

Gallium-67 Scintigraphy in a Case of Tuberculous Peritonitis

Tüberküloz Peritonitli Bir Olguda Galyum-67 Sintigrafisi

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Geliş Tarihi/Received: 09.12.2009

Kabul Tarihi/Accepted: 08.03.2010

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ABSTRACT We report the case of a 57-year-old woman with tuberculous peritonitis admitted with the complaint of abdominal swelling. Physical examination revealed a body temperature of 38.5°C. Laboratory tests demonstrated increased erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) level. Chest X-ray and thorax computed tomography (CT) scan were normal, and cultures from ascites, stool and sputum were negative for *Mycobacterium tuberculosis*. Ultrasonography (USG) and CT scan of the abdomen showed massive ascites with multiple septa and thickened omentum. Gallium-67 (Ga-67) scintigraphy showed diffuse and intense increased uptake in the abdomen. Omental biopsy revealed caseating granulomatous reaction. The diagnosis of active tuberculous peritonitis was considered on the basis of the imaging findings, laboratory results and clinical progress, and treatment was started with anti-tuberculosis drugs. With initiation of the therapy, her fever resolved, the ascites gradually decreased, and ESR and CRP normalized after a month. Ga-67 scintigraphy may be useful when there is a high index of suspicion of tuberculous peritonitis.

Key Words: Peritonitis; tuberculosis; radionuclide imaging; gallium citrate

ÖZET Abdominal şişlik şikayeti ile başvuran tüberküloz peritonit tanılı 57 yaşında kadın olguyu sunduk. Fizik muayenede vücut ısısı 38.5°C saptandı. Laboratuvar bulgularında eritrosit sedimentasyon hızı (ESH) ve C reaktif protein (CRP) düzeylerinde artış saptandı. Akciğer grafisi ve toraks bilgisayarlı tomografisi (BT) normaldi, asit, dışkı ve balgam kültüründe mikobakterium tüberküloz negatifti. Abdominal ultrasonografi (USG) ve BT'de multipl septalı masif asit ve omentumda kalınlaşma saptandı. Galyum-67 (Ga-67) sintigrafisinde batında diffüz ve yoğun artmış aktivite tutulumu izlendi. Omental biyopside granülomatöz reaksiyon saptandı. Radyolojik bulguları, laboratuvar sonuçları ve klinik gidişe dayanarak aktif tüberküloz peritonit tanısı düşünüldü ve antitüberküloz ilaçlarla tedavi başlandı. Tedavinin başlamasıyla, hastanın ateşi düştü, asit giderek azaldı, 1 ay sonra ESH ve CRP düzeyleri normal bulundu. Ga-67 sintigrafisi, tüberküloz peritonit şüphesinin yüksek olduğu durumlarda yararlı olabilir.

Anahtar Kelimeler: Peritonit; tüberküloz; radyonüklit görüntüleme; galyum sitrat

Turk J Nucl Med 2010;19(1):36-40

Tuberculous peritonitis is a rare manifestation of extrapulmonary tuberculosis (TB).¹⁻³ The diagnosis of tuberculous peritonitis is often overlooked because of non-specific symptoms and frequent lack of concurrent lung involvement. Tuberculous peritonitis is a curable infectious disease, caused mainly by *Mycobacterium tuberculosis*. It can mimic many conditions, like inflammatory bowel disease, malignancy and other infectious diseases.⁴ There are no pathognomonic clinical, radiologic or la-

laboratory tests for tuberculous peritonitis.⁵ Diagnostic delays lead to significant morbidity and mortality. A high index of suspicion is necessary to achieve an early diagnosis and improved outcome.^{6,7}

Gallium-67 (Ga-67) is useful in the detection of active inflammatory lesions and certain tumors.⁸ It has been used widely in the evaluation of various infectious diseases including TB. Diffuse or focal abdominal uptake of Ga-67 has been reported in tuberculous peritonitis; however, there are few reports on the evaluation of tuberculous peritonitis using the Ga-67 scan.⁹⁻¹³ We report here a Ga-67 scintigraphy that showed diffuse and intense abdominal uptake of Ga-67 in a case of tuberculous peritonitis.

CASE REPORT

A 57-year-old woman was admitted to our hospital for further examination of ascites. She complained of abdominal swelling. She had no significant personal or family history. Physical examination showed blood pressure of 110/60 mmHg, regular pulse of 92/min, and body temperature of 38.5 °C; breath sounds were clear with no rales. The patient's abdomen was distended. The laboratory data for blood demonstrated elevated erythrocyte sedimentation rate (ESR) (74 mm/h) and C-reactive protein (CRP) level (150 mg/L). Adenosine deaminase (ADA) level was normal. She had received Bacillus Calmette-Guérin (BCG) vaccine in childhood, and her intradermal tuberculin test was negative. Chest X-ray and thorax computed tomography (CT) showed normal appearance of the mediastinum and bilateral pulmonary hili. Cultures of sputum, ascites and stool were negative for acid-fast bacilli. Polymerase chain reaction (PCR) analysis of ascites was also negative. Esophagogastroscopy and ileocoloscopy revealed no ulcer or stenosis in the colon or ileum. Ultrasonography (USG) and CT scan of the abdomen showed massive ascites with multiple septa and thickened omentum (Figure 1). There were no masses or lymph node swellings in the abdominal cavity. Omental biopsy revealed caseating granulomatous reaction. Prior to performing an exploratory laparotomy, a Ga-67 scintigraphy was requested.



FIGURE 1: Abdominal computed tomography showed massive ascites with multiple septa (1) and thickened omentum (2).

A whole-body scintigraphy was performed 24 and 48 hours after intravenous injection of 185 MBq (5 mCi) Ga-67, with a gamma camera (ADAC, Philips) using a large field of view and a medium-energy parallel-hole collimator. Ga-67 scintigraphy showed diffuse and intense increased uptake in the abdomen (Figure 2).

Laboratory and imaging findings and social context pointed to the risk of TB, and thus tuberculous peritonitis was suspected. She was started on anti-tuberculosis drugs with combined use of isoniazid, rifampicin, ethambutol, and morphazinamide. After the initiation of the therapy, her fever resolved, the ascites gradually decreased, and CRP and ESR normalized after a month.

DISCUSSION

While TB infection is commonly seen in underdeveloped countries, in recent years, it has also become more common in developed countries as a result of contributing factors such as acquired immunodeficiency syndrome (AIDS), drug abuse, migration from underdeveloped countries, and

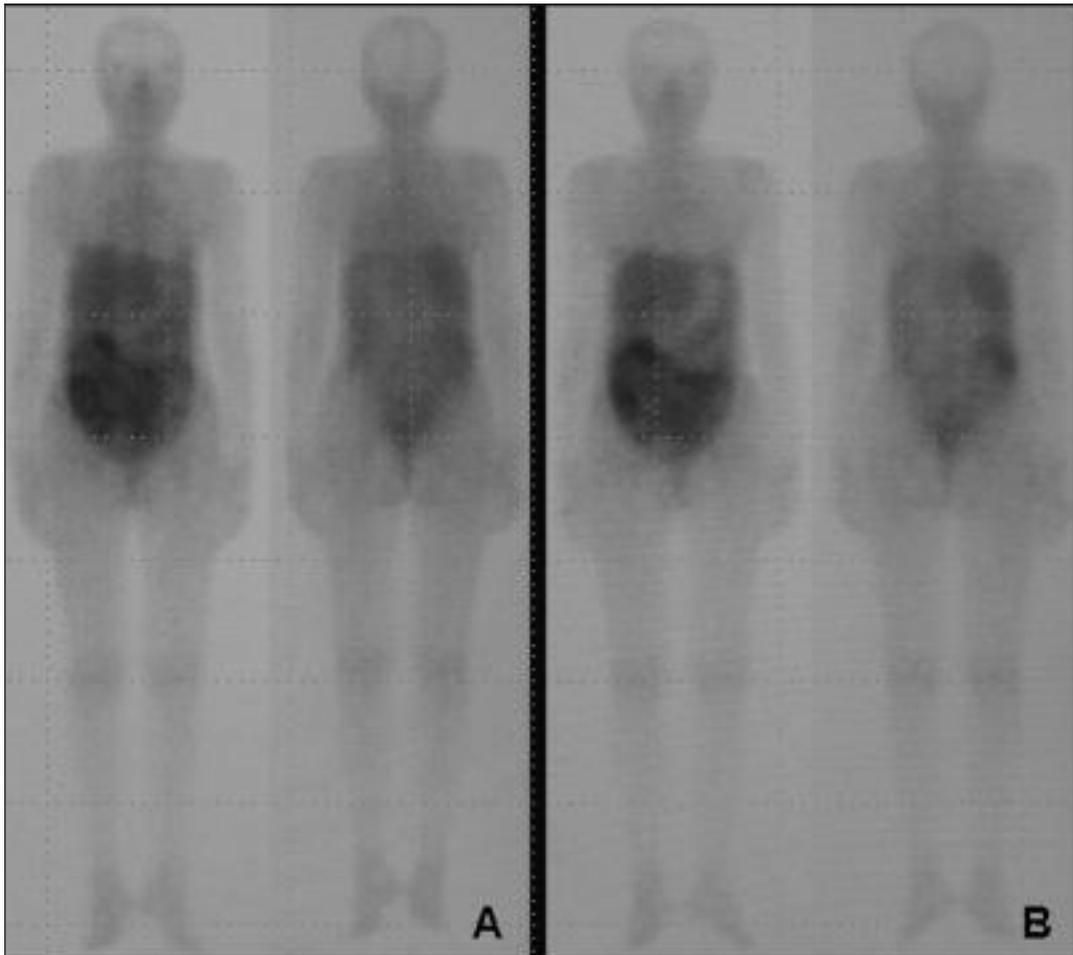


FIGURE 2: Gallium-67 whole-body scintigram taken at 24 hr (A) and 48 hr (B) after injection shows diffuse and intense uptake in the abdomen.

international travel.¹ Peritonitis is a rare form of TB and occurs in up to 3.5% of cases of pulmonary TB and comprises 31-58% of cases of abdominal TB.² Active pulmonary TB is detectable in only 14% of cases. Both sexes are equally affected and the disease is seen most commonly in patients between 35 and 45 years of age. Abdominal swelling is the most common symptom.⁶ Other systemic features of the disease include fever, weight loss, chronic abdominal pain, anorexia, and diarrhea. Peritoneal disease in TB occurs primarily by hematogenous spread but may be secondary to contagious spread from tuberculous lesions of the intestines or fallopian tubes.¹⁻³ In the present patient, it was shown that severe infection of *Mycobacterium tuberculosis* had occurred, although the patient had been healthy, with no history of debilitating diseases such as HIV infection, and had no

lymph node swellings on the CT scan of the thorax and abdomen.

The diagnosis of tuberculous peritonitis is often overlooked because of non-specific symptoms and a frequent lack of concurrent lung involvement. One of the pitfalls in the diagnosis of tuberculous peritonitis is the fact that repeated bacteriologic examination of ascitic fluid and cultures may be negative. The intradermal tuberculin test may be negative in half of patients with tuberculous peritonitis.¹⁴ As has been reported in the literature, the level of ADA in the ascites is increased.¹⁵ Ascites is the most common sonographic finding in TB peritonitis.¹⁶⁻¹⁹ However, these appearances are not specific for tuberculous peritonitis. In patients with such features, peritoneal or omental biopsy may be necessary for proper diagnosis.

The diagnosis of tuberculous peritonitis is often difficult because of non-specific symptoms, lack of pathognomonic laboratory findings and non-specific radiologic features. Radiologic findings of abdominal TB can also mimic those of many different diseases.⁵ On CT scan, classically, TB is more likely to present with mesenteric macronodules (>5 mm in diameter), smudged type with regular omental line and splenic abnormalities including splenomegaly or calcification.^{5,18,19} However, sensitivity for predicting tuberculous peritonitis was only 69%.¹⁹

In patients with fever and non-specific symptoms, the Ga-67 and other infection imaging methods, such as In-111-oxine/Tc99m-hexamethylpropyleneamine oxime-labeled leukocytes or Tc99m-labeled granulocytes scan, should be considered in the diagnostic workup, before invasive diagnostic laparoscopy.^{20,21} Ga-67 is useful in the detection of active inflammatory lesions and certain tumors.^{8,20,21} Ga-67 scan has higher sensitivity for diagnosis of chronic and granulomatous inflammation. Diffuse abdominal uptake of Ga-67 suggesting peritonitis has also been observed in patients with inflammatory bowel disease, malignancy and other infectious diseases. It has been also reported that tuberculous peritonitis was associated with diffuse or focal abdominal uptake of Ga-67.⁹⁻¹³ In addition, the ability to perform whole-body imaging could be useful in demonstrating other locations of TB. One of the most important problems in the application of the Ga-67 scan is its low specificity. Therefore, correlation with the CT scan and the biopsy of positive lesions on the Ga-67 scan are mandatory to diagnose tuberculous peritonitis.

With developments in other imaging modalities, including fluorine-18 fluorodeoxyglucose positron emission tomography (FDG-PET) or FDG-PET/CT, the role of the Ga-67 scan has changed considerably. FDG-PET imaging, an established modality for evaluation of several malignancies, also shows increased uptake in inflammatory conditions.²²⁻²⁴ Jeffry et al. reported on the use of FDG-PET for diagnosis of tuberculous

peritonitis, and concluded that it was not specific for peritoneal TB.²² FDG-PET/CT could have a potential role in assessing treatment efficacy in inflammatory and infectious diseases.²⁴

It has been reported that Ga-67 scintigraphy, FDG-PET and FDG-PET/CT should be useful for monitoring response to treatment of tuberculous peritonitis.^{9,22-24} However, we could not compare the results of Ga-67 scintigraphy after treatment because of the patient's social context and we also could not perform PET scan due to the lack of availability of this modality in our institute.

The diagnosis of tuberculous peritonitis is also established on the basis of satisfactory therapeutic response to anti-tuberculosis drugs in patients with clinical and radiologic evidence of tuberculous peritonitis. The physical symptoms of our patient were not specific. Only fever and social context pointed to the risk of TB. USG and CT imaging showed ascites. Ga-67 scintigraphy was also of moderate interest, with a reported low specificity in the prediction of TB. In patients with such features, satisfactory therapeutic response to anti-tuberculosis drugs may be necessary for proper diagnosis. Laboratory findings and clinical status of our patient improved after treatment with anti-tuberculosis drugs.

Tuberculous peritonitis must be considered in the differential diagnosis of patients with non-specific clinical signs and symptoms, such as massive ascites and fever, that mimic the picture of other diseases. Ga-67 scintigraphic findings are not specific in tuberculous peritonitis, but may be useful in the differential diagnosis. An awareness of the scintigraphic features may contribute valuable information, help in the diagnosis of tuberculous peritonitis, improve diagnostic accuracy, and avoid clinical mismanagement.

A high index of suspicion is an important factor in the early diagnosis and in achieving a beneficial patient outcome. Ga-67 scintigraphy may be useful when there is a high index of suspicion of tuberculous peritonitis.

REFERENCES

1. Marshall TB. Tuberculosis of gastrointestinal tract and peritoneum. *Am J Gastroenterol* 1993;88(7):989-99.
2. Sheldon CD, Probert CS, Cock H, King K, Rampton DS, Barnes NC, et al. Incidence of abdominal tuberculosis in Bangladeshi migrants in east London. *Tuber Lung Dis* 1993; 74(1):12-5.
3. Sochocky S. Tuberculous peritonitis. A review of 100 cases. *Am Rev Respir Dis* 1967;95(3): 398-401.
4. Akhan O, Pringot J. Imaging of abdominal tuberculosis. *Eur Radiol.* 2002;12(2):312-23.
5. Pereira JM, Madureira AJ, Vieira A, Ramos I. Abdominal tuberculosis: imaging features. *Eur J Radiol.* 2005;55(2):173-80.
6. Sanai FM, Bzeizi KI. Systematic review: tuberculous peritonitis--presenting features, diagnostic strategies and treatment. *Aliment Pharmacol Ther* 2005;22(8):685-700.
7. Makiyama A, Okuyama Y, Okajima T, Fujimoto S. Tuberculous peritonitis. *J Gastroenterol.* 2003;38(12):1167-70.
8. Hilson AJ, Maisey MN. Gallium-67 scanning in pyrexia of unknown origin. *Br Med J* 1979;2 (6201):1330-1.
9. Nishiguchi S, Shiomi S, Ishizu H, Kurooka H, Iwata Y, Sasaki N, et al. A case of tuberculous peritonitis monitored by gallium-67 scintigraphy. *Ann Nucl Med* 2001;15(3):247-9.
10. Sumi Y, Ozaki Y, Hasegawa H, Shindoh N, Katayama H, Tamamoto F. Tuberculous peritonitis: gallium-67 scintigraphic appearance. *Ann Nucl Med.* 1999;13(3):185-9.
11. Lin WY, Hsieh JF. Gallium-67 citrate scan in extrapulmonary tuberculosis. *Nuclearmedizin* 1999;38(6):199-202.
12. LaManna MM, Saluk PH, Zekavat PP, Mobini J, Parker JA. Gallium localization in peritonitis. Two case reports. *Clin Nucl Med.* 1984;9(1): 25-7.
13. Itoh K, Hayasaka T, Kuwabara S, Sasaki H, Saito H. [Diffuse abdominal uptake of 67Ga-citrate; report of three cases]. *Rinsho Hoshasen.* 1989;34(12):1497-500.
14. Dinler G, Sensoy G, Helek D, Kalaycı AG. Tuberculous peritonitis in children: report of nine patients and review of the literature. *World J Gastroenterol* 2008;14(47):7235-9.
15. Uzunkoy A, Harma M, Harma M. Diagnosis of abdominal tuberculosis: experience from 11 cases and review of the literature. *World J Gastroenterol* 2004;10(24):3647-9.
16. Mizunoe S, Morinaga R, Umeki K, Yamagata E, Hiramatsu K, Yamakami Y, et al. A case of tuberculous peritonitis diagnosed by ultrasonography-guide peritoneal biopsy. *Kansenshogaku Zasshi.* 2000;74(7):589-93.
17. Brizi MG, Celi G, Scaldazza AV, Barbaro B. Diagnostic imaging of abdominal tuberculosis: gastrointestinal tract, peritoneum, lymph nodes. *Rays.* 1998;23(1):115-25.
18. Sinan T, Sheikh M, Ramadan S, Sahwney S, Behbehani A. CT features in abdominal tuberculosis: 20 years experience. *BMC Med Imaging.* 2002;2(1):3.
19. Ha HK, Jung JI, Lee MS, Choi BG, Lee MG, Kim YH, et al. CT differentiation of tuberculous peritonitis and peritoneal carcinomatosis. *AJR Am J Roentgenol* 1996;167(3):743-8.
20. Alazraki NP. Radionuclide imaging in the evaluation of infections and inflammatory disease. *Radiol Clin North Am* 1993;31(4):783-94.
21. Becker W, Meller J. The role of nuclear medicine in infection and inflammation. *Lancet Infect Dis* 2001;1(5):326-33.
22. Jeffrey L, Kerrou K, Camatte S, Lelievre L, Metzger U, Robin F, et al. Peritoneal tuberculosis revealed by carcinomatosis on CT scan and uptake at FDG-PET. *BJOG* 2003;110(12):1129-31.
23. Takalkar AM, Bruno GL, Reddy M, Lilien DL. Intense FDG activity in peritoneal tuberculosis mimics peritoneal carcinomatosis. *Clin Nucl Med* 2007;32(3):244-6.
24. Imperiale A, Federici L, Lefebvre N, Braun JJ, Pfumio F, Kessler R, et al. F-18 FDG PET/CT as a valuable imaging tool for assessing treatment efficacy in inflammatory and infectious diseases. *Clin Nucl Med* 2010;35 (2):86-90.