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Diagnostic Dilemma

## An Unusual Cause of an Isolated Transient Ischemic Attack in an Otherwise Healthy Elderly Man

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A 67-YEAR-OLD, 71kg, 180cm man with a history of hyperlipidemia and tobacco abuse was transferred from an outside hospital to the authors' institution for further evaluation of a transient ischemic attack. The patient reported that he experienced profound left-sided weakness concomitant with fatigue and imbalance that persisted for approximately 1 hour before spontaneously resolving. He denied residual neurologic deficits. The patient also denied a history of palpitations, chest pain, shortness of breath at rest, on exertion, or when assuming an upright position, orthopnea, dizziness, and syncope. He stated that his exercise tolerance was excellent: he had no functional limitations. The physical examination was unremarkable. A 12-lead electrocardiogram indicated normal sinus rhythm. No significant atrial and ventricular arrhythmias were noted on a subsequent 48-hour Holter electrocardiography study. Flow-limiting stenoses in the carotid arteries were absent in a carotid duplex study. Transesophageal echocardiography (TEE) was performed as part of the diagnostic evaluation and revealed the following images (Figs 1-5; Videos 1-3). What is the diagnosis?

#### **Diagnosis: Fenestrated Atrial Septal Aneurysm**

The midesophageal 4-chamber TEE view demonstrated excessive motion of the atrial septum (Figs 1 and 2;

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Fig 1. Midesophageal 4-chamber TEE image showing maximum leftward displacement of the atrial septum.



Fig 2. Midesophageal 4-chamber TEE image showing maximum rightward displacement of the atrial septum.

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Video 1) consistent with an atrial septal aneurysm. This finding was confirmed using M-mode Doppler echocardiography (Fig 3). Right atrial and right ventricular enlargement also were observed (Fig 4; Video 2), suggesting the presence of a chronic left-to-right shunt. The atrial septum appeared to be discontinuous in the midesophageal bicaval TEE imaging plane (Fig 5; Video 3); an agitated saline test was positive (Fig 6; Video 4). Color-Doppler interrogation of the atrial septum revealed 3 distinct jets of right-to-left blood flow (Fig 7; Video 5). Continuous-wave Doppler indicated that these jets were low velocity (maximum of 1.2 m/sec) (Fig 8), with a peak pressure gradient between the left and right atria of 6 mmHg. Coronary angiography also demonstrated a flowlimiting stenosis of the first diagonal branch of the left anterior descending coronary artery. The patient was taken to the operating room for repair of the fenestrated atrial septal aneurysm and coronary artery bypass graft surgery. Direct inspection of the atrial septum through a right atriotomy during cardiopulmonary bypass revealed 2 large defects (each approximately 1 cm in diameter) in the ostium secundum septum, one of which was located near the superior apex of the septum and the other closer to the tricuspid valve annulus. A smaller defect (0.3 cm), located in the superior-medial aspect of the ostium secundum septum, was identified between the 2 larger defects. The defects were repaired primarily with a running suture in 2 layers. The atriotomy was closed, and the first diagonal artery was bypassed using a reversed saphenous vein graft. After the patient was rewarmed and the heart was de-aired, the patient was weaned from cardiopulmonary bypass without inotropic support. Repeat TEE examination demonstrated that there was no movement or residual right-to-left shunts in the repaired atrial septum. The patient was taken to the surgical intensive care unit in stable condition. The remainder of his hospital stay was uneventful.

Outpouching and excessive motion of the atrial septum toward either or both atrial chambers are required to establish the presence of an atrial septal aneurysm.<sup>1</sup> The diagnostic criteria include extension of the aneurysm more than 1.1cm from the atrial septum midline plane and a base



Fig 4. Midesophageal 4-chamber TEE image showing right atrial and right ventricular enlargement.

that exceeds 1.5 cm in length.<sup>2</sup> The current patient's atrial septal aneurysm fulfilled these criteria, demonstrating approximately 1.5cm motion on either side of the midline (Fig 3) and a base of 2.8 cm. An atrial septal aneurysm is a relatively uncommon clinical finding. Agmon et al found that 2.2% of 393 patients undergoing TEE evaluation after embolic stroke had atrial septal aneurysms.<sup>3</sup> Approximately 1% of all adults had atrial septal aneurysms at autopsy.<sup>4</sup> As observed in the current patient with 3 fenestrations in the atrial septal aneurysms are associated with other atrial pathology including single or multiple fenestrations, atrial septal defect, patent foramen ovale, or thrombus with the aneurysm itself.<sup>2,5,6</sup>

Percutaneously implanted devices are used most often to treat fenestrated atrial septal aneurysms or defects in adults<sup>7–9</sup> and children,<sup>10,11</sup> although some lesions continue to require a surgical approach<sup>12</sup> because of anatomic considerations or complex pathology,<sup>7,13</sup> as the current case illustrates. Interestingly, several recent studies indicated that complete closure of fenestrated atrial septal aneurysm or defects may have important hemodynamic consequences in adults. Ermis et al demonstrated that percutaneous closure of atrial septal defects significantly increased left ventricular end-diastolic pressure



Fig 3. M-mode Doppler echocardiography showing excessive motion of the atrial septum during the cardiac cycle.



Fig 5. Midesophageal bicaval TEE image showing discontinuous atrial septum (white arrows).

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