

Tc-99m(V)-DMSA in wound infection after closure of an ileostomy

Ming-Zhe CHANG,* Chien-Chung TSAI,**,*** Guang-Uei HUNG**** and Wan-Yu LIN*

*Department of Nuclear Medicine, Taichung Veterans General Hospital, Taichung, Taiwan

**Department of Radiology, Tainan Municipal Hospital, Tainan 701, Taiwan

***Department of Radiology, Tian-Sheng Memorial Hospital, Tong Kang, Taiwan

****Department of Nuclear Medicine, Changhua Christian Hospital, Changhua, Taiwan

We present a 71-year-old man who underwent closure of an ileostomy and had a fever seven days post surgery. Both Tc-99m(V)-dimercaptosuccinic acid (DMSA) and gallium-67 citrate scans showed increased tracer accumulation in the right lower quadrant of the abdomen. Tc-99m(V)-DMSA scintigraphy can be a rapid alternative tool in the detection of wound infection in patients after ileostomy closure.

Key words: Tc-99m(V)-DMSA, gallium-67, ileostomy, wound infection

INTRODUCTION

Gallium-67 citrate has been used to evaluate wound inflammation with or without infections after a colorectal operation.^{1,2} However, some of its characteristics, such as delayed imaging timing and physiologic gastrointestinal excretion, make it a sub-optimal agent for clinical use. In this paper, one case was reported and the feasibility of using Tc-99m(V)-dimercaptosuccinic acid (DMSA) scan compared with gallium scan in detecting wound conditions is discussed.

CASE REPORT

A 71-year-old man who had undergone an anterior resection for treatment of colon cancer and an ileostomy for pseudomembrane colitis underwent a closure of ileostomy. Seven days after the procedure, fever developed. Laboratory studies showed a total white blood cell count of 9630/cumm and a C-reactive protein of 3.41 mg/dl. Fever of unknown origin was clinically suspected and Tc-99m(V)-DMSA whole-body imaging was obtained 3 hours after the intravenous administration of 740 MBq Tc-99m(V)-DMSA. The result showed an area of in-

creased activity in the right lower abdomen (Fig. 1). Single photon emission tomography (SPECT) was also performed and showed a lesion located at the deep abdominal wall (Fig. 2). After completing the Tc-99m(V)-DMSA scan, 111 MBq of gallium-67 citrate was injected intravenously. A whole body scan performed 24 hours after the gallium administration showed increased gallium uptake in the same area as that in the Tc-99m(V)-DMSA scan (Fig. 3). An abdominal CT scan showed some amount of amorphous and enhanced soft tissue shadows around the closed operative site in the right anterior abdominal wall corresponding to the findings in the Tc-99m(V)-DMSA scan and gallium scan (Fig. 4). After pus drainage and treatment with antibiotics, his fever subsided and his clinical condition improved.

DISCUSSION

Wound infection is an important postoperative issue, and results in morbidity and mortality in surgical patients.^{3,4} CT is the imaging method of choice for the diagnosis.⁵⁻⁷ However, in patients with distortion of the normal anatomy due to recent trauma or surgery, in an early infection before discrete fluid collections, and in patients without localized signs of an abdominal abscess, nuclear medicine imaging can play some role in evaluating the postoperative wound.^{5,8,9}

Gallium-67 citrate is easy to use and readily available. It is widely used in detection of infectious source and inflammation. Early imaging has been suggested for

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For reprint contact: Wan-Yu Lin, M.D., Department of Nuclear Medicine, Taichung Veterans General Hospital, 160, Taichung Harbor Road, Section 3, Taichung 40705, TAIWAN.

E-mail: wylin@vghtc.vghtc.gov.tw



Fig. 1 The anterior view of planar whole body image shows an area of increased Tc-99m(V)-DMSA uptake in the right low abdomen 3 hours after the intravenous administration of 740 MBq Tc-99m(V)-DMSA (*arrow*).

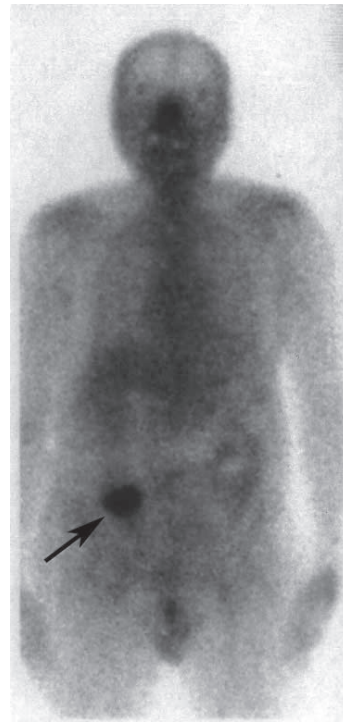


Fig. 3 Planar whole body image shows an area of increased radioactivity in the right low abdomen 24 hours after intravenous injection of 111 MBq of Ga-67 citrate (*arrow*).

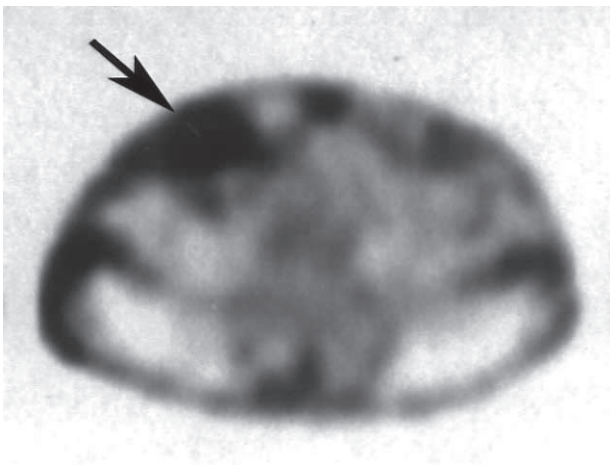


Fig. 2 The SPECT transaxial section shows the lesion is located at the right low abdominal wall extending to the deep layer (*arrow*).

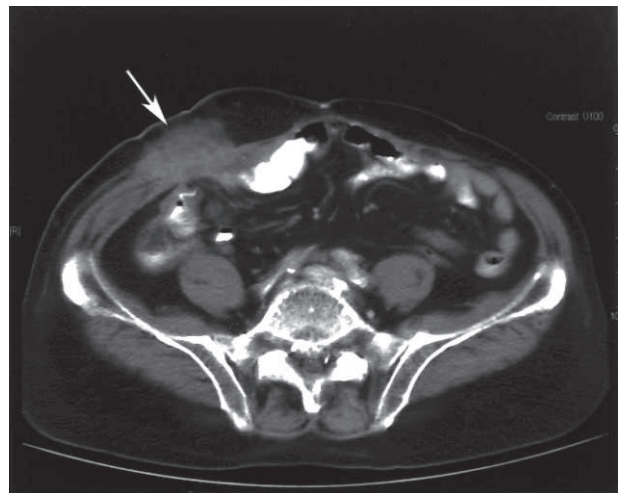


Fig. 4 Computer tomography reveals amorphous and enhanced soft tissue shadows around closed operative site in right anterior abdominal wall (*arrow*).

patients with suspected abdominal abscess.¹⁰ Abdominal imaging can be performed as early as 4 to 6 hours after injection. However, some disadvantages may weaken the clinical application of the 6-hour gallium imaging: (1) The patients were frequently referred to our department in the afternoon. Thus, there was usually not enough time to perform a 6-hour image. (2) The background to target

ratio could be low in a 6-hour image. After intravenous administration, gallium binds to transferrin and heptoglobulin. The protein binding slows plasma clearance; approximately 10% of the gallium remains in the plasma at 24 hours.¹¹ (3) Perkins et al. reported that about 50% of patients imaged between 5 and 9 hours after injection had increased physiologic accumulation of gallium which can

be confused with pathologic activity if early imaging is relied on exclusively.¹² Moreover, normal gastrointestinal activity limits its usefulness in evaluating the abdomen. A delayed imaging of 2 to 4 days sometimes is necessary to differentiate normal bowel activity from infectious lesion.

Tc-99m(V)-DMSA was initially proposed for tumor scintigraphy¹³ and was found to be clinically effective¹⁴ and has been used in patients with medullary carcinoma of the thyroid¹⁵ and squamous cell carcinoma of head and neck.¹⁶ Uptake by inflammatory tissues has also been reported,¹⁷ but not thoroughly understood. Ercan et al. indicated the feasibility of imaging induced abscesses and arthritis with Tc-99m(V)-DMSA in animals.¹⁸ Although not statistically significant, Lee et al. demonstrated a greater sensitivity and accuracy of Tc-99m(V)-DMSA scan in the assessment of bone and joint infection than gallium-67 citrate scan.¹⁹ A high sensitivity and specificity of Tc-99m(V)-DMSA in detection and localization of intestinal inflammation²⁰ and a good correlation to disease activity²¹ have been reported. To our knowledge, this is the first case to report Tc-99m(V)-DMSA in the evaluation of a postoperative wound infection. In this case, both Ga-67 scan and Tc-99m(V)-DMSA scan successfully detected the infection focus. Although the uptake of Ga-67 in the lesion was more intensive than that of Tc-99m(V)-DMSA, the uptake of Tc-99m(V)-DMSA in the lesion was still sufficiently high for interpretation. Actually, according to the study by Lee et al.,¹⁹ any uptake in the bowel was interpreted as a positive study finding and they found no false positive in any of 30 control subjects. We considered that the interpretation of Tc-99m(V)-DMSA scan in the abdomen should not be difficult due to the lack of interference from physiologic bowel activity.

The mechanism of Tc-99m(V)-DMSA accumulation in the infection site is not well known. Some possible mechanisms have been assumed such as infiltration of Tc-99m(V)-DMSA into the interstitial space due to increased capillary permeability in inflammatory tissue, Tc-99m(V)-DMSA complexes bound to proteins at the site of inflammation, and the structure of Tc-99m(V)-DMSA similar to the phosphate ion.^{18,19,22} All these factors may play a role in its localization in infection. However, more studies are still needed to elucidate the localization mechanisms.

Tc-99m(V)-DMSA is superior to Ga-67 citrate in many aspects. It is nearly an ideal radionuclide with physical characteristic suitable for present-day gamma cameras. It is not expensive. Tc-99m(V)-DMSA can be readily prepared from commercially available DMSA kits. A scintigram can be obtained in a few hours after administration without any patient preparation. SPECT imaging can be performed to obtain images with precise location.²³ In addition, it is readily able to detect intra-abdominal lesions due to the urinary excretion rather than gastrointes-

tinal excretion.²⁴ In conclusion, Tc-99m(V)-DMSA scintigraphy can be a rapid alternative tool to gallium scan in the evaluation of wound infection in patients after closure of an ileostomy.

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