Situs

(Thoraco-abdominal situs)

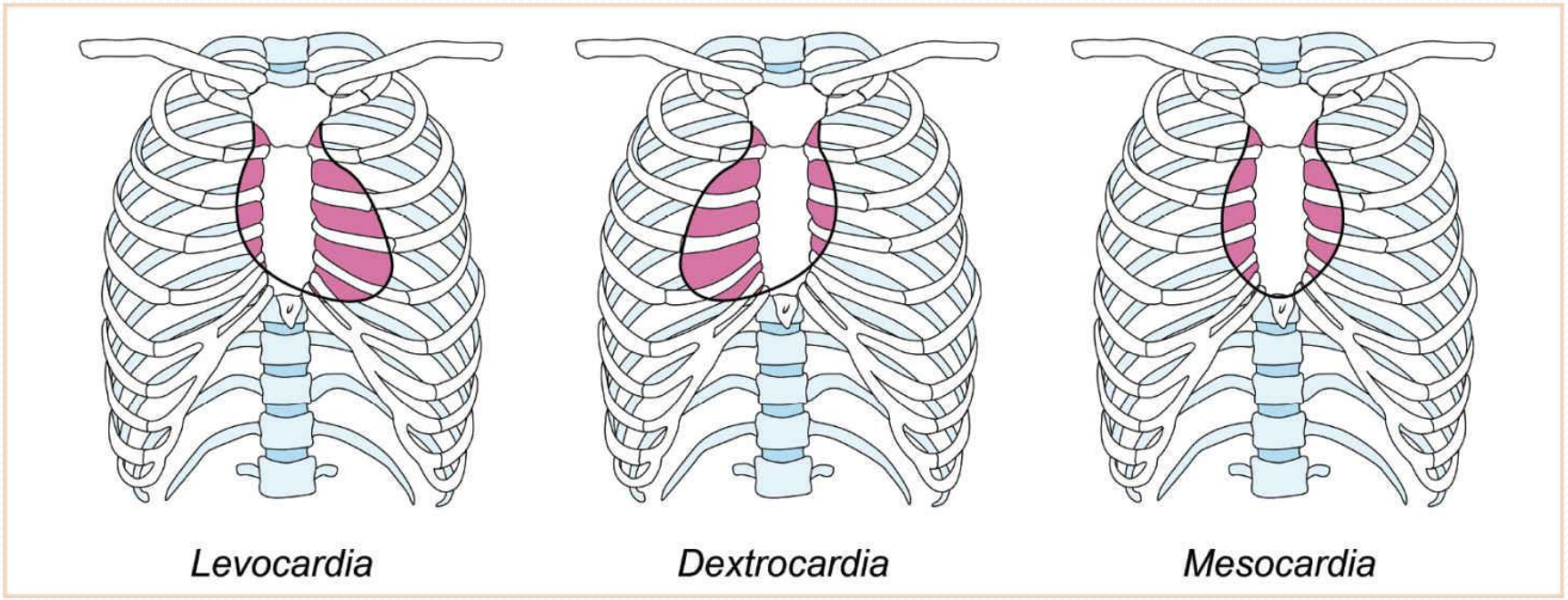
Visceral-atrial situs

Situs refers to spatial arrangement of the viscera

Three types of visceroatrial situs:

- S – solitus (normal arrangement)
- I – inversus (mirror-image of normal arrangement)
- A – ambiguous (abnormal arrangement)

Cardiac positions and apex orientation

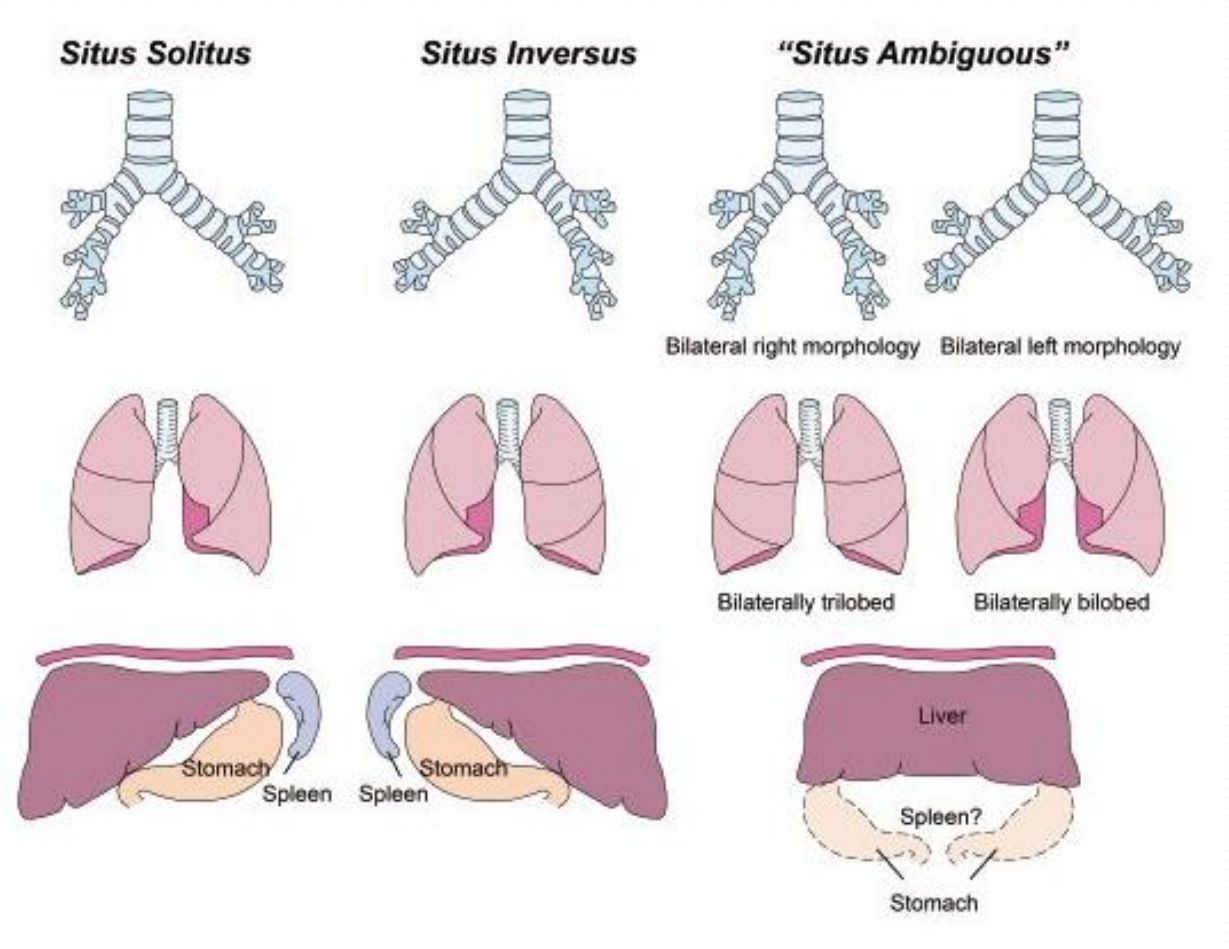


Levocardia- the heart is position predominantly in the left hemithorax
Dextrocardia- the heart is position predominantly in the right hemithorax
Mesocardia- the heart is midline with approximately equal proportions and apex points anteriorly or inferiorly.

Situs Solitus

Refers to the normal asymmetrical arrangement of the abdominal and thoracic organs.

- The spleen, pancreas, stomach, and sigmoid colon are left-sided, and the liver, cecum, and appendix are right-sided.
- The left lung comprises of 2 lobes and the left mainstem bronchus is longer, more horizontal and courses inferior to the left pulmonary artery.
- The right lung comprises of 3 lobes and the right mainstem bronchus is shorter and courses posterior to the right pulmonary artery.
- The heart is predominantly in the left hemithorax.
- Left aortic arch

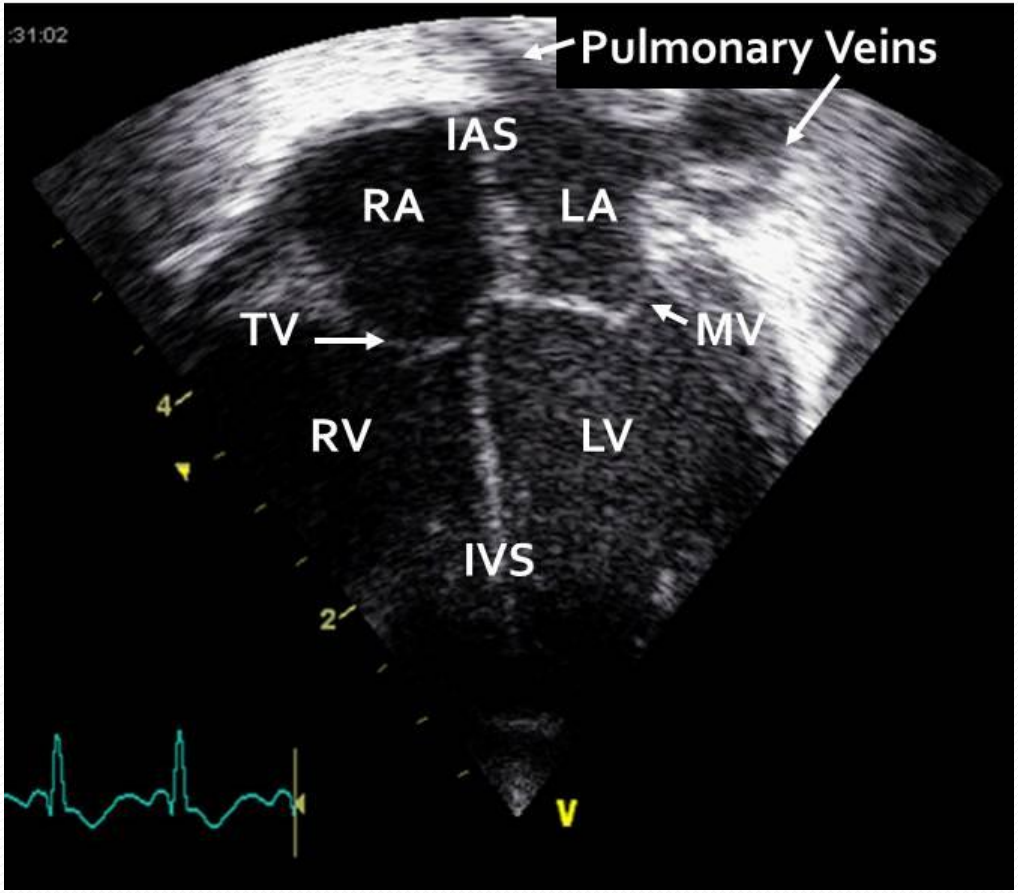

Situs Solitus
Situs Inversus
"Situs Ambiguous"
Bilateral right morphology
Bilateral left morphology
Bilaterally trilobed
Bilaterally bilobed
Stomach
Spleen
Stomach
Spleen
Liver
Spleen?
Stomach

The three main cardiac segments

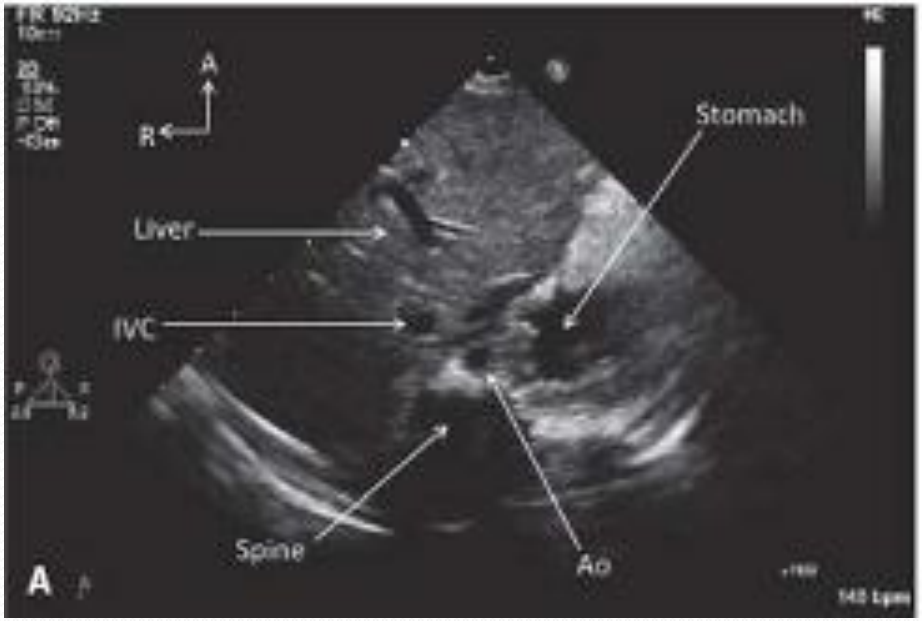
S, D, S (normal)

- Atria- (S) the right-sided right atrium receives SVC, IVC, and CS. The left-sided left atrium receives pulmonary venous return.
- Ventricles- (D) the RV lies to the right of the LV and is anterior and connects to the RA via the tricuspid valve. The LV lies to the left of the RV and is posterior and connects to the LA via the mitral valve.
- Great arteries- (S) the pulmonary artery comes off the RV and runs anterior and leftward. The aorta comes off the LV and runs posterior and rightward.

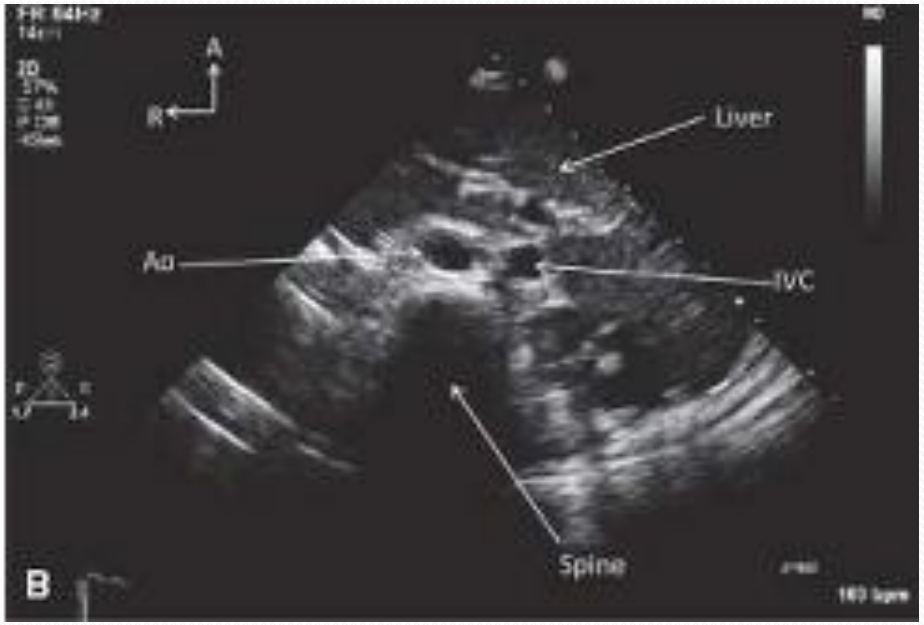
Apical 4 chamber view



Subcostal Sagittal View

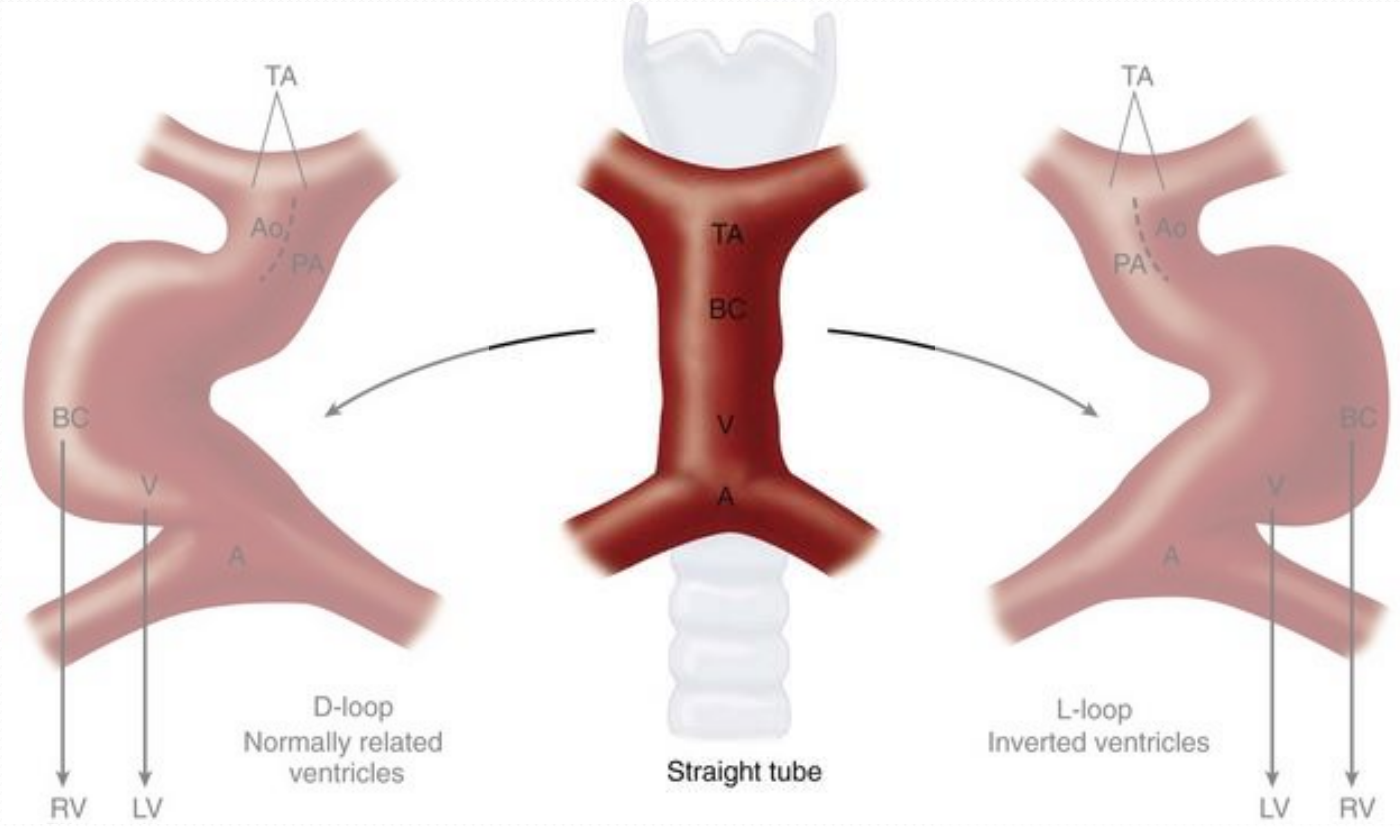


Situs solitus- normal abdominal visceral situs



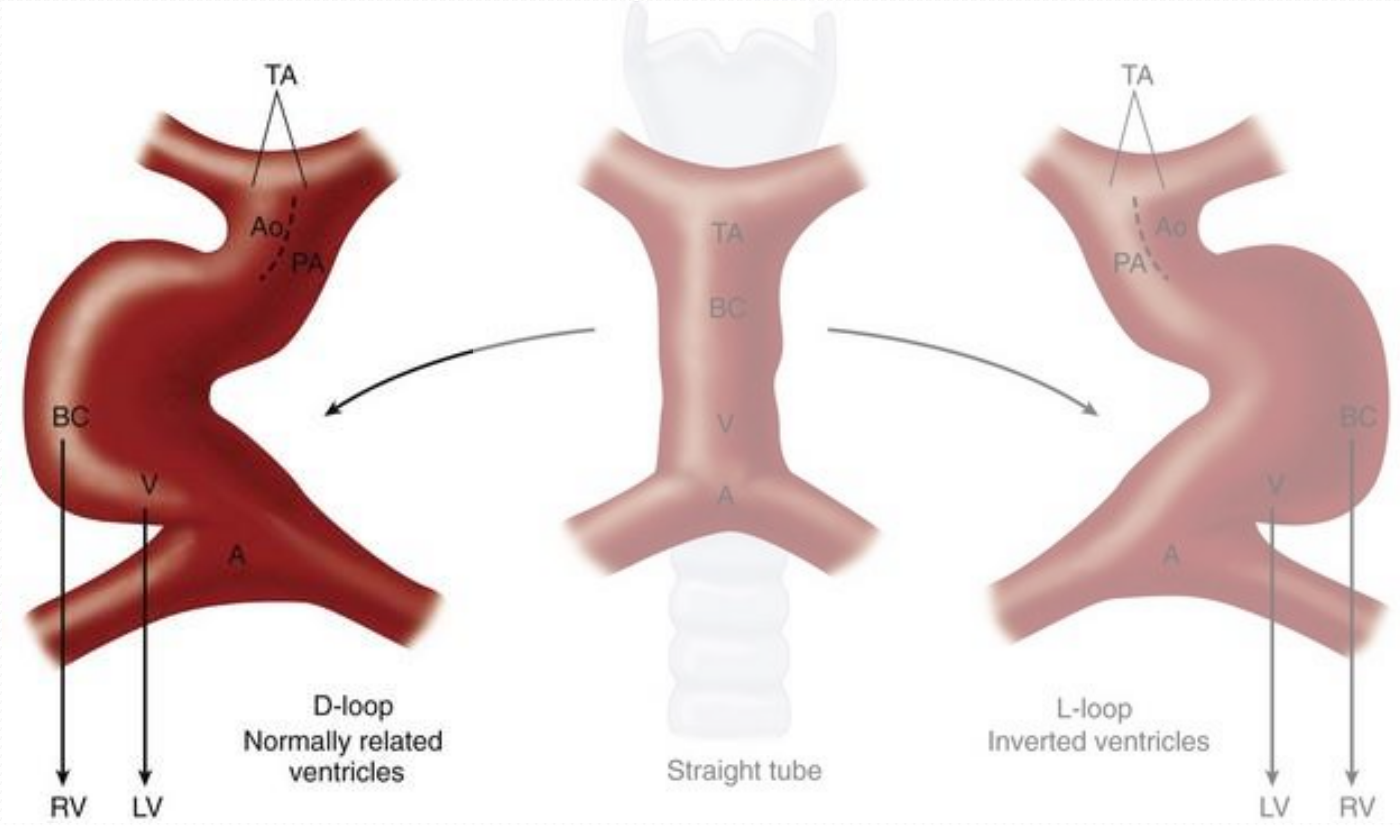
Situs inversus- mirror-image of normal abdominal situs

Embryonic Cardiac Looping



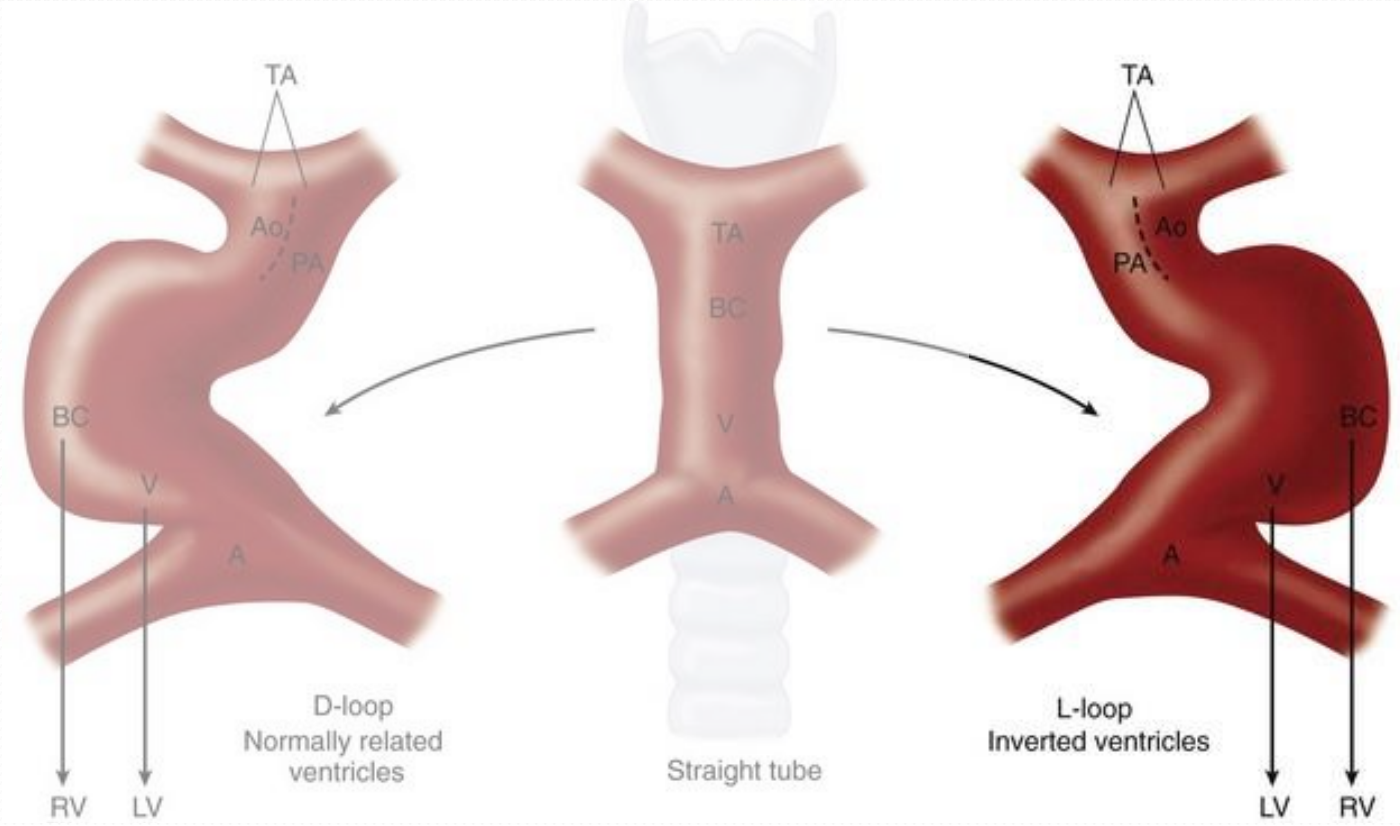
- Looping of the primitive heart tube during the third week of gestation is one of the key embryologic processes for correct anatomic alignment of the four chambers of the heart.

Embryonic Cardiac Looping



- D-loop (dextro) – bends to the right and anterior resulting in the normal morphologic position of the right ventricle (RV) to the right of the left ventricle (LV).

Embryonic Cardiac Looping



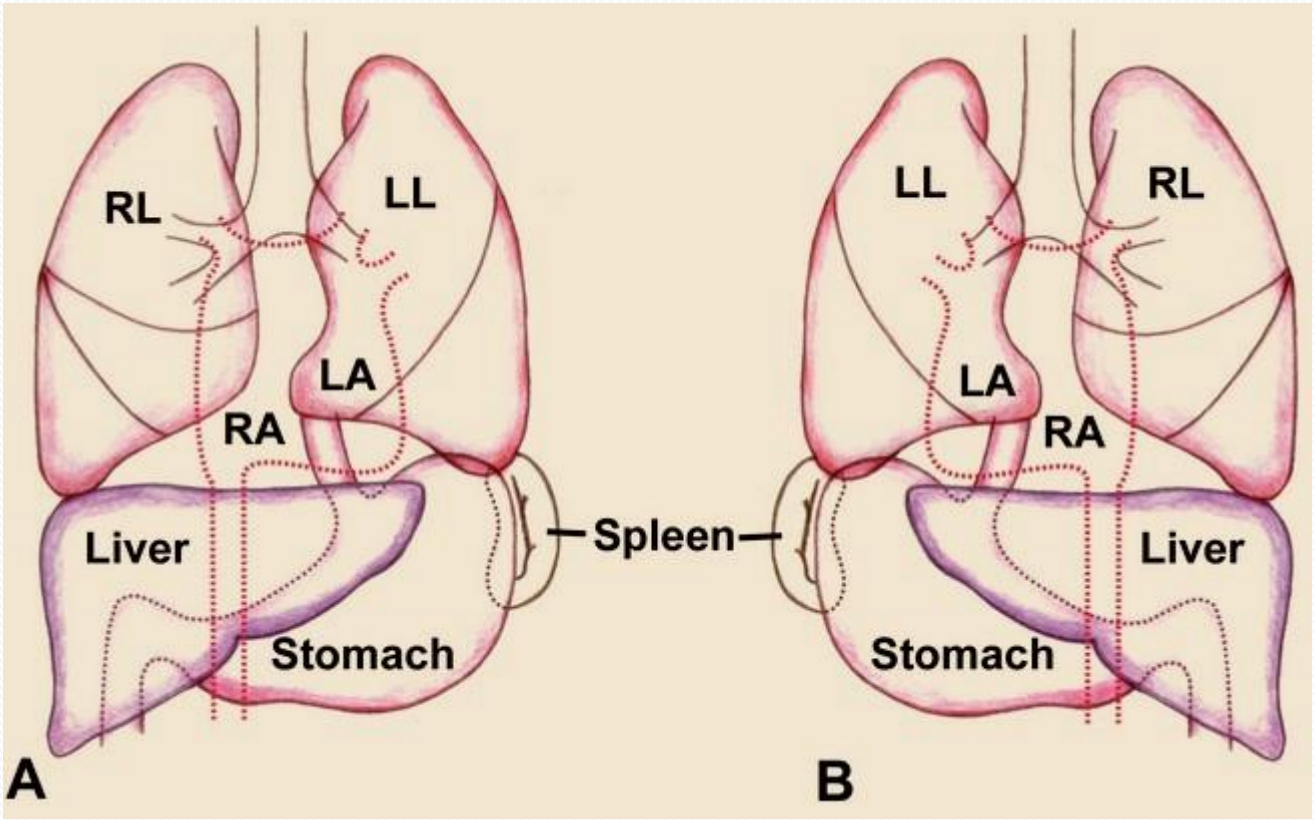
- L- loop (levo) bends to the left leads to abnormal positioning of the ventricles, where the left ventricle (LV) is position to the right of the right ventricle; and result in abnormal connections among the atrial, ventricular, and arterial segments of the heart.

Situs Inversus

Situs inversus totalis is a condition in which the organs of the chest and abdomen are arranged in a perfect mirror image reversal of the normal positioning.

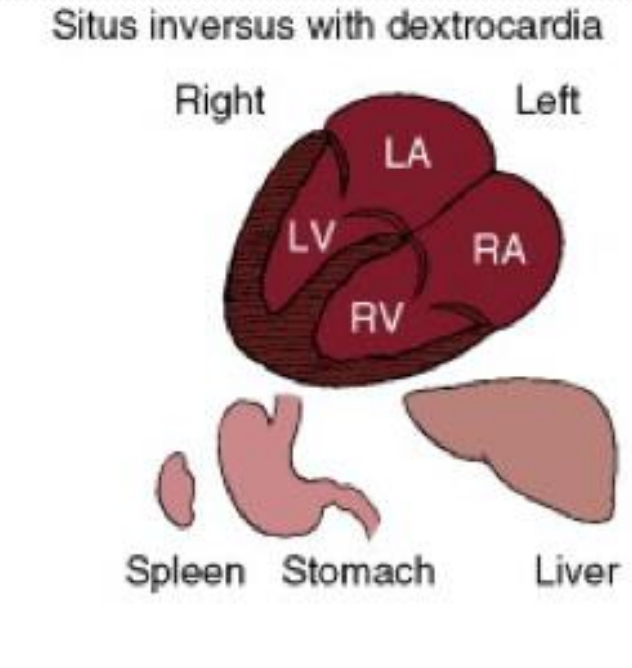
- In situs inversus, the morphologic right atrium is on the left, and the morphologic left atrium is on the right.
- The left ventricle is right-sided and the right ventricle is left-sided.
- The normal pulmonary anatomy is also reversed so that the left lung has 3 lobes and the right lung has 2 lobes.
- The liver and gallbladder are located on the left, whereas the spleen and stomach are located on the right.
- Usually a right aortic arch.
- Very rare condition, it occurs in an estimated 1 in 10,000 people.

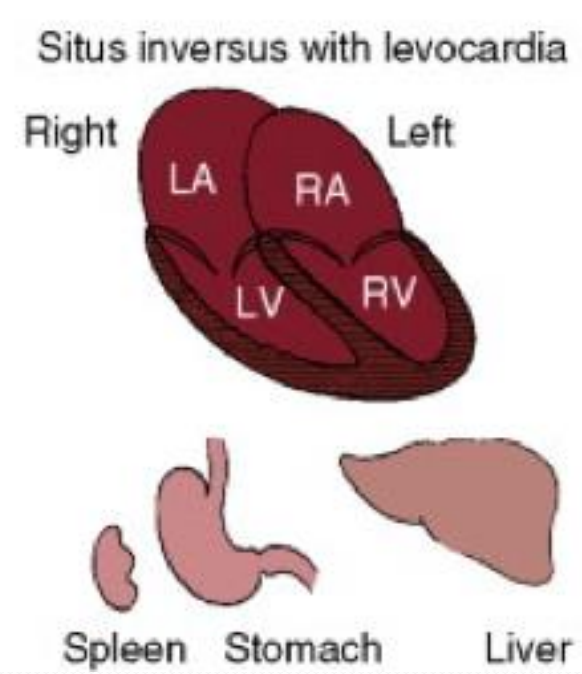
Situs solitus vs Situs inversus

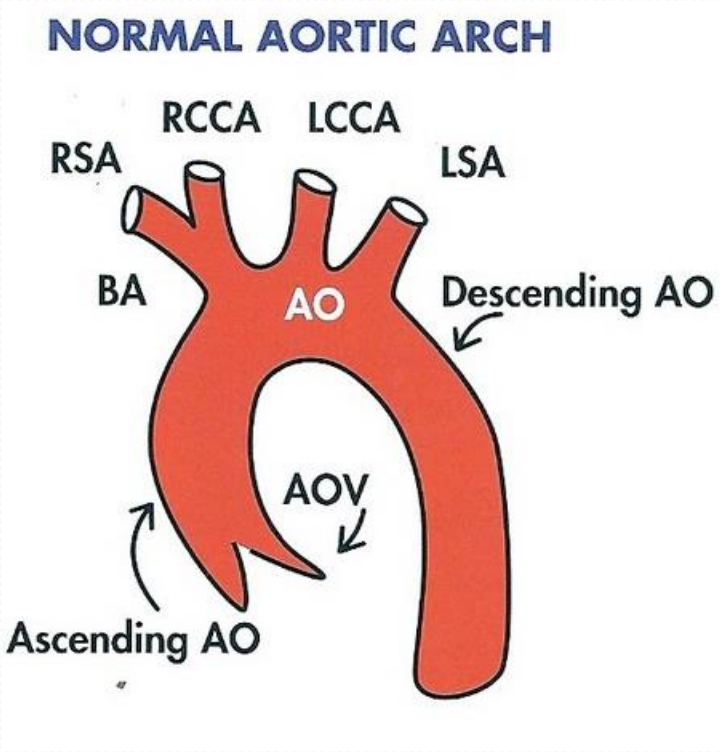


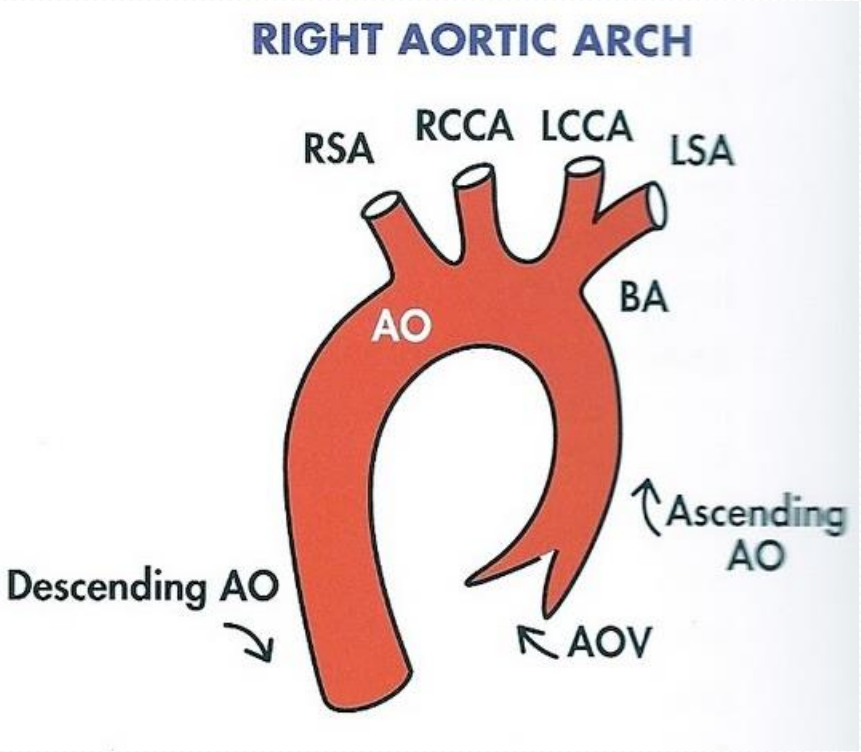
Types of Situs inversus

- Situs inversus with dextrocardia- the base-to-apex axis points to the right. Also termed situs inversus totalis, the cardiac position, the atrial chambers and abdominal viscera is a mirror image of the normal anatomy.
- There is a 5–10% prevalence of congenital heart disease in individuals with situs inversus totalis, most commonly transposition of the great vessels.
- Situs inversus with levocardia- the base-to-apex axis points to the left. (less common compared to situs inversus totalis)
- The incidence of congenital heart disease is 95% in situs inversus with levocardia.


Situs inversus with dextrocardia
Right
Left
LA
LV
RA
RV
Spleen
Stomach
Liver

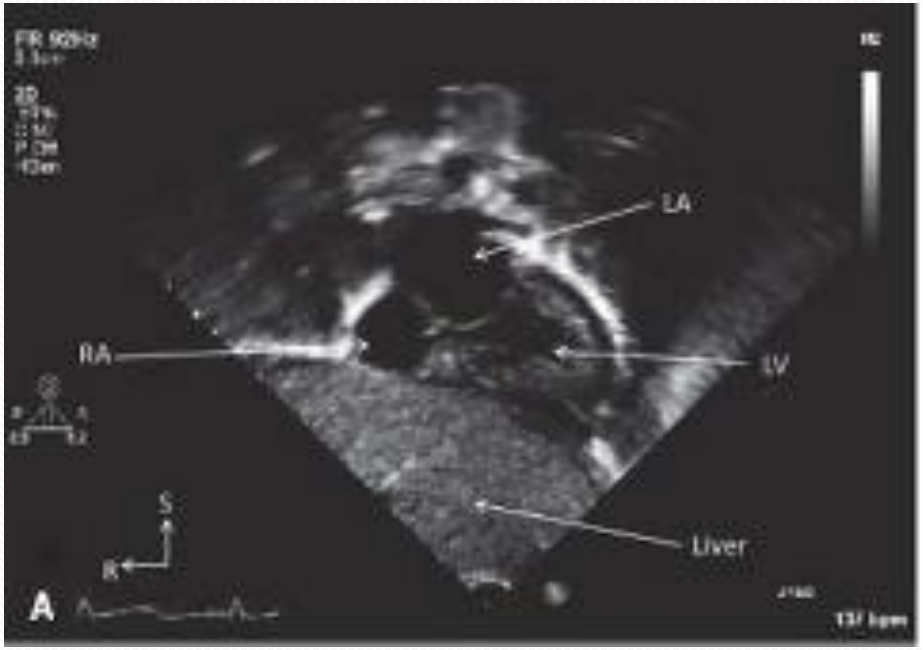

Situs inversus with levocardia
Right
Left
LA
RA
LV
RV
Spleen
Stomach
Liver

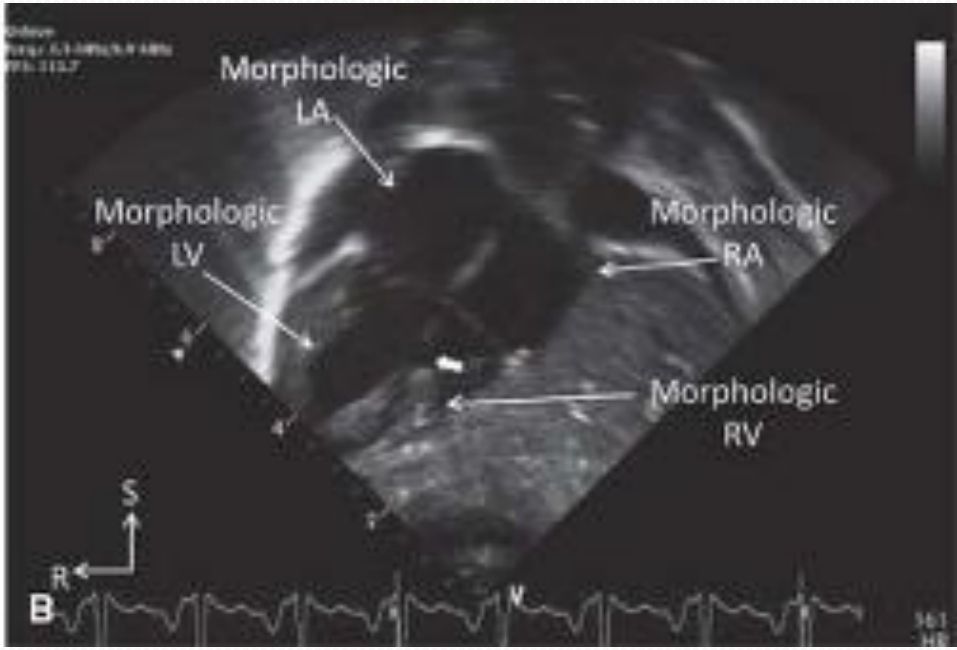


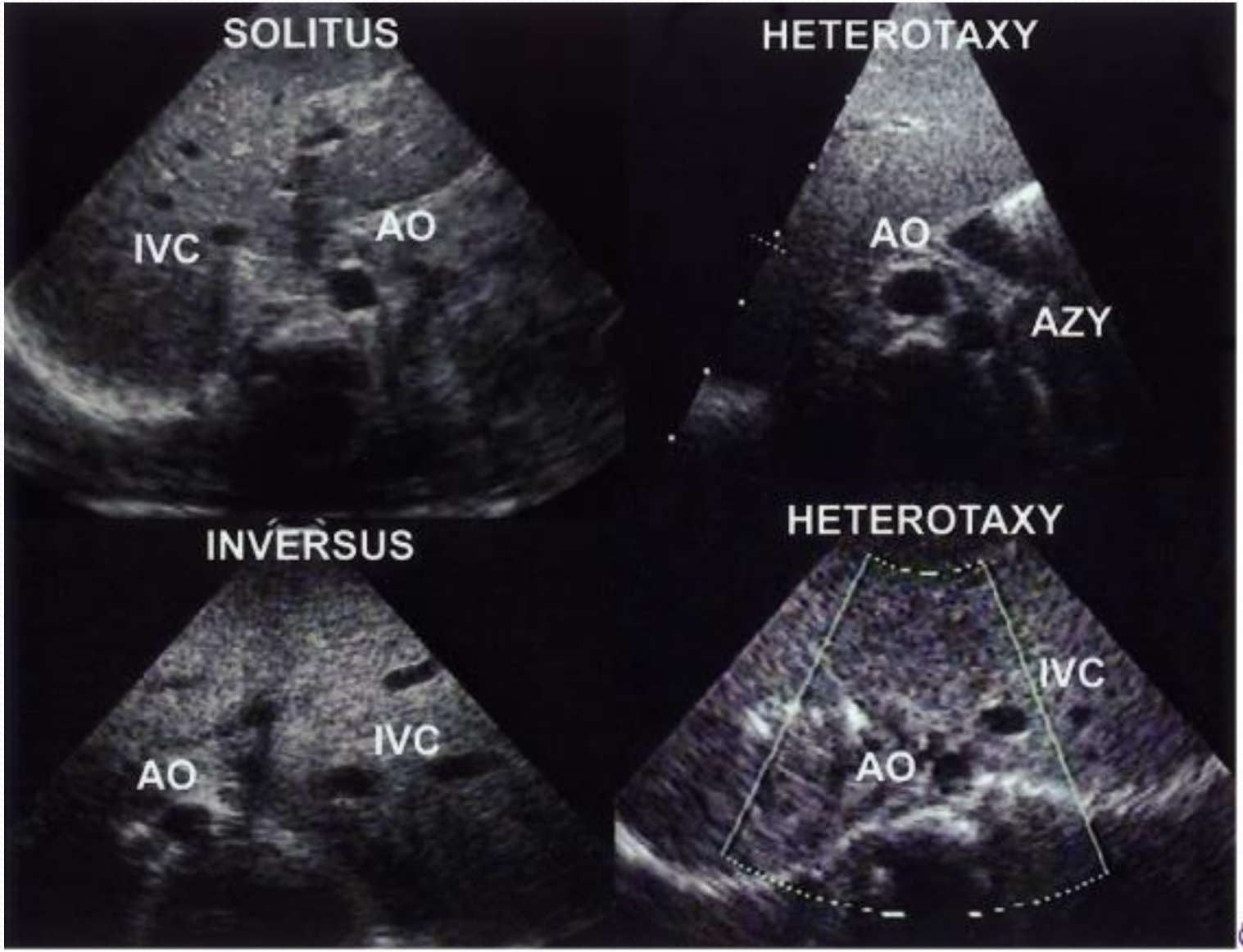


- Usually associated with situs inversus

Subcostal view







Thank you