Detection of Mediastinitis After Heart Transplantation by Gallium-67 Scintigraphy

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We report the findings of a patient with post-cardiac transplant mediastinitis detected by ^{67}Ga-citrate imaging. Fever and leukocytosis were the first clinical signs suggesting infection. The usual diagnostic modalities, including CT and ultrasound, failed to identify the site of infection. A ^{67}Ga scan showed intense abnormal uptake behind the sternum. The site of uptake was shown by necropsy to be necrotic tissue involving cardiac sutures, pulmonary arteries, and the aorta due to infection with *Haemophilus aphrophilus*.

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Previous reports have emphasized the low incidence of mediastinitis in association with the median sternotomy used for cardiac surgery, including heart transplantation (*1–4*). However, mediastinitis, along with other infections, is a devastating complication, with a high rate of morbidity and mortality in heart transplant recipients (*5,6*). These factors make the early diagnosis of mediastinitis a fundamental requirement for the success of therapy. The early diagnosis of mediastinitis is usually dependent upon the presence of sternal wound drainage, the most common presentation, and sternal dehiscence (*7*). In the absence of these findings, the diagnosis becomes unusually difficult due to the lack of specificity of fever, leukocytosis and conventional CT in the identification of the site of infection in the postoperative patient. In this context, an imaging technique that could demonstrate the site of infection would be of great value.

The ^{67}Ga scan has been used as a diagnostic procedure for the detection of occult sepsis and the evaluation of fever of unknown origin (*8–11*). It also has been reported to be of value in the detection of occult cardiac infections as the cause of sepsis (*12–14*). These previous experiences encouraged us to use ^{67}Ga scintigraphy to localize the site of an occult infection in a patient after heart transplantation.

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CASE REPORT

A 47-yr-old patient with a previous anterior wall myocardial infarction, a dilated cardiomyopathy, severe left ventricular dysfunction, and congestive heart failure underwent heart transplantation. During the first 10 postoperative days, he did well with only a pericardial friction rub on physical examination. On the 11th postoperative day, he developed fever (39°C) and complained of chills but had no localizing signs or symptoms. Moreover, the sternal wound appeared normal, without dehiscence, suppuration, or pain. Leukocytosis was present (27.000 m^3). The abdominal examination was normal and a blood culture was negative. No antibiotic treatment was started and the patient's temperature returned to normal.

Two days later the patient again developed fever (40°C) and chills. Treatment with paracetamol and aspirin was begun. Blood cultures remained negative and no localizing signs were evident. However, after 24 hr the patient developed a worsening headache and therapy was changed to vancomycin and amikacin. Serologic tests were negative including cytomegalovirus and toxoplasm, but a new blood culture grew *Haemophilus aphrophilus* sensitive to ampicillin. A chest x-ray, abdominal and chest ultrasound, and a CT scan failed to localize the site of infection; a whole-body ^{67}Ga scan was then ordered.

Forty-eight hours after the intravenous injection of 185 MBq of ^{67}Ga-citrate scan, images of the chest were obtained in the anterior-posterior, left anterior oblique, and right anterior oblique projections (Fig. 1). On the oblique views, a well-defined area of highly pathologic uptake was seen in the retrosternal region. Despite treatment with ampicillin, the patient deteriorated. A new cranial CT scan showed a brain abscess with cerebral edema. The patient subsequently developed coma and died. Necropsy revealed a large area of necrotic tissue arising from the cardiac sutures, which involved the aorta and pulmonary arteries and resulted from infection with *H. aphrophilus*.

DISCUSSION

Infection continues to be a major cause of morbidity and mortality in heart transplant recipients and has been reported to account for more than half of the deaths in the first 90 postoperative days (*4*). The relationship of the incidence of infections in these immunocompromised patients to the therapy regimens for rejection also has been reported (*4,14*). Among the sites of infection, the mediastinum is uncommon compared to other sites such as the

FIGURE 1. Oblique views of the pathologic uptake behind the sternum.

lung and urinary tract. Mediastinitis in transplant recipients has been related to the median sternotomy (*5,15*). Despite its low incidence, it is regarded as a serious complication that can result in sepsis and death. These features make early diagnosis a key factor for successful treatment. The diagnosis of mediastinitis is made, in most cases, on the basis of sternal wound drainage and/or dehiscence and, according to some authors, is dependent on these signs (*7*). However, the diagnosis is extremely difficult in the absence of these signs so that presentation of mediastinitis may be that of occult sepsis. Moreover, in these patients, persistent fever and leukocytosis are only suggestive of infection since they are common postoperative findings after cardiac surgical procedures (*5,16*).

Evidence of mediastinitis by conventional plain films has been reported to be consistently absent and indistinguishable from routine postoperative changes. This same sort of limitation applies to other imaging techniques based on the visualization of anatomic structures, including CT and ultrasound, because of surgical artifacts and the presence of edema and hemorrhage that are usually present in normal patients convalescing from cardiac surgery (*17*).

In the case reported, fever and leukocytosis were the only findings to suggest infection after other diagnostic techniques failed to localize a source and the patient continued to deteriorate. In this context, the decision was made to perform a ^{67}Ga scan, which clearly demonstrated abnormal uptake in the mediastinum on the oblique views. The uptake was ill-defined in the anterior-posterior projection due to the overlying physiologic activity of the sternum. Oblique views circumvented the difficulty created by the superimposition of activity from the sternum and ribs and provided improved visualization of the mediastinum.

Another approach to overcome these limitations would be to apply SPECT imaging, which would provide image separation within a plane and avoid the masking effect of the overlying activity. The use of SPECT for this purpose is well described in other clinical situations (*18,19*).

The use of ^{111}In-leukocytes and its advantages over ^{67}Ga-citrate for the detection of the site of infection have been suggested. However, the blood-pool activity in leukocyte scans makes evaluation of the mediastinum very difficult. With ^{67}Ga, blood-pool activity is nearly never a problem, especially if imaging is done at 48–72 hr. Additionally, the count density is higher with ^{67}Ga than with ^{111}In-WBCs making SPECT easier to interpret.

In conclusion, the information provided by ^{67}Ga scintigraphy in the case reported here suggests the diagnosis of post-surgical mediastinitis as a new application of this imaging technique.

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