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# Double Interatrial Septum and Patent Foramen Ovale in Woman With Transient Ischemic Attack

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**A** 47-year-old woman with a history of hypertension presented with symptoms of transient ischemic attack. Her blood pressure was normal. A 12-lead electrocardiogram and a 24-hour Holter monitor revealed sinus rhythm. Transthoracic echocardiograms showed normal left ventricular systolic function (ejection fraction, 66%), mild left ventricular hypertrophy, and a slightly enlarged left atrium. The apical 4-chamber view showed echo-free space between 2 atria in the center of the interatrial septum (IAS) with 2 parallel atrial-septal structures, raising suspicion of a persistent interatrial space (Fig. 1). With the patient in the Valsalva maneuver, we obtained a 2-dimensional transesophageal echocardiogram (TEE) with agitated saline contrast medium, which revealed a small communication from the interatrial space to the right atrium through a patent foramen ovale (PFO) at the midesophageal short-axis level of the aortic valve (Fig. 2). Real-time 3-dimensional TEE revealed a membrane,

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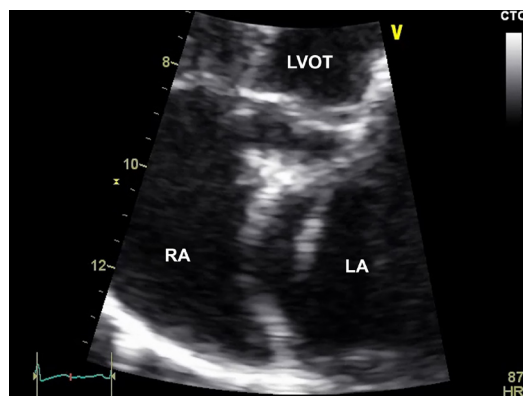
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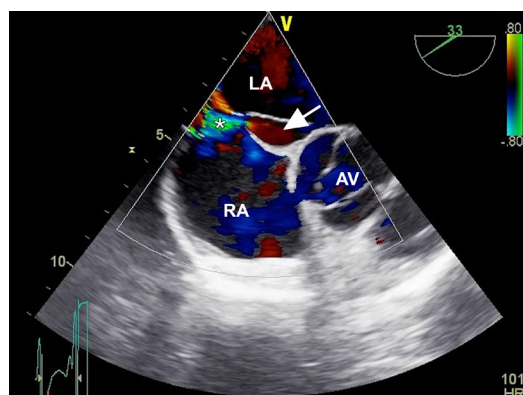
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**Fig. 1** Two-dimensional transthoracic echocardiogram (apical 4-chamber view) shows 2 parallel atrial-septal structures.

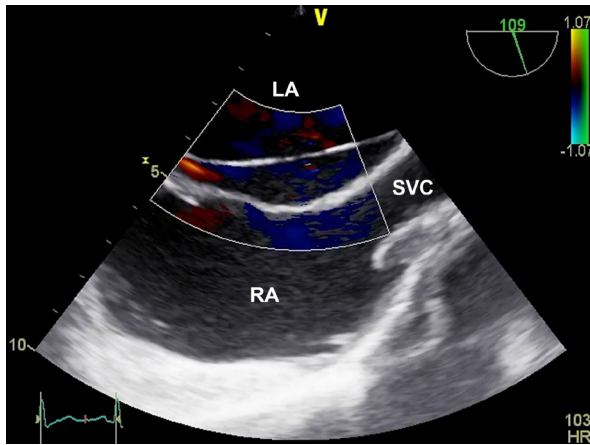
LA = left atrium; LVOT = left ventricular outflow tract; RA = right atrium

Supplemental motion image is available for Figure 1.



**Fig. 2** Two-dimensional transesophageal echocardiogram in color-flow Doppler mode (midesophageal short-axis view at aortic valve [AV] level) shows flow from the interatrial chamber (arrow) to the right atrium (RA) through a patent foramen ovale (asterisk).

LA = left atrium



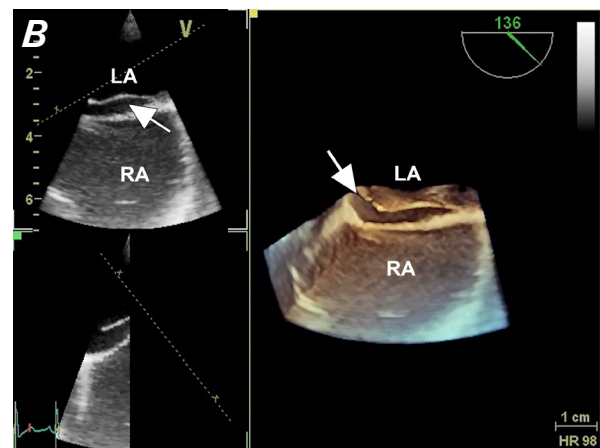
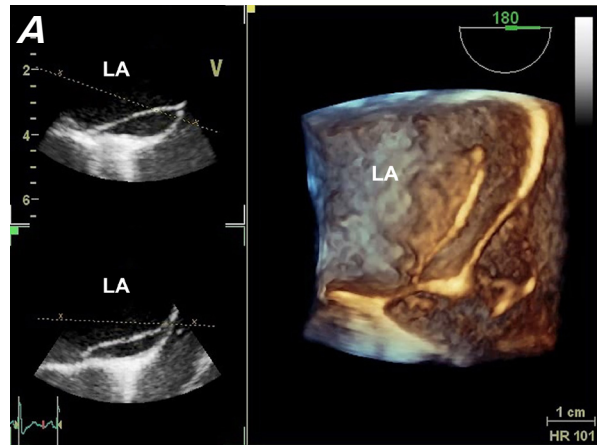
**Fig. 3** Two-dimensional transesophageal echocardiogram (midesophageal bicaval view) shows 2 parallel interatrial septa. LA = left atrium; RA = right atrium; SVC = superior vena cava

parallel to the IAS, that created a double IAS and an additional interatrial space (Figs. 3 and 4). No obstruction existed between the left atrial appendage and the normal pulmonary veins, mitral valve, or coronary sinus. A 2-dimensional TEE in color-flow Doppler mode showed flow into the additional chamber from the left atrium across the left-sided IAS. Previous reports suggest that a double IAS can cause emboli,<sup>1,2</sup> so we considered our patient to be at high risk and the PFO to be the cause of her neurologic event. Device closure of the PFO was not attempted because of possible complications from catheter-based closure. The patient was prescribed anticoagulation therapy and was discharged from the hospital after a 5-day stay. At the 3-month follow-up visit, she had no neurologic complications; 4 years later, she remained asymptomatic.

## Comment

Double IAS, an extremely rare congenital cardiac anomaly, is characterized by the presence of 2 distinct interatrial septa enclosing an interatrial chamber. The accessory membrane lies parallel to the IAS, and the pulmonary veins continue to communicate freely with the mitral valve and left atrial appendage.<sup>2,3</sup> Most patients are asymptomatic unless thromboembolic complications or cardioembolic events occur. Potential causes of double IAS are abnormal or incomplete fusion of the atrial septum primum with the septum secundum, and embryologic left venous valve derived from the embryologic sinus venosus.<sup>2,3</sup> There is no preferred treatment or risk stratification for cardiac sources of embolism in double IAS associated with neurologic events. However, monitoring with 3-dimensional TEE is imperative.

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**Fig. 4** Three-dimensional transesophageal echocardiograms in **A)** modified midesophageal long-axis and **B)** midesophageal views show 2 parallel interatrial septa enclosing an additional interatrial chamber (arrows).

LA = left atrium; RA = right atrium

Supplemental motion image is available for [Figure 4B](#).

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