

Ventricular Septal Defect

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Case Scenario

A 6-month-old child weighing 3.7 kg presents from home for bilateral inguinal hernia repair and circumcision. He was recently seen in the emergency room for an incarcerated hernia that was manually reduced. He was born at 26 weeks estimated gestational age with a birth weight of 1100 grams. He was intubated for 3 weeks and weaned from high-flow nasal cannula to room air prior to discharge from the neonatal intensive care unit at 34 weeks postconceptional age. The parents say that in the neonatal unit the baby was diagnosed with a “hole in his heart” and that he takes medicine for it every day.

Current vital signs are heart rate 140 beats/minute, respiratory rate 45 breaths/minute, blood pressure 70/38 mm Hg and SpO₂ 98% on room air.

The patient has been scheduled for same-day surgery and the parents are requesting a spinal anesthetic, as they are concerned about neonatal apnea with general anesthesia.

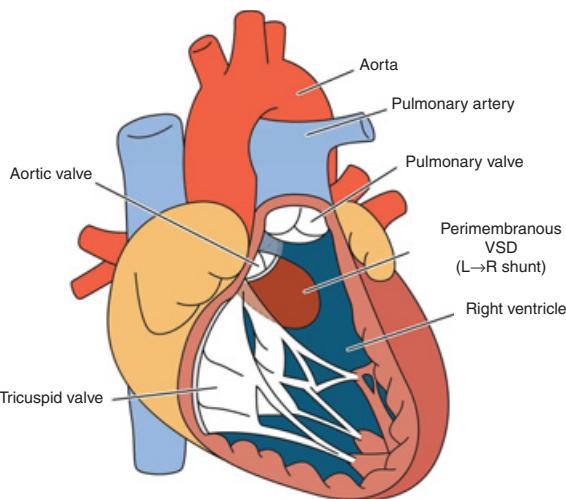


Figure 2.1 Perimembranous ventricular septal defect. Drawing by Ryan Moore, MD, and Matt Nelson.

Key Objectives

- Understand the physiology of a left-to-right shunt.
- Describe the preoperative workup and perioperative management of a premature infant with a ventricular septal defect.
- Identify an anesthetic plan in the context of balancing pulmonary vascular resistance and systemic vascular resistance.
- Outline postoperative management and appropriate discharge planning.

Pathophysiology

How are VSDs characterized?

Ventricular septal defects (VSDs) are the most common congenital heart defect, occurring in 50% of patients with congenital heart disease (CHD). It is estimated that 75–80% of VSDs are **perimembranous** (see Figure 2.1), indicating the communication between ventricles occurs adjacent

to the very small membranous septum. **Inlet** VSDs, also known as canal type, are located posteriorly beneath the septal leaflet of the tricuspid valve. (See Figure 2.2.) **Muscular** VSDs may occur anywhere within the muscular wall of the interventricular septum and can also exist as part of other more complex cardiac defects. (See Figure 2.3.) **Subarterial** (also called subpulmonary, supracristal, conal, or infundibular) VSDs lie beneath the pulmonary valve within the outlet septum. (See Figure 2.4.) A VSD can also be present in many other forms of CHD as part of a constellation of defects.

What are the hemodynamic effects of a VSD?

An isolated VSD results in the ability to shunt blood between the left and right ventricles. The size of the defect and pulmonary vascular resistance (PVR) determine the blood flow across the VSD. Left-to-right (L-to-R) shunting generally occurs predominantly during systole and this shunting results in an increased volume load to both ventricles.