SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT OF CARDIAC TECHNOLOGY - II YEAR

UNIT V :CONGENITAL HEART DISEASE -ASD / VSD

ATRIAL SEPTAL DEFECT AND VENTRICULAR SEPTAL DEFECT

CONGENITAL HEART DISEASE

- Congenital heart defects (CHDs) are problems with the structure of the heart. "Congenital" means that that the problems are present at birth. These defects happen when a baby's heart doesn't develop normally during pregnancy. Congenital heart defects are the most common type of birth defect.
- Congenital heart defects can change the way the heart pumps blood. They may make blood flow too slowly, go the wrong way, or block it completely.

TYPES

CYANOTIC CONGENITAL HEART DISEASE

Cyanotic defects are defects in which blood pumped to the body contains less-than-normal amounts of oxygen, resulting in a condition called cyanosis. It causes a blue discoloration of the skin. Infants with cyanosis are often called "blue babies."

TYPES: TOF, TGA, TAPVC, TA

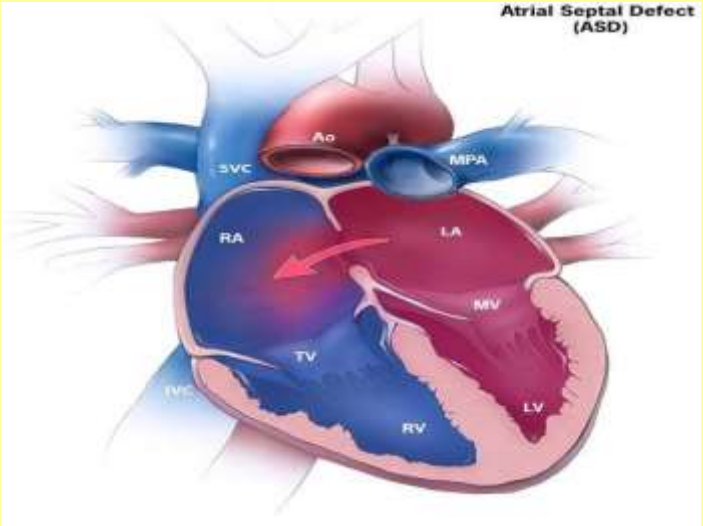
ACYANOTIC CONGENITAL HEART DISEASE

Acyanotic heart disease is a heart defect that affects the normal flow of blood, in which the infant has no cyanosis. The condition is present at birth but may not cause any symptoms or problems until later in life. Sometimes the problem corrects itself during childhood.

TYPES: ASD, VSD, PDA, COA, AS, PS

ATRIAL SEPTAL DEFECT

An abnormal opening in the atrial septum which allows oxygenated blood From the left atrium to mix with deoxygenated blood in the right atrium at a minor pressure difference.



CAUSES

1)Idiopathic

2) Genetics

3) Certain medication

4) Smoking

5) Alcohol

TYPES

1)OSTIUM SECUNDUM

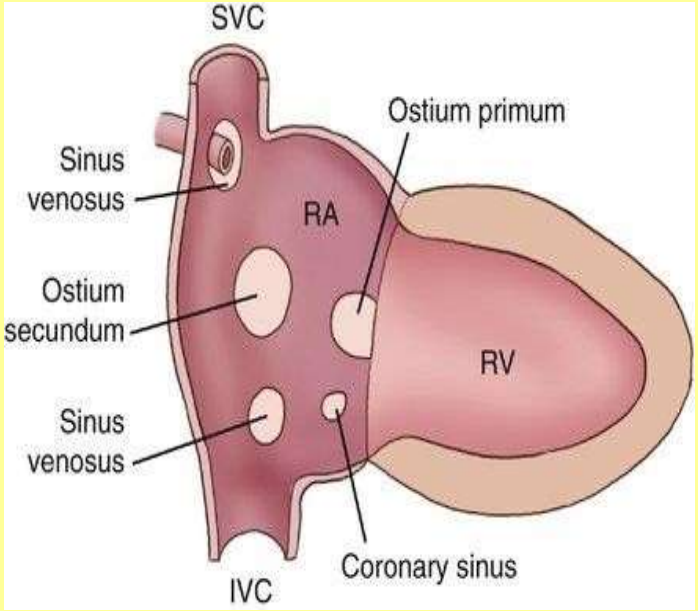
located in the center of the atrial septum (most common type)

2)OSTIUM PRIMUM

located neaí the loweí poítion of the atíial septum, may be associated with defects in the mitíal and tíicuspid valve (second most common type)

3)SINUS VENOSUS

located neaí the top of the atíial septum and fíequently associated with abnoímal connection of the íight pulmonaíy vein(s) to the íight atíium instead to the left atíium (least common type)



PATHOPHYSIOLOGY

Left to right shunt

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Burden on right side of the heart

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Increased pulmonary blood flow

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Pulmonary stenosis/pulmonary HTN

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RV hypertrophy

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Increased RA pressure

|

Right to left shunt

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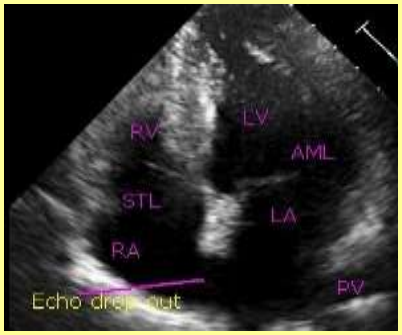
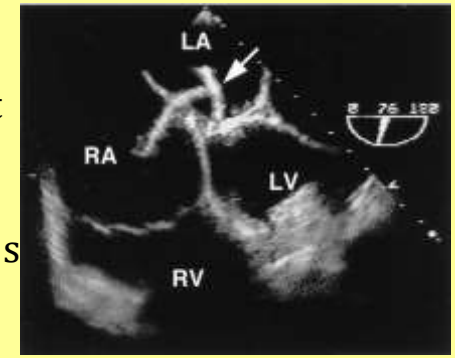
Cyanosis

ECHO FEATURES
2-D ECHOCARDIOGRAPHY ASSESSMENT

- Right side chambers (RA and RV) are dilated due to increased venous return from the systemic circulation as well as the left atrium.This constitutes RV volume overload.



- In A4CH view there is discontinuity in the IAS with an echo drop-out.
- False-positive echo drop-out may be observed even in normal individuals in the region of the foramen ovale, where the covering thin membrane May not be visualized.



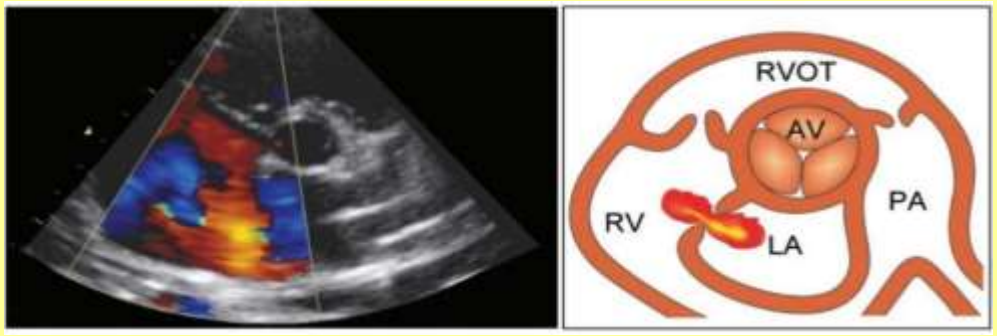
- A true septal defect can be differentiated from a false echo echo drop-out by examining the edges of the septum at the margins of the defect. In true defect the Edges are bright and thick(The T sign) . In false defect the edges are thin and they fade gradually.
- The echo drop-out is seen in the middle of the IAS in ostium secundum type of ASD and just above the mitral valve ring in ostium primum type of ASD.

- No echo drop-out is observed in sinus venosus defect with anomalous pulmonary venous drainage(APVD). However, other features of a left to right shunt are present.
- With a significant volume of left-to-right shunt, there are features of right ventricular volume overload such as right ventricular dilatation beyond 23 mm and paradoxical motion of the IV septum.
- The parasternal short-axis view at the aortic valve level may show the septal defect and a dilated pulmonary artery

DOPPLER ECHO

- Doppler study is not a good modality to pick up an ASD because the jet across the defect is of low velocity.
- For the same reason, color flow mapping can detect flow from the left to right atrium in only a minority of atrial septal defects .
- An increase in flow velocity across the tricuspid and pulmonary valves may indicate right atrial and right ventricular overload due to the left-to-right shunt.
- In ostium primum type of ASD, there may be associated mitral and tricuspid regurgitation (MR and TR).

- Endocardial cushion defects are associated with cleft leaflets of mitral and tricuspid valves.



CONTRAST ECHO

- Because of the technical difficulties with 2-D echo and the limitations of color flow mapping and Doppler echo, a contrast echo study should be performed if an ASD is strongly suspected on clinical grounds
- For contrast study, a small bolus of agitated saline with air bubbles, is injected into a peripheral vein. The air bubbles are seen in the right atrium (RA) and they normally enter into the right ventricle.
- The subject is then asked to perform a Valsalva manoeuvra (to increase intrathoracic pressure) when air bubbles are seen shunting from the right to left atrium across the ASD.This is known as the positive contrast effect.

- A negative contrast effect is observed when there is an area of non-contrast in the right atrium (RA), due to washout of contrast by normal blood from the left atrium (LA).

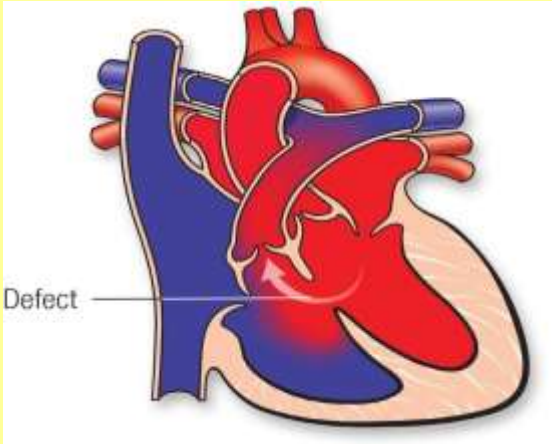
DOPPLER CALCULATIONS

- The pulmonary artery pressure can be estimated from the transtricuspid peak flow velocity and pulmonary hypertension can be identified (see Pulmonary Hypertension).
- A combination of ASD with pulmonary hypertension is known as Eisenmenger reaction.
- The quantity of left-to-right shunt can be estimated from the ratio between pulmonary and systemic stroke volume, which is the Qp : Qs ratio.
- Qs is aortic outflow and Qp is pulmonary outflow. Qp is greater than Qs since a portion of the left atrial output goes to the right atrium.

VENTRICULAR SEPTAL DEFECT

An abnormal opening in the ventricular septum which allows oxygenated blood from the LV(higher pressure)to mix with Deoxygenated blood in the RV (Lower pressure).

The cause of VSD is not yet known. This defect often occurs along with other congenital heart defects.



TYPES

1) SUPRACRISTAL VSD

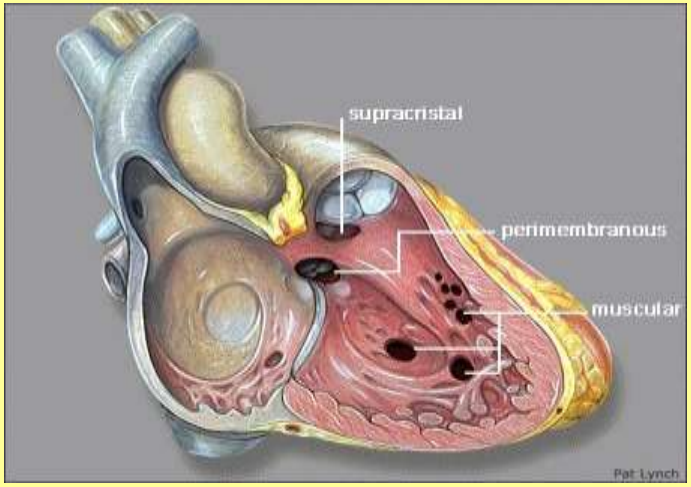
Occurs just beneath the aortic value at the LVOT

2) MEMBRANOUS VSD

The most common type and originate inferior to the crista supraventricularis.

3) MUSCULAR VSD

Occur in the mid to apical IVS.

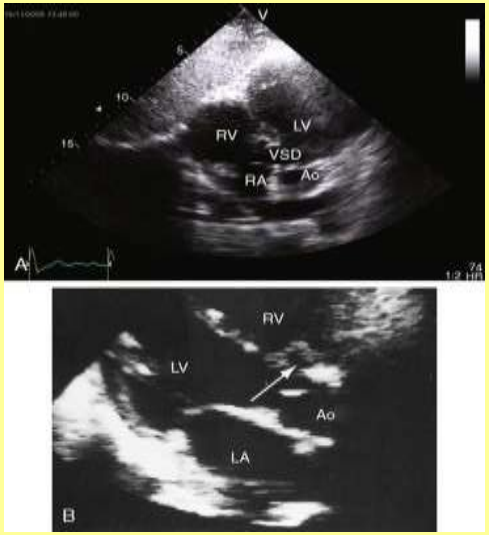


ECHO FEATURES

2-D ECHO FEATURES

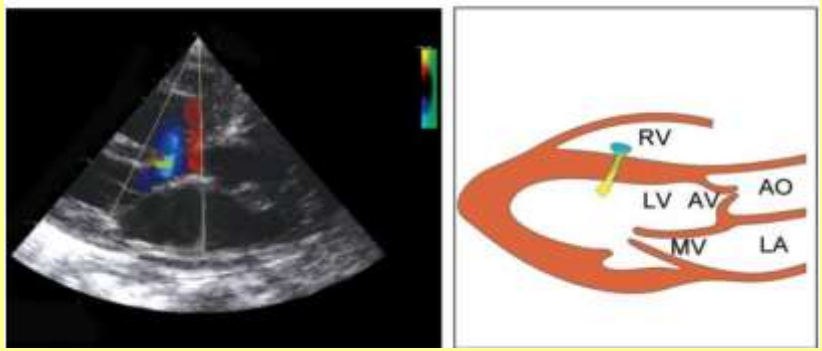
- On 2-D Echo, the left-sided chambers (LA and LV) are dilated, due to increased venous return from the pulmonary cirdrop-ou. This constitutes left ventricular volume overload.
- On careful inspection of the apical 4-chamber (A4CH) view, there is a discontinuity in the interventricular septum (IVS) with echo drop-out.
- The VSD may be small or large in size and single or multiple. The septal defect may be in the upper membranous portion(base) or in the lower muscular septum (apex).
- An infundibular (supracristal) VSD is located below the pulmonary valve (subpulmonary). An atrioventricular defect is located in the posterior portion of the septum around the tricuspid valve
- No echo drop-out is observed if the defect is too small (< 3 mm) in size, it is eccentric in direction or if it is muscular in location, which shuts off during contraction in systole.

- Multiple and small defects give the septum a “sieve-like” or “Swiss-cheese” appearance.



DOPPLER ECHO

- On color flow mapping, there is an abnormal flow pattern from the left to right ventricle
- The width of the color flow map approximates the size of the defect and helps in quantitative assessment.



- On continuous wave (CW) Doppler, a high velocity jet is identified across the septal defect. From the velocity (V) of the jet, the pressure gradient (PG) between the LV and RV be measured (Bernoulli equation: $PG = 4 V^2$).
- High velocity jet with a high pressure gradient is suggestiveo of a small restrictive VSD in the muscular portion. A shunt may not be demonstrated if it is too small in size, eccentric,of low velocity or bidirectional.
- By pulsed wave (PW) Doppler, the high velocity on CW Doppler and the color flow map, can be localized. The sample volume is placed in the right ventricle alongside the septum, adjacent to the suspected area.
- With a significant volume of left-to-right shunt, there are features of right ventricular volume overload such as right ventricular dilatation beyond 23 mm and paradoxical motion of the IV septum.

DOPPLER CALCULATIONS

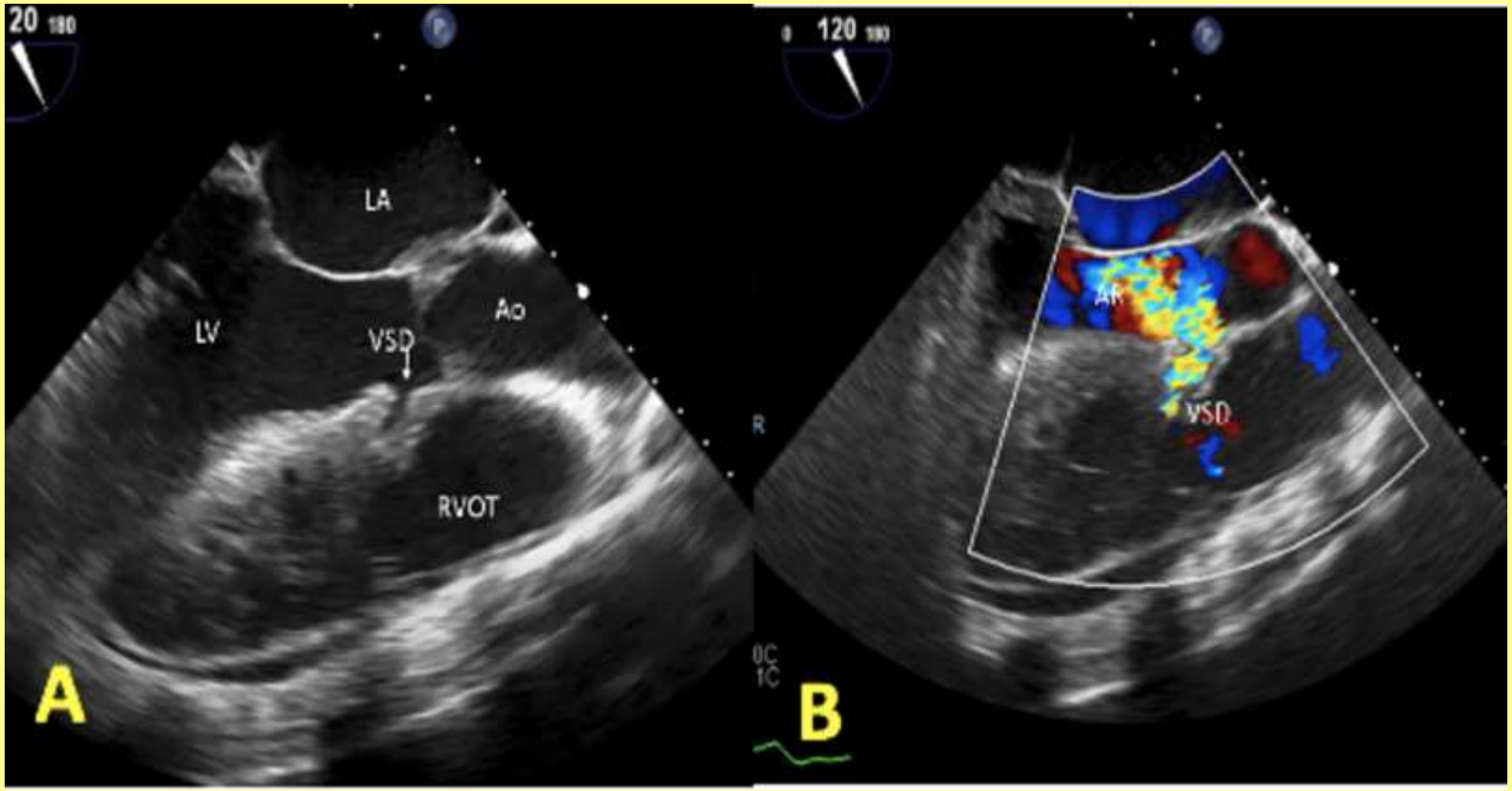
- The pulmonary artery pressure can be estimated from the transtricuspid peak flow

  velocity and pulmonary hypertension can be identified (see Pulmonary Hypertension).

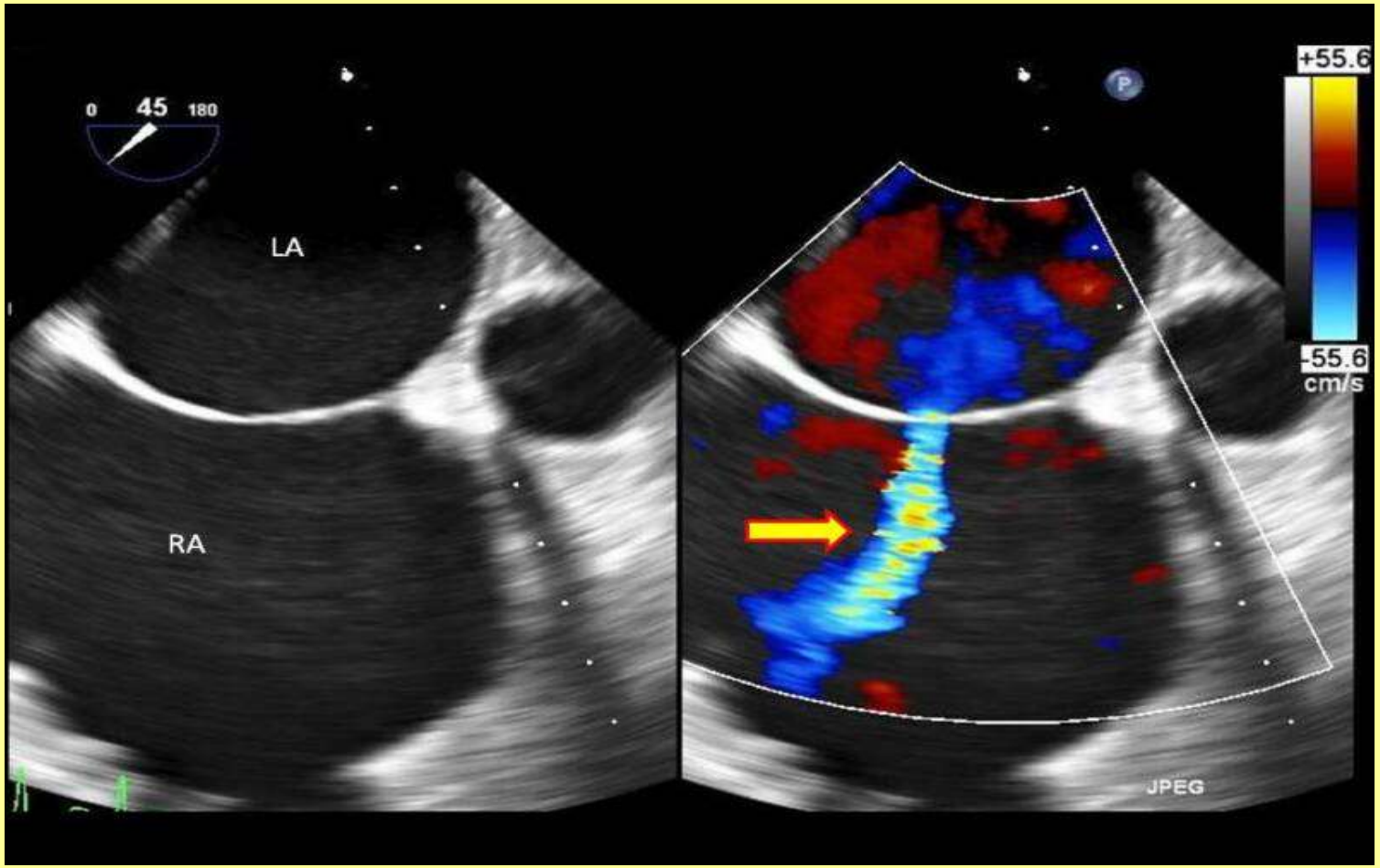
- The quantity of left-to-right shunt can be estimated from the ratio between pulmonary and systemic stroke volume, whichratio is the Qp : Qs ratio.

- Qs is aortic outflow and Qp is pulmonary outflow. Qp is greater than Qs since a portion of the left ventricular output goes to the right ventricle.

VSD in TEE



ASD in colourflow mapping

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THANK YOU