

Persistent Left Superior Vena Cava during Aortic Valve Replacement

Tao Hong*

Perioperative Medicine and Anesthesiology, Georgia Regents University, Augusta, Georgia, USA

A 57-year-old African American man with a 6-month history of chest pain presented for aortic valve replacement. He had documented severe aortic stenosis, moderate aortic insufficiency, left ventricular hypertrophy and an ejection fraction (EF) of 50% on a preoperative transthoracic echocardiography (TTE). After an uneventful induction, a prebypass transesophageal echocardiography (TEE) revealed a calcified tricuspid aortic valve with severe stenosis (aortic valve area 0.7 cm²; AV mean gradient 40 mmHg), severe aortic insufficiency, and an EF of 35%. His coronary sinus was significantly dilated. The X-plane view at the midesophageal (ME) 2-chamber revealed a diameter of 2.09 cm (Figure 1). The diagnosis of persistent left superior vena cava (PLSVC) was made by a bubble study (Figure 2). This finding was further confirmed by the inability to perform retrograde cardioplegia. The enlarged coronary sinus (CS) is well demonstrated in 3-Dimension (3-D) TEE (Figure 3). Once the surgeon was informed of the findings, and other potential associated congenital anomalies ruled out, the cardioplegia solution was injected directly into the coronary arteries and then proceeded with the 21-mm On-X aortic valve replacement. The rest of the procedure was uneventful and the patient was transported to the Surgical intensive care unit (SICU) in stable condition. Later, the patient had computer tomography (CT) scan of his chest for evaluation of his lung nodules. It confirmed the intraoperative TEE diagnosis (Figure 4).

PLSVC is the remnant of the embryologic left sinus horn found in 0.1% to 0.2% of the general population and 2% to 9% of patients with congenital heart disease [1]. However, Bartram et al. found 56 out of 121 patients (46%) with PLSVC were accompanied with congenital diseases [2-4]. PLSVC in association with congenital cardiac malformation increases the risk of mortality in cardiac surgery on cardiopulmonary bypass (CPB) [5]. If it drains into the left atrium or through an unroofed

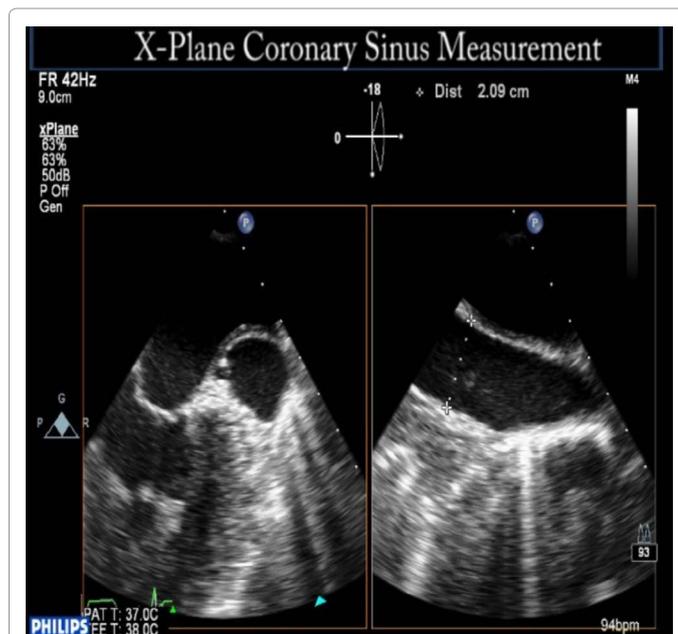


Figure 1: Simultaneously captured X-plane (short and long) of the modified midesophageal 4-chamber views, one standard view and one at a 90-degree angle through the coronary sinus (CS). The CS diameter in this patient is 2.09 cm; a normal CS is less than 1 cm.

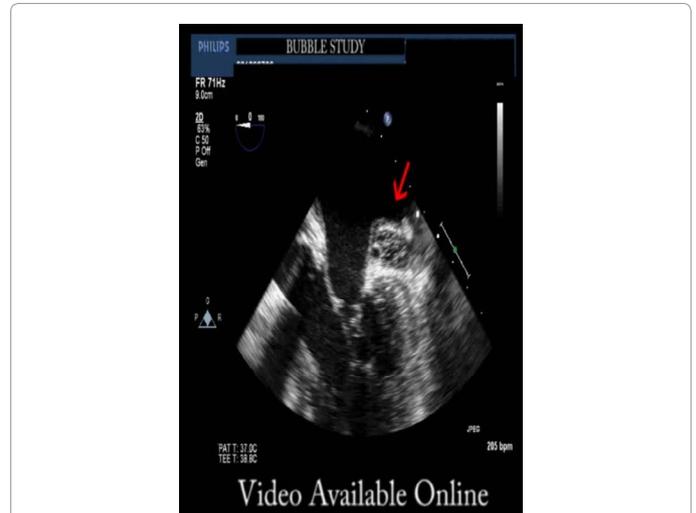


Figure 2: Modified midesophageal 5-chamber view. The bubble study showed positive saline contrast in the coronary sinus. Normal contrast was found in the right atrium by injecting via the right internal jugular vein (not shown here).



Figure 3: Oriented to surgeon's view: Real-time 3-dimensional images of the thickened and calcified aortic valve (AV), normal anterior and posterior mitral valve (MV), pulmonary artery (PA) and dilated coronary sinus (CS).

*Corresponding author: Tao Hong, Perioperative Medicine and Anesthesiology, Georgia Regents University, 1120, 15th Street, BIW-2146, Augusta, Georgia, 30912, USA, Tel: 570-854-7974; E-mail: thong@gru.edu

Received January 22, 2014; Accepted February 22, 2014; Published March 10, 2014

Citation: Hong T (2014) Persistent Left Superior Vena Cava during Aortic Valve Replacement. Gen Med (Los Angel) 2: 135. doi: 10.4172/2327-5146.1000135

Copyright: © 2014 Hong T. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

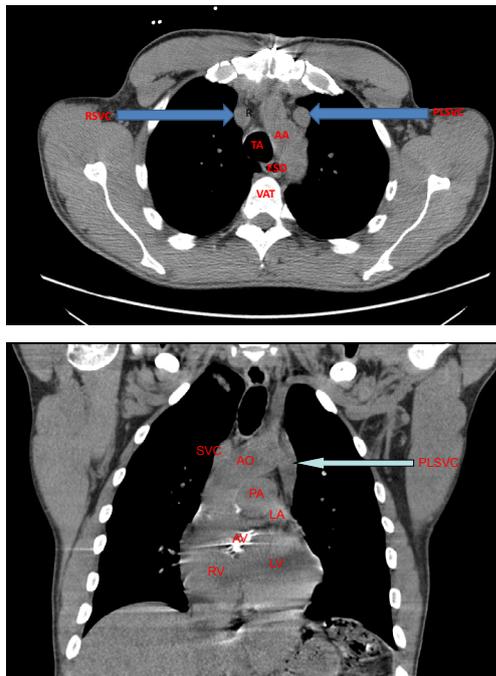


Figure 4: Computer tomography (CT) demonstrated persistent left superior vena cava (PLSVC). It also showed the other structures including superior vena cava (SVC) or right superior vena cava (RSVC), aortic arch (AA), trachea (TA), esophagus (ESO), vertebra body (VAT), aorta (AO), pulmonary artery (PA), left atrium (LA), Aortic valve (AV), right ventricle (RV), and left ventricle (LV).

CS or partially unroofed CS, or CS ostial atresia, a significant right-to-left shunting, cyanosis, and even brain abscess secondary to paradoxical embolization can occur. It should be surgically corrected by redirect the PLSVC to the right atrial appendage [5,6]. In patients with CS ostial atresia, the exclusion of PLSVC may cause severe coronary ischemia during cardiac surgery [6].

PLSVC could be missed by echocardiography [5]. Diagnosis of PLSVC is usually made as an incidental finding during cardiovascular imaging or surgery as in our case. In most cases, PLSVC drains into the right atrium through CS. It has no hemodynamically significance and no clinical symptoms. Thus, no surgical management is needed [7]. Because of that reason, we did not attempt to make surgical correction or direct visual inspection of CS because it requires right atrium incision and two cannulations for the venous drainage instead of one. However, it can cause technical difficulties during procedures such as right cardiac catheterization performed by using left subclavian vein, such as pace-maker application, implantable cardioverter defibrillator administration, biventricular cardiac pace or electrophysiologic studies as there is an acute angle between the CS orstium and tricuspid valve [6]. If it is associated with absence right SVC [2,4,7], it can be problematic for central access in both pre CPB and cannulation for the cardiac surgery. Lou et al. reported to use L-shaped cannula to directly insert into the PLSVC [7].

The presence of PLSVC is a relative contraindication to the administration of retrograde cardioplegia during cardiac surgery [3,5-

7]. Cardioplegia may be inadequate, since it comes back through the PLSVC. If a failed retrograde cardioplegia goes unrecognized, this could result in failed myocardial protection, which in turn would cause heart failure, Arrhythmia and cardiogenic shock. Therefore, we use antergrade cardioplegia by injecting the cardioplegia solution directly into the coronary arteries ostia.

Full TEE exam and index of suspicion are the keys to making an earlier diagnosis of PLSVC. 80% of PLSVC is associated with dilation of the coronary sinus [5] as seen in this case. The diagnosis can be made by injection of enhanced saline contrast in the left antecubital vein. The contrast will be seen in the dilated CS before the right atrium (RA). There is normal transient contrast in the RA after injection through the right SVC. Combining 3D and 2D echocardiography is important because of the strong association between PLSVC and other congenital abnormalities, such as coronary AV fistula, partial anomalous pulmonary venous return, or “unroofed” CS affording the shunt between CS and left atrium. If there is any doubt, a venogram, contrast-enhanced CT or magnetic resonance imaging should be performed to obtain the precise diagnosis of PLSVC [8]. In our case, we confirmed the diagnosis of PLSVC by CT scan.

References

1. Azocar RJ, Narang P, Talmor D, Lisbon A, Kaynar AM (2002) Persistent left superior vena cava identified after cannulation of the right subclavian vein. *Anesth Analg* 95: 305-307, table of contents.
2. Neema PK, Manikandan S, Rathod RC (2007) Absent right superior vena cava: the perioperative implications. *Anesth Analg* 105: 40-42.
3. Oosawa M, Sakai A, Abe M, Hanayama N, Lin ZB, et al. (1995) [Repeat open heart surgery in a case associated with persistent left superior vena cava: a method of simple occlusion of L-SVC using an alternative extra-pericardial approach and retrograde cardioplegia]. *Kyobu Geka* 48: 741-744.
4. Bartram U, Van Praagh S, Levine JC, Hines M, Bensky AS, et al. (1997) Absent right superior vena cava in visceroaortal situs solitus. *Am J Cardiol* 80: 175-183.
5. Giuliani-Poncini C, Perez MH, Cotting J, Humi M, Sekarski N, et al. (2014) Persistent left superior vena cava in cardiac congenital surgery. *Pediatr Cardiol* 35: 71-76.
6. Ratliff HL, Yousufuddin M, Liewing WR, Watson BE, Malas A, et al. (2006) Persistent left superior vena cava: case reports and clinical implications. *Int J Cardiol* 113: 242-246.
7. Luo ZQ, Liu KY, Han Z, Zhou C, Liu FL, et al. (2012) Surgical management of persistent left superior vena cava associated with an absent right superior vena cava. *J Card Surg* 27: 117-118.
8. Demirkan B, Gungor O, Turkvatan A, Guray Y, Guray U (2010) Images of persistent left superior vena cava draining directly into left atrium and secundum-type atrial septal defect. *J Cardiovasc Comput Tomogr* 4: 70-72.