Multimodality Imaging Assessment of Anatomic and Functional Pulmonary Vein Stenosis

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A 68-year-old man with a history of permanent atrial fibrillation and symptoms of fatigue and palpitations underwent pulmonary vein ablation under intracardiac echocardiography and NAVX system 3D mapping guidance. He noticed improvement in his symptoms after the procedure and remained in sinus rhythm on follow-up arrhythmia monitoring. However, symptoms of shortness of breath and a non-productive cough developed over 2 to 3 months. A computed tomography scan confirmed a significant stenosis of the left superior pulmonary vein. Multimodality imaging techniques were used to investigate the functional significance of the stenosis (Figure). Two-dimensional, 3D, and Doppler transesophageal echocardiography identified aliasing of color Doppler flow and spectral broadening along a long area of stenosis, demonstrating the presence of turbulent flow. The presence of turbulent flow and increased velocities on pulsed Doppler interrogation of the vein confirmed functionally significant stenosis. A tight stenosis of the left superior pulmonary vein was seen at cardiac catheterization, and successful placement of a Genesis PG1910B stent dilated to 7 mm in diameter was performed.

Disclosures
None.

Reference
Figure. A, Biplane transesophageal echocardiography of the left superior pulmonary vein at 90° perpendicular views (19° and 110°). Spectral broadening of color Doppler pulmonary venous flow identifies the presence of turbulent flow. A region of proximal flow convergence is seen at the site of maximum stenosis. B, 3D full-volume color Doppler acquisition is reconstructed to display the region of proximal flow convergence and turbulent flow. C, The presence of increased velocities on pulsed or color Doppler interrogation of pulmonary venous flow, in conjunction with turbulent flow, is consistent with significant pulmonary vein stenosis. A recent analysis comparing computed tomography with pulmonary vein Doppler velocities by transesophageal echocardiography found optimum detection of stenosis at peak diastolic velocities >100 cm/s, with 86% sensitivity and 95% specificity.1 D, Volume-rendered imaging of the left superior pulmonary vein identifies a long segment of significant stenosis in the proximal segment. E, Multiplanar reconstruction of the proximal left superior pulmonary vein demonstrates the long segment of stenosis and postprocedure diffuse wall thickening. The maximum area of luminal stenosis is 7 mm distal to the true ostium. F, Multiplanar reconstruction confirms that the true minimum cross-sectional area is 2×3 mm. An internal reference is typically used to quantify the percent stenosis. A proximal reference measurement of 7×12 mm and a distal reference measurement of 7×7 mm equates to a severe (70% to 80%) luminal stenosis.