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Mediastinal Imaging Pitfalls

Sivan Lieberman, MD,* Mylene T. Truong, MD,† and Edith M. Marom, MD*

Potential pitfalls in the interpretation of diseases involving the mediastinum are seen when imaging with computed tomography and [18F]-fluoro-2-deoxy-D-glucose positron emission tomography. These pitfalls can involve any mediastinal structure, including the mediastinal vessels, heart, lymph nodes, thymus, trachea, esophagus, and fat. Misinterpretation of normal variants or benign conditions as pathology can affect staging and alter treatment. After reading this review, the reader should be able to identify common mediastinal imaging pitfalls and apply ancillary measures to confirm the correct diagnosis and thus reach an accurate diagnosis to facilitate correct patient treatment.
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Computed tomography (CT) is the most accurate in diagnosing mediastinal abnormalities.[1] Thus CT and [18F]-fluoro-2-deoxy-D-glucose (FDG) positron emission tomography (PET) are widely used in the diagnosis of many thoracic diseases as well as in staging and assessment of therapeutic response in oncologic patients. Potential pitfalls in the interpretation of diseases involving the mediastinum are seen when imaging with CT and FDG PET-CT. These pitfalls can involve any mediastinal structure, including the mediastinal vessels, heart, lymph nodes, thymus, trachea, esophagus, and fat. Misinterpretation of normal variants or benign conditions as pathology can affect staging and alter treatment. Knowledge of these commonly encountered imaging pitfalls is imperative for accurate diagnosis and treatment.

Vascular Pitfalls

Variations in normal perivascular mediastinal structures, flow-related artifacts, and iatrogenic procedures can be misdiagnosed as dissection, perforation, or filling defects in major arteries and veins. Normal intravascular anatomy can be confused with an abnormality. The aortic cusps can be confused with an aortic dissection and the pulmonary cusps should not be confused with the fine strands of chronic pulmonary embolism (Fig. 1). Their typical location should differentiate them from a true abnormality. When in doubt, reconstructing the image axial to the plane of the valve reveals that there are 3 cusps in anatomical orientation differentiating them from an intravascular abnormality. Another vascular normal variant that should not be confused with an aortic injury or aneurysm is aortic diverticulum, which typically occurs at the aortic isthmus and manifests as a smooth focal bulge that forms obtuse angles with the aortic wall. It is usually located at the anteromedial aspect of the aorta.[2]

Finally, focal FDG uptake within atherosclerotic plaques due to the inflammatory component should not be confused with FDG uptake in malignant lymph nodes when staging oncology patients (Fig. 2).[3]

Normal perivascular anatomy such as the pericardial recesses can be confused with an abnormality. The superior pericardial recess can be seen anterior or posterior to the ascending aorta and mimics dissection. These recesses can be recognized by their fluid attenuation, focal nature, and typical anatomical location (Fig. 3).[4] Likewise, partial volume averaging of lymph nodes and vessels can simulate acute or chronic pulmonary embolism. Lymphatic tissue is extramural and the normal smooth contour of the vessel filled with intravenous contrast is preserved. The review of sagittal and coronal reformatted images can help in difficult cases.

High-attenuation intravenous contrast in the left brachiocephalic vein or superior vena cava may produce artifacts that project over the aorta and mimic aortic dissection, or project over the right pulmonary and upper lobe arteries and mimic

*Department of Diagnostic Imaging, Chaim Sheba Medical Center, Sackler Faculty of Medicine, Tel-Aviv University, Ramat Gan, Israel.
†Department of Diagnostic Radiology, the University of Texas MD Anderson Cancer Center, Houston, TX.
Address reprint requests to Edith M. Marom, Department of Diagnostic Imaging, Chaim Sheba Medical Center, Ramat Gan 5265601, Israel. E-mail: edith.marom@gmail.com

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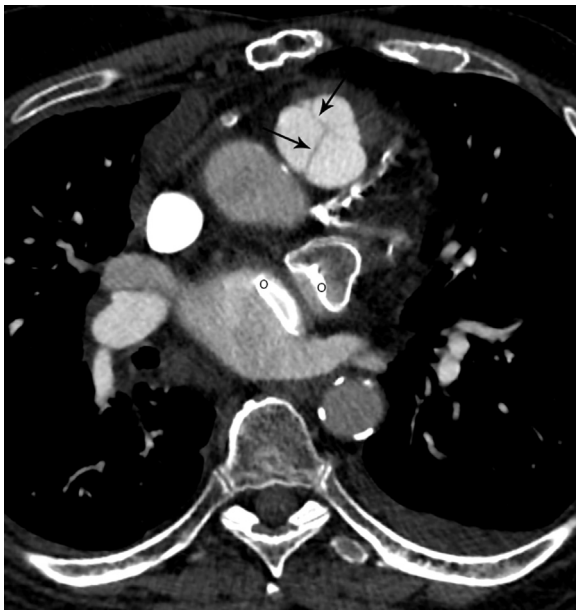

Figure 1 Contrast-enhanced chest CT at the level of the pulmonary artery root in a 73-year-old man after placement of a left atrial appendage occluder (O) shows fine curvilinear opacities (arrows) within the enhanced pulmonary artery. The typical appearance and location of the pulmonary valve should not be confused with the strands of pulmonary emboli. When in doubt, multiplanar reconstruction to display the 3 cusps of the pulmonary valve in one plane would avoid misinterpretation.

strands of pulmonary emboli. These artifacts appear as straight parallel lines or radiate from a single point, are poorly defined, and often extend beyond the confines of the vessel (Fig. 4). Prospectively, these artifacts can be reduced by following the intravenous contrast injection with a saline solution bolus or injecting contrast from the right hand.[5,6]

Normal motion of structures can degrade images. Cardiac and respiratory motion produces curvilinear artifacts. Cardiac motion is most pronounced at the aortic root and proximal pulmonary artery and can be recognized by its characteristic location and its restriction to only 1 or 2 image slices (Figs. 5 and 6). When in doubt, a repeat CT at the same level with electrocardiographic gating eliminates cardiac motion artifacts.[7]

Normal blood flow may cause artifacts within the vessel. The azygos and hemiazygos veins are the only large veins in the thoracic cavity with valves. With high injection rates and right arm injections, intravenous contrast has a greater likelihood of accumulating within these valves, mimicking calcified lymph nodes[8] (Fig. 7). Flow-related artifacts due to early-phase imaging with poor mixture of unopacified blood and intravenous contrast or a localized increase in vascular resistance may lead to misdiagnosis as an intravascular filling defect, or thrombus (Fig. 8). Flow-related artifacts in the pulmonary arteries may be misdiagnosed as pulmonary emboli. During inspiration, there is a variable increase in unopacified venous blood from the inferior vena cava, briefly diluting the contrast

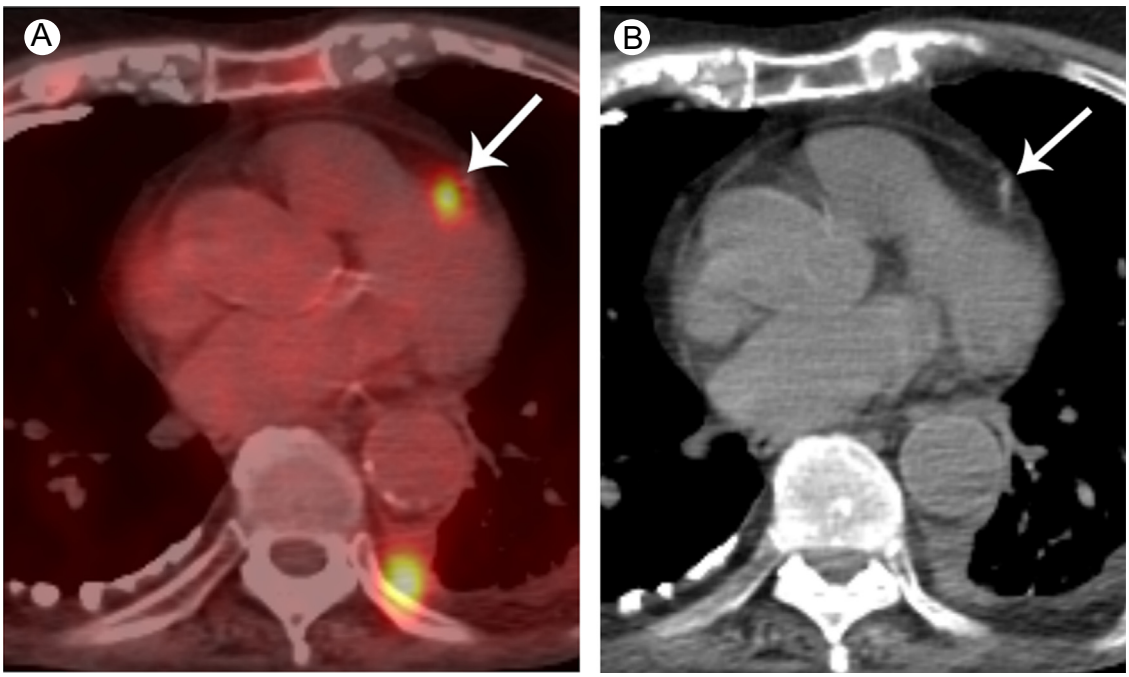

Figure 2 FDG PET-CT scan of an 80-year-old man with multiple recurrent squamous carcinomas of the head and neck. Fused FDG PET-CT scan (A) at the level of the heart shows focal FDG uptake (arrow) abutting the heart but careful inspection of the accompanying CT (B) shows that this uptake is localized to the left anterior descending coronary artery, due to inflammation associated with atheromatous changes. (Color version of figure is available online.)