

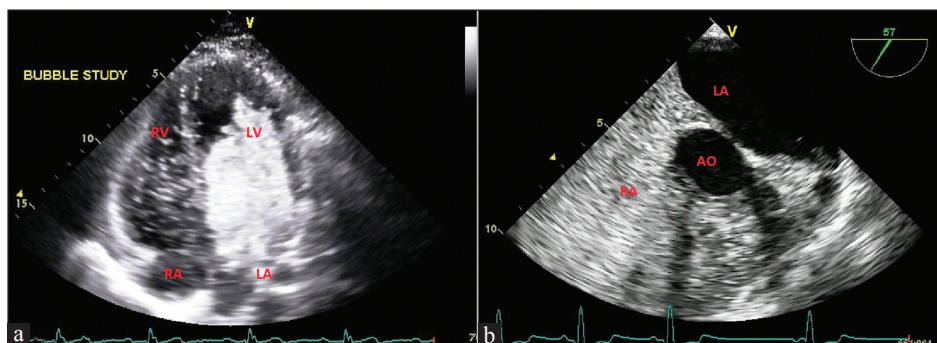
## Diagnosis of Persistent Left Superior Vena Cava Draining Directly into the Left Atrium

Dear Editor,

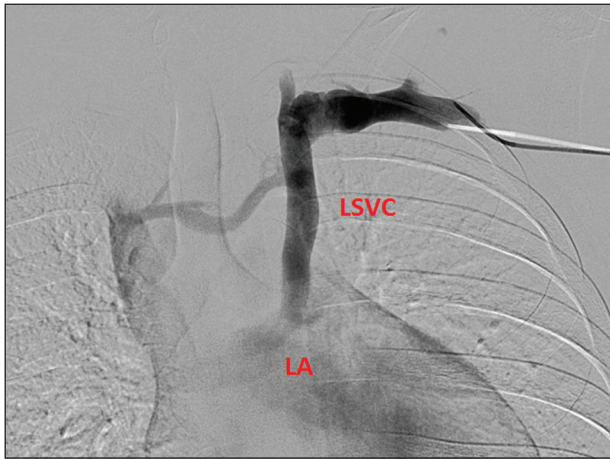
It is well-reported that persistent left superior vena cava (PLSVC) draining directly into the left atrium (LA), is the most common congenital thoracic venous anomaly.<sup>[1]</sup> It results from failure of regression of the left cardinal vein.<sup>[2]</sup> In 80-90% of the reported cases, PLSVC drains into the right atrium (RA), through a coronary sinus. In remaining 10% of cases, it connects to the LA and can be associated with hemodynamic instability, syncope, systemic emboli and abscesses.<sup>[3,4]</sup> Patients with PLSVC are usually asymptomatic, but due to its anatomical defect, difficulties for establishing central venous access, pacemaker implantation and cardiothoracic surgery are common.<sup>[5]</sup> Contrast echocardiography remains the cornerstone diagnostics of PLSVC.<sup>[6,7]</sup> The risk of adverse effects associated with contrast echocardiogram including transient ischemic attack or stroke remains extremely low.<sup>[8]</sup> Transthoracic echocardiogram (TTE), in general is safer than transesophageal echocardiogram (TEE) because there is no risk of the sedatives, esophageal perforation and aspiration in the former.<sup>[9]</sup> To the best of our knowledge, there are very few reported cases, which gives the importance of injecting microbubble contrast specifically into the left arm for establishing the diagnosis of PLSVC by echocardiogram.<sup>[10,11]</sup> We herein, report another case of PLSVC draining directly into the LA, diagnosed by bubble echocardiogram when the contrast

was injected in the left cubital vein and escaped initial detection after injecting into the right cubital vein. Our case taken in conjunction with the reported ones suggests the proper technique of establishing the diagnosis of Persistent Left Superior Vena Cava to identify the rare cause of stroke.

A 23-year-old male patient with a history of a known patent foramen ovale (PFO) and an old left parietal lobe abscess, presented with a syncopal episode that occurred shortly after receiving agitated saline contrast in an out-patient echo lab. The syncopal episode was likely due to cerebral vascular insufficiency due to the massive amount of micro bubbles entering the cerebral circulation. Two years previously, during the evaluation of his brain abscess, TEE was carried out, when microbubble contrast was injected in the right arm, which revealed a left-to-right shunt representing the diagnosis of PFO and a conservative approach was recommended. The precise cause of the brain abscess could not be determined, but it was felt to be possibly related to the PFO. One week before the presentation, he started having complaints of shortness of breath on exertion. A repeat TTE with bubble study was performed to evaluate the status of the PFO and to exclude other cardiac causes of dyspnea. The intravenous contrast for this study was started in the left arm and shortly after the microbubble contrast injection was given; the patient complained of feeling lightheaded, then collapsed to the ground and was unresponsive for a few minutes. He denied any fever, chills, blurred or double vision. His vital signs and physical examination were unremarkable with the cranial nerves intact and no focal motor or sensory changes. Laboratory diagnostics were unremarkable. TTE with agitated saline injected intravenously through his left arm showed a normal coronary



**Figure 1:** (a) Transthoracic echocardiogram bubble study with agitated saline injected intravenously through the left arm showing a large bolus of bubbles entering into the left atrium (LA). (b) Transesophageal echocardiogram bubble study with agitated saline injected intravenously through the right arm revealed complete opacification of the LA with bubbles in the right atrium. Abbreviations; Right ventricle (RV), Left ventricle (LV), Aorta (AO)



**Figure 2:** Left upper extremity venous angiogram showing left superior vena cava (LSVC) with direct communication to the left atrium and a collateral branch (bridging innominate vein) from the LSVC, which communicates with the normal right superior vena cava

sinus with a large bolus of bubbles entering into the LA first and then subsequently the RA [Figure 1a]. These findings were consistent with a venous connection to the LA or left pulmonary veins, most likely showing PLSVC draining into the LA. On his previous echocardiogram, the microbubbles entered into the RA when intravenous agitated saline was injected in the right arm [Figure 1b]. The finding was confirmed by left upper extremity venous angiogram that showed left superior vena cava (LSVC) with direct communication to the LA and collateral branch from the LSVC, which communicates with the normal right superior vena cava [Figure 2].

PLSVC was treated with percutaneous transcatheter closure with an 18 mm Amplatzer vascular plug, near to the junction of PLSVC and LA. Subsequently, PFO was closed with a 25 mm cribriform device. The purpose of closure of PLSVC and PFO is prevention of further embolism. Hence, we suggest that echocardiogram with agitated saline injected intravenously through the left arm is important in the diagnosis of a case of PLSVC draining directly into the LA.

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