

Atrial Septal Defects



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KEYWORDS

- Atrial septal defect • Congenital heart disease • Cardiac surgery • Amplatzer
- Ostium secundum • Ostium primum • Sinus venosus • Unroofed coronary sinus

KEY POINTS

- The second most common congenital heart defect is an atrial septal defect (ASD). Patients may be asymptomatic, making thorough examination and diagnostic imaging necessary.
- The secundum ASD is the most common type. Primum, sinus venosus, and unroofed coronary sinus atrial communications may have additional associated cardiac anomalies.
- Percutaneous device closure is possible in secundum ASDs with sufficient surrounding tissue if the device placement does not interfere with other anatomic structures.
- Surgical repair may be performed for all types of ASDs. Mitral valve repair and baffling of a pulmonary vein or left superior vena cava may be executed simultaneously.
- The success rate for closure of ASDs is high. The complication risk is slightly higher in surgical closures; however, both are generally well tolerated.

INCIDENCE AND PREVALENCE

An estimated 1.35 million infants worldwide are born with congenital heart disease every year. This corresponds to approximately 8 in 1000 live births.¹ In the United States, congenital heart defects are the most common birth anomaly, found in 1 of every 100 births and the most common cause of infant mortality.² Of all the types of congenital heart disease, ASDs represent the second most common and account for 7% to 10% of all congenital heart defects.^{1,3–5} Worldwide, ASDs are noted to be 1.64 per 1000 live births with a female-to-male ratio of 2:1.^{3,6}

The most common type of atrial septal communication is an ostium secundum defect, representing 80% of all ASDs. Ostium primum and sinus venosus defects each represent approximately 10%. The rarest type of ASD is an unroofed coronary sinus.^{7,8}

EMBRYOLOGY

Commencing 20 days after conception, the cardiovascular system begins to develop. Blood vessels begin to form a tubular heart.⁹ This tubular heart constricts into various

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segments, thereby dividing it from top to bottom into the truncus arteriosus, bulbus cordis, ventricular area, and atrial area. By day 23, the tube begins to loop, resulting in the formation of the primitive heart. The atria then become repositioned within the pericardium as 1 common chamber. The venous drainage localizes to opposite sides of the posterior common atrium. The sinoatrial junction localizes to the right, and the cardinal veins, umbilical vein, and vitelline vein localize to the left side of the common atrium. It is because of these venous junctions that the atria have smooth posterior walls.

At approximately day 35 of gestation, the atrium begins to form 2 separate cavities. It experiences external compression from the truncus arteriosus and the bulbus cordis. Concurrently, the septum primum is developing internally. This is the beginning of the atrial septum. The septum primum has a bowl shape and extends superiorly to the atrioventricular canal and the junction of the mitral and tricuspid valves. The septum secundum then begins to develop to the right of the septum primum. At the end of the process, the only opening that remains is the foramen ovale, which is a slitlike opening between the primum and secundum septums.^{5,6} This opening continues to permit blood to flow across the atria during fetal circulation.⁹ In certain instances, there is a defect in the wall between the right-sided pulmonary veins and the superior vena cava, which is associated with partial anomalous pulmonary venous return.^{8,10}

Several changes occur in the fetal heart when the infant is born. As oxygen enters the lungs, pulmonary vascular resistance decreases. As blood enters the pulmonary vasculature, the afterload for the right ventricle is lowered and left ventricular volume is increased. This change in intracardiac pressure closes the flaplike structure of the patent foramen ovale. The patent ductus arteriosus, which is a vessel that connects the aorta to the pulmonary artery, also contracts and closes after birth. The closure of these communications is necessary for isolating the venous blood to the right side of the heart and pulmonary circulation and the arterial blood to the left side of the heart and systemic circulation.¹¹

ANATOMY OF ATRIAL SEPTAL DEFECTS

There are 4 main types of ASDs, including ostium secundum, ostium primum, sinus venosus, and unroofed coronary sinus. As their names indicate, they are differentiated by their location. **Fig. 1** demonstrates the intracardiac location of each of these defects.

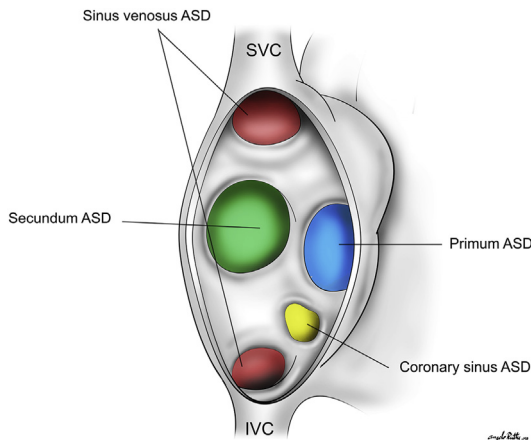


Fig. 1. Intracardiac location of ASDs.

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