Ventricular Septal Defect

Echocardiography

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Definition

- VSD is one of the most common congenital cardiac abnormalities in the newborn.
- It can occur as an isolated finding or in combination with other congenital defects.
- VSD can occur in any portion of the ventricular septum, but usually along the fusion lines between the different portions.

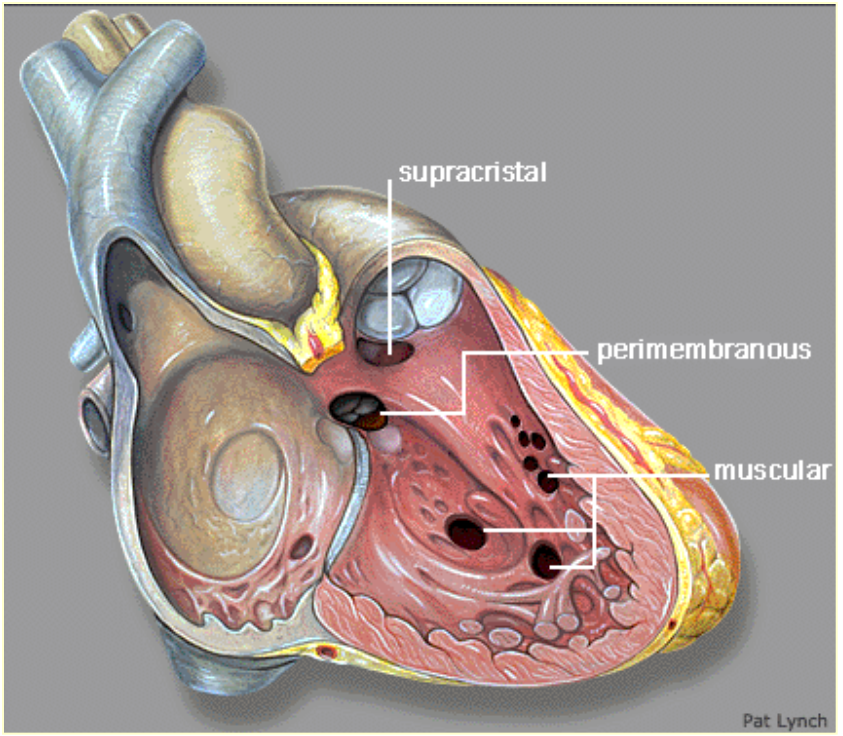
Diagnostic flow-chart

Echocardiographic evaluation of ventricular septal defects includes:

- Identification of the location of defects on the septum
- Establishing the number of defects
- Delineation of associated anatomic features
- Assessment of the size and hemodynamic significance of the defects

VSD localization

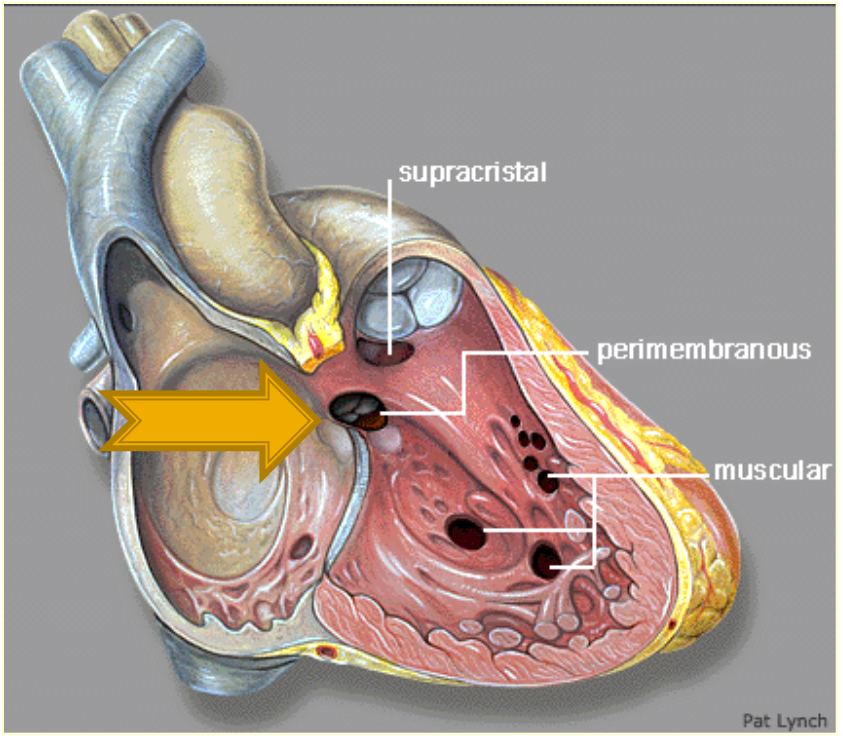
- Perimembranous: 80%
- Muscular: 5-20%
- Inlet: 5-8%
- Supracristal (Double Committed): 5-7%



VSD localization

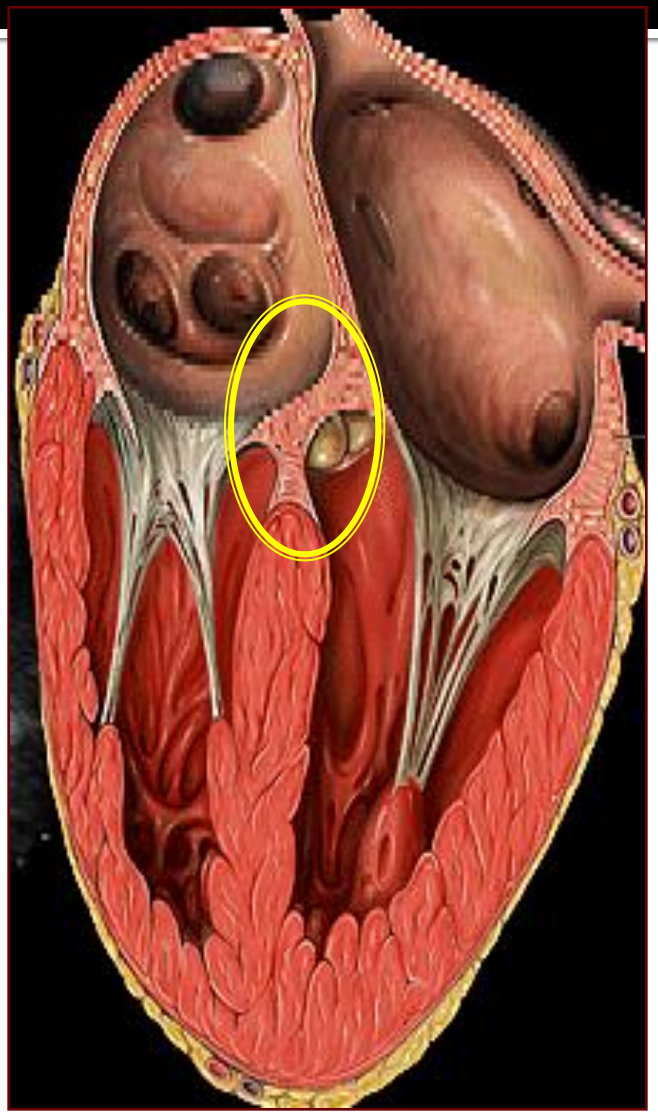
- Membranous:

Relatively small, bounded superiorly by the aortic valve (RC and NC cusps) and inferiorly by the muscolar septum



Membranous Septum

- From the RV the Membranous septum is divided in 2 parts by the septal leaflet of the Tricuspid valve.
- **Pars atrioventricularis**, which lies above the tricuspid valve
- **Pars interventricularis**, which lies beneath the septal leaflet of the TV

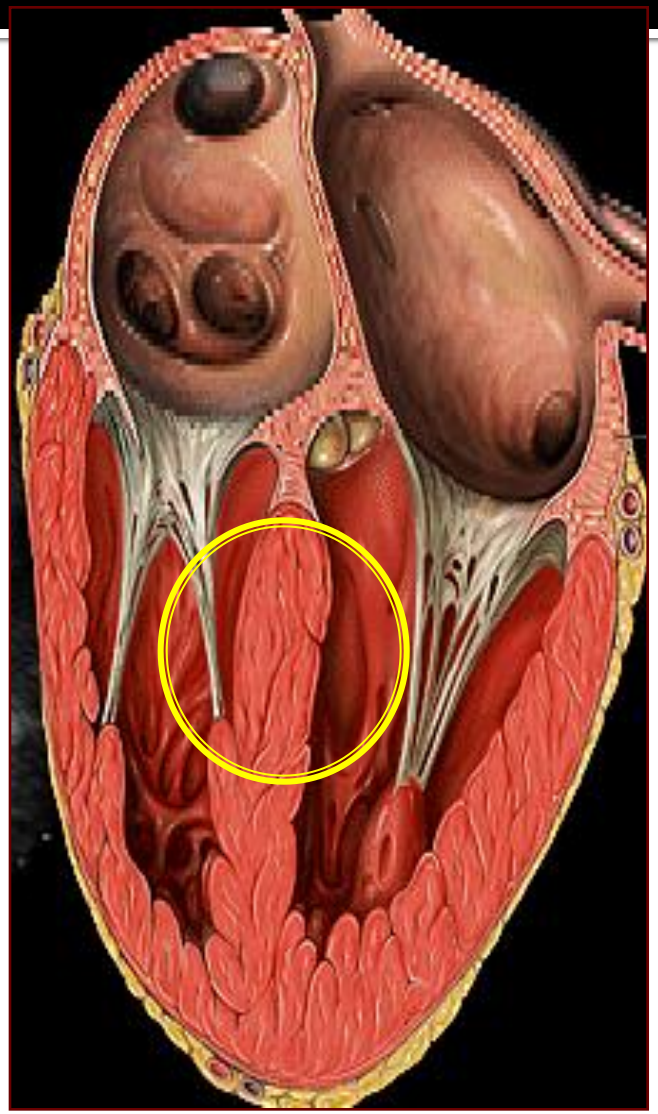


Muscular Septum

- 1. Inlet Portion
- 2. Trabecular septum
- 3. Outlet (or infundibular septum)

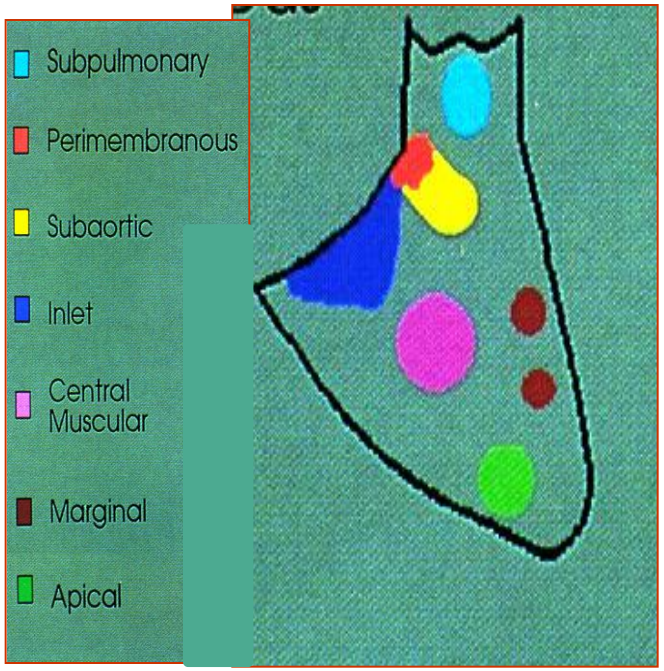
Inlet Septum

- Inferior to the membranous septum, between the 2 AV valves. It is the 1\3 superior and posterior portion of the muscular septum. Its inferior borders are bounded by the chordal attachments of the AV valve



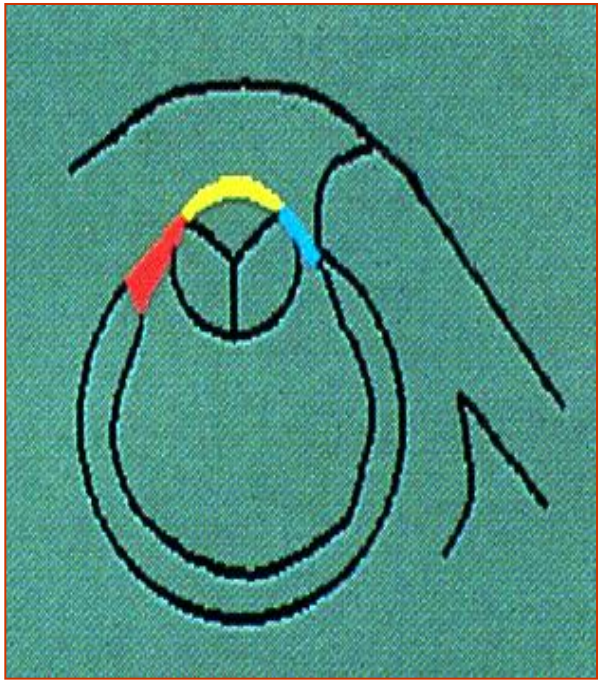
Trabecular Septum

- It is the largest portion of the ventricular septum and does not lie in the same plane.
- It extends from the membranous septum to the cardiac apex.



Outlet septum

- It lies inferior to the great vessels, beneth the RC cusp of the aortic valve and the L cusp of the pulmonary valve.

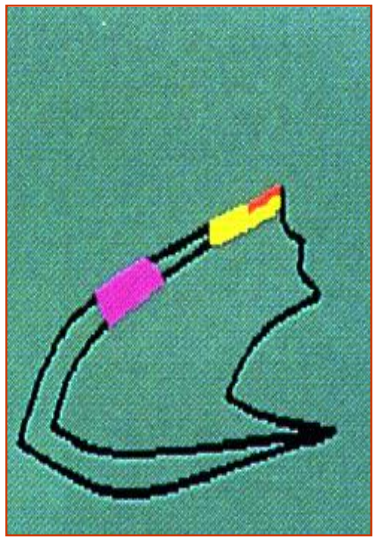


Echo-views: Parasternal Long Axis View

- The standard PLAX images predominatly:

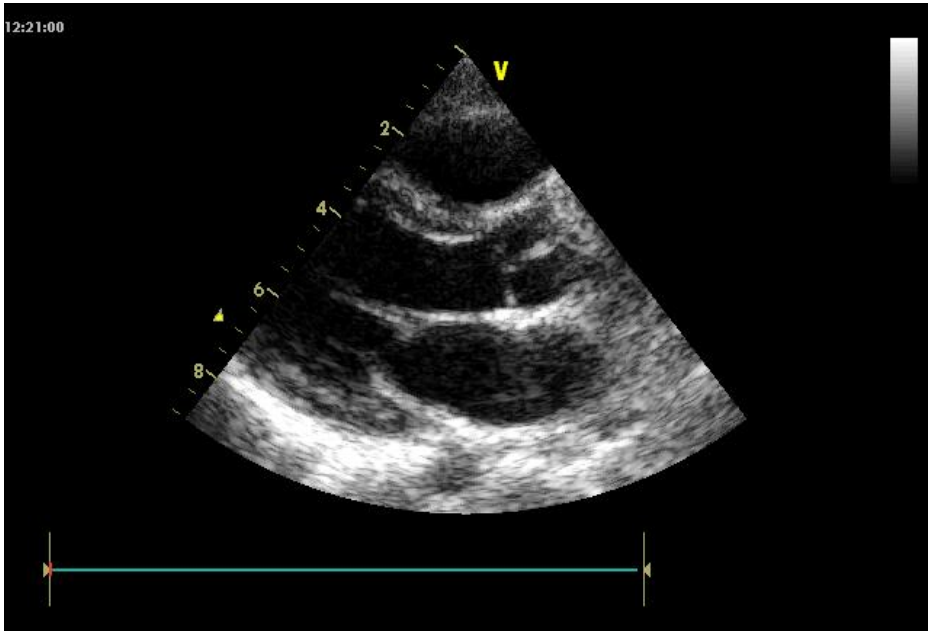
The infundibular septum (superior 1\3 of the septum)

The trabecular septum (the remaining portion)



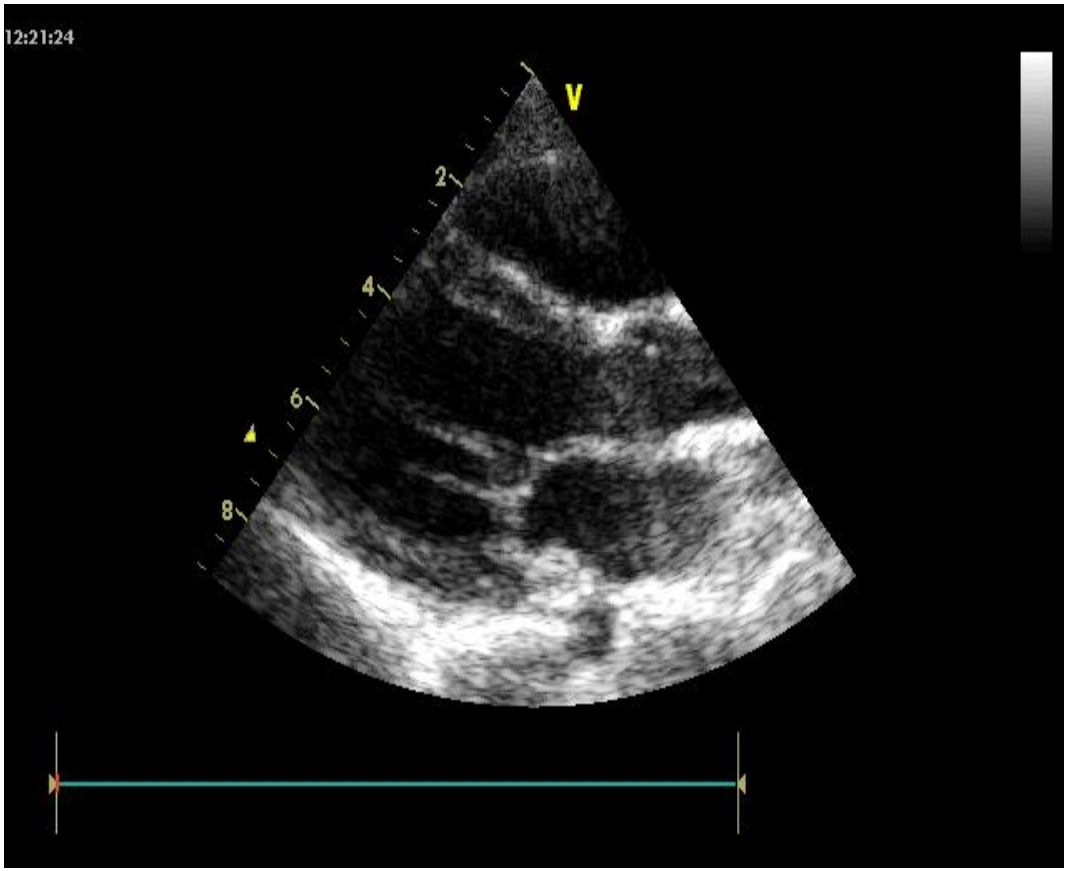
Echo-views: Parasternal Long Axis View –off axis

- From the standard PLAX angulating the trasducer toward the right hip the RV inflow tract can be visualized.
- As the US plane passes from the aortic valve to the tricuspid valve the membranous septum is imaged.



Echo-views: Parasternal Long Axis View –off axis

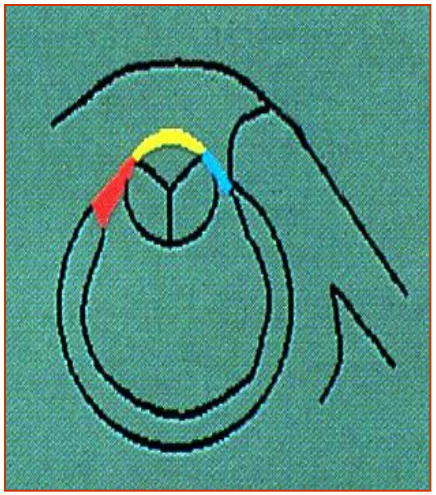
Tilting the US plane more anteriorly until the PV the Supracristal portion of the outlet septum can be visualized.

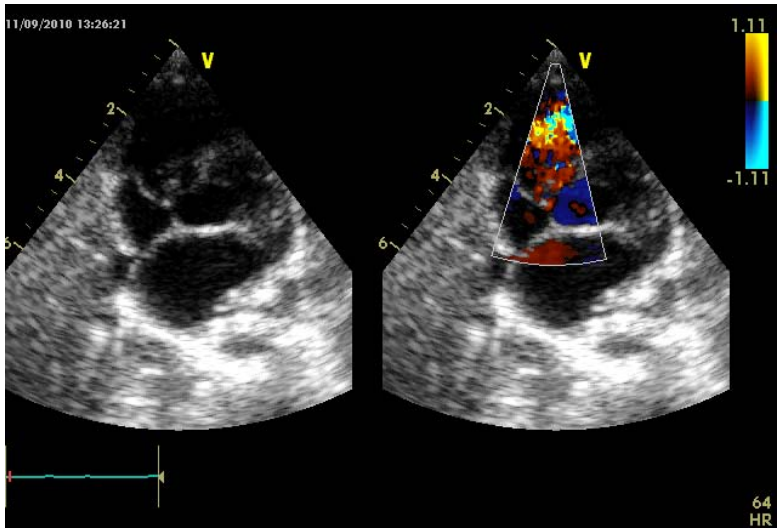


Parasternal Short Axis View

At the base of the heart we can see:

- The membranous septum to the right, beneath the septal leaflet of the TV
- The subaortic defects in the middle
- Infundibular defects on the left.

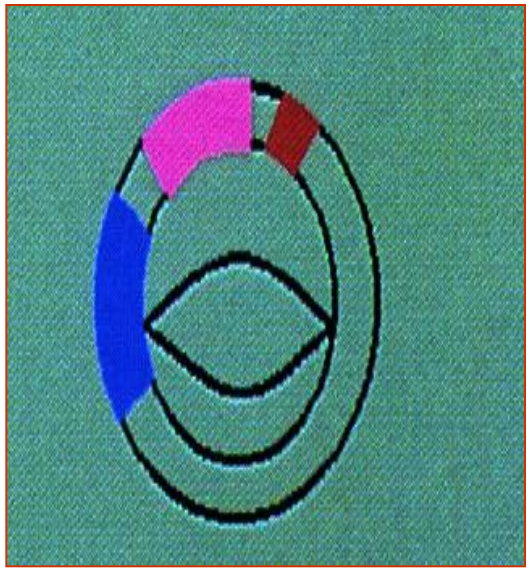




Parasternal Short Axis view

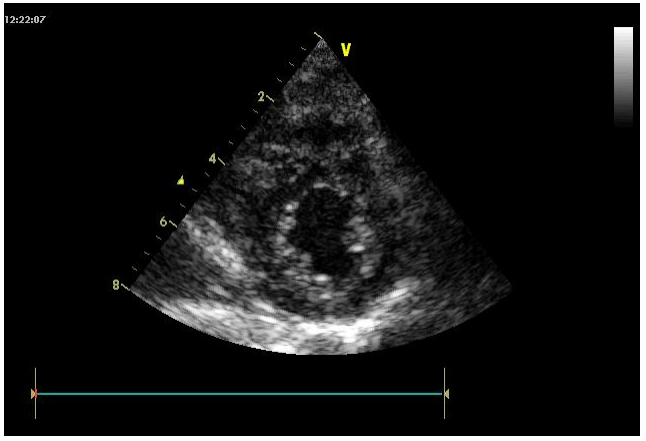
Through the 2 AV valves:

- Inlet ventricular septal defects
- Mid muscular defects
- Anterior trabecular defects

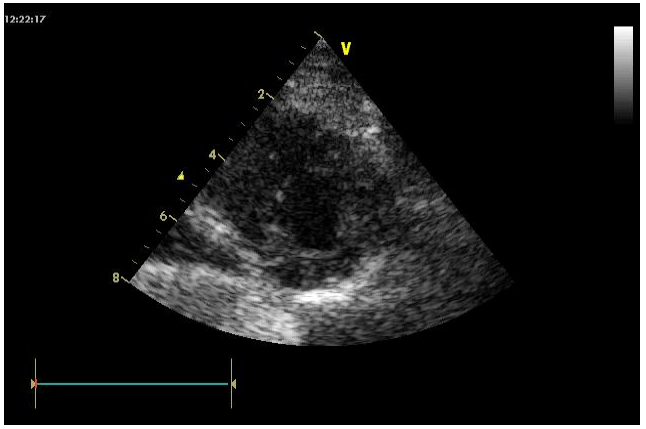


Parasternal Short Axis

At the level of Papillary muscles:
Trabecular defects

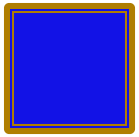


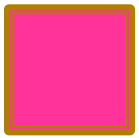
At the level of the Apex:
Apical Trabecular defects

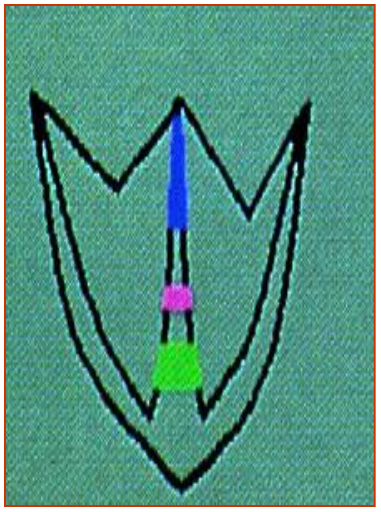


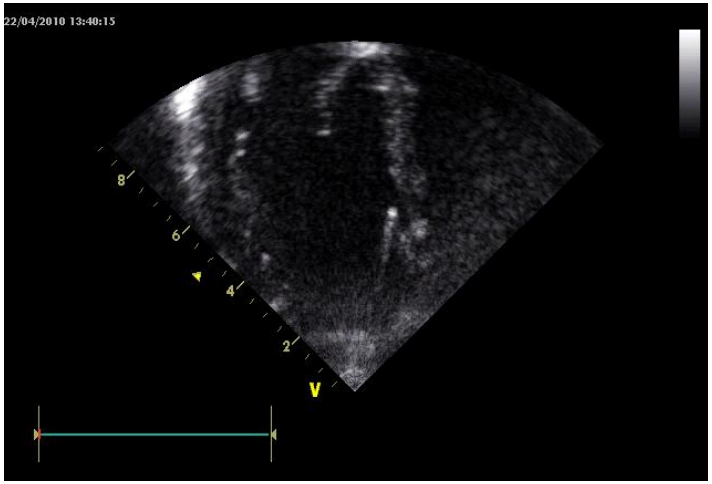
Apical 4 Chamber View

- Inlet defects are visualized in the superior 1\3 of the septum
- Mid muscular defects in the middle half of the septum
- Apical defects in the apical portion of the septum (distal to moderator band).



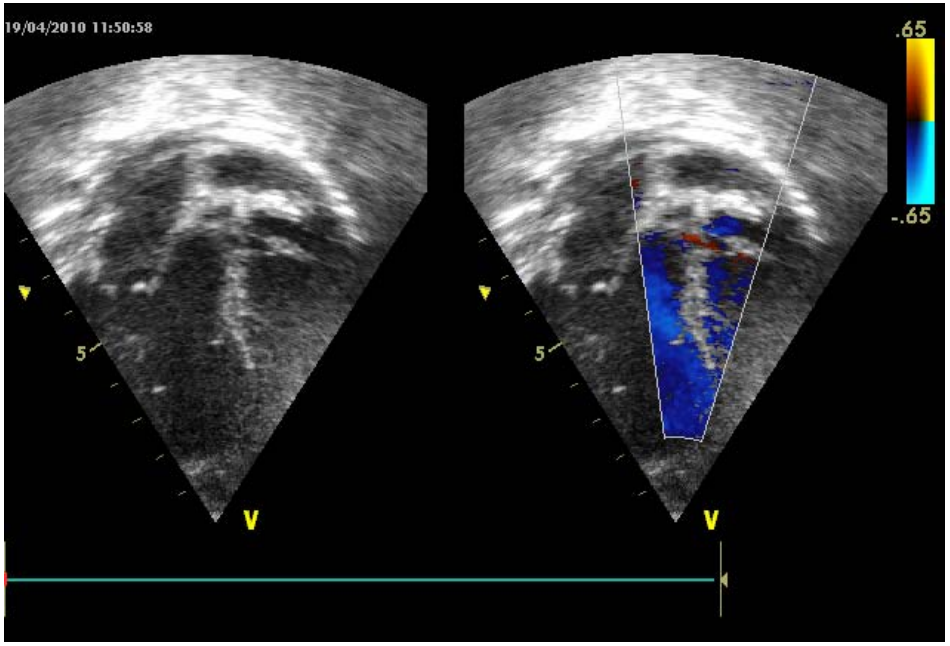


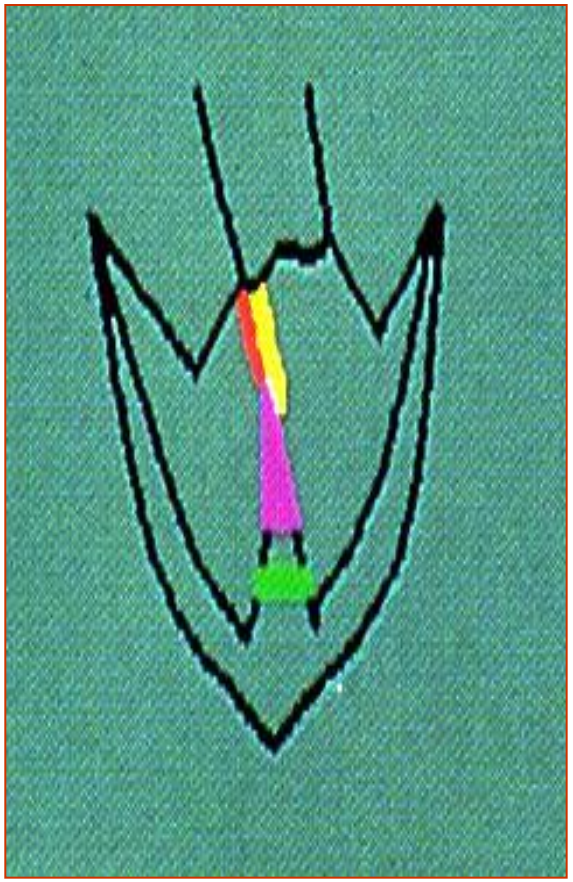




Apical 5 Chamber View

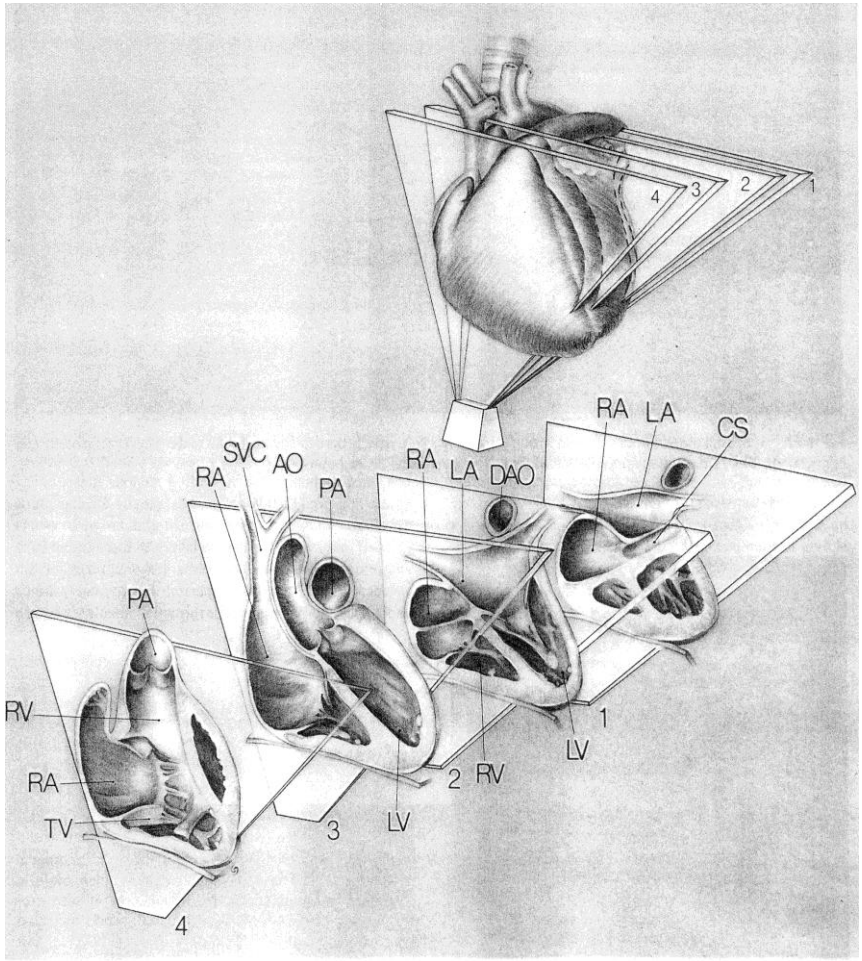
- Subaortic outlet septum (infracristal portion)
- Mid muscular septum
- Apical septum



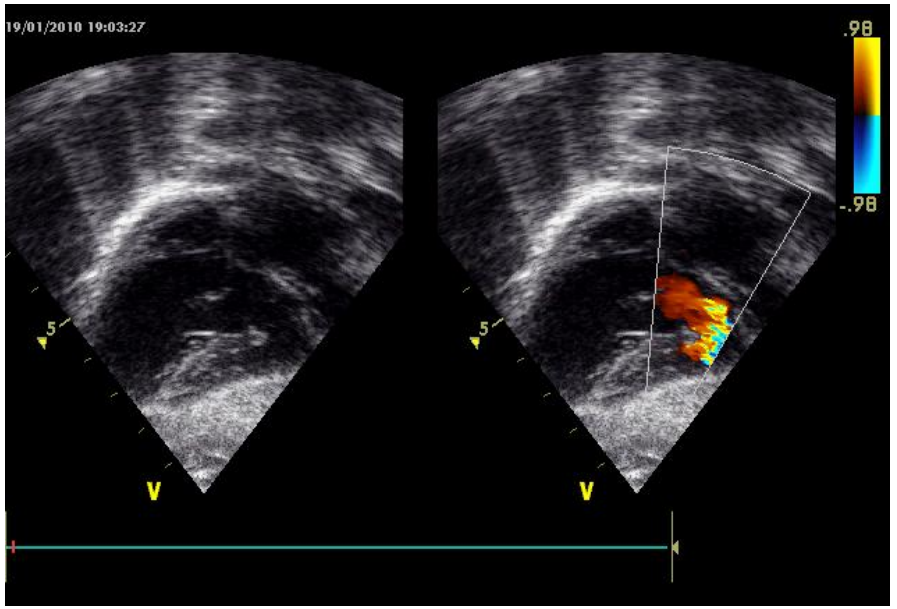


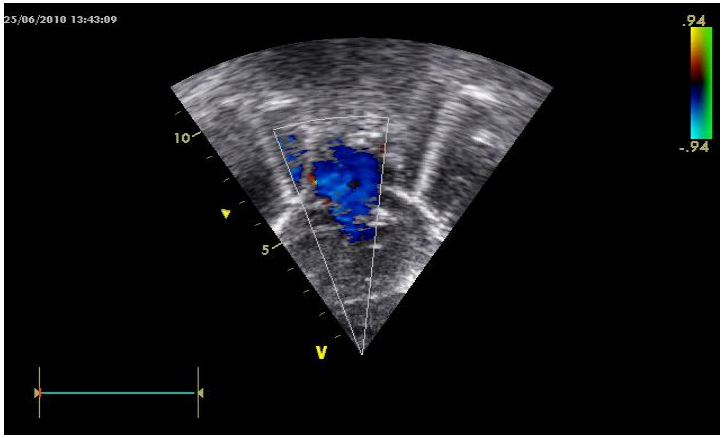
Standard echo cut

Subcostal views



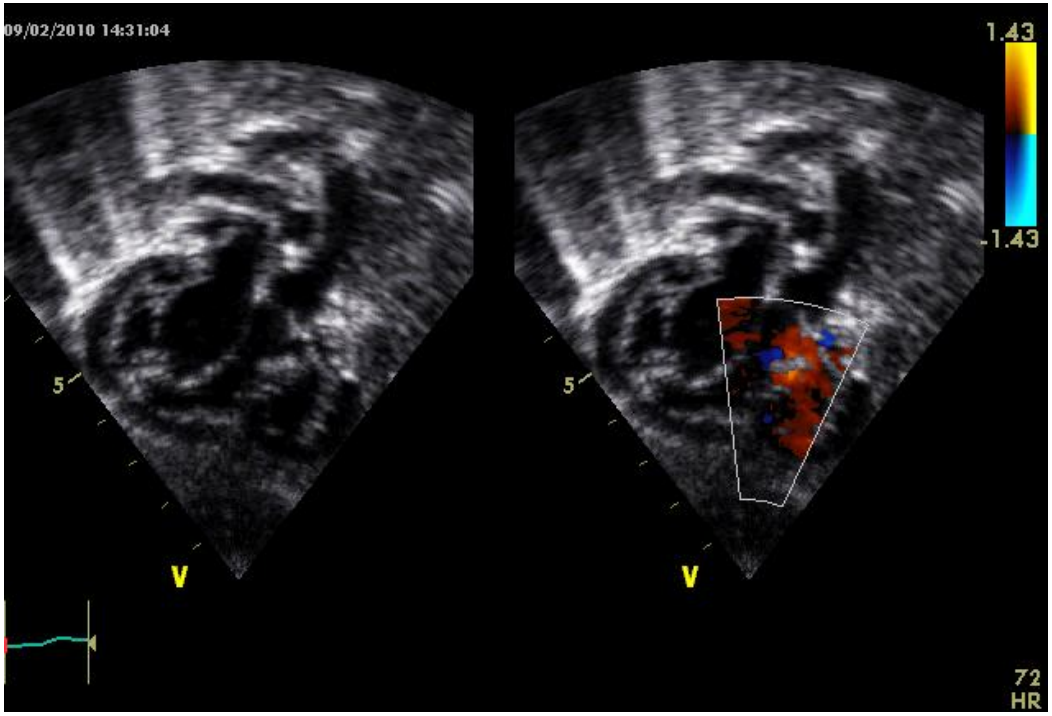
Subcostal coronal view (4 chamber)

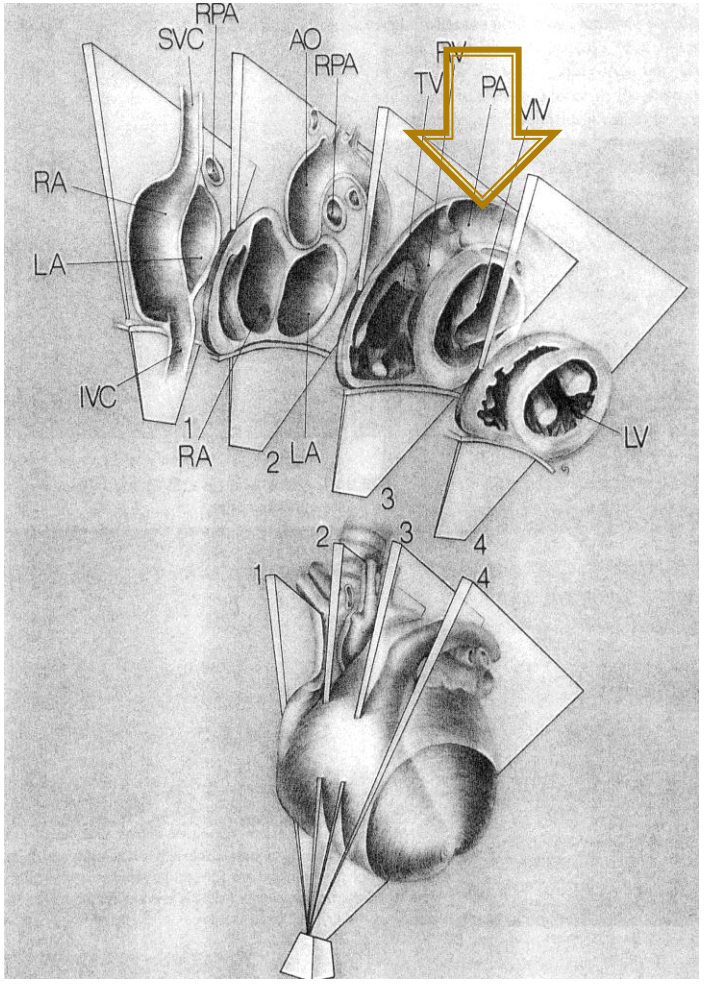




Subcostal sagittal view (short axis)

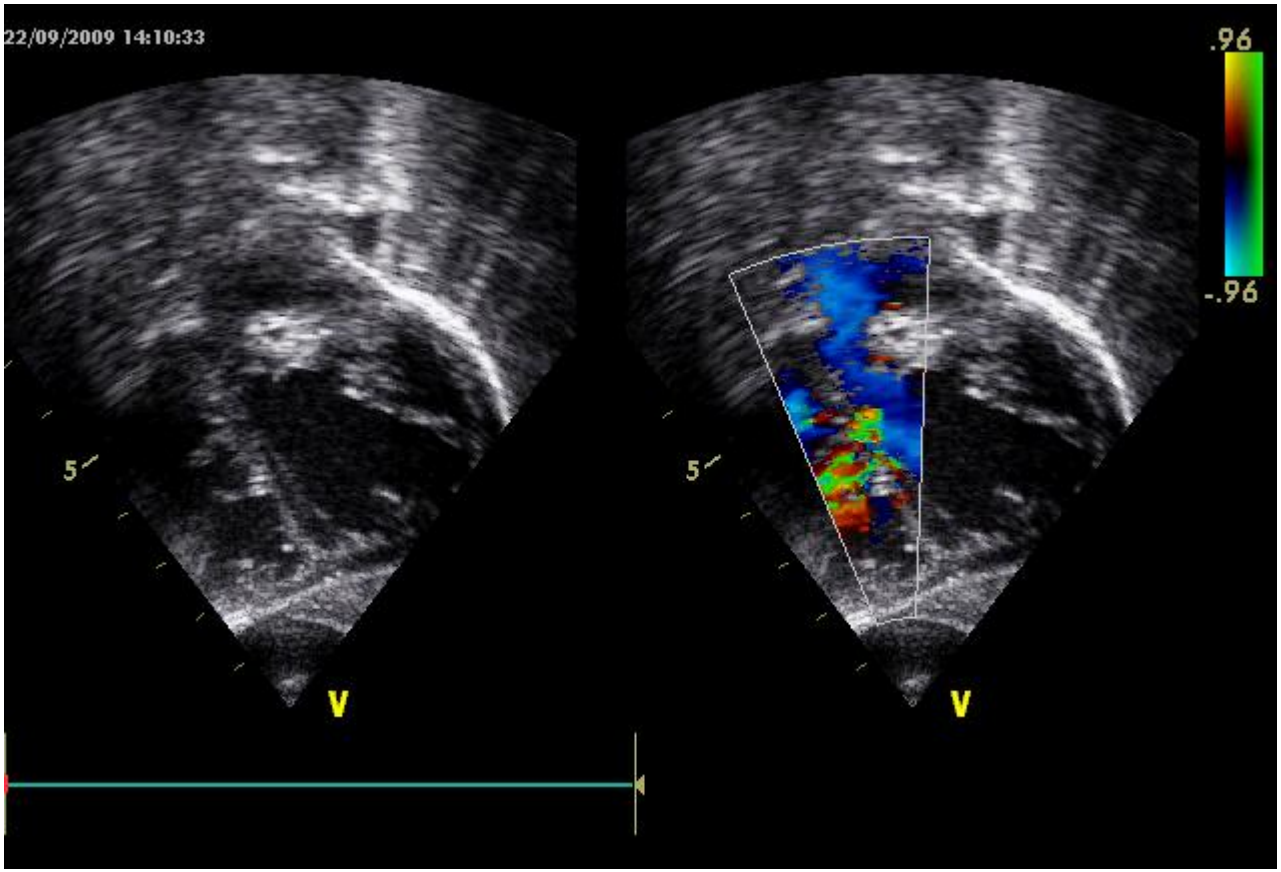
- Outlet septum
- Trabecular septum





VSD localization and echo view

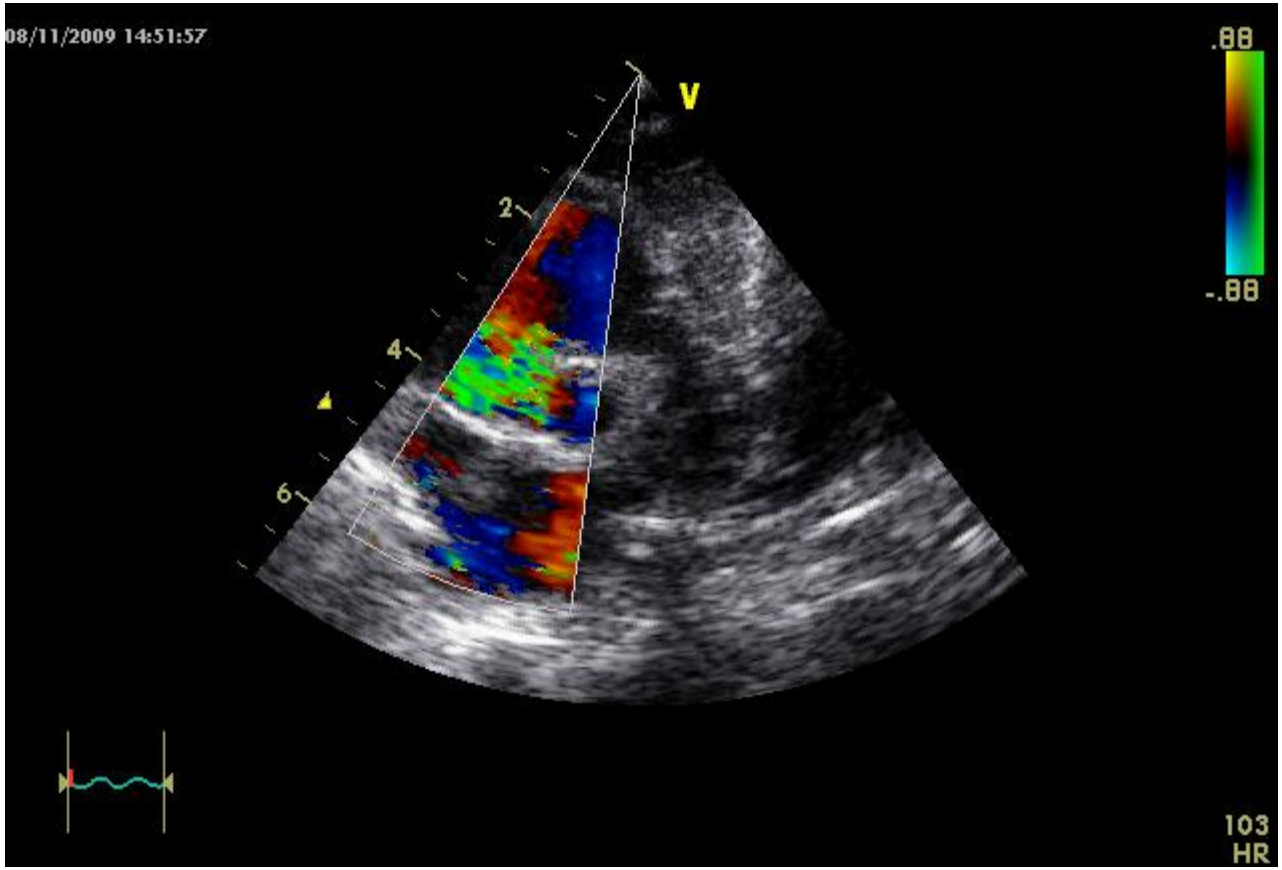
Perimembranous ventricular septal defect



Subcostal left oblique view

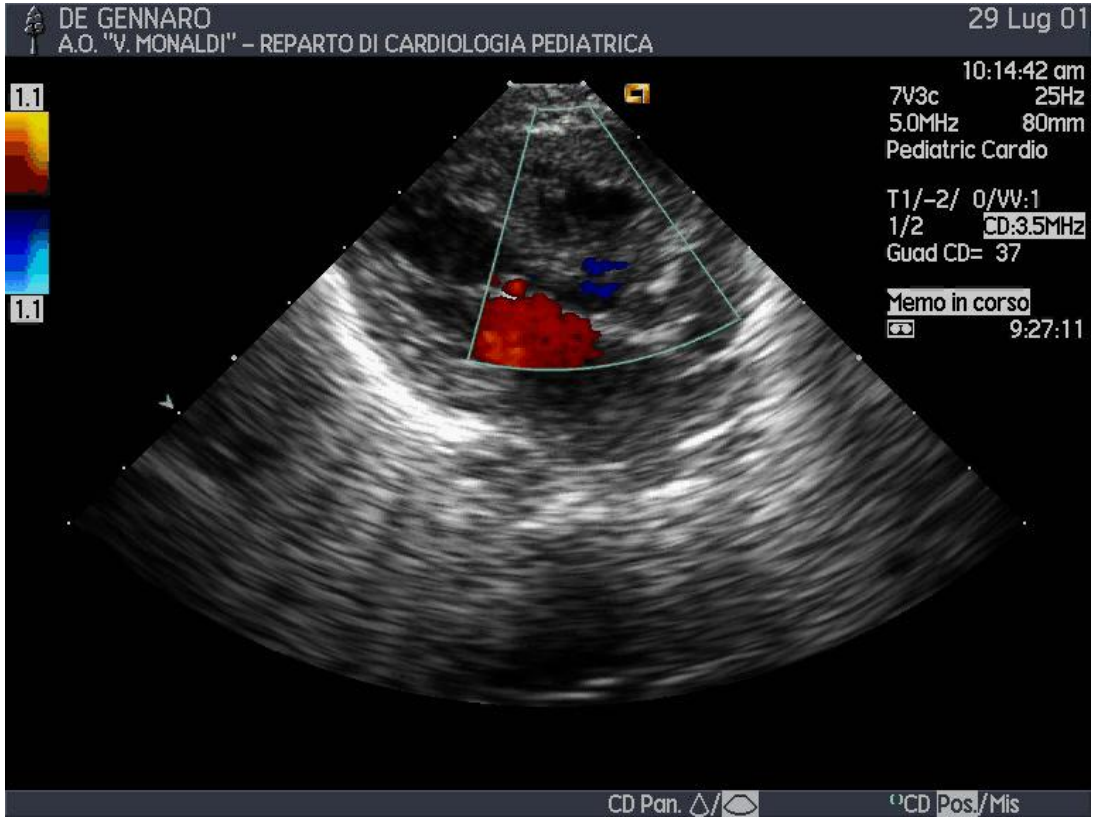
VSD localization and echo view

Perimembranous ventricular septal defect



VSD localization and echo view

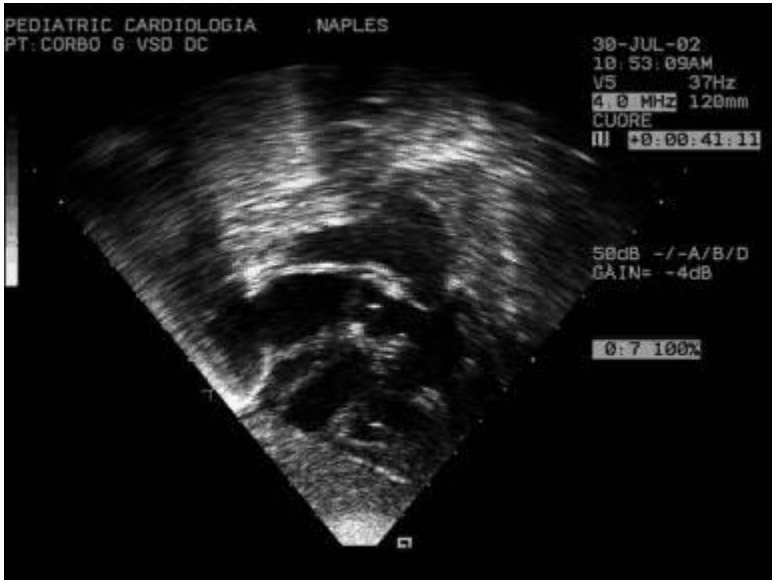
Perimembranous ventricular septal defect



Long Axis view

VSD localization and echo view

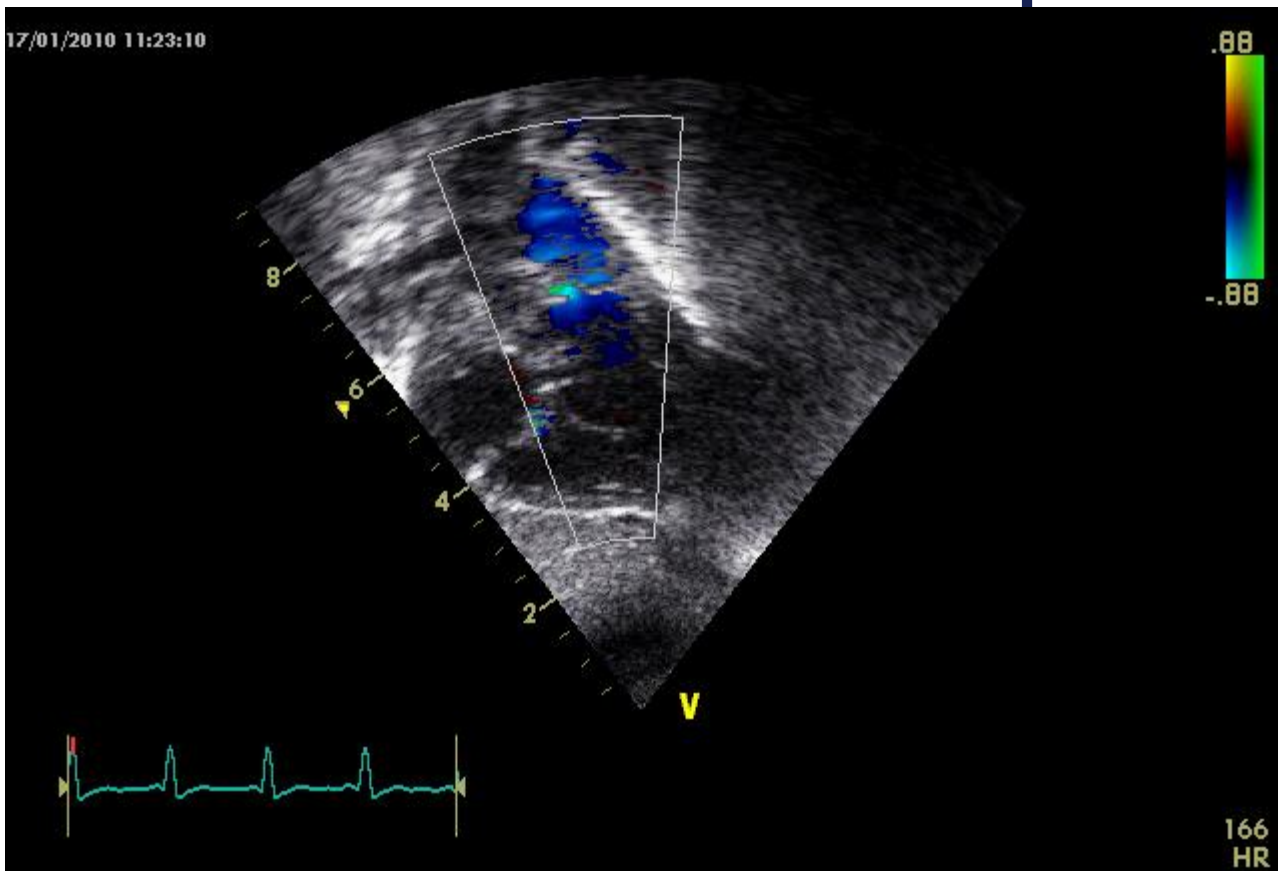
Double committed ventricular septal defect



Subcostal coronal view

VSD localization and echo view

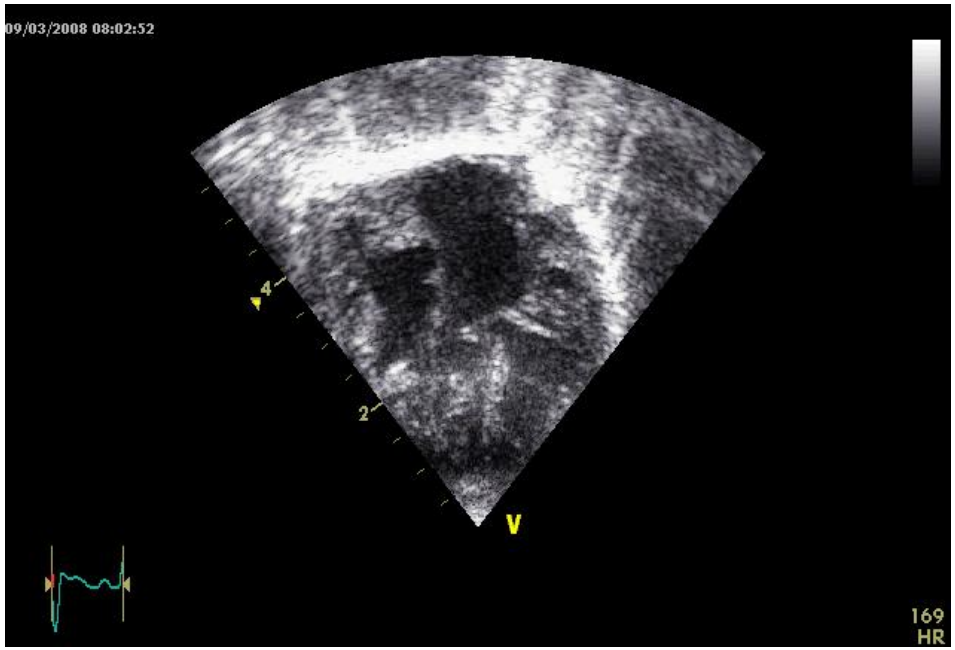
Double committed ventricular septal defect



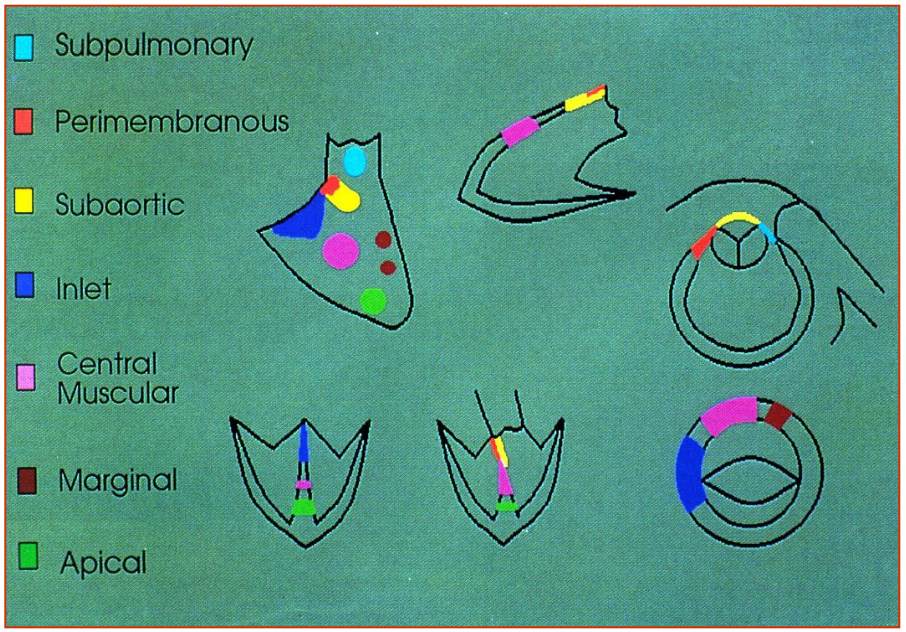
Subcostal view

VSD localization and echo view

Inlet ventricular septal defect

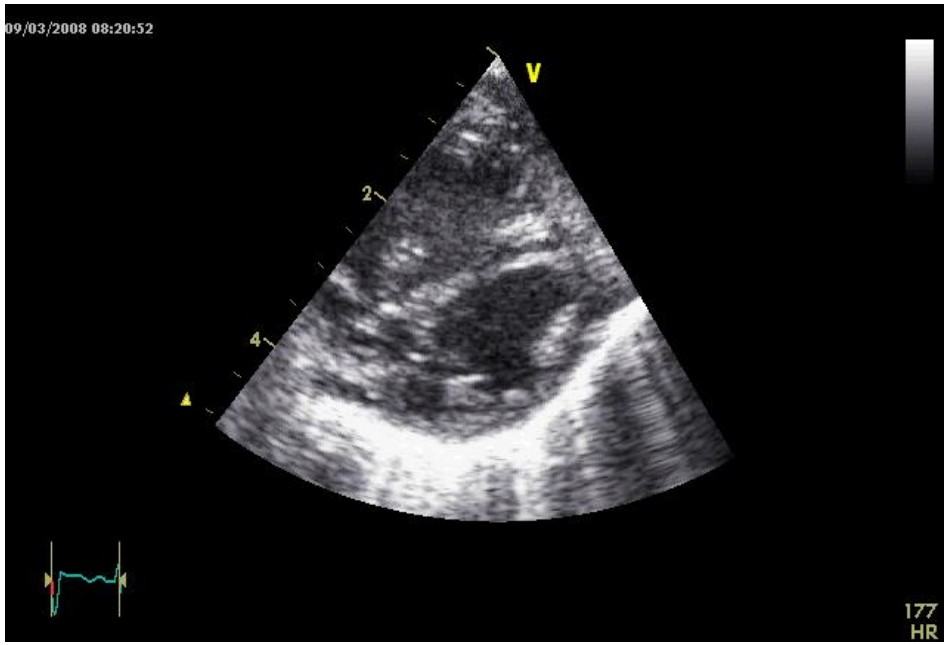


Apical 4 Chambers view
(patients affected by cAVC)

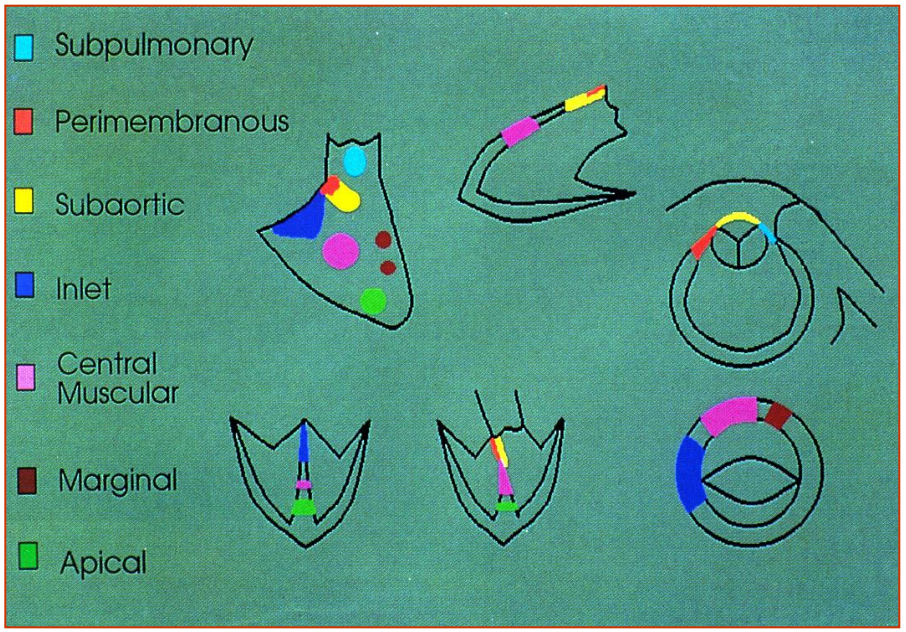


VSD localization and echo view

Inlet ventricular septal defect

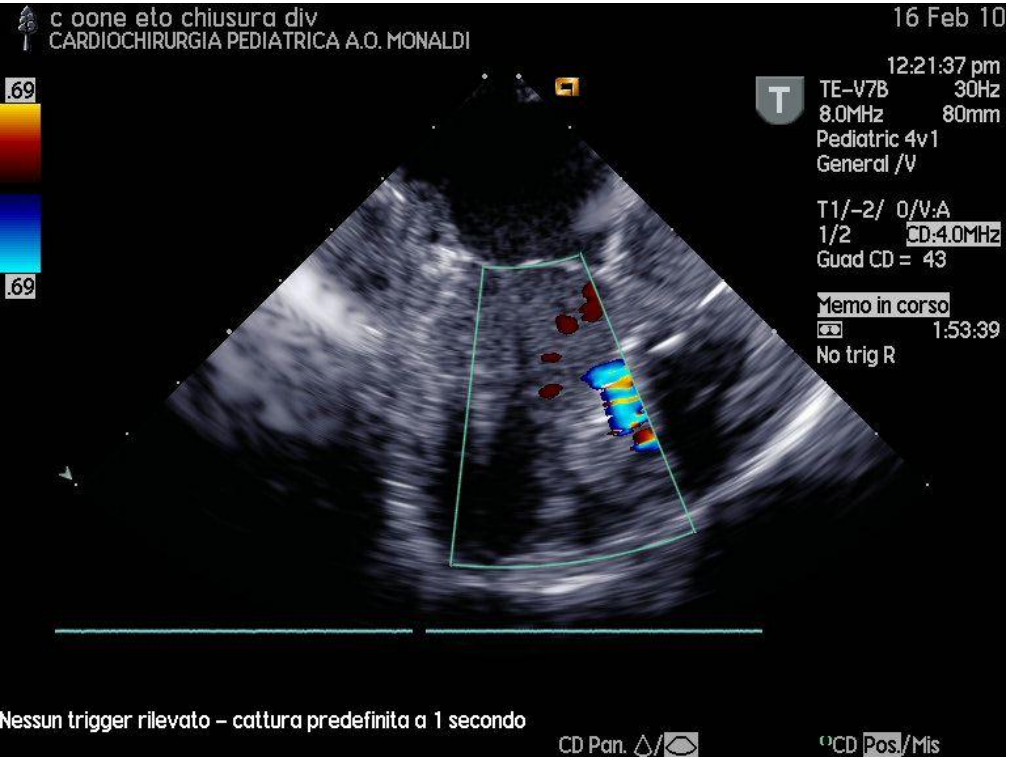


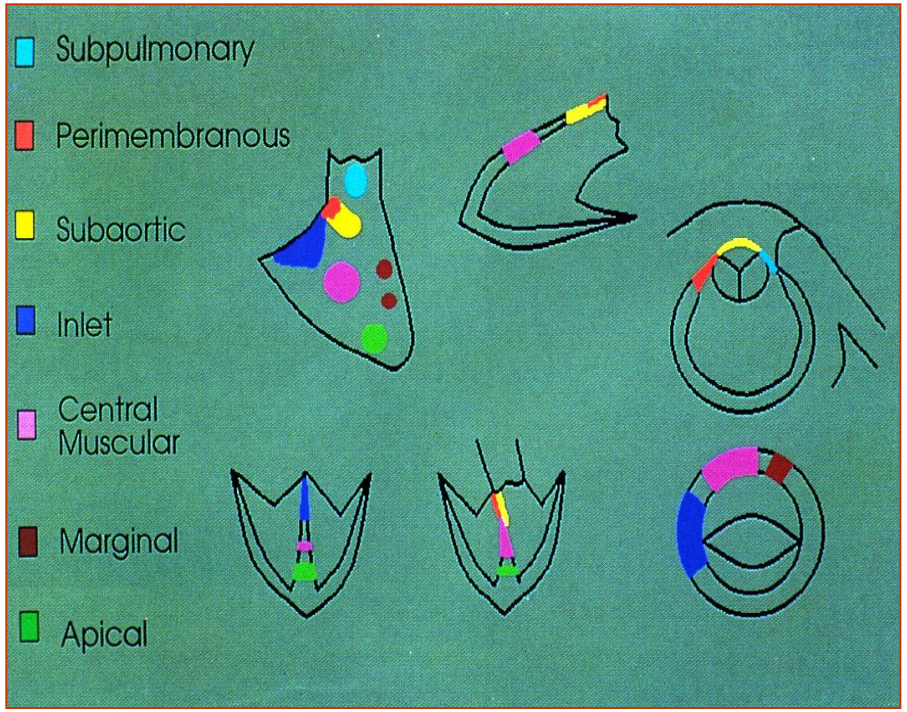
Short axis view
(patients affected by cAVC)



VSD localization and echo view

Multiple muscular VSD

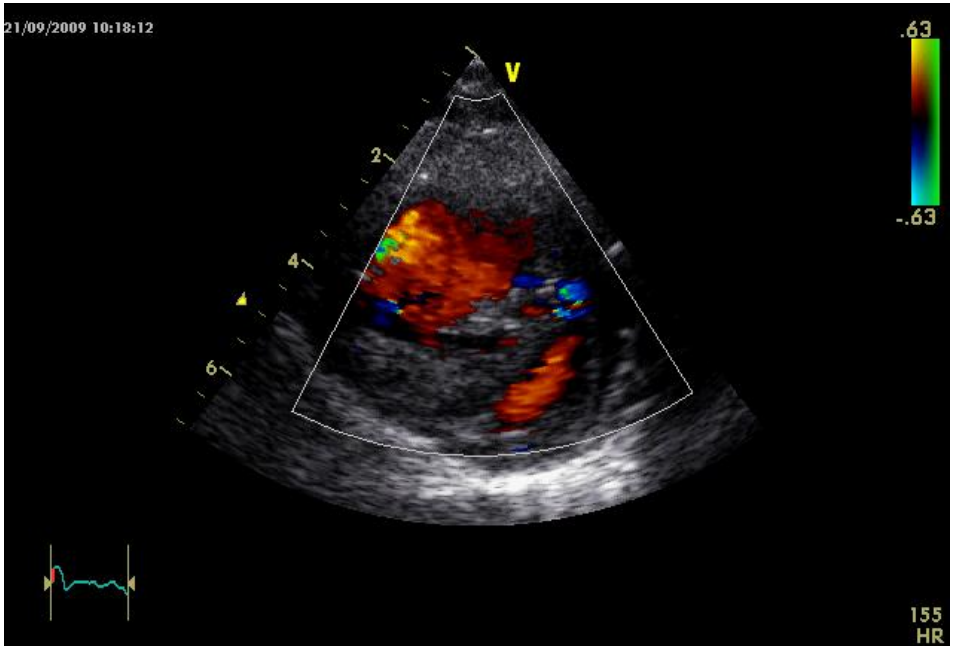


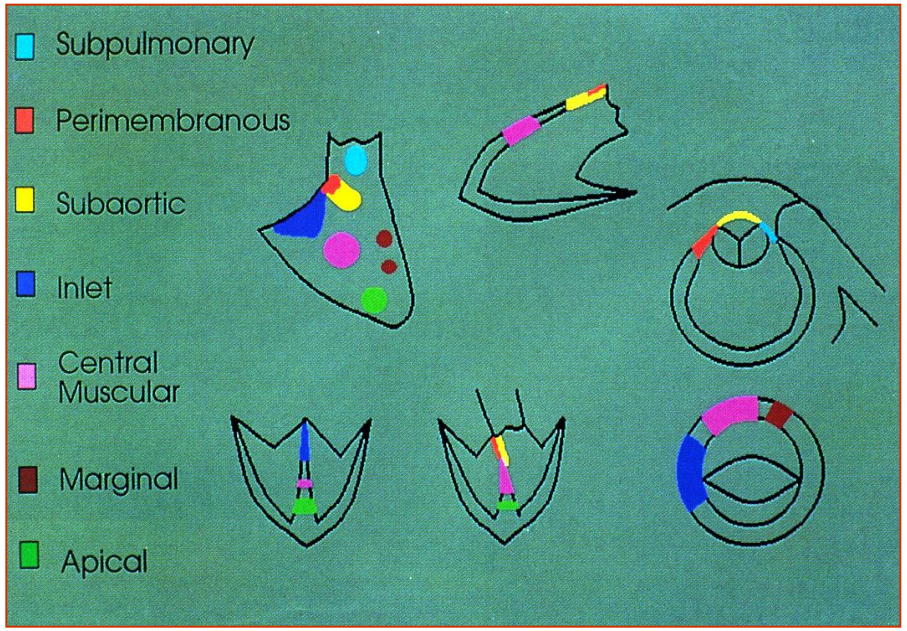


Apical 4 Chamber view

VSD localization and echo view

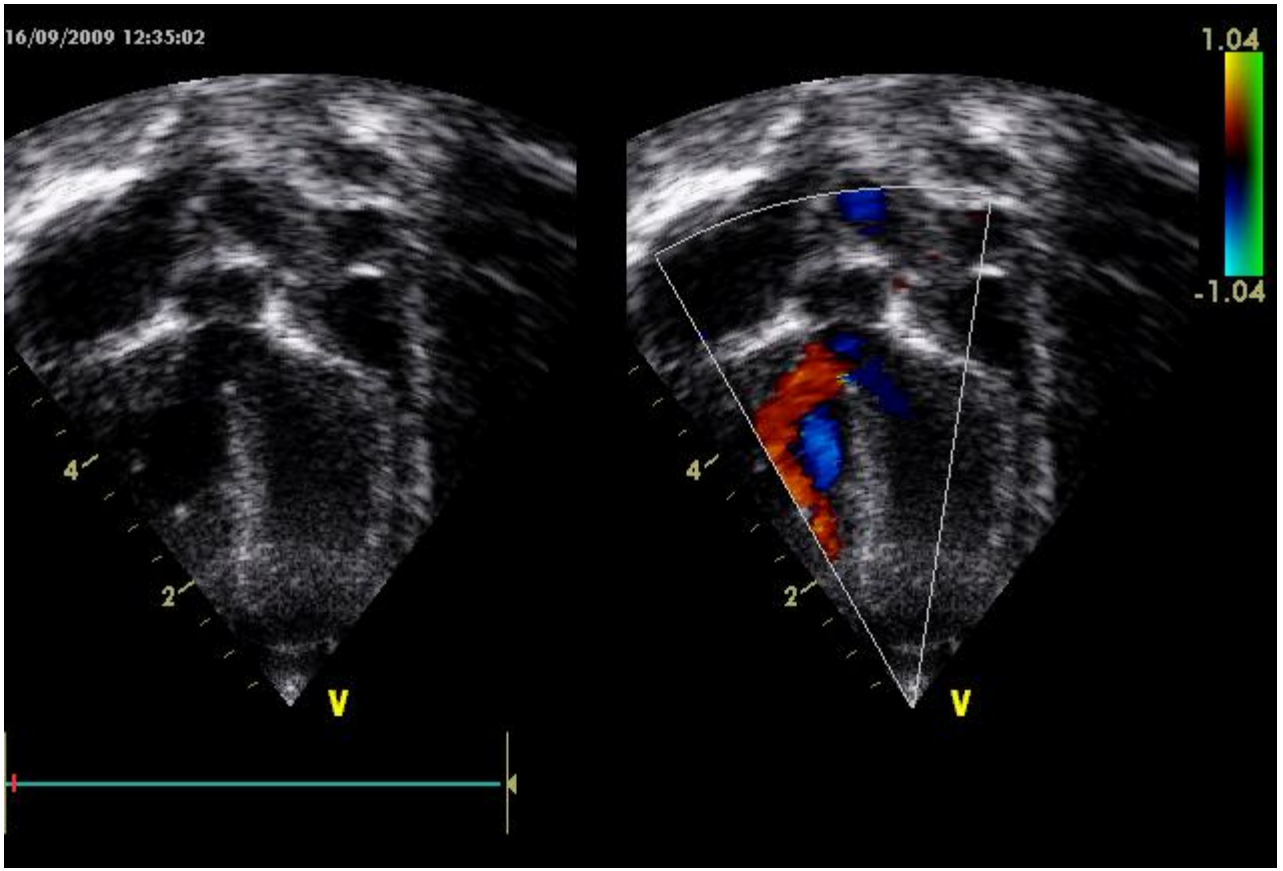
Trabecular ventricular septal defect

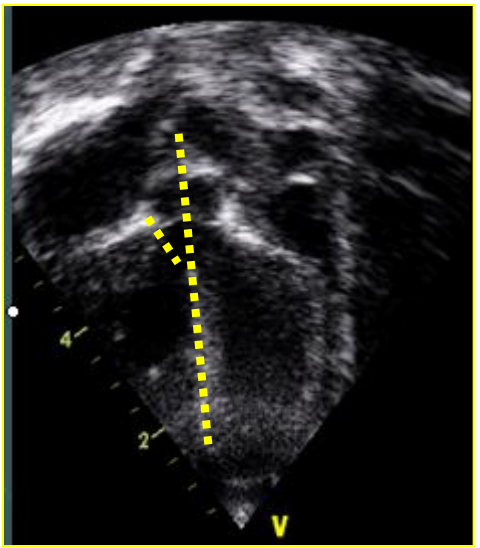




Short Axis view

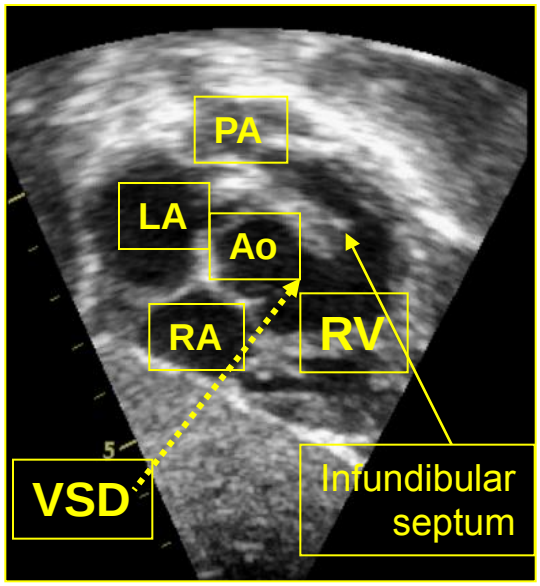
Interventricular septum malalignment



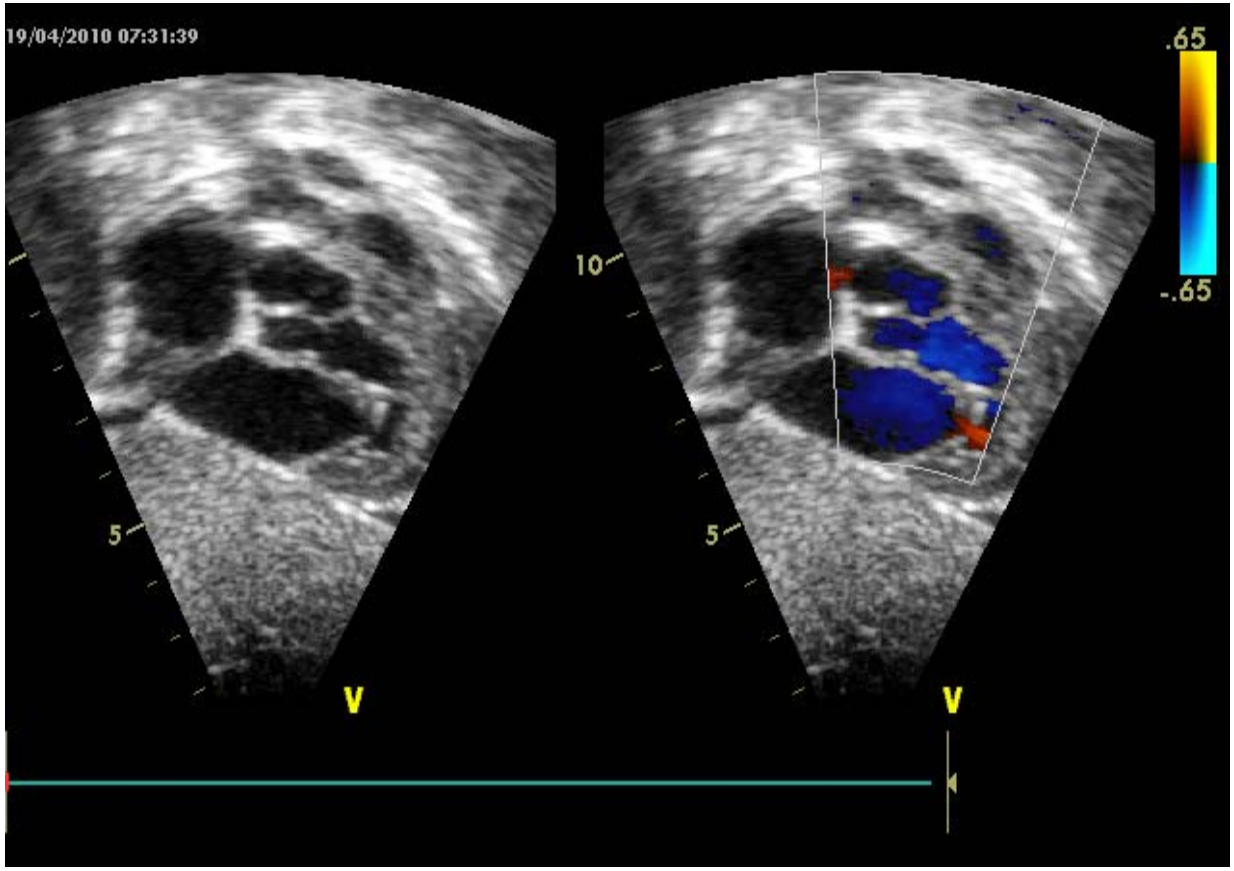


VSD and outflow obstruction

Antero-superior deviation of infundibular septum creates a sub pulmonary obstruction.

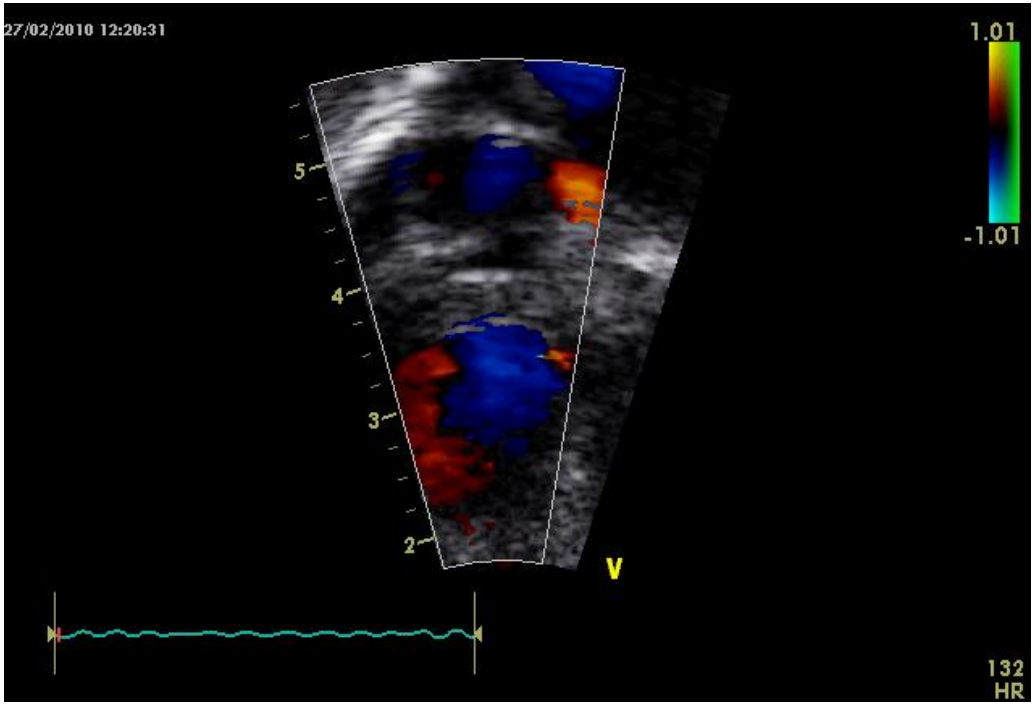


Right oblique subcostal view

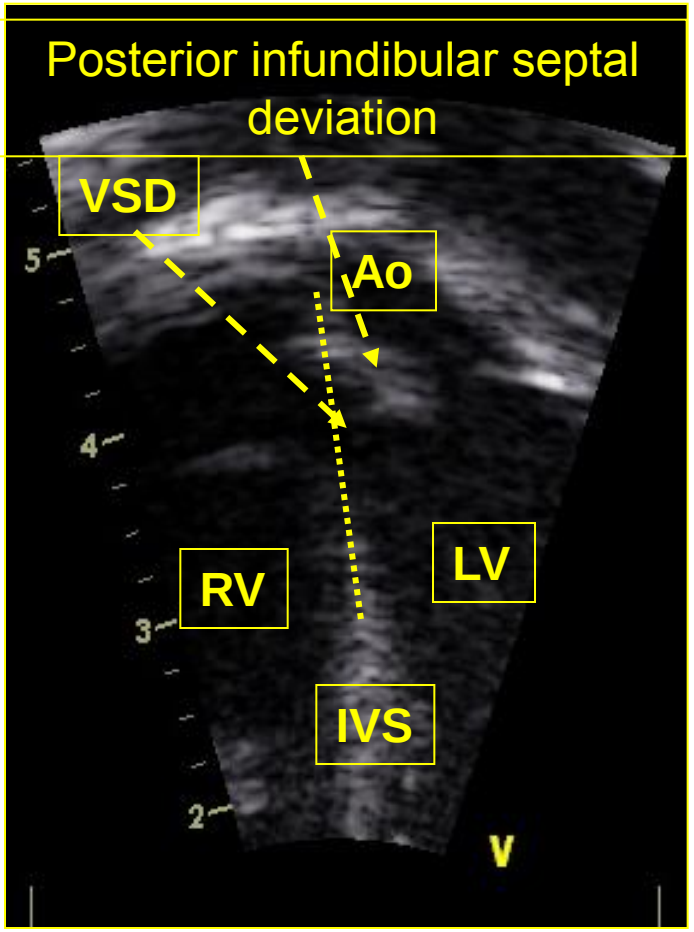


VSD and outflow obstruction

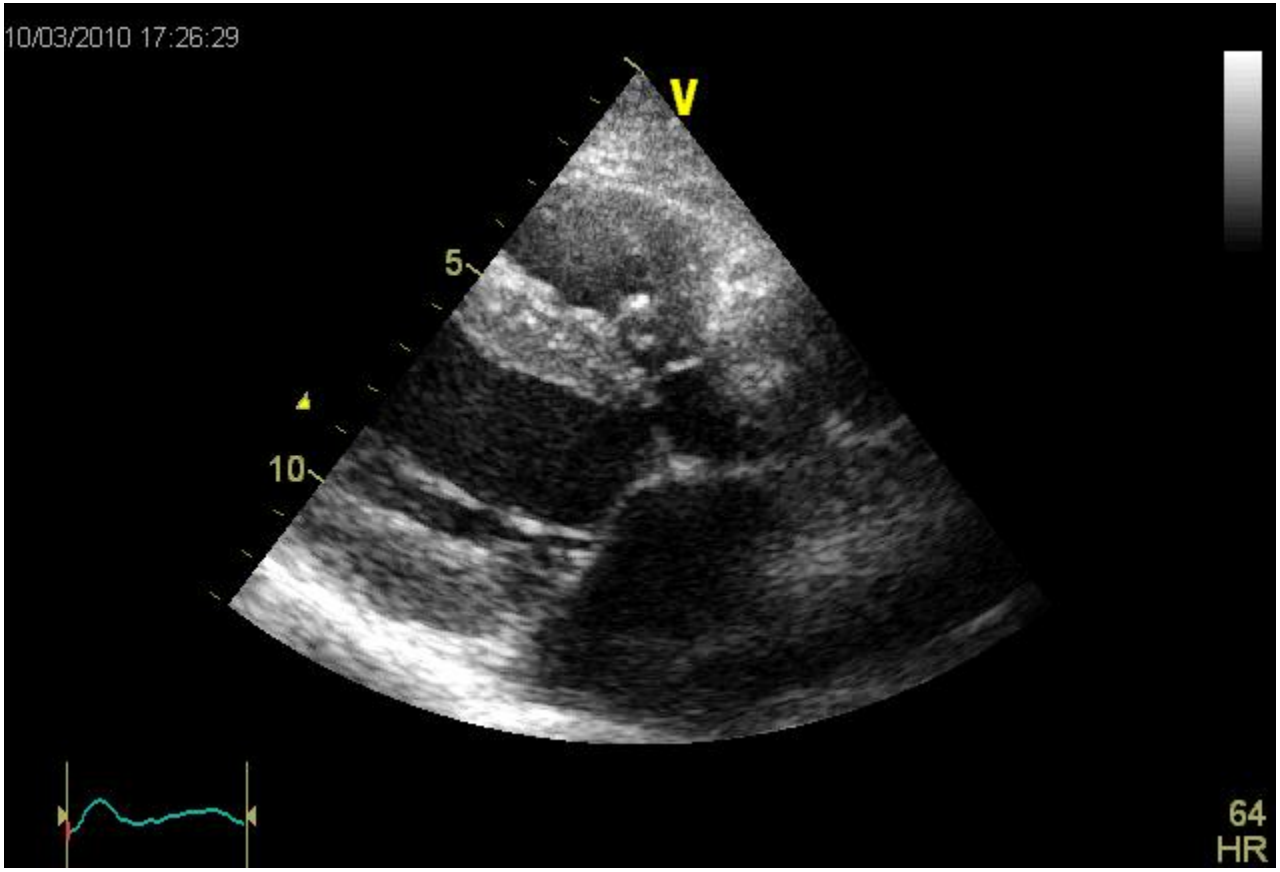
Posterior deviation of infundibular septum can lead to a sub-aortic stenosis. This form can be associated with aortic coarctation.



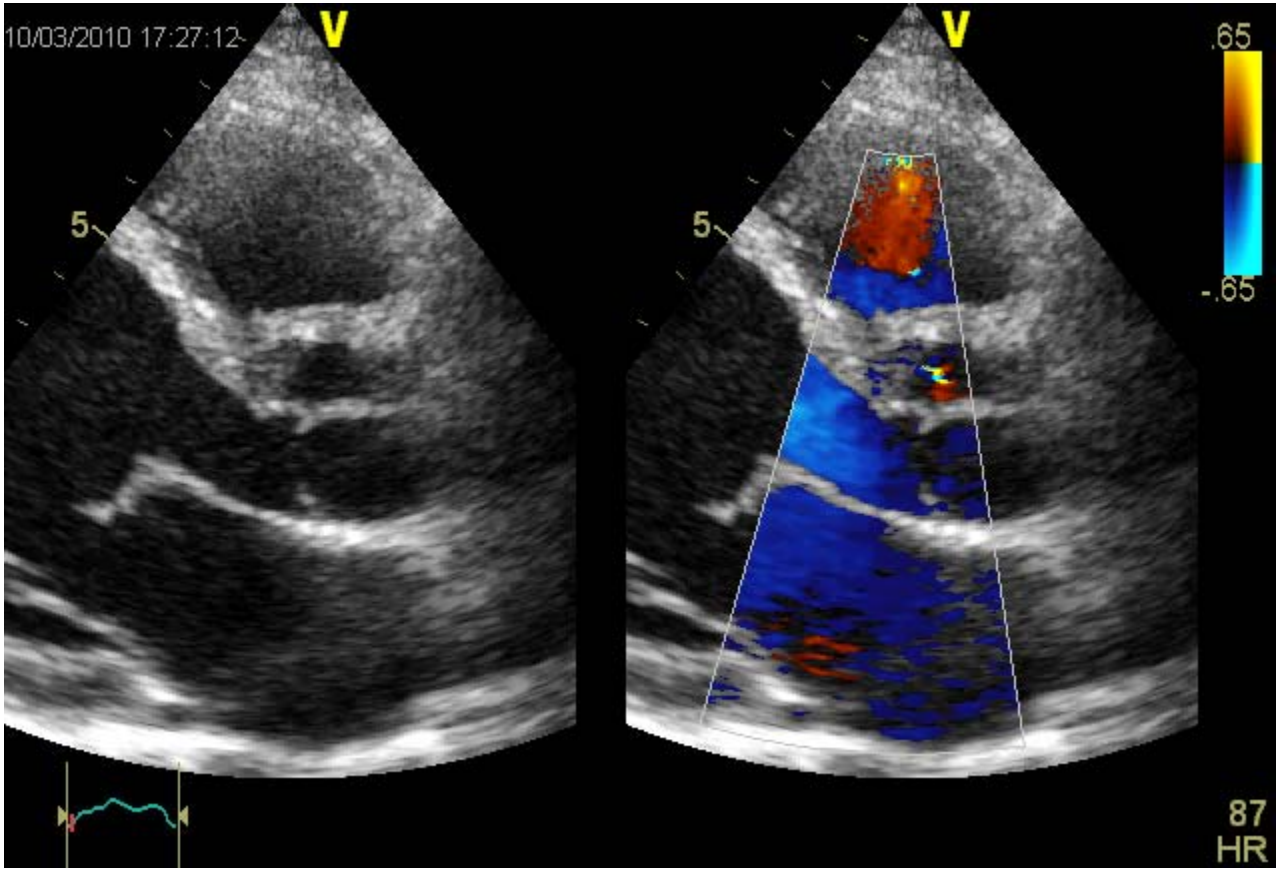
Zoomed view of an apical 5 chamber cut



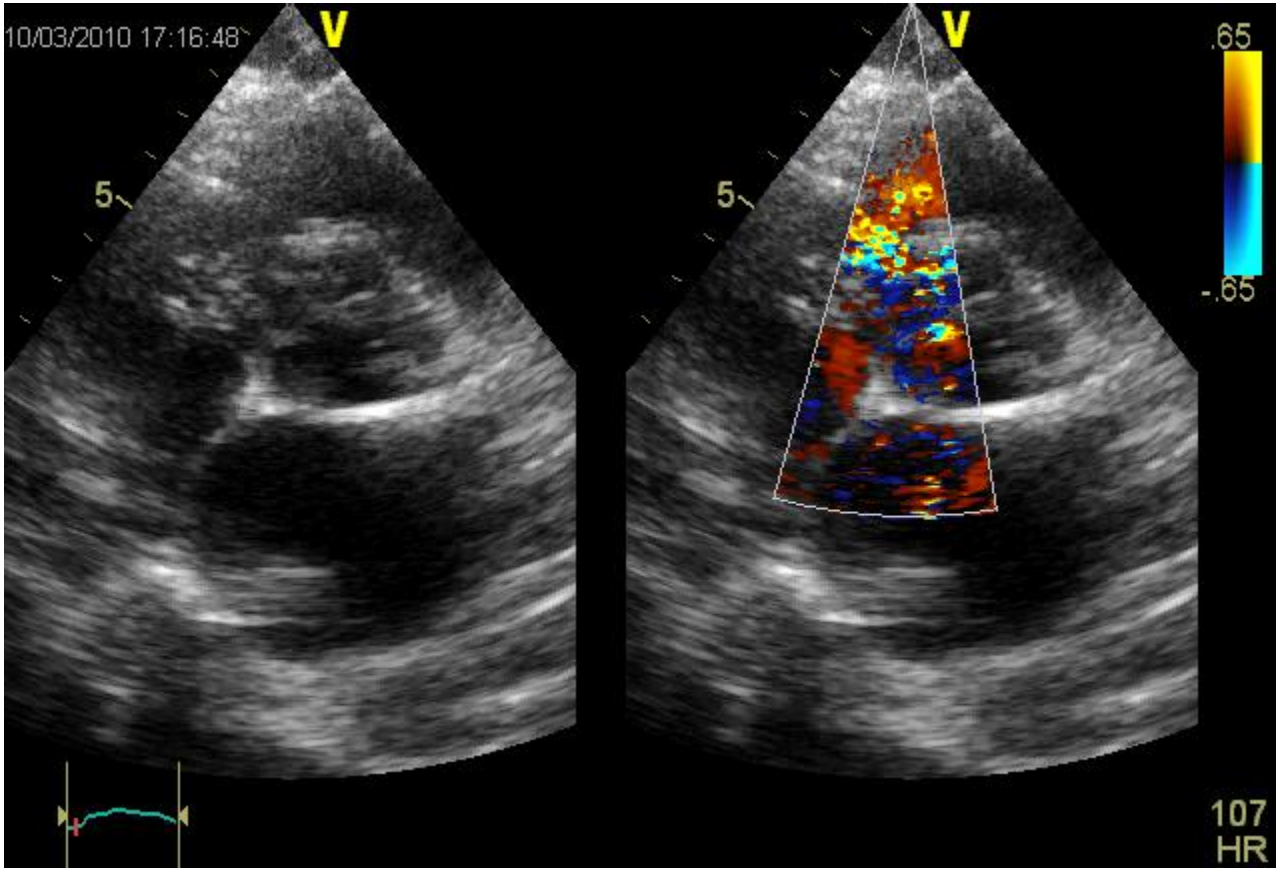
Laubry-Pezzi type VSD



Laubry-Pezzi type VSD

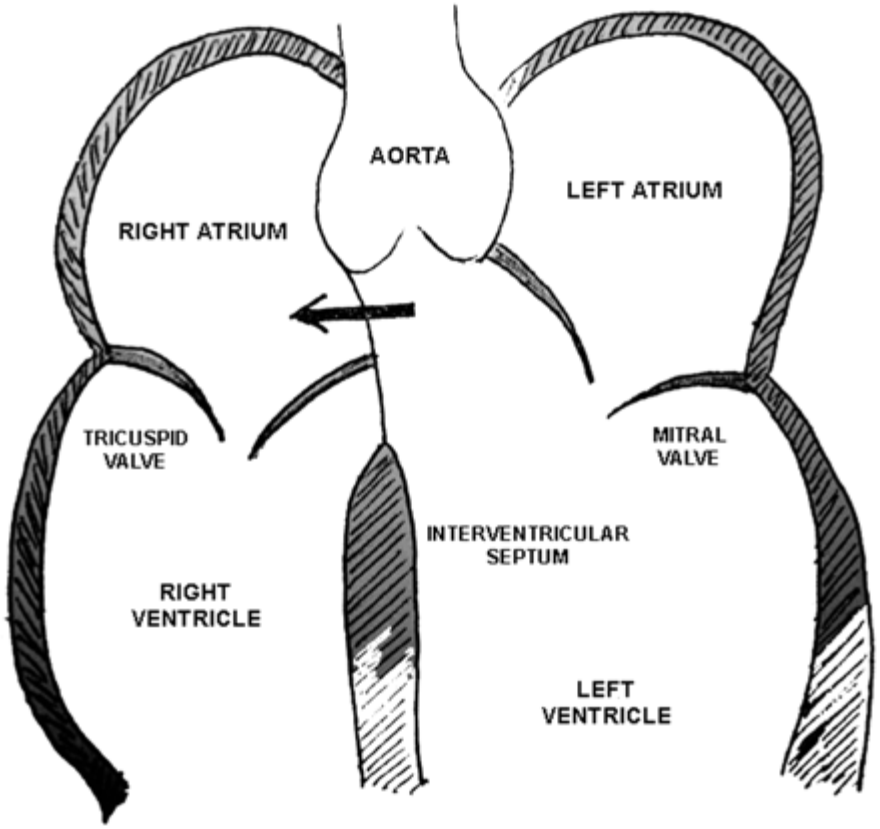


Laubry-Pezzi type VSD

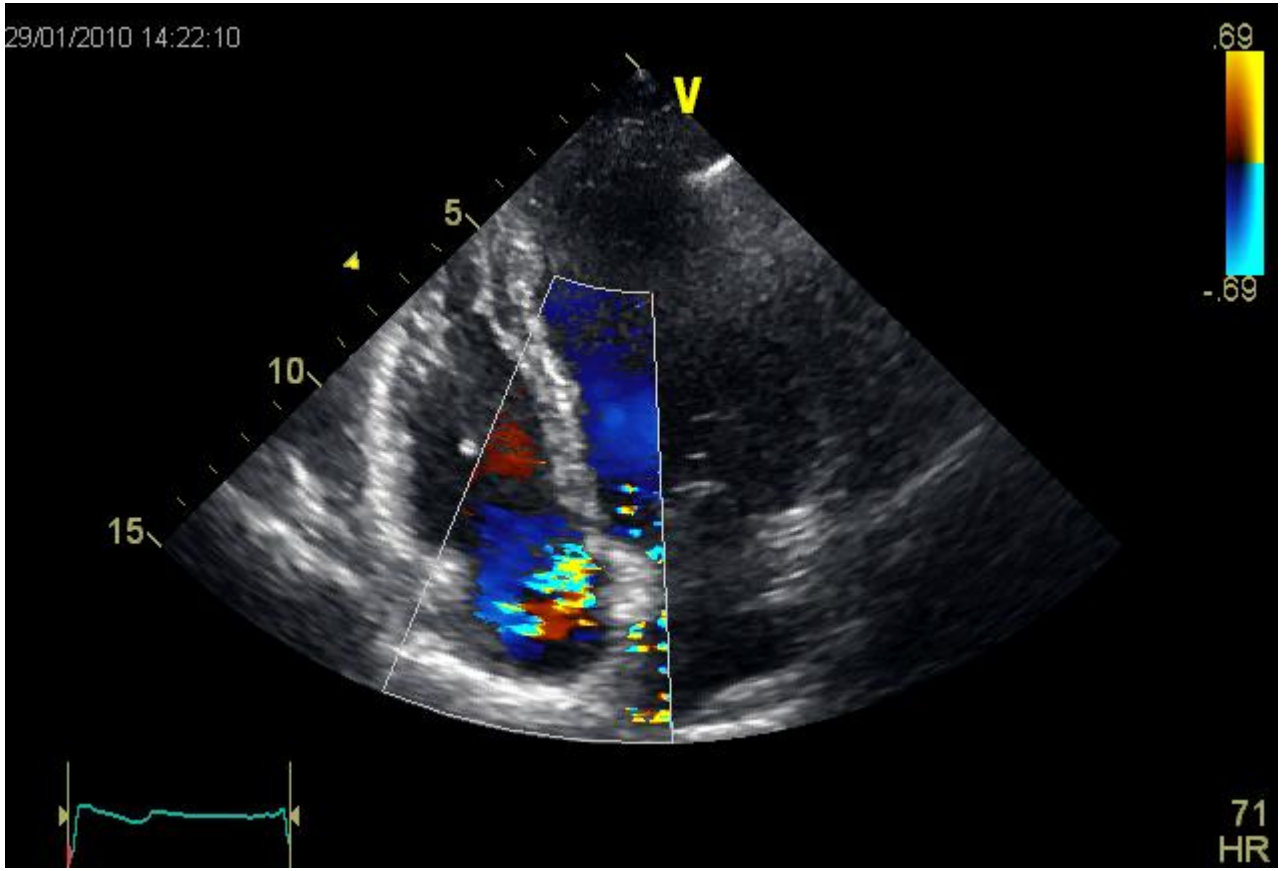


Gerbode type VSD

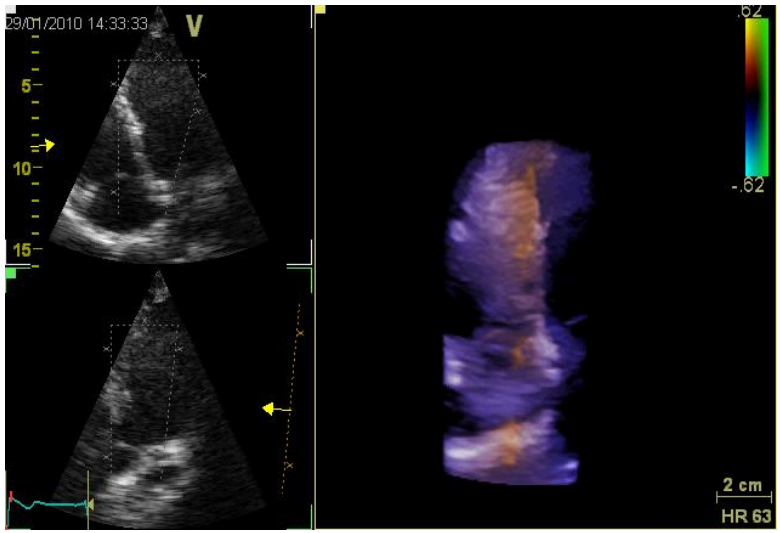
Gerbode defect is a rare form of VSD that allows for communication between the left ventricle and the right atrium.



Gerbode VSD



Gerbode VSD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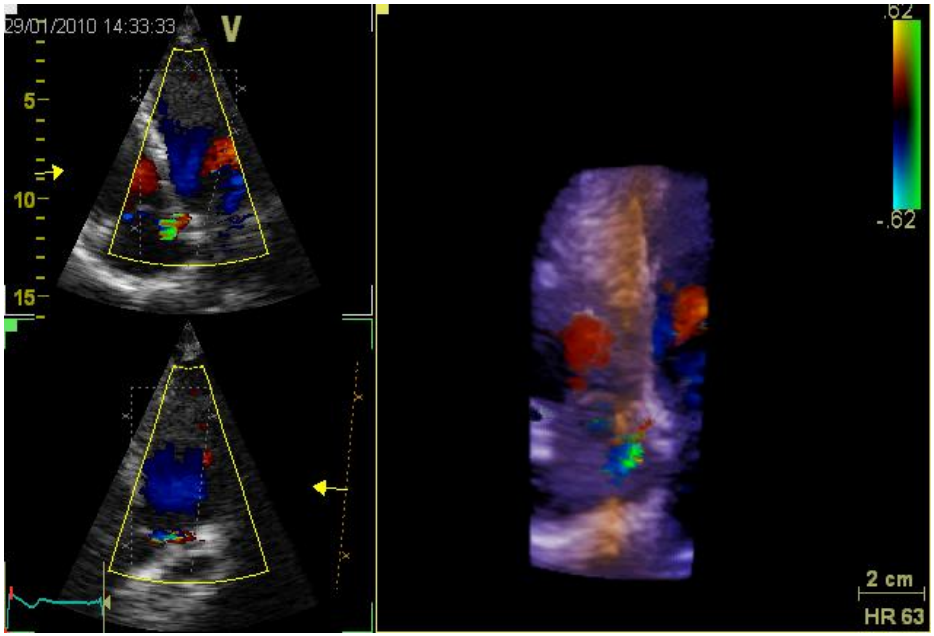
V
5
10
15
.62
-.62
2 cm
HR 63


29/01/2010 14:33:33
V
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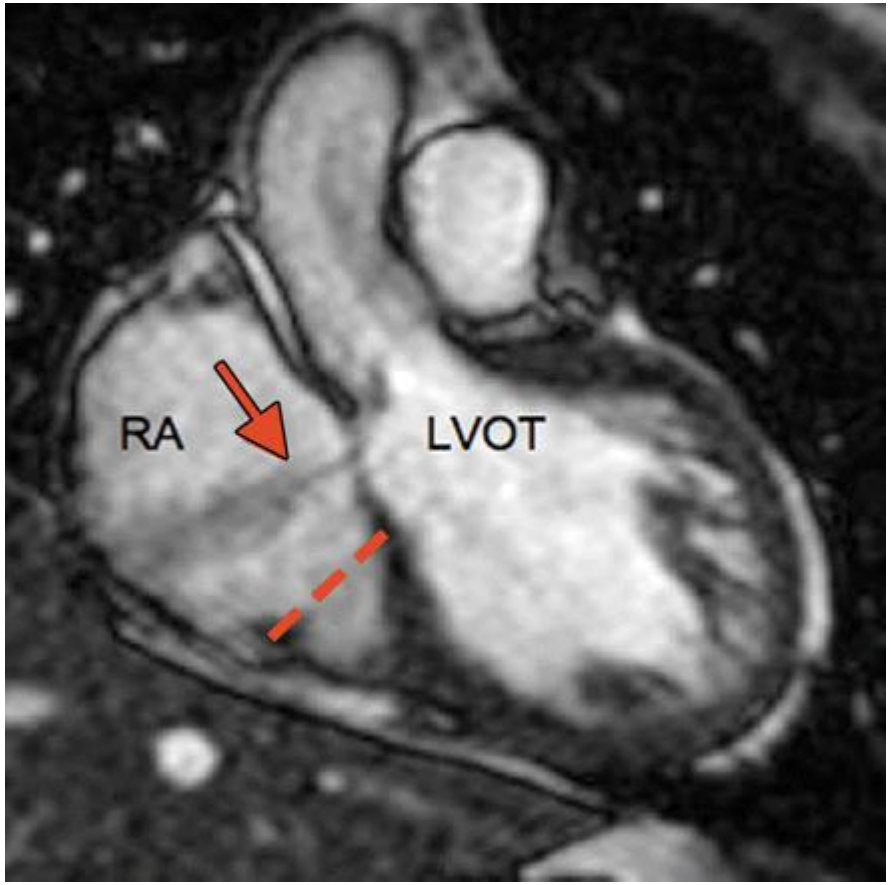
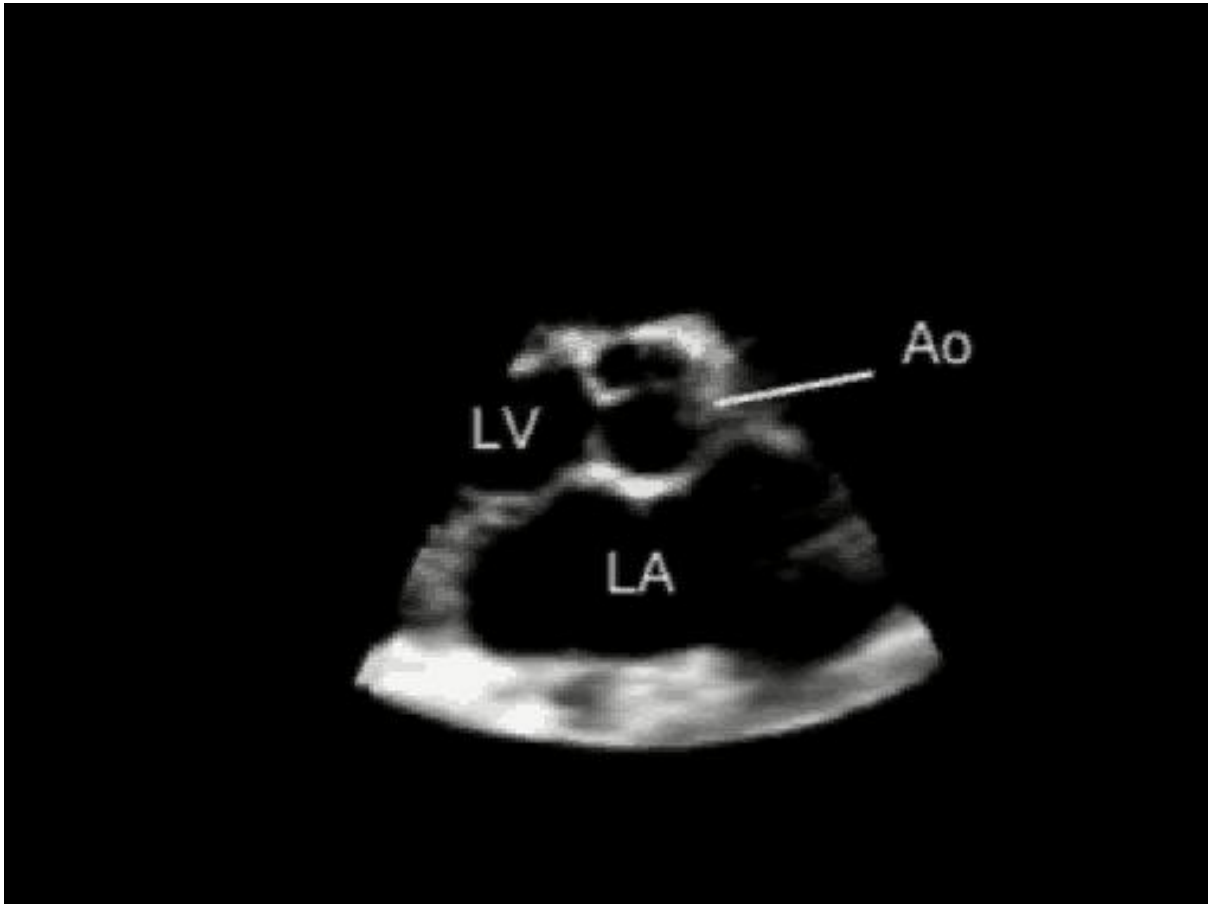
2 cm
HR 63

Gerbode VSD

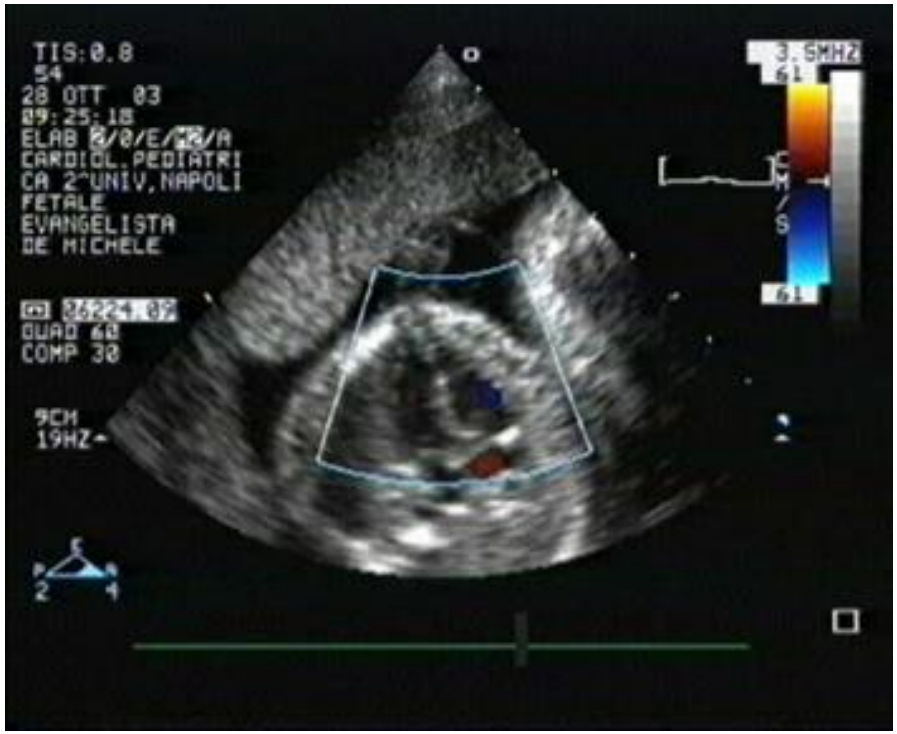


Normal diastolic pulmonary arterial pressure using PR jet is very useful to distinguish the true pulmonary arterial hypertension from high velocity jet in the right atrium caused by **Gerbode type defect**.

VSD and 3D- Echo

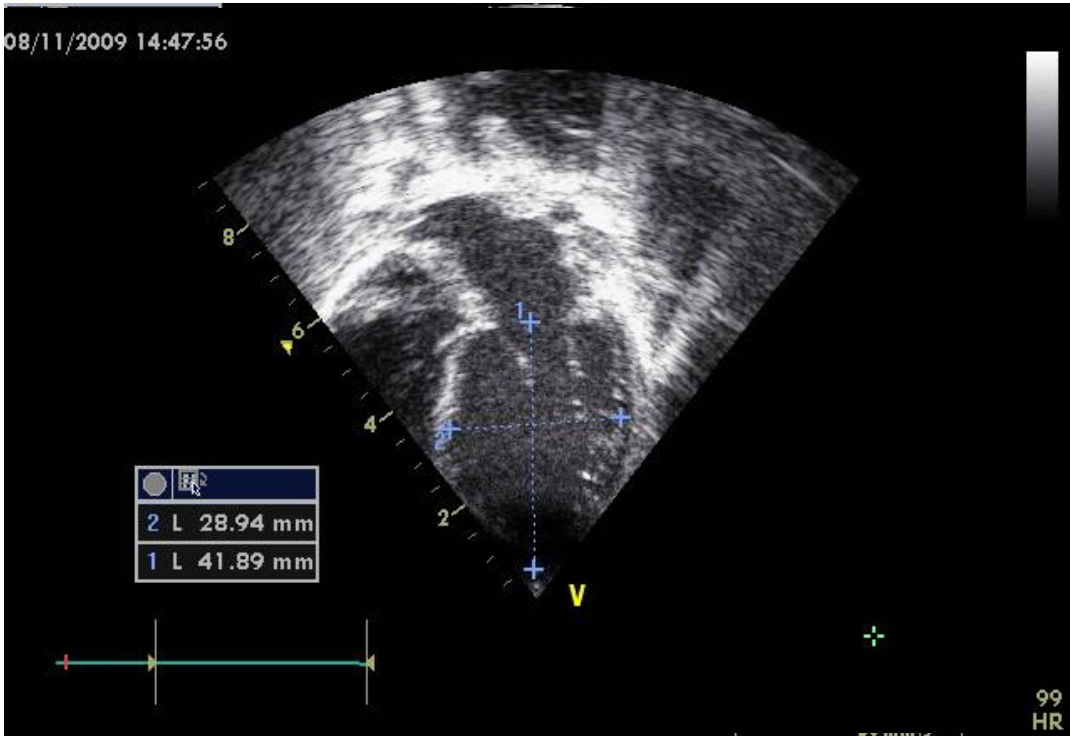


VSD in fetal age



VSD characterization

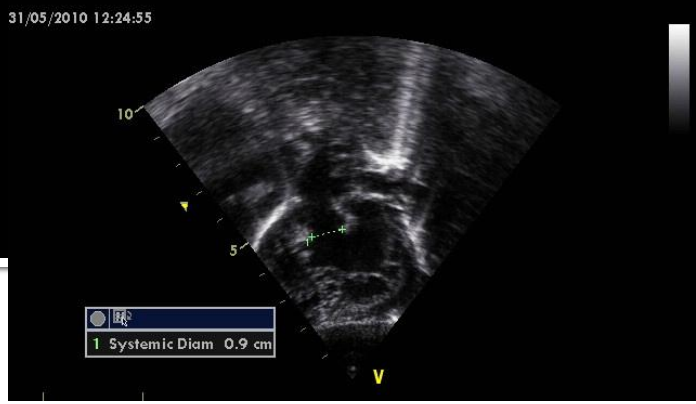
- VSD diameter
- Trans-ventricular pressure gradient estimation
- Right ventricular pressure estimation
- LV shape

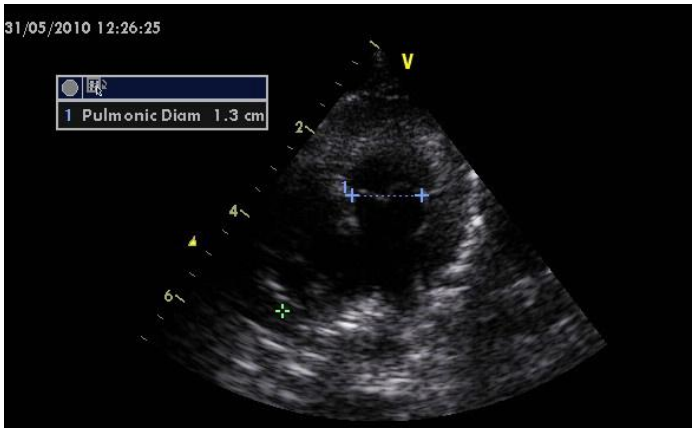


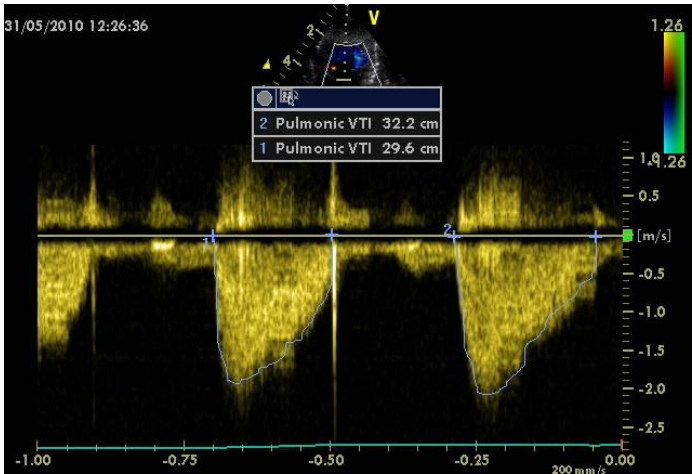
QP/QS estimation

Calculate:

- LVOT diameter
- RVOT diameter
- VTI in LVOT using PW velocities
- VTI in RVOT using PW velocities
- **(Qp/Qs < 1.4): Mild**
- **(Qp/Qs 1.4-2.2): Moderate**
- **(Qp/Qs > 2.3): Severe**







Follow-up in VSD patients

- Position of device or patch
- Residual or accessory shunt
- Aortic Regurgitation
- Left atrial and ventricular volumes normalization