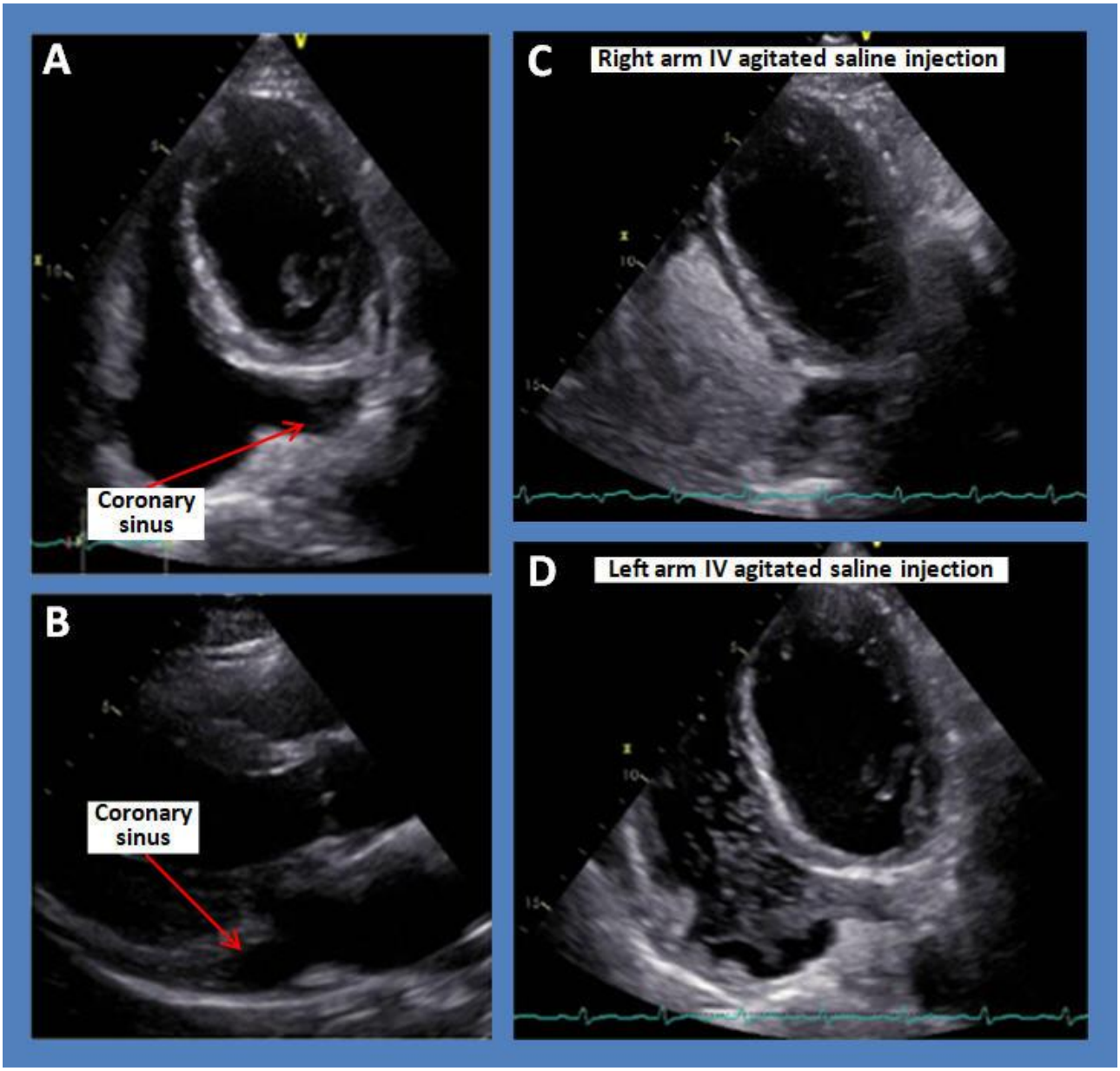
Persistent Left Superior Vena Cava: *A Left-Sided Short Circuit!*

Alexis Parks, D.O.[a], Nikky Bardia, M.D.[a], Christopher Malozzi, D.O.[a], Bassam Omar, M.D., Ph.D.[a, b]



Description

The above echocardiographic images reveal a dilated coronary sinus in a modified apical 4-chamber view (Fig. A) and parasternal long axis view (Fig. B). Injection of IV agitated saline into the right arm (Fig. C) routes the bubbles into the right superior vena cava inserting into the right arm with an expected appearance of the bubbles into the right atrium without opacification of the coronary sinus. However, injection of the agitated saline into the left arm (Fig. D) results in an unexpected initial

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appearance of the bubbles into the dilated coronary sinus pouring into the right atrium, indicating the presence of a persistent superior vena cava inserting into the coronary sinus.

Discussion

A left superior vena cava is a venous structure that exists during embryological development and usually disappears after birth [1]. However, some individuals have a persistent left superior vena cava, which is considered the most common thoracic venous anomaly, with a prevalence of 0.3 – 0.5% in the general population [2]. For most patients, this anomaly does not cause any hemodynamic compromise and is completely asymptomatic [3].

Embryonic vessels includes two superior cardinal veins which drain blood from the cranial portion of the fetus and an inferior caudal vein which drains the caudal portion [4]. Around the eighth week of gestation the left and right superior cardinal veins form an anastomosis which eventually forms the brachiocephalic vein. The caudal portion of the right superior cardinal vein forms the superior vena cava while the caudal portion of the left regresses to form the ligament of Marshall. If the caudal portion of the left superior cardinal vein does not regress, a vein that drains into the coronary sinuses forms, resulting in a persistent left superior vena cava. Variations of this anomaly could include a right and left superior vena cava with an Innominate vein bridging or the right superior vena cava could regress leading to a solitary left superior vena cava [5]. Most patients with this deformity have a left SVC that drains into the right atrium via the coronary sinuses. Some cases the left SVC drain into the left atrium which causes a shunt and potential paradoxical embolism [6, 7].

Most cases are diagnosed incidentally on cardiac imaging [8]. If a Swan-Ganz catheter is being placed via left subclavian, it will pass through the left superior vena cava and into the coronary sinus [9]. More definitive diagnosis is established via echocardiogram with bubble study [10]. TTE will show a dilated coronary sinus and a bubble study must be performed on both upper extremities as shown above. When agitated saline is administered via the right upper extremity it will be seen in the right atrium first. However, when administered via the left upper extremity, it will be seen first in the coronary sinus, then in the right atrium. Further imaging can be obtained via multislice CT or MR venography [11].

Most complications arise during procedures that require vascular access. The vasculature on the left can complicate placement of Swan-Ganz catheters, central lines, and ICDs [12]. Other complications associated with accessing the left SVC include arrhythmias [13], tamponade, cardiogenic shock [14], and coronary sinus thrombosis [15]. These complications are rare and are becoming less common with modern technology. In cardiac surgery, the malformation can be a contraindication to retrograde cardioplegia, requiring the coronary sinus to be dissected to permit reanastamosis of left SVC to the right atrium [16].

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a Division of Cardiology. University of South Alabama, Mobile, AL 36617

b Corresponding Author: Bassam Omar, Division of Cardiology, University of South Alabama, 2451 USA Medical Center Dr., Mobile, AL 36617, USA.

Email: bomar@health.southalabama.edu

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