in the evaluation of patients with such abdominal mass lesions remains uncertain. A case is presented in which there was no ^{67}Ga uptake in an extensive region of retroperitoneal fibrosis, but avid accumulation at a separate site of malignancy. The results from this case may offer a perspective on the potential utility of ^{67}Ga scintigraphy in retroperitoneal fibrosis.

CASE REPORT

A 72-yr-old male was admitted to the hospital because of progressive renal failure. The patient had been in his usual state of health until 2 mo prior to admission, when he began to develop abdominal pain and fullness and progressive dysuria. On admission, his serum creatinine was 15.0 mg/dl and his blood urea nitrogen was 123 mg/dl. A radionuclide renogram performed with iodine-131-hippuran demonstrated minimal uptake and excretion, while a flow study with technetium-99m-labeled glucoheptonate demonstrated delayed but preserved flow to both kidneys, with a region of photopenia in the upper pole of the right kidney. Abdominal CT scan revealed extensive retroperitoneal soft tissue extending to just below the aortic bifurcation (Fig. 1), and retrograde pyelogram demonstrated bilateral ureteral obstruction. Bilateral stents were inserted, and following this procedure, urine flow increased substantially and serum creatinine decreased to 1.8 mg/dl within 9 days.

After two percutaneous needle biopsies of the periaortic soft-tissue mass were nondiagnostic, laparoscopic examination with biopsy was performed. Histologic examination of multiple biopsy specimens revealed a proliferation of typical fibrocytes with varying degrees of fibrosis, findings consistent with retroperitoneal fibrosis. Isolated aggregations of small lymphocytes were noted, but neither inflammatory cells nor evidence of active inflammation or malignancy were seen.

On an initial chest radiograph, a right peritracheal mass was noted (Fig. 2), and subsequent chest CT demonstrated marked right peritracheal and hilar lymphadenopathy. In spite of the results from the retroperitoneal biopsies, the suspicion remained that both the abdominal and chest abnormalities represented neoplasm, possibly lymphoma. To assess the relative activity of the disease states in the abdomen and chest, and potentially to direct further biopsies, a gallium scan was performed. Forty-eight hours following administration of 370 MBq ^{67}Ga -citrate, planar images demonstrated increased uptake in the right mediastinum and upper chest, while both planar and single-photon emission computed tomographic (SPECT) imaging of the abdomen showed no significant abnormal uptake in the periaortic mass (Fig. 3). At subsequent mediastinoscopy, biopsy of involved lymph nodes demonstrated small cell lung carcinoma.

DISCUSSION

Retroperitoneal fibrosis is often categorized as idiopathic if the etiologic agent responsible for the inflammatory process is uncertain (1,3,4), and malignant if

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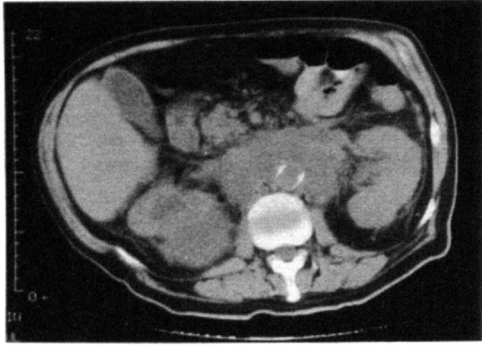


FIGURE 1
Abdominal CT image shows abnormal retroperitoneal soft-tissue mass surrounding the aorta. Inferior portion of large right renal cyst is also seen.

neoplasm is present (6,10). Nonmalignant causes of active inflammation such as chronic periaortitis, diverticulitis, urinary leakage, and abdominal infection (1-4), and neoplasms including gastric, cervical, and breast carcinoma (10,15) have been implicated in cases of retroperitoneal fibrosis. While the characteristic distribution of retroperitoneal fibrosis, typically encircling but not displacing the lower abdominal aorta and often extending to below the iliac bifurcation (1), is readily identified by CT and MRI (5-10), the imaging appearance is not sufficiently specific to distinguish nonmalignant from malignant diseases in many cases. The recent observation of high signal intensity on T2-predominant images in some cases of malignant retroperitoneal fibrosis, in contrast to the uniformly low intensity for nonmalignant masses, offers promise for possible non-invasive tissue characterization with MRI (10). While avid ^{67}Ga uptake has been described in individual cases of retroperitoneal fibrosis (8,11-14), no series comparing imaging results in the nonmalignant and malignant forms has been reported.

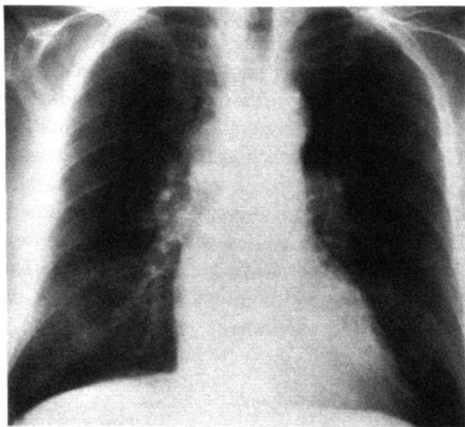


FIGURE 2
Chest radiograph demonstrates widening of the mediastinum secondary to right peritracheal mass density.

The rationale for performing gallium imaging in the present case was that although the laparoscopy biopsy specimens had shown no evidence of active inflammatory or neoplastic cells, in light of the selective sampling inherent in such biopsies, the possibility remained that other sites in the abdomen might harbor an active process. The failure of gallium to accumulate in the regions of retroperitoneal fibrosis indicated that an active inflammatory process was not ongoing at these locations, thereby directing attention to the chest, where malignancy was confirmed at mediastinoscopy. It is likely that the chest and abdominal findings were in fact unrelated, as there was no imaging or clinical evidence of active tumor anywhere in the abdomen. The patient had a right renal cyst which had previously undergone percutaneous drainage, and it is possible that leakage of urine had been responsible for the development of the retroperitoneal fibrosis.

Two histologic patterns have been described in retroperitoneal fibrosis, one containing a large number of inflammatory cells, and the other old-looking and relatively acellular, similar to that seen in the present instance (1). A gallium scan will likely be positive in the early stages of retroperitoneal fibrosis represented by the former pattern (8) and show little or no abnormal uptake in the later stages of the disease when minimal inflammatory reaction is present. Gallium imaging may thus be useful in predicting the likelihood of a therapeutic response to corticosteroids in patients with newly diagnosed retroperitoneal fibrosis (16), as well as in monitoring response to therapy in those with initially positive scintigraphy. Similarly, the absence of gallium uptake in apparently mature retroperitoneal fibrosis

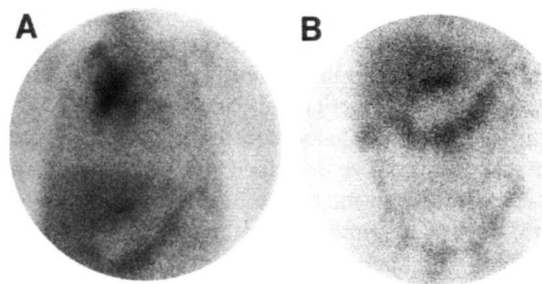


FIGURE 3
Anterior chest image from the ^{67}Ga scan (A) demonstrates avid uptake in the right medial chest extending from the hilum to the level of the clavicle. Anterior abdominal image (B) shows normal distribution of activity in the liver, transverse colon, and pelvis, but no uptake is evident in the area of the retroperitoneal fibrosis. SPECT imaging of this same area (not shown) also demonstrated no abnormal gallium accumulation in the fibrotic tissue surrounding the abdominal aorta. Increased gallium activity seen along the inferior border of the left lobe of the liver was localized to the region of the gastric antrum and proximal duodenum on SPECT and abdominal CT, and most likely represented either normal bowel activity or mild gastritis/duodenitis.

makes it less likely that the fibroproliferative process is the result of malignancy (17).

While CT and MRI provide superior delineation of the extent of the masses of retroperitoneal fibrosis (5-10), gallium-67 scintigraphy can supply distinct information concerning the activity of the process stimulating the fibrotic deposition (8,12). A prospective study is needed to determine how best gallium imaging might contribute to the management and follow-up of patients with retroperitoneal fibrosis.

REFERENCES

1. Mitchinson MJ. The pathology of idiopathic retroperitoneal fibrosis. *J Clin Pathol* 1970;23:681-689.
2. Arger PH, Stolz JL, Miller WT. Retroperitoneal fibrosis: an analysis of the clinical spectrum and roentgenographic signs. *AJR* 1973;119:812-821.
3. Lepor H, Walsh PC. Idiopathic retroperitoneal fibrosis. *J Urol* 1979;122:1-6.
4. Mitchinson MJ. Retroperitoneal fibrosis revisited. *Arch Path Lab Med* 1986;110:784-786.
5. Fagan CJ, Larrieu AJ, Amparo EG. Retroperitoneal fibrosis: ultrasound and CT features. *AJR* 1979;133:239-243.
6. Degesys GE, Dunnick NR, Silverman PM, Cohan RH, Illescas FF, Castagno A. Retroperitoneal fibrosis: use of CT in distinguishing among possible causes. *AJR* 1986;146:57-60.
7. Mulligan SA, Holley HC, Koehler RE, et al. CT and MR imaging in the evaluation of retroperitoneal fibrosis. *J Comput Assist Tomogr* 1989;13:277-281.
8. Leibowich S, Tumeik SS. Gallium-67 imaging and computed tomography in early retroperitoneal fibrosis. *Clin Nucl Med* 1988;13:829-830.
9. Yuh WTC, Barloon TJ, Sickels WJ, Kramolowsky EV, Williams RD. Magnetic resonance imaging in the diagnosis and followup of idiopathic retroperitoneal fibrosis. *J Urol* 1989;141:602-605.
10. Arrive L, Hricak H, Tavares NJ, Miller TR. Malignant versus nonmalignant retroperitoneal fibrosis: differentiation with MR imaging. *Radiology* 1989;172:139-143.
11. McCombs RK, Singhi V, Olson WH. Positive Ga-67-citrate scan in retroperitoneal fibrosis. *J Nucl Med* 1979;20:238-240.
12. Liebman RM. Positive gallium scan in retroperitoneal fibrosis. *AJR* 1983;141:949-950.
13. Oguma Y, Nishimura M, Shosaku A, Hasegawa H, Kawakami Y. A case of retroperitoneal fibrosis following dihydroergotamine therapy: with special reference to partial diabetes insipidus and positive Ga scan. *Nippon Naika Gakkai Zasshi* 1984;73:864-870.
14. Clinicopathologic Conference. Fever and abdominal mass in a 74-year-old man with long-standing vena caval obstruction. *Am J Med* 1985;78:1010-1016.
15. Usher SM, Brendler H, Ciavarrà VA. Retroperitoneal fibrosis secondary to metastatic neoplasm. *Urology* 1977;9:191-194.
16. Higgins PM, Bennett-Jones DN, Naish PF, Aber GM. Non-operative management of retroperitoneal fibrosis. *Br J Surg* 1988;75:573-577.
17. Kaplan WD. Gallium-67 tumor imaging. *Postgrad Radiol* 1984;4:145-173.