

Chest CT and Gallium-67 SPECT Scintigraphy Scan Co-Registration in a Post-Heart Transplantation Patient with Unresolved Fever

Ahuva Grubstein MD¹, Hanna Bernstine MD MSc MHA² and Adam P. Steinmetz MD²

Departments of ¹Radiology and ²Nuclear Medicine, Rabin Medical Center (Beilinson Campus), Petah Tikva, Israel
Affiliated to Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

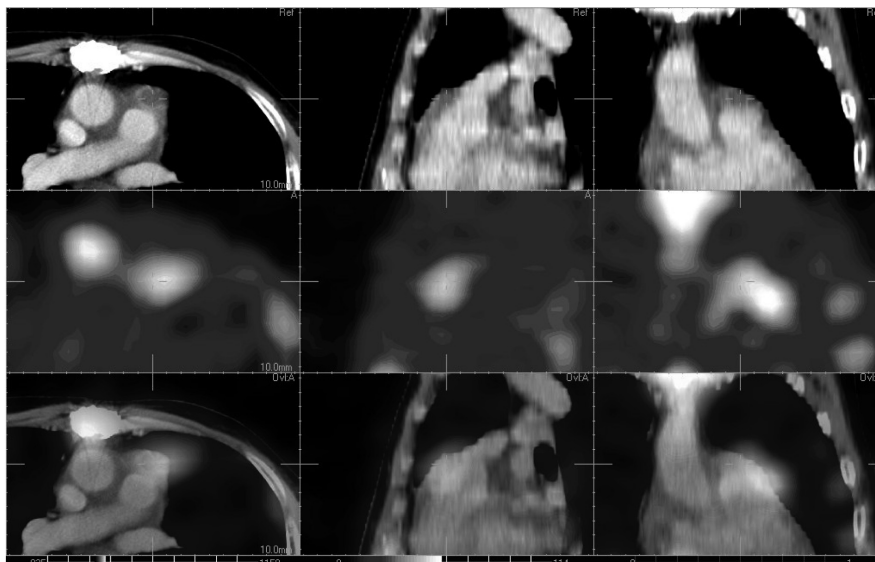
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Cardiac transplantation is currently the accepted treatment for end-stage cardiac failure refractory to medical treatment. One year survival is approximately 85% and 10 years survival approaches 60%. Infections and rejection remain significant causes of morbidity and death despite improvements in early antibiotic treatment and immunosuppression techniques. Fungal infections, especially aspergillosis and candidiasis, continue to be a major cause of morbidity and mortality [1]. Computed tomography has emerged as an important tool for early diagnosis of infections, ischemic or neoplastic complications [3-5]. Gallium-67 scintigraphy is used to evaluate fever of unknown origin and to confirm suspected infections. Co-registration and image fusion of the two modalities combines the CT anatomical information with the functional-biological information of scintigraphy.

Patient Description

We present the case of a 47 year old patient, a heart transplant recipient due to dilated cardiomyopathy. The patient was hospitalized 3 months after the operation because of low grade fever, tenderness and redness of the sternal scar. Chest CT and gallium-67 scintigraphy studies were normal at that time. He was treated with intravenous ceftazidime and vancomycin. Two months later he was hospitalized again with low grade fever and a secreting wound in the lower sternal scar area. Local bacterial culture from the wound yielded *Aspergillus fumigatus* growth. Chest CT with intravenously contrast media injection showed pericardial effusion, partially loculated, anterior to the main pulmonary artery, and thickened costal cartilage along



Chest CT demonstrates a lesion anterior to the main pulmonary artery, with hypodense center and an enhancing wall, corresponding to an area with increased uptake on gallium-67 scintigraphy.

the seventh and eighth ribs, more pronounced on the left. Most of the findings were attributed to postoperative changes, and a definite diagnosis of osteomyelitis or fever origin could not be excluded. Gallium-67 scintigraphy and SPECT of the chest showed abnormal lambda-shaped linear uptake corresponding approximately to the xiphoid and bilateral lower costal cartilages.

A separate focus of increased uptake was noticed on the left mediastinal upper border [Figure]. Both findings were new, compared to a previous gallium scintigraphy. The CT and the SPECT were co-registered by an automatic algorithm based on normalized mutual information [4,5]. The fused images of the two modalities showed that the bilateral linear increased gallium uptake matched thickened

costal cartilage, ribs and xyphoid bones observed on CT; therefore, chondritis and osteomyelitis of the xyphoid and bilateral adjacent costal cartilages, more extensive on the left, was diagnosed. The pathological uptake next to the pulmonary artery matched small, contrast enhancing collections seen within the pericardial effusion, anterior to the pulmonary artery. The patient underwent wound debridement and was discharged with triazole, an oral antifungal treatment.

Comment

Normal postoperative chest CT findings in the first few weeks after surgery include enlarged cardiac silhouette, pneumomediastinum, subcutaneous emphysema and mediastinal widening [4,5]. These normal changes can mask the appearance

of major survival-limiting complications including infections. Gallium-67 scintigraphy on the other hand is a sensitive, but not specific, method for demonstrating inflammation caused by several factors, among them infections. A major drawback of this modality is its low anatomical resolution.

Both the chest CT and the gallium-67 scintigraphy can be misleading in a postoperative patient, since they overestimate the severity of the findings. The CT/gallium-67-SPECT co-registration technique enables detection and localization of subtle findings hidden behind

major post-transplantation, as this case demonstrates.

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Correspondence: Dr. A. Grubstein, Dept. of Radiology, Rabin Medical Center (Beilinson Campus), Petah Tikva 49101, Israel
Fax: (972-77) 345-0646,
email: ahuva.efi@gmail.com