A 59-YEAR-OLD MAN with severe aortic stenosis presented for valve replacement surgery. After uncomplicated induction of anesthesia, an introducer was placed into the left internal jugular vein, through which a pulmonary artery catheter (PAC) was easily directed into the pulmonary artery on the first attempt. The intraoperative course was uneventful. On postoperative day 1 in the intensive care unit, the following chest x-ray was obtained (Fig 1). What is the diagnosis?

Fig 1. Postoperative anteroposterior chest radiograph.

Fig 2. Two contrast enhanced computed tomography images depicting the persistent left superior vena cava in its course from the neck to the heart. (A), This is a coronal image of the chest demonstrating left superior vena cava (circle) and a smaller right superior vena cava (arrow). (B) This is an axial image of the chest at the level of the aortic arch demonstrating a left superior vena cava (circle) with the smaller right superior vena cava (arrow).

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DIAGNOSIS: PERSISTENT LEFT SUPERIOR VENA CAVA

The chest radiograph shows a PAC on the left side of the spine, suggesting placement through a persistent left superior vena cava (LSVC). A PAC placed in a patient with normal anatomy would be seen on the right side of the spine in a chest radiograph. In the current patient, the PAC was placed into correct position without difficulty on the first attempt. Its course (confirmed by TEE) originated in the left internal jugular vein (IJV), travelled through the persistent LSVC into the coronary sinus, exited into the right atrium, and traversed through the tricuspid valve into right ventricle, eventually crossing the pulmonic valve in the main pulmonary artery. An ultrasound examination showed absence of a right IJV; however, the computed tomography (CT) scan and surgical field examination revealed presence of a right superior vena cava. Preoperative CT also revealed the congenital anomaly (Fig 2A,B). After the initiation of cardiopulmonary bypass (CPB), the aorta was cross-clamped, and antegrade cold cardioplegia was given. Because of the presence of the persistent LSVC, retrograde cardioplegia was not administered. The patient was weaned off of CPB with minimal vasopressor support and good biventricular function. His postoperative course was uneventful.

In normal cardiac development, the embryonic left cardiac vein (left common cardinal vein) degenerates or atrophies, producing the ligament of Marshall (oblique vein of Marshall). Failure of the left cardiac vein to degenerate results in a persistent venous connection to the coronary sinus. The coronary sinus is usually dilated from increased blood flow that results from this abnormal connection. The coronary sinus (normally 1 cm wide) can be an important initial clue in establishing the diagnosis of persistent LSVC. It must be noted that a dilated coronary sinus is not specific to a persistent LSVC as it can also be seen in circumstances resulting in right heart volume or pressure overload, such as tricuspid valve regurgitation, pulmonary artery stenosis, or pulmonary hypertension. As many as two thirds of patients with persistent LSVC can have bilateral superior vena cavae if the right superior vena cava remains patent as well. Most patients with persistent LSVC are asymptomatic, but the presence of persistent LSVC has important consequences during cardiac surgery, central venous access, cardiac catheterization, and pacemaker lead implantation. A persistent LSVC may impede or obscure the correct placement of cardiac catheters or leads. Conversely, the oblique vein of Marshall can be used to pace the left atrium. Persistent LSVC is a relative contraindication to the administration of retrograde cardioplegia during cardiothoracic surgery because the dilated coronary sinus may not accommodate a self-inflated retrograde catheter balloon, resulting in the inability to guarantee retrograde flow of cardioplegia towards the myocardium.

The diagnosis of a persistent LSVC can be made through various diagnostic techniques. One case describing a patient with persistent LSVC reported a lack of progression of normal right heart waveforms and unusually high cardiac output when a PAC was incorrectly placed into the coronary sinus. The diagnosis of persistent LSVC can be made with angiography, but chest radiograph, magnetic resonance imaging, CT, and echocardiography may be used to establish the diagnosis.
REFERENCES