

Partial anomalous left supracardiac pulmonary venous return

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Section: Cardiovascular

Area of Interest: Cardiovascular system Pulmonary vessels Thorax Anatomy

Procedure: Contrast agent-intravenous

Procedure: Diagnostic procedure

Imaging Technique: CT

Imaging Technique: CT-Angiography

Special Focus: Pathology Case Type: Anatomy and Functional Imaging

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Patient: 62 years, male

Clinical History:

A 62-year-old male patient, complaining of chest pain, was referred to our radiology department to exclude pulmonary embolism.

Imaging Findings:

MDCT examination was performed in an arterial phase after injection of 80 ml Imeron 300. Pulmonary embolism was excluded. Incidentally, only three of four pulmonary veins were connected to the left atrium. The fourth pulmonary vein, which drains the left upper lobe, was dilated and connected to the innominate vein through a vertical vein (see figures). The superior vena cava and the right side of the heart were dilated.

Discussion:

Pulmonary veins are the vessels carrying oxygenated blood from capillary-alveolar interface to the left atrium [1]. Most individuals have 4 pulmonary veins, which drain into the left atrium.

During embryological development, when the left atrium/common pulmonary vein fails to connect to one or more of the tributaries of the primitive pulmonary vascular bed with persistent connection of these tributaries to the systemic circulation, through the cardinal or umbilicovittelline system, will lead to persistent pulmonary systemic connection [2]. When all four pulmonary veins fail to connect to the left atrium the condition is called total anomalous pulmonary venous return (TAPVR). Partial anomalous pulmonary venous return (PAPVR) is the condition, where connection fails in one or more, but not all veins.

Our patient is an example of PAPVR, which forms about 0.5% of cases of congenital heart diseases [3]. It is classified according to the level of the drainage of the anomalous vein into supracardiac, cardiac and infracardiac [4]. In 90% of cases these anomalies are associated with ASD [5, 6]. PAPVR with a single anomalous vein has no significant effect on the haemodynamics and is usually discovered incidentally [7]. Symptomatic cases are usually due to associated conditions such as ASD [2].

Echocardiography is generally the first investigation of choice in the evaluation of congenital heart diseases. It is

helpful in the detection of associated anomalies, such as ASD, but visualization of the anomalous vein is difficult. Conventional angiography can show the anomalous vein but this is an invasive procedure and therefore superseded by cross sectional imaging, that allows visualization of the anomalous vein connected with the systemic circulation. A better delineation may be achieved by using post-processing techniques like MIP and 3D-volume rendering. CT has an accuracy approaching 100% [8]. MRI has the advantage of not using ionizing radiation, and having a sensitivity of 95% [9]. It can also detect ASD and help in evaluation of cardiac function [10].

Most patients with PAPVR do not require surgery [11]. Surgery can be considered in the following situations: Significant left to right shunt with a pulmonary to systemic flow ratio of more than 2:1; cardiomegaly on chest X-ray or right ventricular hypertrophy on ECG; in recurrent chest infections (as in scimitar syndrome); if compression of surrounding structures exists; or if any surgical cardiac repair is planned for other reasons, such as ASD [12].

PAPVR has an excellent prognosis with good post-operative results in asymptomatic patients.

Differential Diagnosis List: Partial anomalous left upper pulmonary venous return., TAPVR, Persistent left superior vena cava, Left infra-aortic innominate vein, Dilated pericardiophrenic vein, Dilated superior intercostal vein

Final Diagnosis: Partial anomalous left upper pulmonary venous return.

References:

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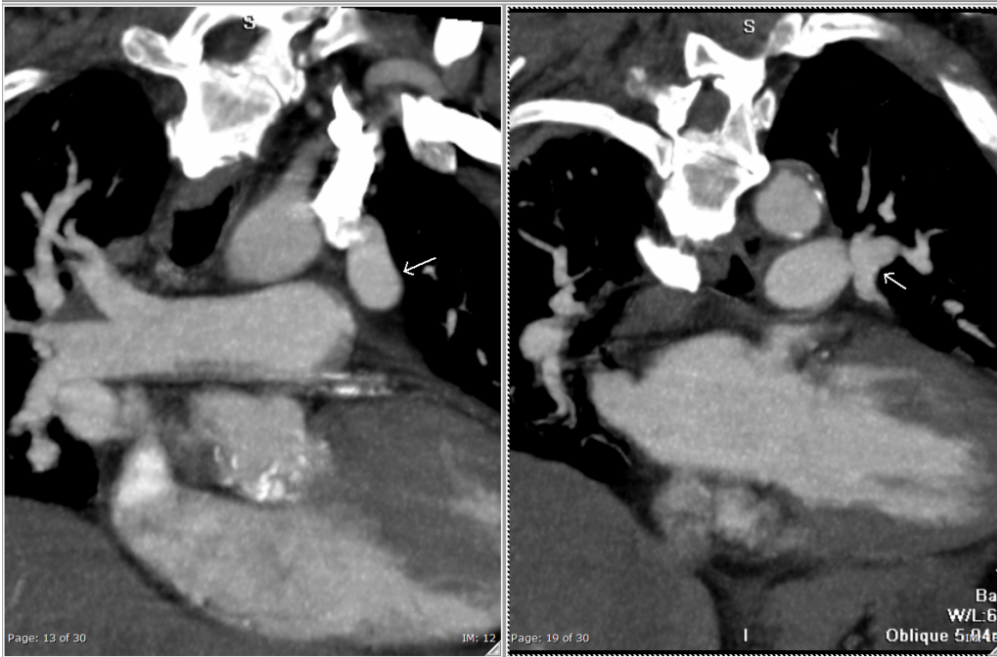
Figure 1

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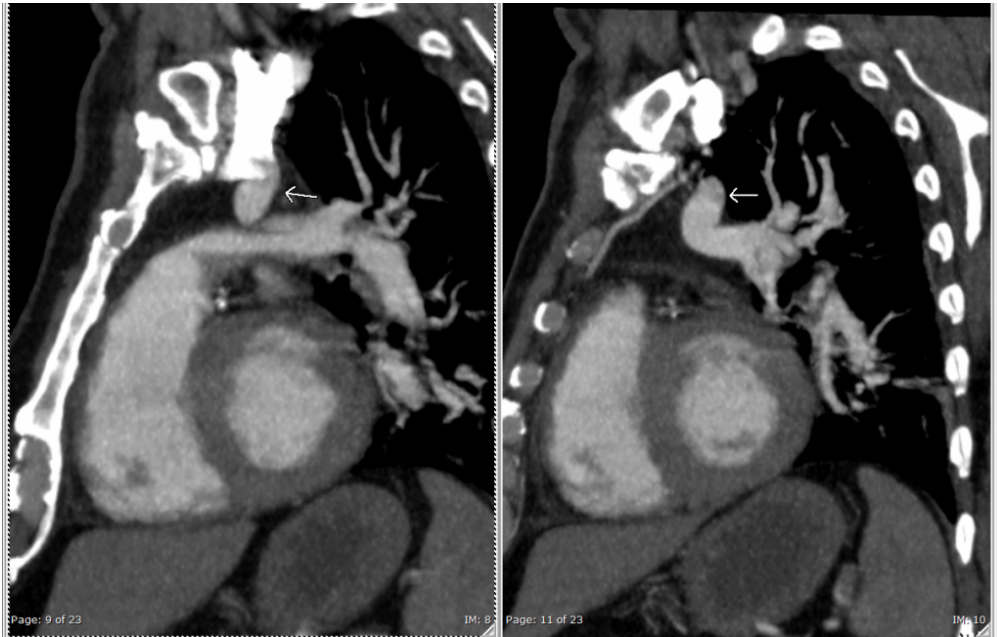
Description: Axial CT examination showing an anomalous left upper pulmonary vein connecting to the innominate vein. **Origin:** ©Department of Radiology, Loerrach District Hospital, Germany/2012

b



Description: Coronal oblique MIP showing an anomalous left upper pulmonary vein connected to the innominate vein via a vertical vein (arrow) **Origin:** ©Department of Radiology, Loerrach District Hospital, Germany/2012

c



Description: Sagittal oblique MIP showing an anomalous left upper pulmonary vein connected to the innominate vein. **Origin:** ©Department of Radiology, Loerrach District Hospital, Germany/2012

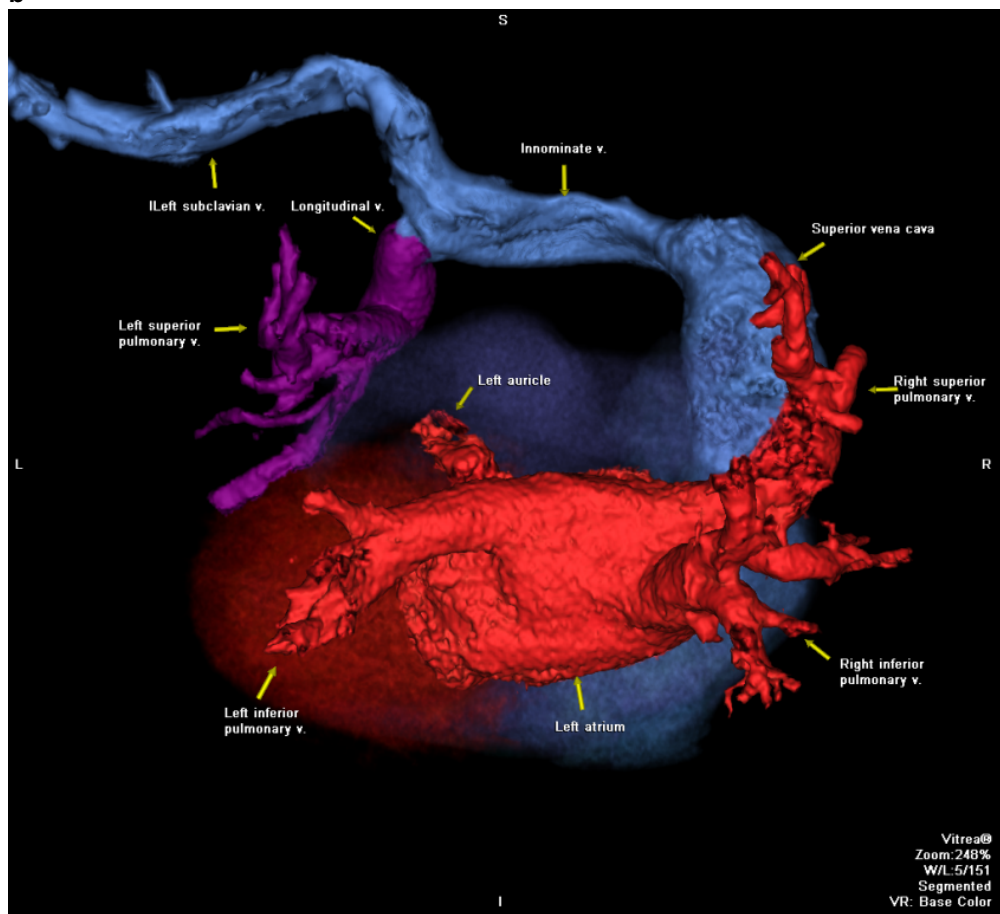
Figure 2

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Description: Volume rendering frontal view with segmentation showing three pulmonary veins connected to the left atrium (red). The left upper pulmonary vein (violet) is connected to the right side via the innominate vein & SVC (blue). **Origin:** ©Department of Radiology, Loerrach District Hospital, Germany/2012

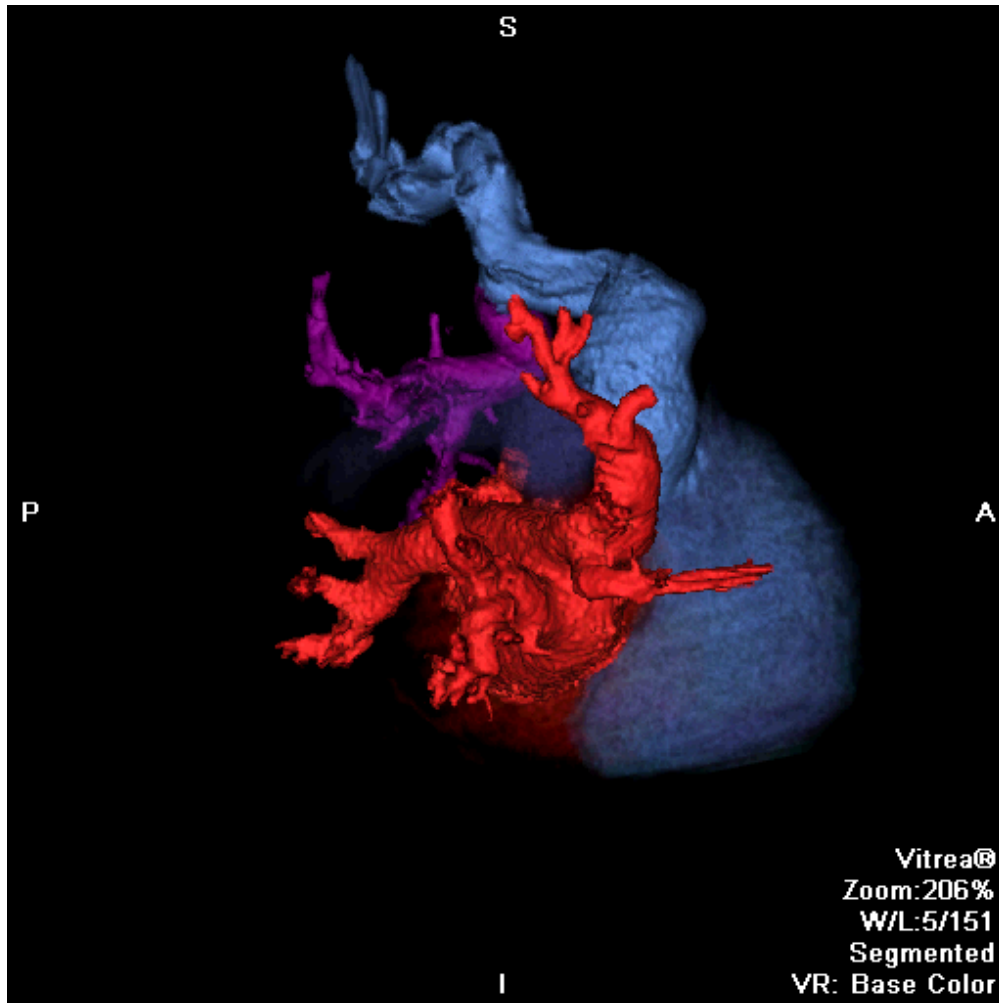
b



Description: Volume rendering dorsal view with segmentation showing three pulmonary veins connected to the left atrium (red). The left upper pulmonary vein (violet) is connected to the right side via the innominate vein & SVC (blue). **Origin:** ©Department of Radiology, Loerrach District Hospital, Germany/2012

Figure 3

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Description: Anomalous left upper pulmonary vein (violet) connected to the innominate vein & superior vena cava to the right side of the heart (blue) and the other 3 pulmonary veins are connected to the left atrium (red). **Origin:** ©radiology department, Loerrach district hospital, Germany/2012