Discovery of a persistent left superior vena cava during pacemaker implantation

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Figure 1. Course of two guidewires after puncture of the left subclavian vein, right (A) and left (B) from the mediastinal border.

An 83-year-old male was admitted to the coronary care unit because he had developed a total atrio-ventricular (AV) block after he had undergone a transurethral resection of the prostate for benign prostate gland hypertrophy.

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Figure 2. Modified oblique sagittal contrast computer tomography presentation demonstrating the PLSVC, communicating with both the RSVC through the left brachiocephalic vein and the enlarged coronary sinus. A=right superior vena cava, C=left brachiocephalic vein, E=coronary sinus, F=aorta, G=main pulmonary artery, H=left superior vena cava, RA=right atrium, I=atrial pacemaker lead.

The patient's medical history reported surgery for a hernia nuclei pulposi and an inguinal hernia several years ago. Medical therapy consisted of finasteride 5 mg once daily which was stopped after surgery. At physical examination, the patient was in a good clinical condition, his blood pressure was 110/70 mmHg, pulse 33 beats/min and heart sounds were normal without murmurs. The ECG showed sinus bradycardia and a total AV block with a junctional escape rhythm. Laboratory tests and transthoracic echocardiography were completely normal.

Since the AV block persisted up to two days after surgery it was decided to treat the patient with a dual chamber rate responsive pacemaker system. The left subclavian vein was punctured twice and two guidewires were introduced under fluoroscopy (figure 1). We presumed that the unfamiliar position of the guidewire running down the left mediastinal border was

due to a persistent left superior vena cava (PLSVC). The PLSVC draining via the dilated coronary sinus into the right atrium and the communication between the left and right superior vena cava through the left brachiocephalic vein were visualised under fluoroscopy after injection of intravenous contrast through the left and right antecubital vein. During the pacemaker implantation procedure the left-sided guidewire could be easily repositioned in the right superior vena cava and pacemaker leads were positioned in the right atrium and right ventricle, respectively.

Subsequently, computer tomography of the thorax was performed and the anatomical relations could be confirmed (figure 2).

Persistent left superior vena cava is the most common variation in the thoracic venous system. The anomaly is estimated to be present in 0.3 to 0.5% of the general population and in 5 to 10% of patients with other congenital heart defects.^{1,2}

In early embryonic development the venous blood of the upper part of the body drains into the right atrium via two bilateral and symmetrically running veins (left and right anterior cardinal veins).^{2,4} At approximately eight weeks gestation, the left brachiocephalic vein develops as a bridge between the left and right cardinal veins. The part of the left anterior car-

dinal vein below this anastomosis usually collapses and degenerates, leaving only the right anterior cardinal vein which becomes anastomosed to the superior vena cava (figure 3A).

Several subtypes of PLSVCs can be distinguished; in about 20% of patients the RSVC is absent resulting in drainage of venous blood from the head and both arms through the left brachiocephalic vein, the PLSVC and the coronary sinus into the right atrium (figure 3B). However, in most patients an RSVC is also present and in 60% of the cases the PLSVC and RSVC are connected by the left brachiocephalic vein (figure 3C).²

PLSVC is typically asymptomatic when it is not accompanied by other heart defects and its presence is usually discovered during central venous catheterisation or pacemaker implantation.³ Serious complications can occur during catheterisation as a result of PLSVC-like shock, cardiac arrest or angina, probably due to manipulation of the catheter in the coronary sinus, or perforation of the brachiocephalic vein can occur if the RSVC is absent.²

Positioning a pacemaker lead through the PLSVC and coronary sinus in the right ventricle may be difficult in these patients.^{5,6} After we had demonstrated the anatomical relations in our patient we decided to introduce the pacemaker leads via the PLSVC through

Figure 3. Schematic drawing of the variations of the superior vena cava. 3A) The normal situation. 3B) Single left superior vena cava. 3C) Doubled superior vena cava, the right superior vena cava is either connected to the left by the left brachiocephalic vein or is without any connection: A=right superior vena cava, B=internal jugular vein, C=left brachiocephalic vein, D=subclavian vein, E=coronary sinus, F=aorta, G=main pulmonary artery, H=left superior vena cava, RV=right ventricle, LV=left ventricle.

the left brachiocephalic vein and RSVC in the right atrium and right ventricle respectively. ■

In this section a remarkable 'image' is presented and a short comment is given.

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