



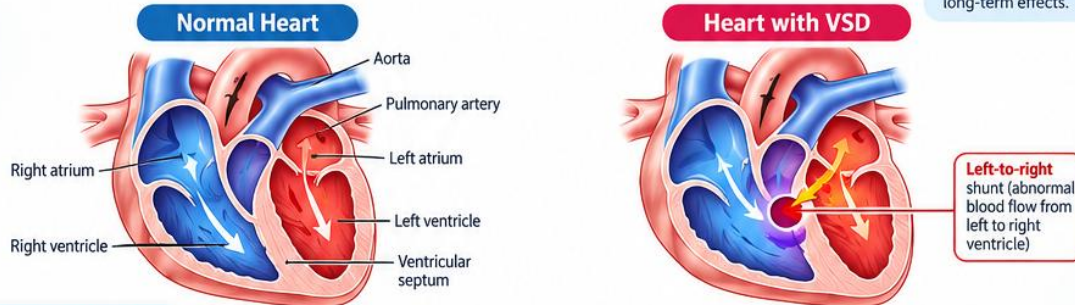
CARING FOR HEARTS

Ventricular Septal Defect (VSD)

Types and Management

A Ventricular Septal Defect (VSD) is a hole in the wall (septum) separating the right and left ventricles of the heart. It is the most common congenital heart defect.

Blood normally flows from the left ventricle (higher pressure) to the right ventricle (lower pressure) through the VSD, creating a **left-to-right** shunt. The size and location of the defect determine the symptoms and long-term effects.



Types of VSD

1. Perimembranous VSD (Most Common)



- Located near the heart valves in the membranous septum.
- Accounts for 70–80% of VSDs.
- May partially close with tissue from the tricuspid valve.
- Can affect the aortic valve over time.

2. Muscular VSD



- Located within the muscular portion of the ventricular septum.
- May be single or multiple ("Swiss cheese" septum).
- Highest rate of spontaneous closure.

3. Outlet (Supracristal/Subarterial) VSD



- Located beneath the aortic and pulmonary valves.
- More common in Asian populations.
- Associated with progressive aortic valve prolapse and aortic regurgitation.
- Often requires surgical closure even when relatively small.

4. Inlet VSD



- Located near the atrioventricular valves.
- Often associated with atrioventricular septal defects.
- More common in patients with chromosomal disorders such as Down syndrome.

Classification by Size

Small (Restrictive)



- Minimal shunting
- Normal heart chamber sizes
- Often asymptomatic
- Loud murmur
- Frequently closes spontaneously

Moderate



- Moderate left-to-right shunting
- Enlargement of left-sided chambers
- May cause mild symptoms

Large (Nonrestrictive)



- Significant shunting
- Pulmonary overcirculation
- Congestive heart failure in infancy
- Risk of pulmonary vascular disease if untreated

Symptoms

Small VSD



- Often no symptoms
- Heart murmur detected during routine examination

Moderate or Large VSD



- Rapid breathing
- Feeding difficulties
- Poor weight gain
- Excessive sweating during feeding
- Fatigue
- Recurrent respiratory infections

Diagnostic Evaluation



Physical Examination

- Harsh holosystolic murmur along the lower left sternal border
- Possible thrill
- Signs of heart failure in larger defects



Echocardiography (Gold standard)

- Determines VSD type and size
- Shunt direction
- Chamber enlargement
- Pulmonary pressures
- Associated heart defects



Additional Testing

- ECG
- Chest X-ray
- Cardiac MRI (selected cases)
- Cardiac catheterization (when needed)

Natural History



- Muscular VSDs: 70–90% close spontaneously.
- Small perimembranous VSDs: many close or become smaller.
- Large VSDs rarely close spontaneously.
- Most spontaneous closures occur during infancy and early childhood.

Management



Observation

- Appropriate for small VSDs
- No symptoms
- No chamber enlargement
- Normal pulmonary pressures



Treatment of Heart Failure Symptoms (if needed)

- Diuretics (e.g., furosemide)
- Nutritional support and high-calorie feeds
- Monitor growth and symptoms

Indications for Closure

- ✓ Significant left ventricular enlargement
- ✓ Symptoms of heart failure
- ✓ Poor growth despite medical therapy
- ✓ Elevated pulmonary artery pressures
- ✓ Progressive aortic valve prolapse or regurgitation
- ✓ Prior infective endocarditis
- ✓ Significant residual shunt

Closure Options



Surgical Repair

- Patch closure
- Excellent long-term outcomes
- Very low mortality



Transcatheter Device Closure

- Selected patients (e.g., muscular VSDs)
- No sternotomy
- Shorter hospital stay
- Faster recovery

Long-Term Follow-Up



Small Unrepaired VSD

- Periodic cardiology follow-up
- Monitor for aortic valve changes
- Chamber enlargement
- Rare endocarditis

Repaired VSD

- Generally excellent prognosis
- Periodic follow-up throughout childhood and adulthood
- Assess residual shunts, valve function, and rhythm disturbances

Sports and Activity Recommendations



Small VSD (No Pulmonary Hypertension)

- ✓ No exercise restrictions.

Successfully Repaired VSD

- ✓ Full participation after recovery if normal ventricular function and no significant residual defect.

Pulmonary Hypertension or Residual Significant Defect

- ⚠ Activity recommendations should be individualized by a congenital cardiologist.

Prognosis



- The prognosis for most children with VSD is excellent.
- Many small defects close spontaneously, and modern surgical repair provides near-normal life expectancy and quality of life.
- Early recognition and appropriate follow-up help prevent complications such as pulmonary vascular disease and aortic valve dysfunction.



CARING FOR HEARTS

Dr. Shabib Alhadheri, MD
Advanced Pediatric Cardiology

1478 W Elliot Rd, Suite 102
Gilbert, AZ 85233

480-855-1339
www.apcardio.com

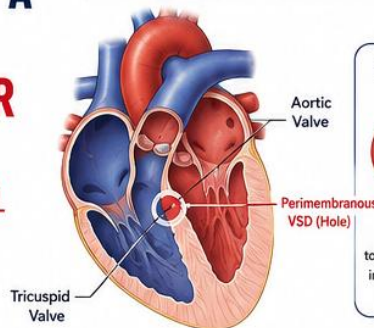
UNDERSTANDING MANAGEMENT OF A MODERATE TO LARGE PERIMEMBRANOUS VENTRICULAR SEPTAL DEFECT (VSD)

Early Diagnosis. Timely Treatment. Better Outcomes.

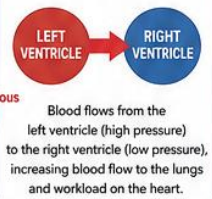
A perimembranous VSD is a hole in the wall (septum) between the heart's lower chambers. When moderate to large, it causes extra blood flow to the lungs and extra work for the heart.



WHAT IS A PERIMEMBRANOUS VSD?



LEFT-TO-RIGHT SHUNT (Most Common)



WHY IT MATTERS



Increases blood flow to the lungs



Enlarges the heart (especially left side)



May lead to heart failure if untreated



Can cause pulmonary hypertension over time

WHO IS AT RISK?

- Infants are most commonly affected
- Symptoms often appear at 4–8 weeks of age
- Can affect growth, feeding, and breathing

SIGNS & SYMPTOMS

INFANTS (4–8 WEEKS ONWARDS)



- Fast breathing
- Sweating during feeds
- Poor feeding
- Poor weight gain
- Frequent respiratory infections
- Fatigue
- Swelling or enlarged liver

OLDER CHILDREN



- Exercise intolerance
- Easy fatigability
- Recurrent pneumonia
- Growth delay
- May have no symptoms despite heart enlargement

HEMODYNAMIC EFFECTS



Left-to-right shunt



Increased pulmonary blood flow



Left heart enlargement (Left atrium & left ventricle)



Increased workload on the heart



Risk of pulmonary hypertension if untreated

POTENTIAL COMPLICATIONS IF UNTREATED



Congestive Heart Failure – most common in infancy



Failure to Thrive – due to increased calorie needs



Pulmonary Hypertension – from chronic overcirculation



Eisenmenger Syndrome – irreversible lung disease, cyanosis, and bidirectional shunt (late stage)



Aortic Valve Prolapse – may lead to aortic regurgitation



Infective Endocarditis – increased risk



Arrhythmias – including heart block (rare)



Exercise Intolerance – due to chronic heart strain



Progressive Left Ventricular Dysfunction – over time

DIAGNOSIS



Echocardiogram (Gold Standard): Determines size, location, shunt, heart chamber enlargement, pulmonary pressures, and valve involvement



ECG: May show left ventricular hypertrophy or enlargement of heart chambers



Chest X-ray: May show enlarged heart and increased blood flow to the lungs



Cardiac MRI: Used in complex cases to measure shunt and evaluate pulmonary arteries

MANAGEMENT APPROACH

Medical treatment does NOT close the VSD but helps control symptoms and support growth.

MEDICATIONS



- Diuretics (e.g., Furosemide, Chlorothiazide, Spironolactone)
- Afterload reduction (e.g., ACE inhibitors)
- Helps reduce fluid in lungs and improve heart function

NUTRITIONAL SUPPORT



- High-calorie formula
- Fortified feeds
- Feeding therapy
- Nasogastric tube if needed
- Supports growth and development

TREAT INFECTIONS PROMPTLY



- High risk for colds, bronchiolitis, pneumonia, RSV
- Early medical care helps prevent complications

REGULAR MONITORING



- Track growth, symptoms and heart size,
- Adjust medications as needed
- Monitor for complications

WHEN & HOW TO CLOSE



TIMING

- Symptomatic infants: Usually by 3–6 months
- Severe symptoms: May need earlier surgery
- Asymptomatic with large shunt or heart enlargement: Close in early childhood

METHODS



SURGICAL REPAIR (Gold Standard)

- Very high success rate (>95%)
- Complete and durable closure
- Patch used: Autologous pericardium or synthetic material



TRANSCATHETER DEVICE CLOSURE (Selected Patients Only)

- Less invasive; shorter recovery
- Not suitable for many perimembranous VSDs due to risk of heart block and proximity to aortic valve

INDICATIONS FOR CLOSURE

- ✓ Persistent heart failure despite optimal medical therapy
- ✓ Failure to thrive or poor weight gain
- ✓ Large left-to-right shunt ($Qp:Qs \geq 1.5-2:1$) with heart chamber enlargement
- ✓ Progressive enlargement of left heart chambers
- ✓ Aortic valve prolapse or aortic regurgitation
- ✓ Recurrent infective endocarditis
- ✓ Pulmonary hypertension (before irreversible changes occur)

SAFETY PEARLS

- Never stop heart medications without your pediatric cardiologist's advice.
- Watch for increased breathing, poor feeding, poor weight gain, or fatigue—seek medical care early.
- Keep all follow-up appointments and echocardiograms.
- Good hand hygiene and vaccines help prevent serious infections.
- Endocarditis prevention may be recommended in certain situations—always follow your cardiologist's guidance.

PARENT ACTION CHECKLIST

- ☐ Give medications exactly as prescribed
- ☐ Monitor your child's breathing, feeding, and energy level
- ☐ Track weight gain and growth
- ☐ Attend all follow-up visits and heart ultrasounds
- ☐ Keep vaccines up to date (including flu & RSV when recommended)
- ☐ Seek care early for fever, cough, fast breathing, or poor feeding
- ☐ Ask questions and stay informed



Dr. Shabib Alhadheri, MD
Advanced Pediatric Cardiology

Compassionate Care. Advanced Expertise. Brighter Futures.



1478 W Elliot Rd, Suite 102
Gilbert, AZ 85233



Phone: 480-855-1339