



CardioCase

of the Month

Gasping For Air: Atrial Septal Defect

By Anita W. Asgar, MD, FRCPC; and
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CardioCase Presentation

Mrs. Thompson, 64, has a history of Type 2 diabetes, hypertension, and atrial fibrillation. She has noticed progressive shortness of breath over the last five to six years. She has also noticed bilateral pitting edema. Mrs. Thompson was treated with diuretics by her family physician and experienced transient improvement in symptoms. Three months later, she required admission to the hospital due to recurrent dyspnea. An electrocardiogram shows atrial fibrillation with a ventricular rate of 98 beats/minute, right axis deviation, and possible right ventricular hypertrophy (Figure 1).

Mrs. Thompson's Examination

1. Afebrile, irregular heart rate: 110 beats/minute.
2. Blood pressure: 136/74 mmHg.
3. *Respiratory exam:*
 - Bibasilar crackles.
4. *Cardiac exam:*
 - Jugular venous pulsation at 5-6 cm above the sternal angle.
 - Right ventricular lift with diffuse apex.
 - Normal S₁, and a fixed split S₂ with a loud pulmonic valvular sound component.
 - Grade 2/6 pansystolic murmur auscultated at the left lateral sternal border.

Other investigations

- Chest X-ray shows cardiomegaly, increased right ventricular size, increased pulmonary markings, and vascular redistribution.
- Thoracic echocardiogram indicates right ventricular enlargement, elevated pulmonary artery pressures, and an atrial septal defect (ASD).
- Transesophageal echocardiogram demonstrates preserved left ventricular function, mild tricuspid regurgitation, an estimated pulmonary artery pressure of 40 mmHg, and an ASD measuring 28 mm. A pulmonary to systemic shunt ratio of 4.3:1 is calculated on right heart catheterization.

What's Your CardioCase Diagnosis?

CardioCase Discussion

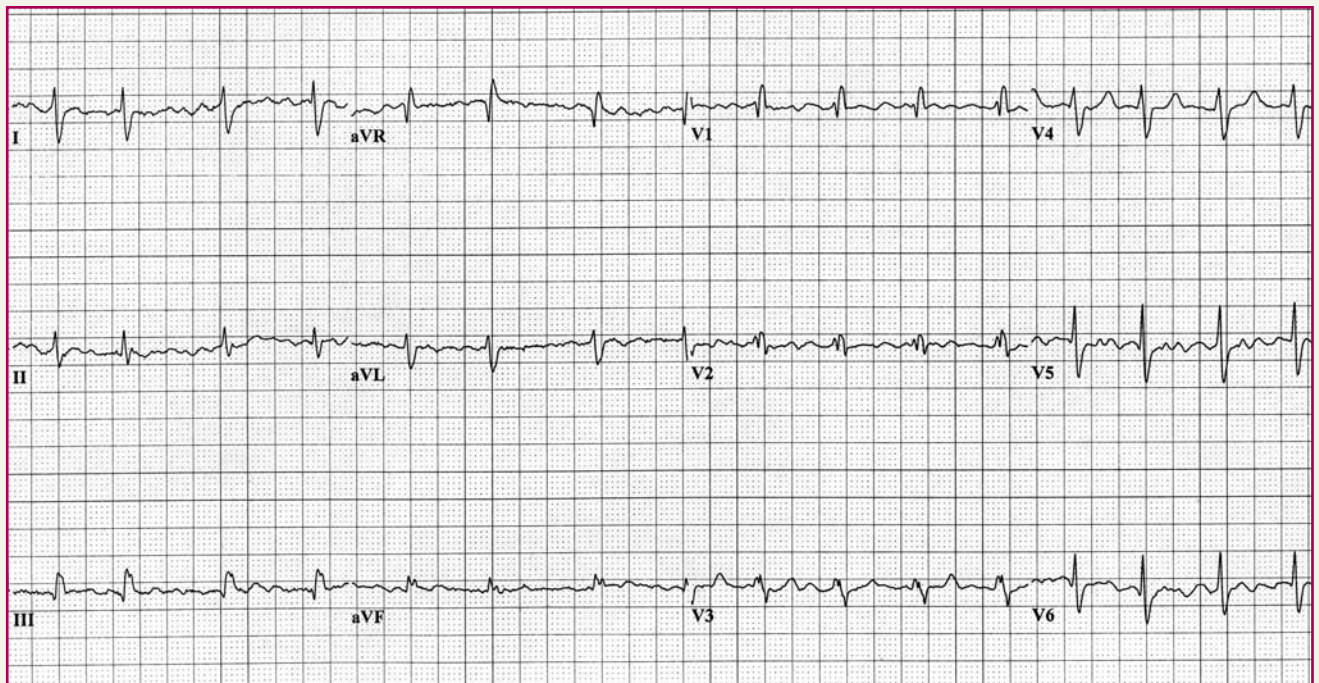


Figure 1. Mrs. Thompson's ECG.

What is ASD?

Atrial septal defects (ASDs) are the second most common form of congenital heart disease in adults. ASDs are estimated to account for 30% to 40% of adult congenital heart disease. There are four types of ASD: secundum, primum, sinus venosus, and coronary sinus. Secundum ASD is the most common, accounting for 70% of all ASDs (See Figure 2).¹ Mitral valve prolapse is present in up to 70% of patients with secundum ASD, and may be associated with significant mitral regurgitation.

ASDs result in a continuous flow of oxygenated blood from the left to the right atrium across the defect. The amount of shunt flow is dependent on the size of the defect and the relative distensibility of the

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Table 1

Criteria for Percutaneous Atrial Defect Closure

- Ostium secundum defect.
- Left-to-right shunting across the septum.
- Maximal defect diameter of 20 mm.
- Dilated right ventricle with evidence of volume overload.
- A safe distance (4-5 mm) from the margins of the defect to intracardiac structures (atrioventricular valves, superior caval vein, upper right pulmonary vein, and coronary sinus).
- Adequate rim of tissue around at least 75% of the defect circumference.

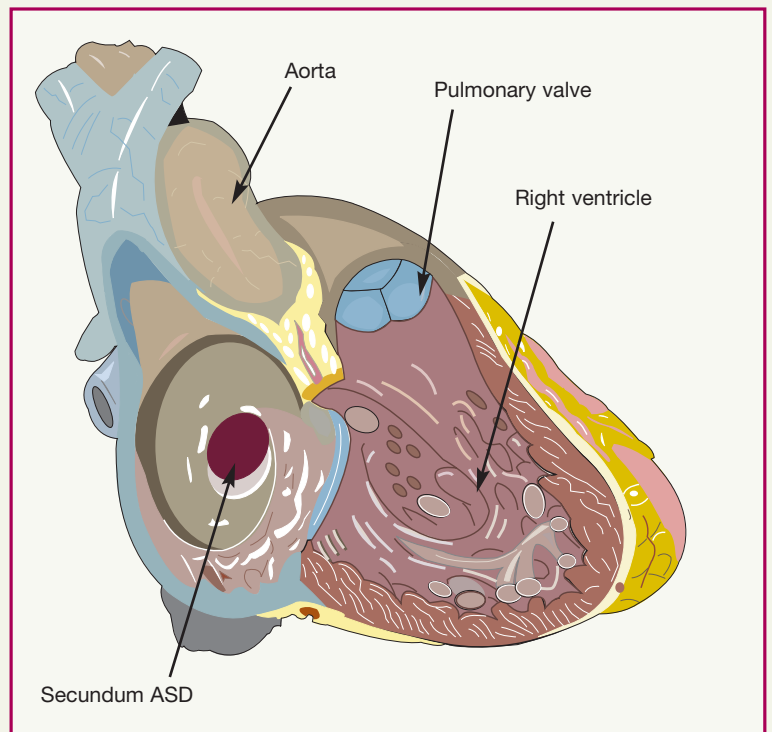


Figure 2. Secundum atrial septal defect.

two sides of the heart. The shunt results in a circulation of blood that travels from the right atrium to the right ventricle, then to the pulmonary circulation, followed by the left atrium and back to the right atrium. The chronic excessive flow of blood through the right ventricle and pulmonary arteries eventually leads to right atrial and ventricular dilatation due to volume overload.

What are the clinical manifestations?

Estimates suggest that most patients with significant ASD shunting will become symptomatic by the age of 40, with progressive limitation of activity over time. The initial symptoms are often mild and non-specific, consisting of fatigue, exercise intolerance and palpitations.² Atrial arrhythmias, such as fibrillation or flutter, may develop and are associated with elevated pulmonary artery pressure. A study of patients undergoing surgery for ASD demonstrated that the incidence of atrial arrhythmias increases with age, affecting approximately 80% of patients over the age of 60.³ Right ventricular failure eventually develops in roughly 10% of patients by the age

of 40, and may be the presenting symptom in older patients.¹ Pulmonary hypertension, although uncom-

The case of Mrs. Thompson

Mrs. Thompson underwent cardiac catheterization and percutaneous closure of her atrial septal defect with an Amplatzer septal occluder using transesophageal guidance. There was a trivial shunt post-procedure. She noticed improvement in her symptoms a day after the procedure. Eight months after the procedure, she reported remarkable improvement in her shortness of breath and exercise tolerance. She denied any recurrent symptoms of heart failure. Followup transesophageal echocardiogram showed mild tricuspid regurgitation, reduction in right ventricular size, a well-positioned closure device, and no leak.

CardioCase Discussion

mon, may occur at any age and result in Eisenmenger's syndrome. Patients with an ASD who develop a right-to-left shunt are at risk of stroke due to paradoxical embolism.⁴

Physical examination findings in these patients are related to the degree and duration of shunting and may yield the following:

- Wide and fixed splitting of S₂, the auscultatory hallmark of ASD.
- Parasternal lift, which occurs in 50% of patients with ASD.
- Dilated pulmonary artery trunk, palpable in the second left intercostal space.
- Pulmonary systolic flow murmurs, audible in virtually all patients except those with severe pulmonary hypertension.
- Patients with ASD (5% to 15%) may have mitral valve prolapse with mitral regurgitation, which uncommonly develops into significant mitral regurgitation.
- Loud S₁ due to the accentuation of the tricuspid component.
- Diastolic rumble due to the increased flow across the tricuspid valve.
- Once right ventricular failure develops, patients may develop a holosystolic murmur of tricuspid regurgitation.⁵

How do I manage ASD?

Once the diagnosis of an ASD has been reached, decisions regarding management must be made. Significant ASDs, those with a shunt ratio > 1.5 or associated with right ventricular enlargement, require closure when symptoms are present. In patients under 40, significant ASDs should be closed whether symptoms are present or

Take-home message

- ASD is a common congenital lesion in adults.
- Symptoms are non-specific and include fatigue, shortness of breath, and decreased exercise tolerance.
- Consider ASD when patients present with fatigue, dyspnea and cardiomegaly.
- Percutaneous ASD closure is an effective option with a low rate of complications.
- Symptoms resolve almost immediately post-ASD closure with improvement in right atrial and right ventricular size in approximately one month.



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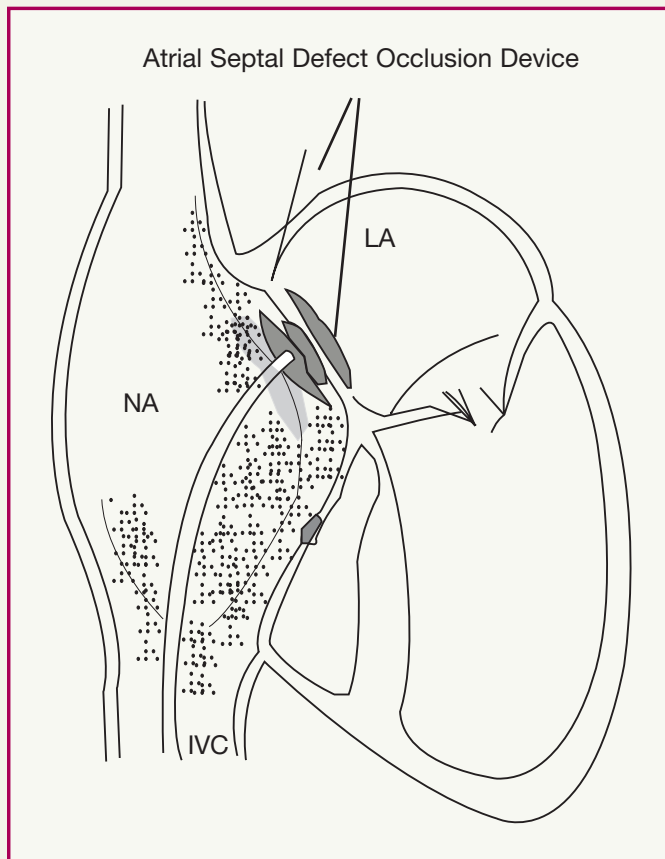


Figure 3. Percutaneous closure of ASD using occlusion device.

not. In asymptomatic patients 40 years or older, the proper treatment strategy is unclear, though recent data suggest better long-term outcomes when ASDs are closed.⁶

Options for ASD closure include percutaneous device closure and surgery. Indications for device closure are the same as for surgical closure, however, the selection criteria are more stringent (Table 1).⁷ Device closure is only suitable for secundum lesions. The lesion must have an adequate septal margin inferiorly for proper device support (Figure 3). Transesophageal echocardiography is essential during the procedure to aid in proper device placement. There are several devices available for ASD closure, including the Amplatzer occlusion device. The procedure is safe and effective with major complications occurring in less than 1% of cases, and

minor complications in 3% to 4% of cases. ASD closure, confirmed by echocardiogram, is achieved in 85% of patients or more.⁸ At one month post-procedure, studies indicate evidence of reduction in right atrial and right ventricular size, as well as improvement in electrocardiogram changes.⁹

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