CONDITION

Ventricular septal defect

A ventricular septal defect is an opening between the heart's lower chambers that is usually present from birth.

WHAT IT IS
Opening between the heart's lower chambers

BODY SYSTEM
Heart and circulation

MAIN SYMPTOMS
Often none, fast breathing, poor feeding, slow growth

WHAT CAUSES IT
Altered heart development before birth; rarely acquired

HOW IT IS DIAGNOSED
Echocardiogram, sometimes cardiac catheterisation

MAIN TREATMENT
Monitoring, symptom medicines, or closure

CAN IT BE CURED?
Sometimes - closure can seal the opening

IS IT AN EMERGENCY?
Sometimes - severe breathing trouble or blue-grey skin

LONG-TERM OUTLOOK
Usually good; large defects need specialist care

Overview

A ventricular septal defect, or VSD, is an opening in the wall between the heart's two lower pumping chambers. This wall is called the ventricular septum. Most VSDs are present at birth, making them a type of congenital heart condition.

The left side of the heart normally pumps oxygen-rich blood to the body. The right side pumps blood to the lungs. With a typical VSD, some blood passes from the left ventricle through the opening and back toward the lungs. This is called a left-to-right shunt.

How much the VSD matters depends on its size, location, and effect on blood flow. A small opening may cause no symptoms and can sometimes close as a child grows. A large opening may send too much blood to the lungs, making the heart work harder and affecting feeding, growth, or breathing.

A VSD does not usually make a baby look blue. Blue or grey skin can occur if severe lung blood vessel disease develops or if another heart condition is present.

Rarely, a VSD develops later in life after a heart attack, heart procedure, or serious chest injury. An acquired VSD is different from a congenital VSD and often needs urgent treatment.

Symptoms

Many small VSDs cause no symptoms. A clinician may first notice one after hearing a heart murmur, an extra sound caused by blood moving through the opening.

Symptoms from a larger VSD often appear during the first weeks or months of life. They may include:

Older children and adults may notice breathlessness during activity, reduced exercise tolerance, tiredness, or a fast or irregular heartbeat. Swelling of the legs or abdomen can occur if the heart is struggling to pump effectively.

Symptoms alone cannot show whether someone has a VSD. Other heart and lung conditions can cause similar problems.

- Fast or effortful breathing, especially during feeds
- Sweating, tiring, or stopping often while feeding
- Taking a long time to feed or drinking less than expected
- Slow weight gain or poor growth
- Frequent chest infections or reduced energy

Causes and risk factors

Most VSDs form while the heart is developing early in pregnancy. The tissue that separates the ventricles does not join completely, leaving an opening. In many cases, there is no clear reason why this happens.

Some VSDs occur with other congenital heart differences. They can also be associated with genetic or chromosome conditions, including Down syndrome. Having a close family member with a congenital heart condition may increase the chance, but most babies with a VSD do not have an affected parent.

Certain factors during pregnancy can raise the overall chance of congenital heart conditions. These include poorly controlled diabetes, some infections, and exposure to certain medicines

or substances. Their presence does not mean a baby will develop a VSD.

A newly acquired VSD may occur when heart muscle is damaged, particularly after a heart attack. This is uncommon but can cause sudden, serious symptoms.

Diagnosis

A clinician may suspect a VSD after hearing a heart murmur during an examination. The loudness of a murmur does not reliably show how serious the defect is. Some small VSDs create a loud murmur, while a very large opening may produce a softer sound.

An echocardiogram usually confirms the diagnosis. This ultrasound scan shows the heart's structure, the opening's location and size, and the direction and amount of blood flow. It can also show whether the heart chambers are enlarged or the pressure in the lung circulation appears raised.

Other tests may include an electrocardiogram, which records the heart's electrical activity, and a chest X-ray. A blood oxygen reading may be taken, although it can be normal in someone with a VSD.

Cardiac catheterisation is not needed for most straightforward VSDs. It may be used when specialists need more exact pressure measurements or are considering closing the opening with a device. During this procedure, a thin tube is passed through a blood vessel to the heart.

Some VSDs are found before birth during an ultrasound or fetal echocardiogram. Small openings can be difficult to see before delivery.

Treatment and management

Treatment depends on the VSD's size and location, symptoms, growth, heart chamber enlargement, pressure in the lung blood vessels, and whether nearby heart valves are affected.

A small VSD that is not placing strain on the heart may only need monitoring. Medicines do not make the opening close. Follow-up checks show whether it is becoming smaller and whether blood flow is affecting the heart.

Babies with symptoms may receive medicines that reduce extra fluid or help the heart manage its workload. Feeding support or higher-calorie nutrition may help when feeding is tiring or weight gain is slow. These measures manage the effects of the VSD rather than repairing it.

Closure may be considered when a VSD causes ongoing symptoms, poor growth, significant extra blood flow to the lungs, heart enlargement, high lung pressures, or problems with a

nearby valve.

The main closure methods are:

Not every VSD is suitable for catheter closure. The choice depends partly on the opening's position and its distance from heart valves and electrical pathways.

If severe, irreversible damage has developed in the lung blood vessels, closing the VSD may be unsafe. This requires assessment by a specialist congenital heart team.

After closure, follow-up checks look for a small remaining leak, valve problems, heart rhythm changes, or pressure in the lung circulation. Antibiotics like amoxicillin or doxycycline before dental work are not routinely required for every person with a VSD. They may be advised in specific higher-risk situations, such as for a limited time after closure with artificial material, a remaining leak beside a patch or device, or a previous episode of infective endocarditis.

- Surgery: The opening is usually covered with a patch while the child or adult is under a general anaesthetic
- Catheter closure: A device is guided to the heart through a blood vessel and placed across selected types of VSD

Complications

Most small VSDs do not cause major complications. Larger defects can place extra strain on the heart and lung circulation.

Possible complications include heart failure, in which the heart cannot keep up with the body's needs, and pulmonary hypertension, meaning high pressure in the blood vessels of the lungs.

Over many years, severe pulmonary hypertension can reverse the direction of blood flow through the opening. This is called Eisenmenger syndrome and can cause low blood oxygen, breathlessness, and blue-grey lips or skin. It is uncommon where significant VSDs are identified and treated early.

Other possible complications include leakage of the nearby aortic valve, irregular heart rhythms, and infective endocarditis, an infection of the heart's inner lining. A small leak can sometimes remain after repair without causing important problems.

Prevention

A congenital VSD usually cannot be prevented. It happens while the heart is forming, often without an identifiable cause.

Before and during pregnancy, managing long-term health conditions, avoiding tobacco and alcohol, checking medicine safety, and keeping recommended vaccinations up to date support a healthy pregnancy. These steps reduce some pregnancy risks but cannot guarantee that a VSD will not occur.

Because some congenital heart conditions have a genetic link, genetic counselling may be helpful for families with an affected child, several affected relatives, or a known genetic condition.

Living with it and what to expect

Many small VSDs become smaller or close naturally, especially during early childhood. Others remain open but never place significant strain on the heart. Larger VSDs are less likely to close without treatment.

After successful closure, most children can attend school, play, and take part in everyday activities. People with a small VSD and no pulmonary hypertension, rhythm problem, or valve disease can often exercise normally. A congenital heart specialist may suggest limits when complications are present.

Follow-up needs are not the same for everyone. A small, uncomplicated VSD may need only occasional review. A repaired VSD with no remaining problem may also need infrequent checks. People with a residual opening, valve leakage, pulmonary hypertension, an abnormal heart rhythm, or a more complex heart condition generally need closer and sometimes lifelong specialist care.

Good dental hygiene is important because bacteria from the mouth can occasionally enter the bloodstream and infect abnormal heart tissue. Regular brushing, flossing, and dental care are more useful for most people than routine preventive antibiotics.

Pregnancy is often well tolerated when a VSD is small or has been repaired without complications. Pulmonary hypertension or Eisenmenger syndrome makes pregnancy much higher risk. Anyone with a VSD who is considering pregnancy should have a pre-pregnancy review with an adult congenital heart and pregnancy team.

When to get medical help

Seek emergency help for:

Arrange prompt medical assessment if a baby is breathing faster than usual, repeatedly becomes sweaty or exhausted during feeds, takes much less milk, or has fewer wet nappies.

New swelling, a clear drop in activity, persistent palpitations, or an unexplained ongoing fever also needs timely review.

Routine follow-up is appropriate for monitoring growth, heart sounds, exercise tolerance, and test results when there are no new concerning symptoms. Contact the relevant heart team if scheduled congenital heart follow-up has been missed or if pregnancy is being planned.

- Severe or rapidly worsening difficulty breathing
- Blue or grey lips, tongue, or face
- Fainting, collapse, unusual unresponsiveness, or difficulty waking
- Sudden chest pain and breathlessness, particularly after a heart attack

Common questions

Can a VSD close on its own?

Yes. Many small VSDs become smaller or close during childhood. This is especially common with openings in the muscular part of the septum. Larger defects and some defects near heart valves are less likely to close naturally.

Is a hole in the heart the same as a VSD?

A VSD is one type of "hole in the heart." The phrase can also describe an opening between the upper chambers, called an atrial septal defect. These conditions affect blood flow differently and are not treated in exactly the same way.

Does every VSD need surgery?

No. Small VSDs that do not cause symptoms or strain the heart are often monitored. Closure is considered when the opening causes important extra blood flow, poor growth, heart enlargement, high lung pressure, or valve problems.

Can someone with a VSD exercise?

Many people with a small or successfully repaired VSD can exercise without special restrictions. Advice may be different if there is pulmonary hypertension, a heart rhythm problem, valve leakage, reduced pumping strength, or another heart condition.

Can a VSD come back after it has closed?

A naturally closed VSD generally does not reopen. After surgery or catheter treatment, a small residual leak can remain beside the patch or device. Follow-up imaging can show whether this is present and whether it matters.

Can adults have a VSD without knowing it?

Yes. A small congenital VSD may not be found until adulthood, often when a murmur is heard. Adults can also rarely develop a new VSD after a heart attack or injury; sudden symptoms in that setting need emergency assessment.

Sources

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