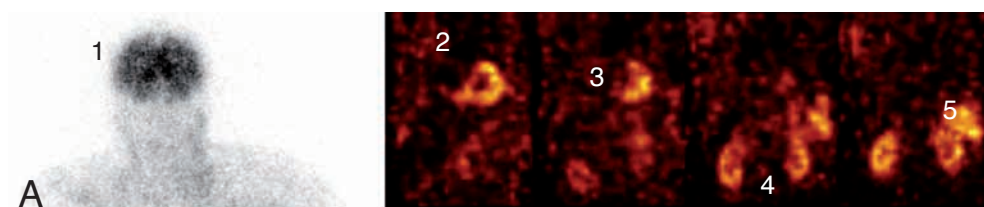


## IMAGES IN CLINICAL RADIOLOGY

### *Complete right-to-left shunt on lung perfusion SPECT results in the detection of a persistent left vena cava superior draining to the left atrium*

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1 = brain, 2 = absent lung, 3 = heart, 4= kidney, 5= spleen

In order to exclude acute pulmonary embolism, a lung perfusion scintigraphy was performed in a 53-year-old male, with a history of Fallot's tetralogy. He had been immobilized because of a tibial fracture and complained of worsening chest pain and dyspnea.



Since there was no adequate venous access on the right side, the tracer (99mTc- labeled macroaggregated albumin or 99mTc-MAA) was injected in a left antecubital vein.

Subsequent SPECT- images of the chest showed complete absence of 99mTc-MAA in the pulmonary circulation, while considerable tracer accumulation was noticed in the organs with high systemic blood flow: brain, heart, kidneys and spleen (Fig. A). These findings raise the suspicion of a complete right-to-left shunt.

The patient was referred to radiology for a CT angiography of the chest. This revealed a persistent left vena cava superior (arrows) draining to the left atrium, explaining the complete right-to-left shunting of the venous return from the left arm and jugular system (Fig. B, C) There was no evidence for pulmonary embolism. Inter- and intralobular septal lines with some peribronchial cuffing and a subpleural effusion were present, consistent with the diagnosis of increased hydrostatic pressure edema due to iatrogenic fluid overload. Effective treatment consisting of oxygen supply, fluid restriction and antidiuretics was initiated.

In contrast to what is expected in patients with a right-to-left shunt, no uptake of 99mTc-MAA was seen in the thyroid, a finding that could be explained by hypoplasia of the thyroid in this individual.

#### Comment

A persistent left vena cava superior (VCS) is known to occur more frequently in patients with cardiac malformations (4,3-11%), compared to a general population (0,3%). In the large majority of the cases (90%), the left VCS will drain via the coronary sinus into the right atrium and is of no hemodynamic significance.

In normal conditions 99mTc-MAA particles undergo embolization in pulmonary arterioles and capillaries in accordance with the pulmonary arterial blood flow. Right-to-left shunts of 10-15% will be responsible for the visualization of organs with high systemic blood flow like brain, kidneys, spleen and thyroid. Myocardial activity will only be seen if larger shunts (> 39%) are present. A complete absence of 99mTc-MAA sequestration in the pulmonary circulation is however highly exceptional.

#### Reference

1. Rosenbaum R., Reiner B., Bidwell K., et al.: Right-to-left shunting via persistent left vena cava identified by perfusion lung scintigraphy. *J Nucl Med*, 1989, 30: 412-414.