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A case of tuberculous peritonitis monitored by gallium-67 scintigraphy

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An 18-year-old man was admitted to our hospital for further examination of fever of unknown origin and ascites. Ga-67 scintigraphy revealed diffuse increased uptake throughout the abdomen. He was diagnosed with tuberculous peritonitis and began the treatment for tuberculosis (rifampicin, 450 mg/day orally and isoniazid, 300 mg/day orally, and 0.75 g of streptomycin by intramuscular injection 2 times a week). One year after starting the treatment, Ga-67 scintigraphy revealed accumulation of radioactivity in the upper abdomen, but the diffuse accumulation in the abdomen decreased. A specimen obtained by tumor biopsy under ultrasonic guidance revealed a tuberculous granuloma. Percutaneous injection was performed in the tumor with 1.0 g of streptomycin. On Ga-67 scintigraphy performed 2 weeks after the injection of streptomycin, the accumulation of radioactivity in the upper abdomen had disappeared. These findings suggest that Ga-67 scintigraphy is useful for diagnosis and observation during treatment of tuberculous peritonitis.

Key words: tuberculous peritonitis, gallium-67 scintigraphy, fever of unknown origin

INTRODUCTION

TUBERCULOUS PERITONITIS is uncommon, occurring in not more than 1.0% of patients with tuberculosis.[1,2] The diagnosis of tuberculous peritonitis is often difficult because of vague symptoms, lack of pathognomonic laboratory findings and non specific radiographic features.[2]

Ga-67 scintigraphy is an useful tool for the diagnosis of active inflammatory diseases.[3–5] Among inflammatory diseases, active pulmonary tuberculosis exhibits accumulation of radiogallium at high rates.[6] Moreover, Ga-67 scintigraphy is useful for the diagnosis of not only pulmonary tuberculosis but also extra-pulmonary tuberculosis such as tuberculous peritonitis.[7] We report a case of tuberculous peritonitis in which Ga-67 scintigraphy was useful for diagnosis and subsequent observation of the clinical course.

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CASE REPORT

An 18-year-old man was admitted to our hospital because of general fatigue and a high fever of 38.0°C of 4 weeks duration. On physical examination, ascites and mild abdominal distention were found. The white blood cell count was 9,200/mm^3, red blood cell count 549 × 10^4/mm^3, platelet count 29.3 × 10^4/mm^3, serum total protein 7.1 g/d*l*, serum albumin 3.7 g/d*l*, lactate dehydrogenase activity 383 IU/*l*, C-reactive protein concentration 2.1 mg/d*l*, adenosine deaminase (ADA) activity 28.0 IU/*l*, and anti-*Mycobacterium tuberculosis* antibody was positive. A tuberculin test yielded an area of induration, 2.0 cm in diameter, in 48 hours.

Ga-67 scintigraphy revealed diffuse increased uptake throughout the abdomen and normal hepatic uptake, but uptake in the lungs was not increased (Fig. 1). He was diagnosed with tuberculous peritonitis on the basis of high ADA levels in serum, positivity for anti-*Mycobacterium tuberculosis* antibody in serum and positivity for tuberculin test. Treatment for tuberculosis was started with rifampicin, 450 mg/day orally and isoniazid, 300 mg/day orally, and 0.75 g of streptomycin by intramuscular injection 2 times a week.

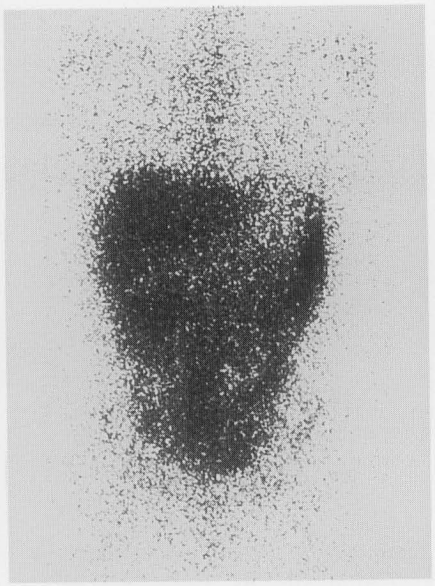

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Fig. 1 Ga-67 scintigraphy revealed diffuse increased uptake throughout the abdomen.

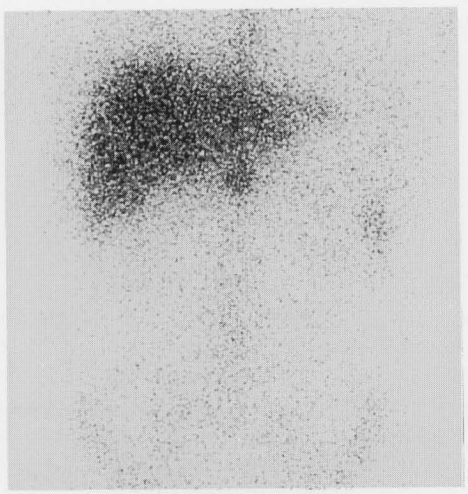

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Fig. 2 Ga-67 scintigraphy revealed an accumulation of radioactivity in the upper abdomen, but the diffuse accumulation in the abdomen decreased.

One year after starting the treatment, body temperature decreased, and the white blood cell count and C-reactive protein concentration had fallen to within the normal range. Ga-67 scintigraphy revealed an accumulation of radioactivity in the upper abdomen, but the diffuse accumulation in the abdomen was decreased (Fig. 2). Ultrasonography revealed a hypoechoic tumor measuring 20 × 20 mm (Fig. 3A). An enhanced computed tomography image of the abdomen revealed a tumor with ring enhancement (Fig. 3B). Hematoxylin-Eosin staining of a specimen obtained by tumor biopsy under ultrasonic

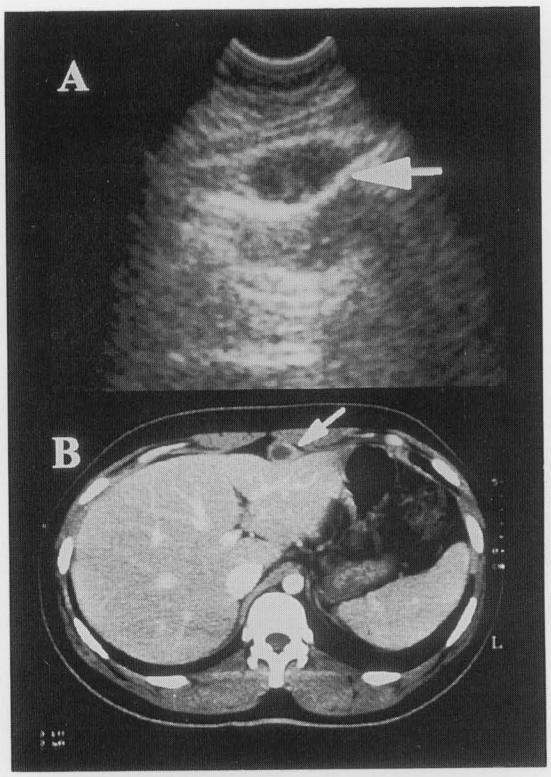

Fig. 3 A: Ultrasonography revealed a hypoechoic tumor measuring 20 × 20 mm corresponding to the accumulation of radioactivity detected on Ga-67 scintigraphy. B: Enhanced computed tomography imaging of the abdomen revealed a tumor with ring enhancement.

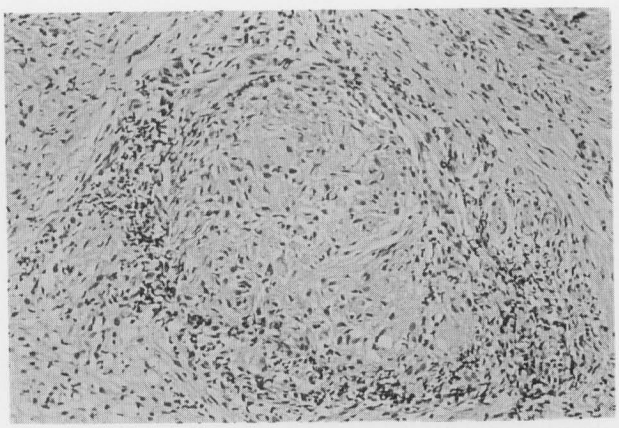

Fig. 4 Hematoxylin-Eosin staining of a specimen obtained by tumor biopsy revealed a tuberculous granuloma composed of epithelioid cells, multinucleated giant cells, central necrosis and a mantle of lymphocytic infiltration.

guidance revealed a tuberculous granuloma composed of epithelioid cells, multinucleated giant cells, central necrosis and a mantle of lymphocytic infiltration (Fig. 4). Percutaneous injection into the tumor was performed with 1.0 g of streptomycin. On Ga-67 scintigraphy performed

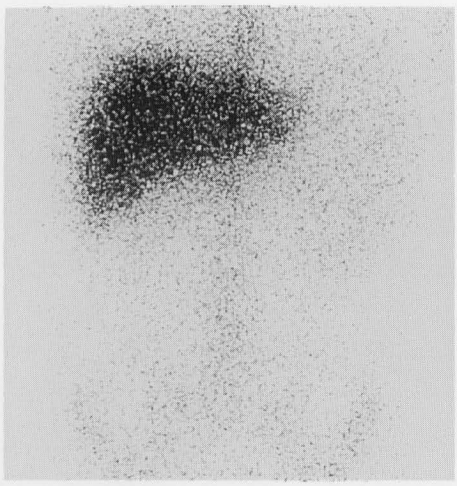

Fig. 5 On Ga-67 scintigraphy performed 2 weeks after injection of streptomycin, accumulation of radioactivity in the upper abdomen disappeared.

2 weeks later, accumulation of radioactivity in the upper abdomen had disappeared (Fig. 5).

DISCUSSION

Ga-67 scintigraphy is useful for the detection of acute and chronic bacterial infections.[4] Although the mechanism of Ga-67 localization in inflammatory tissue remains unclear, it is considered to be carried by the trasferrin or lactoferrin[8] and is taken up by polymorphonuclear leukocytes[9] and bacteria.[10]

Siemsen et al.[11] reported pulmonary uptake of radiogallium in 97% of patients with active tuberculosis. Yang et al.[7] detected a positive finding on Ga-67 scintigraphy in 19 of 23 patients (83%) with extrapulmonary tuberculosis. Three of the 23 patients had tuberculous peritonitis and all had positive findings. Sumi et al.[12] reported finding diffuse abdominal uptake in 10 of 16 patients (63%) with tuberculous peritonitis, and focal abdominal uptake in 6 of 16 patients (37%).

In the same population, decreased hepatic uptake was observed in 9 of 16 patients (56%), and normal hepatic uptake in 4 of 16 patients (25%). These findings were assumed to be the result of competition by inflammation, which acts as a "sink" for radiogallium.[13] The other causes of reduced hepatic uptake of gallium include recent chemotherapy, blood transfusion (iron overload), and liver failure.[13] In our patient, Ga-67 scintigraphy revealed normal hepatic uptake, probably because there was no other cause of reduced hepatic uptake.

In the current case, localized Ga-67 accumulation was found after the initial treatment for tuberculosis. The mass was considered to be encapsulated tuberculosis, which was formed in the process of initial diffuse degeneration of tuberculous peritonitis, its recovery on treatment, subsequent severe adhesion of the peritoneum, formation of tuberculoma in the space formed by the adhesion, and proliferation of connective tissues around the lesion. Ga-67 scintigraphy is useful for the evaluation of activity of such tumors, which are difficult to evaluate by other imaging methods.

In conclusion, Ga-67 scintigraphy could diagnose the activity of tuberculosis, and played an important role in the determination of therapy. It seemed that Ga-67 scintigraphy is useful for the diagnosis and observation during the treatment of tuberculous peritonitis.

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