CASE REPORT

Role of $^{111}$In-WBC SPECT/CT in the Definitive Diagnosis of Mycotic Aortic Aneurysm (MAA)

Aaron Bogart, Meghna Chadha, Shehanz Ellika, Chiranjiv Virk, Chaitanya Ahuja, Zhiyun Yang

Louisiana State University Health Science Center, Shreveport, Louisiana, USA

Abstract

A 52-year-old woman presented with sharp epigastric pain, chest pain and fever for several days. Initial CT scans demonstrated aortic irregularity and non-specific soft tissue abnormality surrounding the juxtarenal aorta with differentials including aortic pseudoaneurysm and periaortic hematoma. The Indium-111 oxine-labeled leukocyte ($^{111}$In-WBC) study indicated a mycotic aortic aneurysm (MAA). MAA is a rare life-threatening condition with significant morbidity and mortality. MAA survival rate has improved with novel surgical advances, but early diagnosis is critical for timely treatment to optimize patient outcomes. Our case illustrates the combined role of functional $^{111}$In-WBC SPECT and anatomic CT scan in establishing a definitive diagnosis of MAA.

Keywords: $^{111}$In-labeled leukocytes; SPECT/CT; Mycotic Aortic Aneurysm (MAA)

Introduction

Indium-111 oxine-labeled leukocytes ($^{111}$In-WBC) scintigraphic imaging is a noninvasive imaging modality to localize infection and provides functional and metabolic information. This molecular imaging test can make a precise diagnosis in the early phase of the disease process and can delineate the entire extent of disease, which helps in treatment planning and monitoring response to therapy. A major drawback of this imaging technique is its low resolution and lack of anatomic information. The newer dual-modality imaging system allows both functional $^{111}$In-WBC single-photon emission computed tomography (SPECT) and computed tomography (CT) to be performed during a single imaging session with fusion of both imaging sets. This hybrid imaging technique provides combined functional and anatomic detail [1]. Our case demonstrates better disease localization with $^{111}$In-WBC SPECT/CT and improved differentiation between physiologic and pathologic tracer uptake, which is superior to functional SPECT imaging and anatomic CT imaging alone.

Case report

A 52-year-old woman was initially evaluated in the emergency department for 2-day history of sharp epigastric and chest pain, along with nausea and vomiting. She was a smoker with past medical history positive for hypertension, stroke and chronic kidney disease. Laboratory data obtained at admission revealed an elevated WBC count of 18.6k/uL with a negative CT angiogram for pulmonary embolism. After exclusion of acute cardiopulmonary conditions, treatment for gastritis was instituted and patient was discharged from the hospital. She presented two days later to the emergency room with symptoms and signs of high fever, chills, severe abdominal pain and hypertensive emergency. A contrast enhanced CT scan of the abdomen demonstrated irregularity of the abdominal aorta and soft tissue abnormality surrounding the juxtarenal aorta and adjacent right renal artery with differential diagnosis of aortic pseudoaneurysm and periaortic hematoma (Figure 1). The patient was managed for hypertensive emergency but continued to have an elevated WBC of 14-24k/uL. On day 4 of admission, an $^{111}$In-WBC scan was ordered for localization of the source of infection. $^{111}$In-WBC 24-hour delayed whole

![Figure 1: Axial contrast enhanced CT images through the abdomen demonstrates irregularity of the abdominal aorta and ill-defined retroperitoneal soft tissue abnormality encircling the juxtarenal abdominal aorta and adjacent proximal right renal artery (red arrows).](image-url)
two days after the 111In-WBC study, prior to surgery and abnormality. A repeat CT scan of the abdomen was performed aorta. Subsequently an magnetic resonance imaging (MRI), consistent with MAA and infectious process around the vertebral body, corresponding to the periaortic soft tissue uptake in the prevertebral soft tissues anterior to the L1 level, (red arrows). The combined SPECT/CT images localized this focal increased uptake over the T12 and L1 (red arrows).

Figure 3: Axial (A) and sagittal (B) 111In-WBC SPECT-CT fusion images demonstrating increased uptake in the prevertebral soft tissues (red arrows) centered the L1 level, correlating with aortic irregularity and ill-defined soft tissue abnormality found on the axial (C) and sagittal (D) low dose CT (yellow arrows) and the prior axial (E) and sagittal (F) diagnostic CT images (blue arrows).

body images showed a subtle area of increased radiotracer uptake over the T12 and L1 vertebral bodies (Figure 2). The combined SPECT/CT images localized this focal increased uptake in the prevertebral soft tissues anterior to the L1 vertebral body, corresponding to the periaortic soft tissue abnormality found on the prior CT abdomen scan (Figure 3), consistent with MAA and infectious process around the aorta. Subsequently an magnetic resonance imaging (MRI) of the abdomen was performed which demonstrated the same abnormality. A repeat CT scan of the abdomen was performed two days after the 111In-WBC study, prior to surgery and demonstrated spread of the retroperitoneal infection with multiple retroperitoneal abscesses. An in-situ abdominal aortic reconstruction was performed in-lieu of endovascular graft repair, secondary to the higher rate of re-infection. Her post-operative course was complicated by stroke and overall deterioration of her condition. The decision was later made by family to enter Hospice care and the patient died a month later.

Discussion

MAA is associated with infection of the vascular wall and formation of a blind, saccular outpouching that is contiguous with the arterial lumen [2], with reported incidence ranging from 0.8% to 3.4% of all aortic aneurysms [3]. Their non-specific presentation with fever, malaise and leukocytosis, pose a particular challenge to diagnosis and management, which is further compounded by the underlying infectious process [4]. Nontreatment or delayed treatment leads to fulminant sepsis, spontaneous arterial rupture, and death [2, 5-8]. MAA can develop from hematogenous spread of infectious emboli into vasa vaso or preexisting aneurysms, infection of a preexisting intimal defect by circulating infectious agent, contiguous involvement of the vessel wall from an adjacent source of infection, or direct inoculation of the vessel wall with the infectious agent at the time of vascular injury which may be traumatic or iatrogenic [9]. Regardless of the mechanism, predisposing factors include malignancy, alcoholism, steroid therapy, chemotherapy, autoimmune disorders, diabetes mellitus, arterial trauma, endocarditis, drug abuse and septicemia. Up to 70% of people diagnosed with MAA are immunosuppressed individuals and 46% are those with recent infections [10]. The diagnosis of MAA is often delayed and frequently requires extensive clinical work-up to search the source of sepsis. Patients are usually symptomatic (93%) with fever; abdominal pain, back pain, and elevated WBC count [10]. Early imaging with 111In-WBC scan may provide improved localization of the infectious source in patients with nonlocalizing signs of infection and may lead to earlier diagnosis of MAA with improved patient outcomes. Other noninvasive imaging techniques that can facilitate detection of MAA include: CT, MRI, MR angiography and Doppler ultrasonography (US). These imaging modalities allow detection and characterization of infected aneurysms in clinically suspected cases, along with vascular mapping to facilitate treatment planning in confirmed cases and have replaced conventional angiography [11]. However these imaging modalities may fail to show findings that are specific to an infected aneurysm [12]. 111In-WBC SPECT/CT adds specificity to the presence of infection in a patient with an aneurysm that was detected by other imaging modalities and also helps in identifying multiple sites of infection. In our case, the initial diagnostic CT abdomen did not provide a specific diagnosis. The 111In-WBC SPECT/CT provided an accurate diagnosis of MAA which was possible after carefully excluding scattered bone marrow uptake and misregistration on combined SPECT and low dose CT images.

The gold standard management of MAA is surgical resection and debridement of the infected aorta and surrounding tissues, the use of muscle flaps or omentum to cover the infected field, and either interposition grafting or extra-anatomic bypass followed by long-term antibiotic therapy [13, 14]. However, surgical management in these patients carries a high mortality [13].
Conclusion

Early diagnosis of MAA is critical, but often unsuspected, due to the insidious onset of symptoms. Our case illustrates the role of $^{111}$In-WBC SPECT/CT in providing early localization of clinically occult sites of infection and establishing precise diagnosis of MAA with high specificity which leads to prompt treatment and improved patient outcomes. Furthermore, $^{111}$In-WBC SPECT/CT may detect additional unsuspected sites of infection.

Disclosures

None – all authors claim no conflicts of interest or disclosures.

References