

VENTRICULAR SEPTAL DEFECT

It is the **most common** cardiac anomaly & account for **25% of all CHD**.

Perimembranous & membranous defects are the most common types, whereas **supracristal & muscular** (if multiple called *Swiss cheese*) are

less common. **Path.** The volume of Lt to Rt shunt is depend on **size** of the defect & the degree of pulmonary & systemic vascular **resistance**.

☒ **Small VSD (<0.5 cm²)** is called "**Restrictive**" because pressure in the

R.V. is normal & higher pressure of L.V. always drives blood from Lt to Rt side. ☒ **Large VSD (>1 cm²)** is called "**Non-restrictive**" because pressure in the R.V. & L.V. is equalized, therefore direction of shunt is depend on the ratio between pulmonary & systemic vascular resistance (Qp:Qs). VSD may be **asymptomatic** in newborn in the **1st month** of life because **pulmonary vascular resistance is normally high** in this period which ↓

the amount of shunt, therefore, the holosystolic murmur of VSD may be **inaudible in the newborn**; then after 4-6 wk of life when PVR ↓, the shunt will ↑ → clinical symptoms. This period is **shorter in premature**,

thus clinical symptoms appear earlier. Some patients with **large VSD**, the PVR **never ↓** due to large pulmonary blood flow through the shunt. **C.M.**

☒ **Small VSD** may be **asymptomatic** & found accidentally during routine physical exam as **loud, harsh (or blowing) holosystolic murmur** over

the lower left sternal border +/- thrill. ☒ **Large VSD** (with excessive pulm blood flow & pulm hypertension). **Hx. Dyspnea, profuse perspiration (sweating), feeding difficulty, FTT, recurrent RTI, and HF in early infancy.** Cyanosis usually absent, but duskiness may be noted during infections or crying. **Ex. Prominence** of the left precordium with palpable parasternal **lift,**

laterally displaced apical impulse and apical thrust, and a systolic **thrill**.

The **holosystolic murmur** is generally less harsh than that of a small VSD but more blowing in nature. The pulmonic component of the 2nd heart sound may be ↑.

Mid-diastolic murmur at the apex may occur due to \uparrow blood flow across the **mitral valve** which indicate Qp:Qs ratio of $\geq 2:1$.

Note: This murmur is best heard with the **bell** of stethoscope. **Inv.** CXR & ECG are **normal** in small VSD, whereas findings in large VSD:- \boxtimes **CXR**; gross cardiomegaly, \uparrow pulmonary vascular markings with frank pulmonary edema +/- pleural effusion. \boxtimes **ECG**; biventricular hypertrophy, P waves may be notched or peaked!. \boxtimes **Two-dimensional Echo & Color Doppler** are diagnostics, it also can

calculate pressure gradient across the defect. **Note:** In membranous VSD, the Echo may show a thin membrane consisting of tricuspid valve that partially cover the defect and limit the volume of the left-to-right shunt, this is called "**ventricular septal aneurysm**".

\boxtimes **Cardiac catheterization**; not routinely indicated but it can

demonstrate the hemodynamics of VSD e.g. pulmonary blood flow & PVR. \boxtimes **Left ventriculography** can demonstrate the size, location, and number

of ventricular defects before surgery. **Cx.** HF, FTT, recurrent RTI, infective endocarditis, pulm hypertension, &

Eisenmenger physiology (due to reversal of shunt). **Rx.**

\boxtimes **Small VSDs**; only **reassure** the parents, the child should be encouraged to a normal life with **monitoring** by clinical exam, ECG & Echo for spontaneous closure. **Prophylactic antibiotics** may be indicated before surgical procedures for protection against infective endocarditis. \boxtimes **Large VSDs**; in addition to the antibiotic Px, aim is to **control HF** by

medical therapy in the **1st yr** of life; if it **successful**, the shunt may diminish in size with clinical improvement including weight gain; whereas if medical therapy was **unsuccessful**, refer patient to **surgery**

to prevent the development of pulmonary vascular disease. **Note:** *Oxygen administration in patients with large VSD \rightarrow pulm vasodilation \rightarrow*

\downarrow pulm pressure \rightarrow \uparrow shunting of blood through VSD \rightarrow \uparrow dyspnea. Pulmonary arterial palliative banding with repair in later childhood is reserved for complicated cases or very premature infants.

Some patients with VSD may develop **acquired infundibular pulmonary stenosis**, which can limit the shunt & protect the pulmonary circulation. **Indications of surgical closure in VSD** include: patient at any age with large VSD (especially if medical Rx is failed); infants between 6-12 mo of age with large VSD & pulmonary hypertension (even if the symptoms are controlled with medications); patients older than 2 yr with Qp : Qs ratio > 2:1 (even if VSD is small); and patients with supracristal VSD.

Cxs of surgery are rare e.g. residual ventricular shunts requiring

reoperation or heart block requiring pacemaker. **Note:** *Transcatheter occlusion closure is most successful in treating mus-*

cular VSDs, which may be difficult to access by surgery; whereas perimembranous VSD catheter closure has a high risk of postprocedure

heart block and is not recommended. **Severe** pulmonary vascular disease is **contraindication** to closure of VSD; but it can be prevented by early surgery (within 1st yr of life). **Pg. 30-50% of small VSDs close spontaneously**, mainly in the **1st 2 yr**;

whereas others may be delayed till **4 yr** of life, although some are reported to close till adulthood. **Small muscular VSDs are more likely**

to close (up to 80%) than membranous VSDs (up to 35%).

Supracristal VSD

It is common in **Asian** children & accounts for **≈5%** of VSDs. It commonly associated with **aortic insufficiency** in **50-90%** of cases due to prolapses of the aortic cusp into the defect which may partially or

completely occlude it (although the defect is anatomically located directly below the pulmonary valve!). **C.M.** It vary widely from **asymptomatic children** to florid **aortic**

incompetence & massive cardiomegaly in symptomatic adolescents. The physical signs of aortic insufficiency (diastolic murmur and wide pulse pressure) when present, are added to those of VSD, although its

murmur is best heard at the middle to upper left sternal border. **Rx. Surgery** is recommended to **all** patients with supracristal VSD (**even**

in asymptomatic child) to prevent development of aortic regurgitation & irreversible left ventricular dysfunction.