Cardiac Board-type Case Review

What's the DDX?

Cyanotic newborn

Cyanosis With Decreased Vascularity

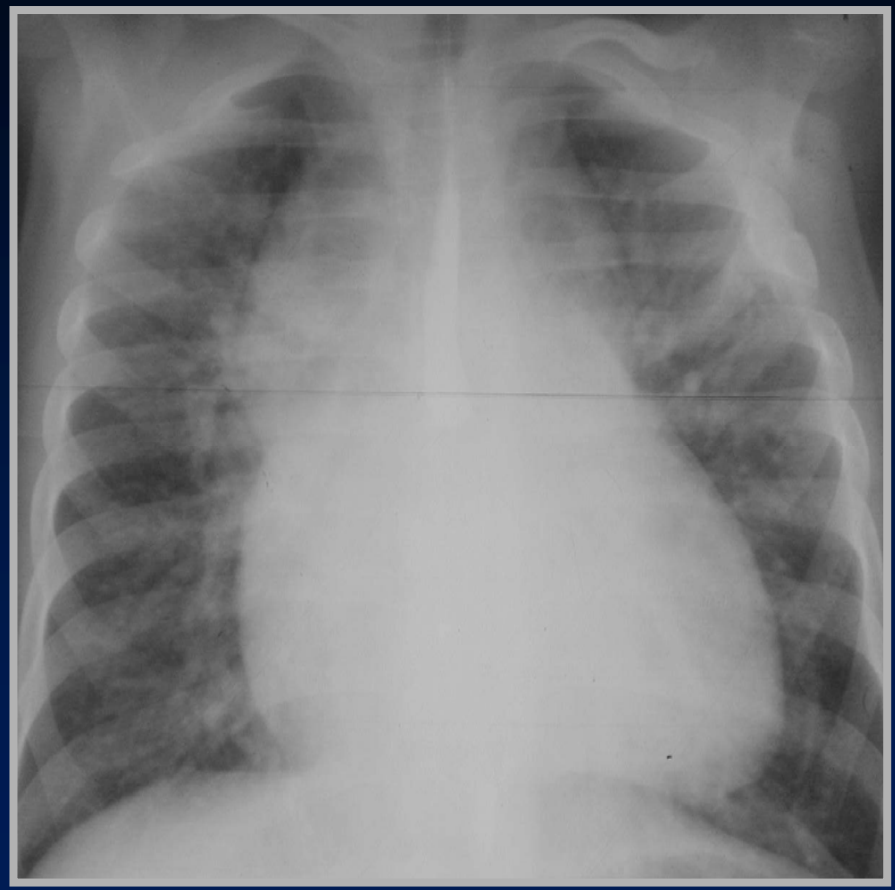
- Tetralogy
- Truncus-type IV
- Tricuspid atresia*
- Transposition*
- Ebstein's

* Also appears on DDx of cyanosis with increased vascularity

What's the diagnosis?

Ebstein's Anomaly

What's the DDX?



8 year-old cyanotic male

Cyanosis With Increased Vascularity

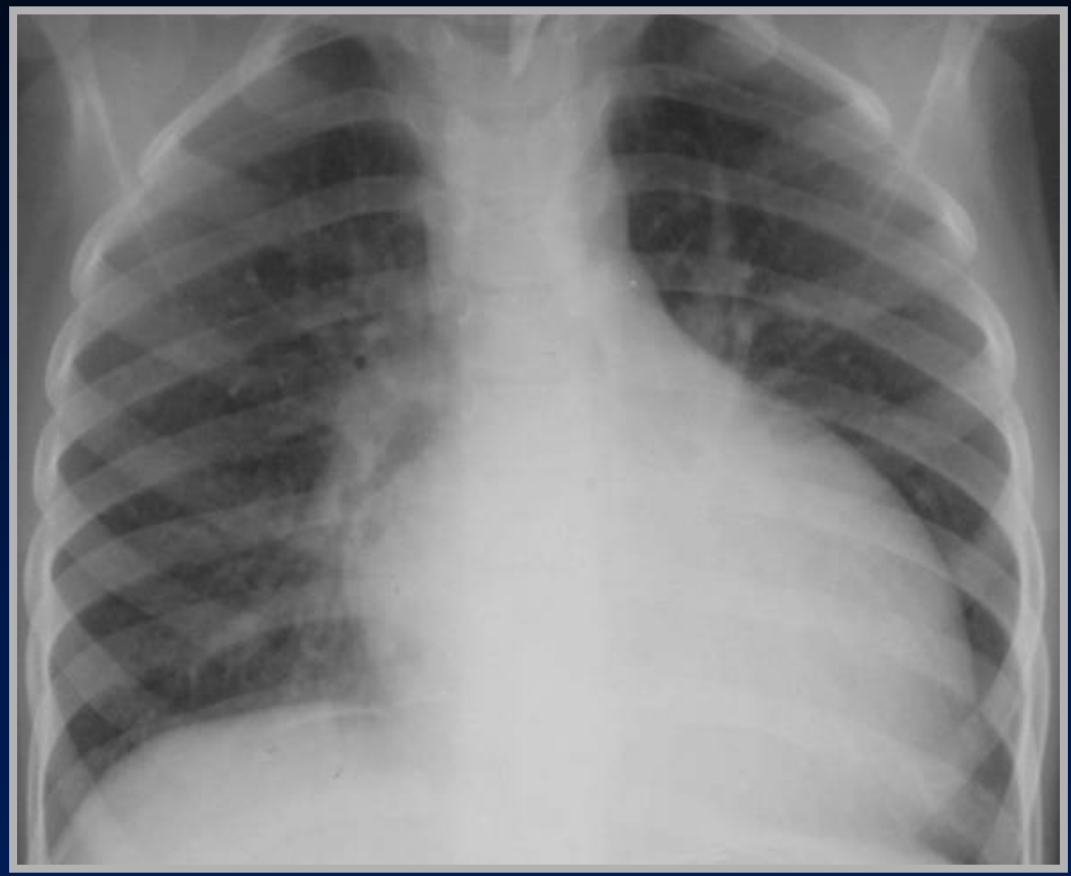
- Truncus types I, II, III
- TAPVR
- Tricuspid atresia*
- Transposition*
- Single ventricle

* Also appears on DDx of cyanosis with decreased vascularity

What's the diagnosis?

TAPVR-Supracardiac type 1

What's the DDX?

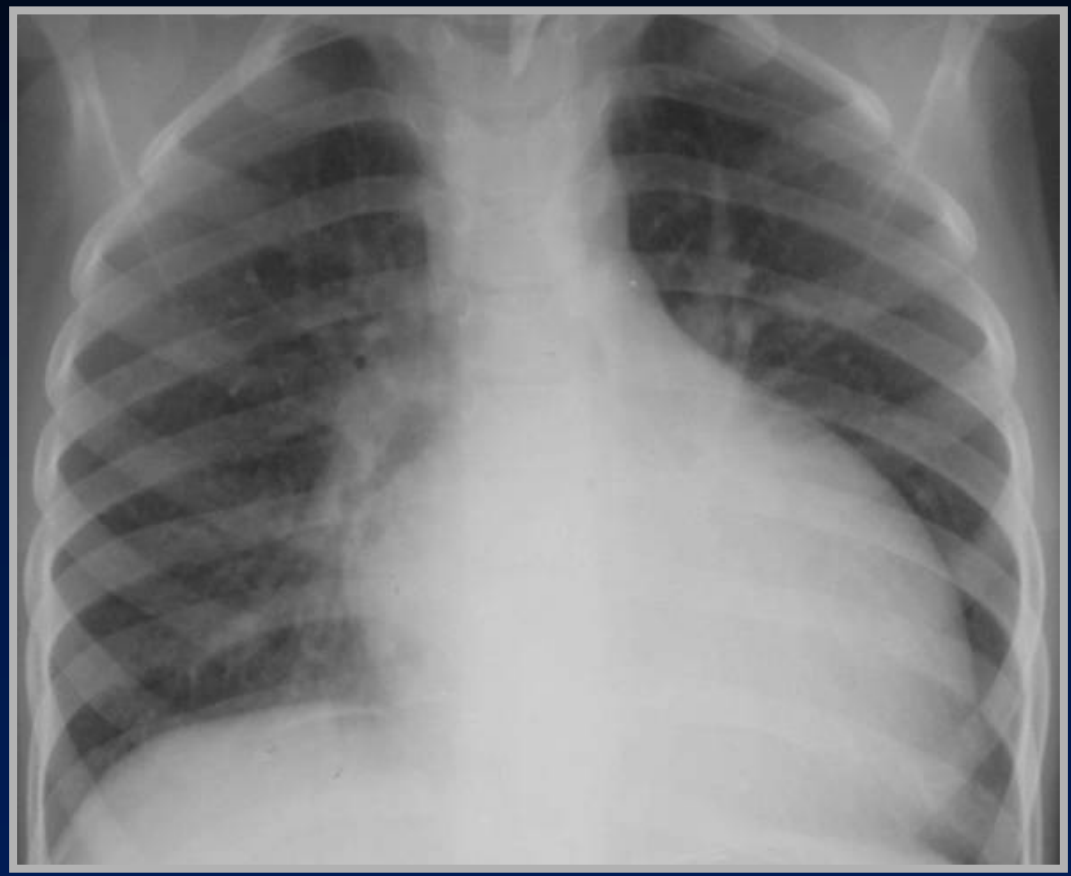


Acyanotic newborn

Cardiomegaly with Normal Vasculature

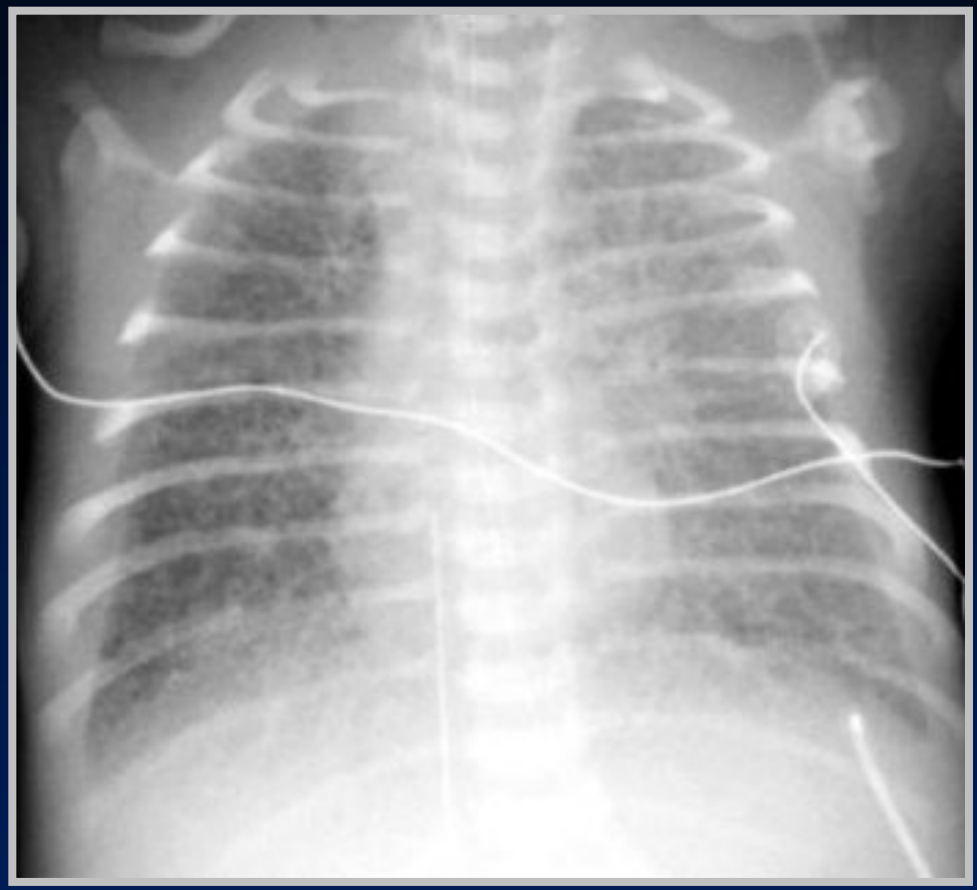
- Viral myocarditis
- Endocardial fibroelastosis
- Aberrant left coronary artery
- Cystic medial necrosis
- Diabetic mother

What's the diagnosis?



Viral myocarditis

What's the DDX?



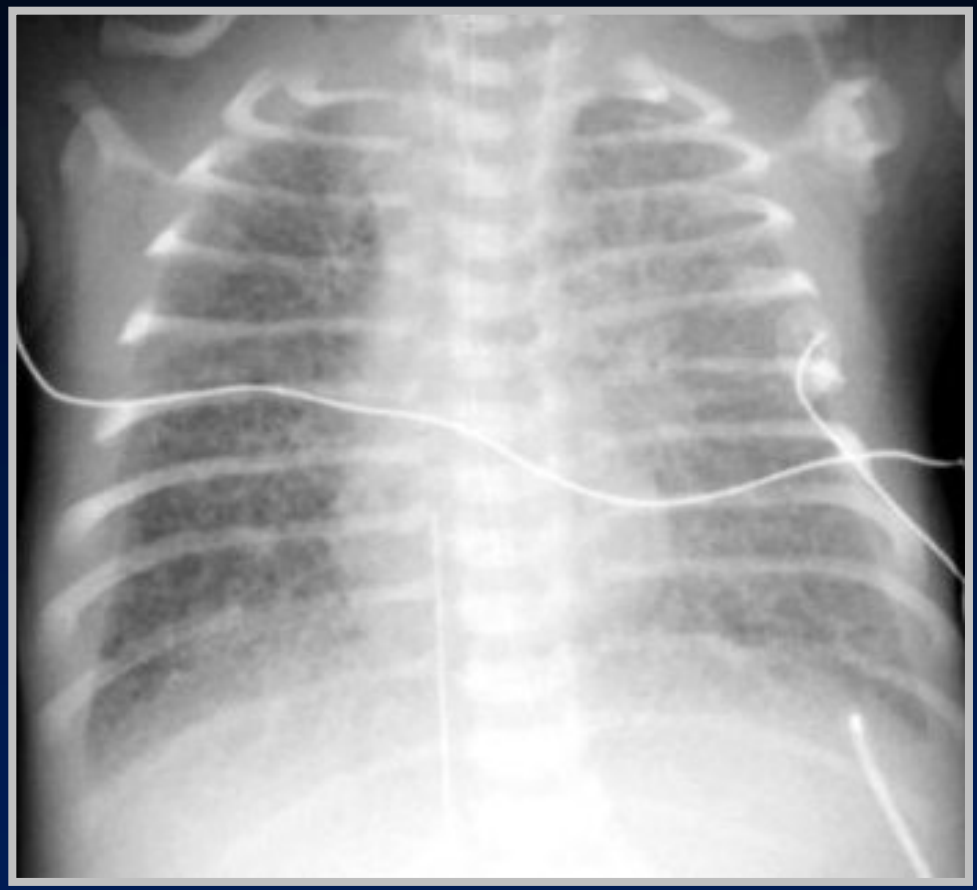
Acyanotic newborn

Causes of CHF In Newborn

Impede Return of Flow to Left Heart

- Infantile coarctation
- Congenital aortic stenosis
- Hypoplastic left heart syndrome
- Congenital mitral stenosis
- Cor triatriatum
- Obstruction to venous return from lungs
  - TAPVR from below diaphragm

What's the diagnosis?



Hypoplastic Left Heart Syndrome

What's the diagnosis?

7 yo acyanotic female

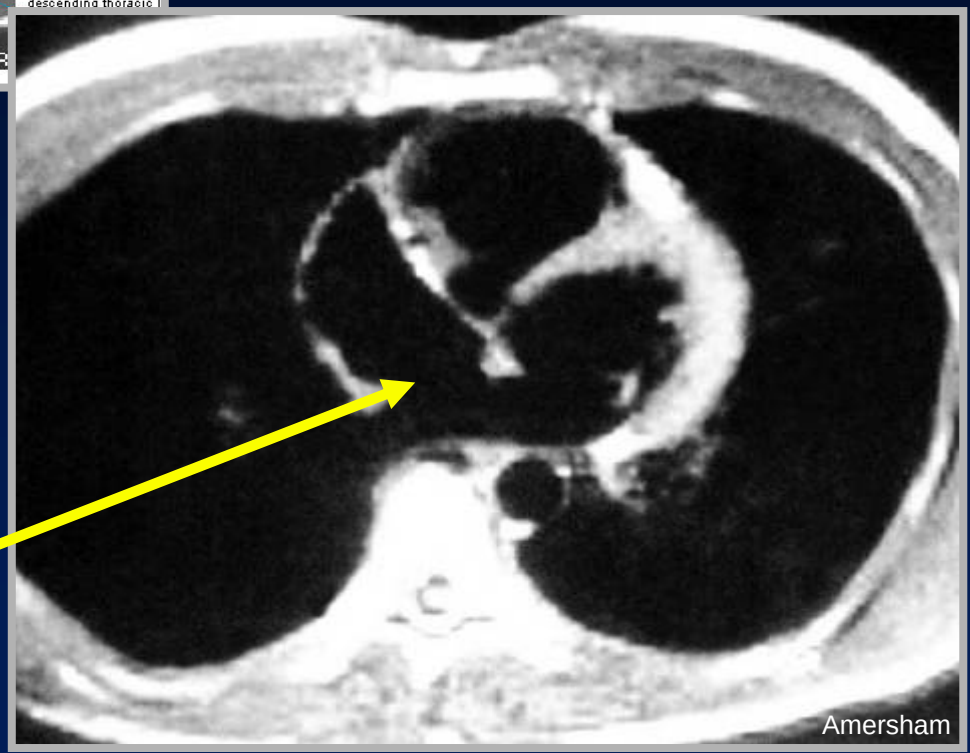
Atrial septal defect

Another example

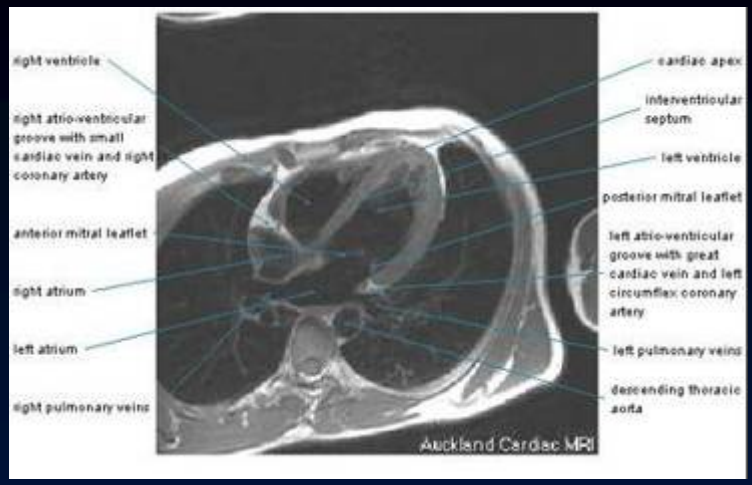
34 yo acyanotic female

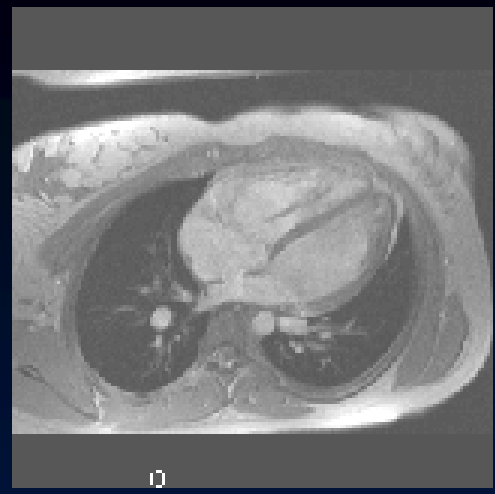
ASD (primum) with PAH

34 yo acyanotic female



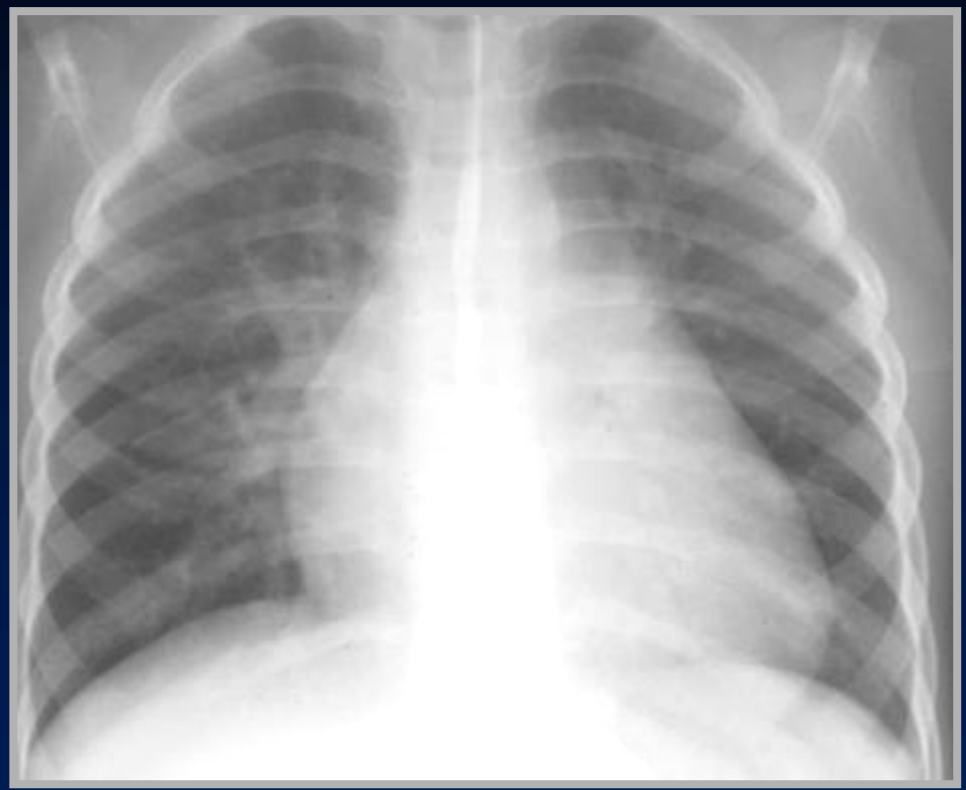
Ostium Secundum ASD-MRI





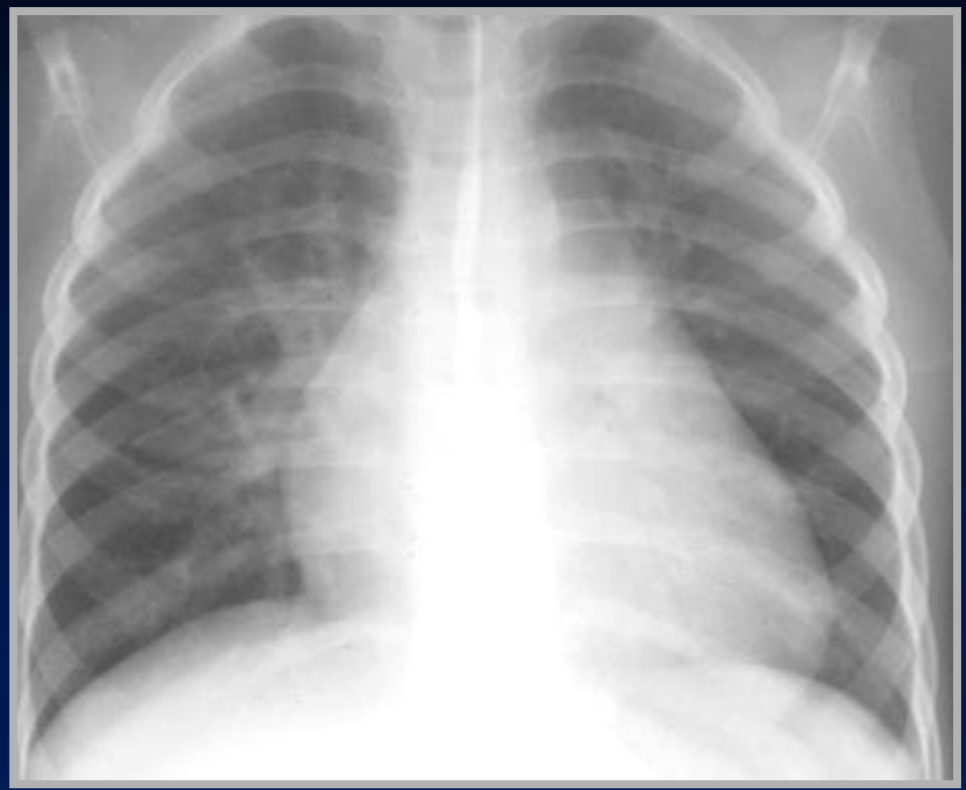
- **Discontinuity in the atrial septum with systolic signal void consistent with L to R shunt at atrial level**
- **Right atrium is slightly dilated; RV, LV and LA size are normal**

What's the diagnosis?

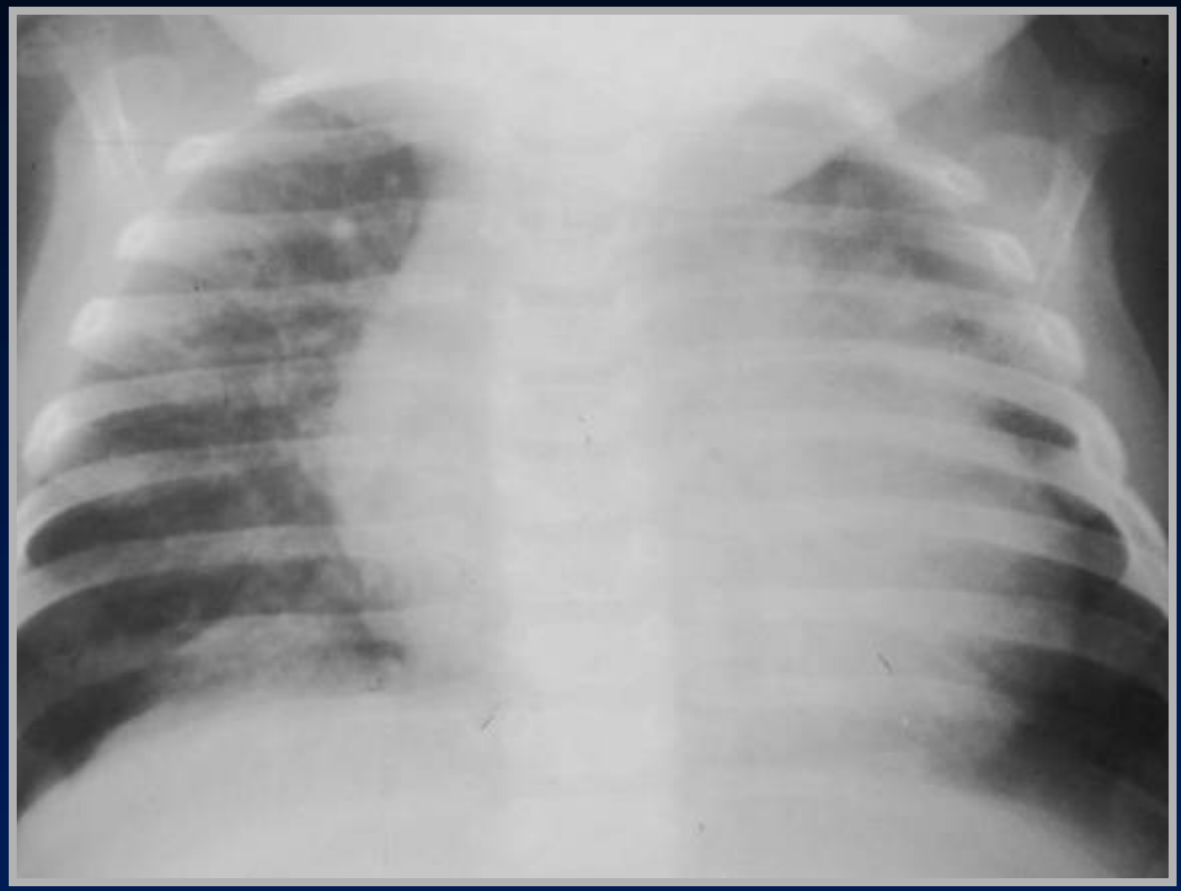


1 yo acyanotic female

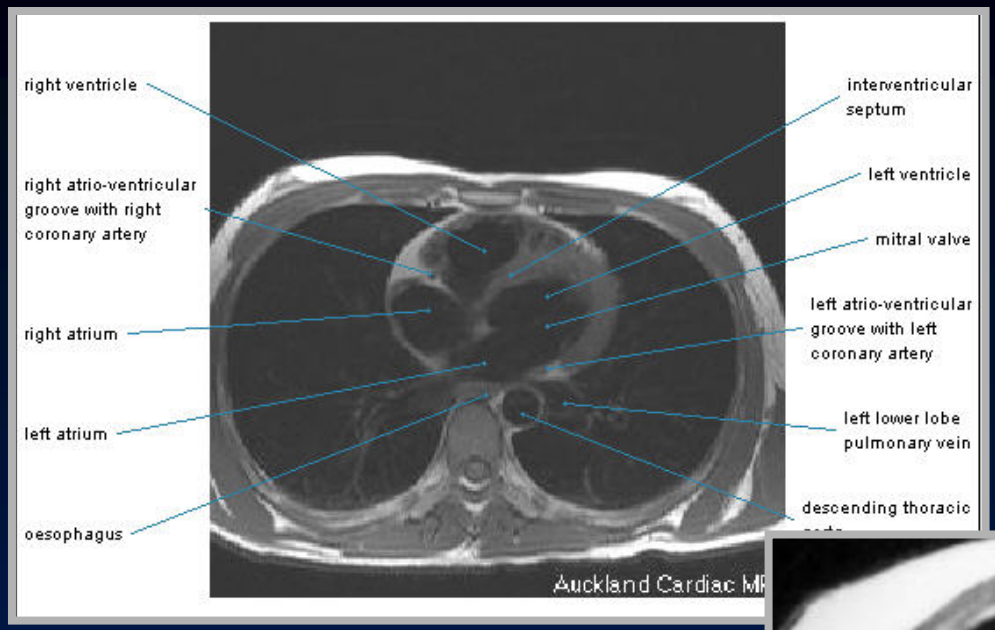
Ventricular Septal Defect

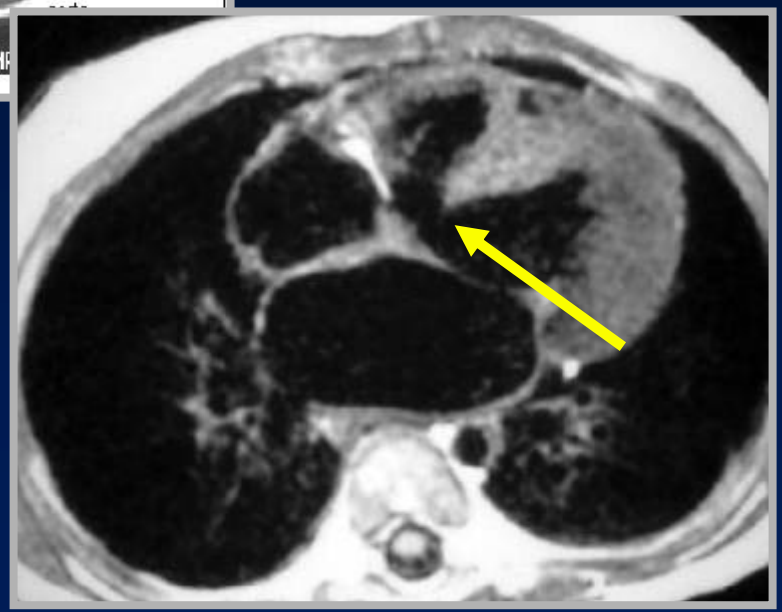


Another example-VSD



VSD





Membranous VSD-MRI

Amersham

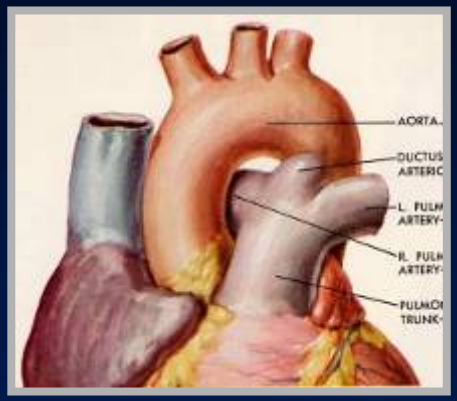
What's the diagnosis?

8 mos old acyanotic female

Patent Ductus Arteriosus

Patent Ductus Arteriosus-MRI

- **Jet of signal loss showing continuous flow from the aorta to the MPA consistent with sizeable PDA; MPA is severely dilated at level of PDA**



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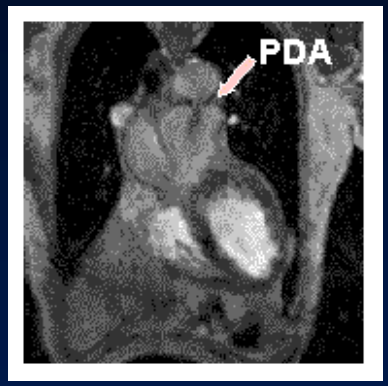
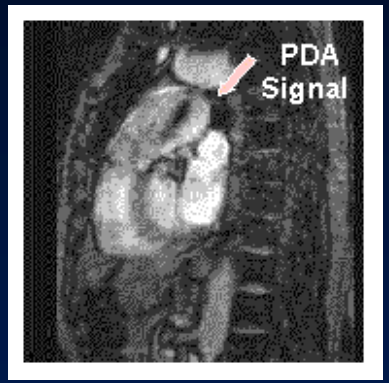
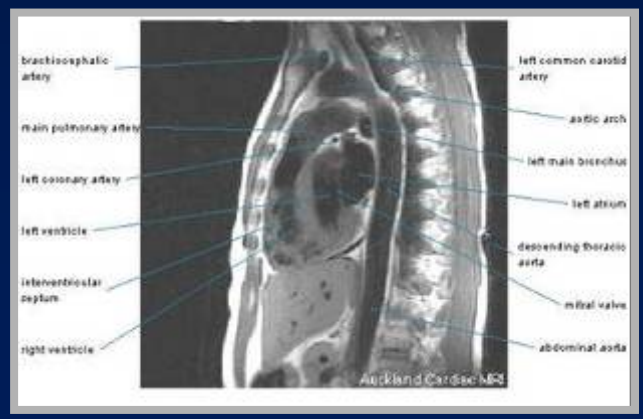
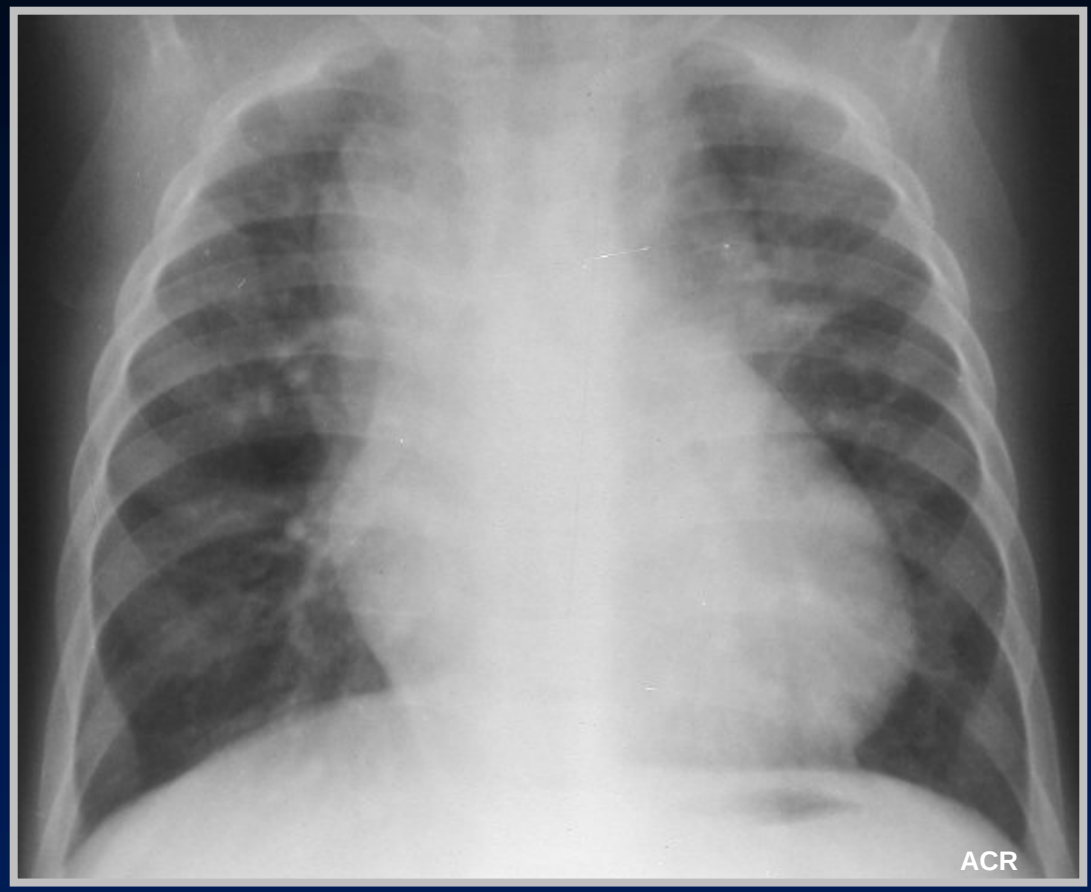




SCVMR

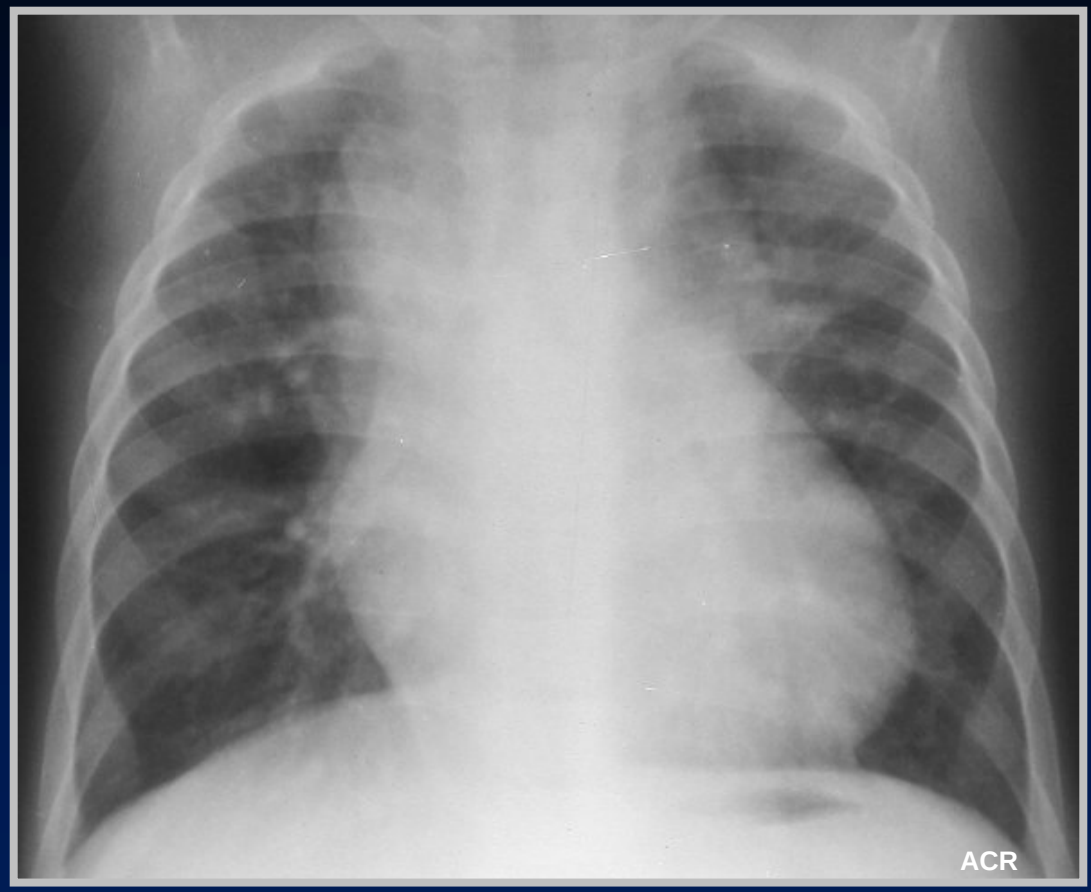


What's the diagnosis?

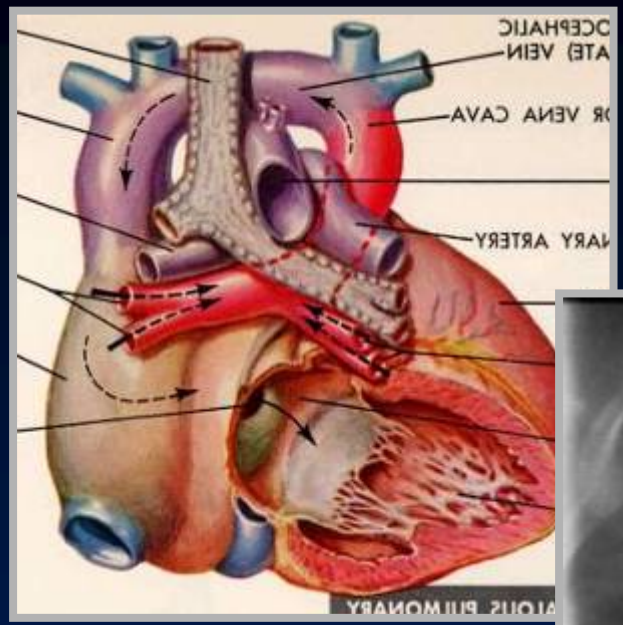


9 mos old cyanotic female

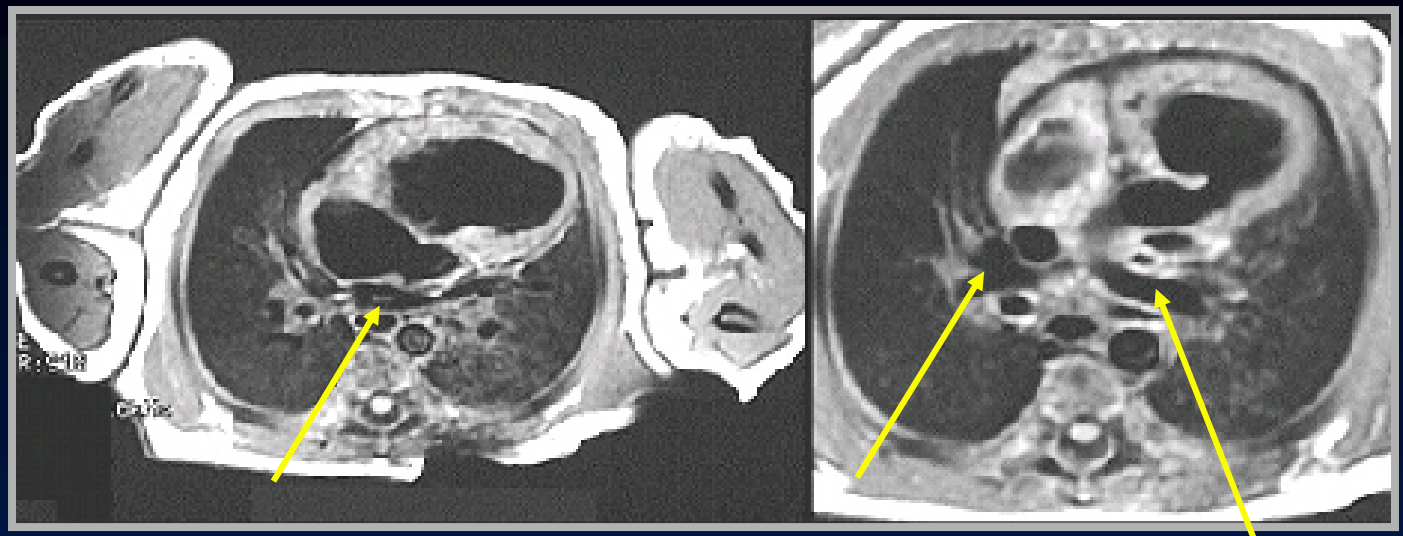
TAPVR-supracardiac type

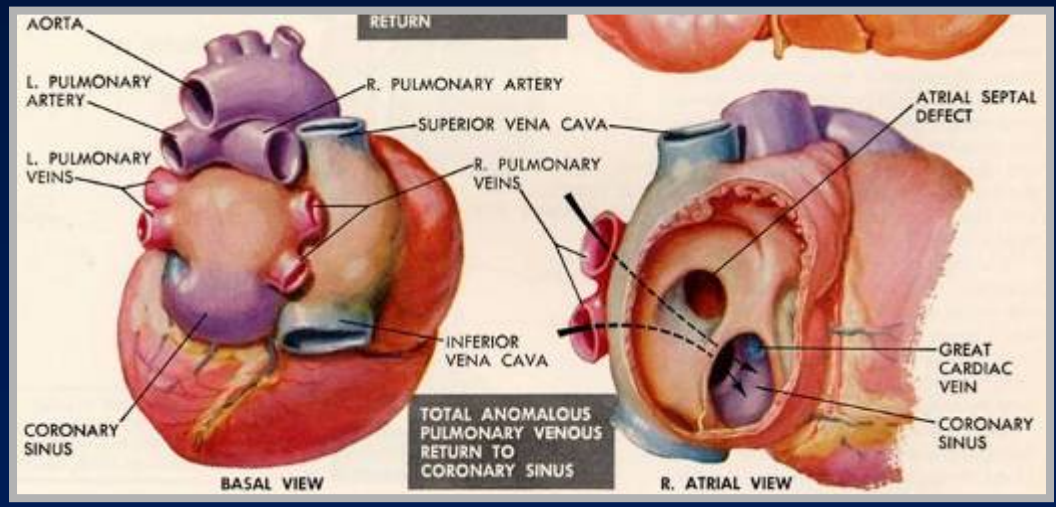


TAPVR
Supracardiac Type 1

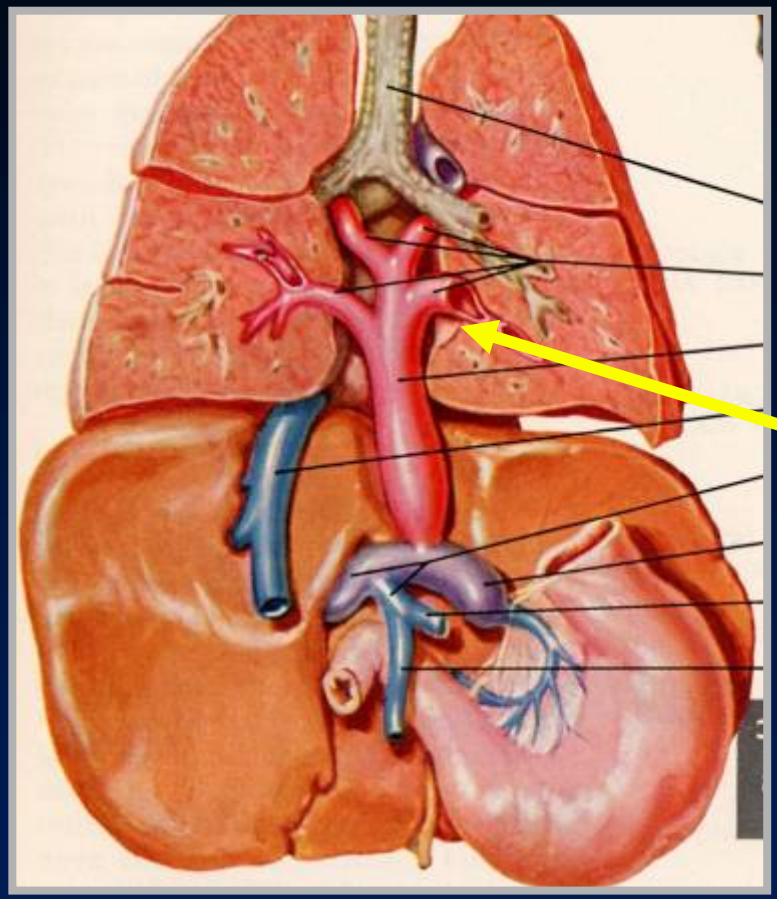


Angiographic Appearance





TAPVR-cardiac type-MRI



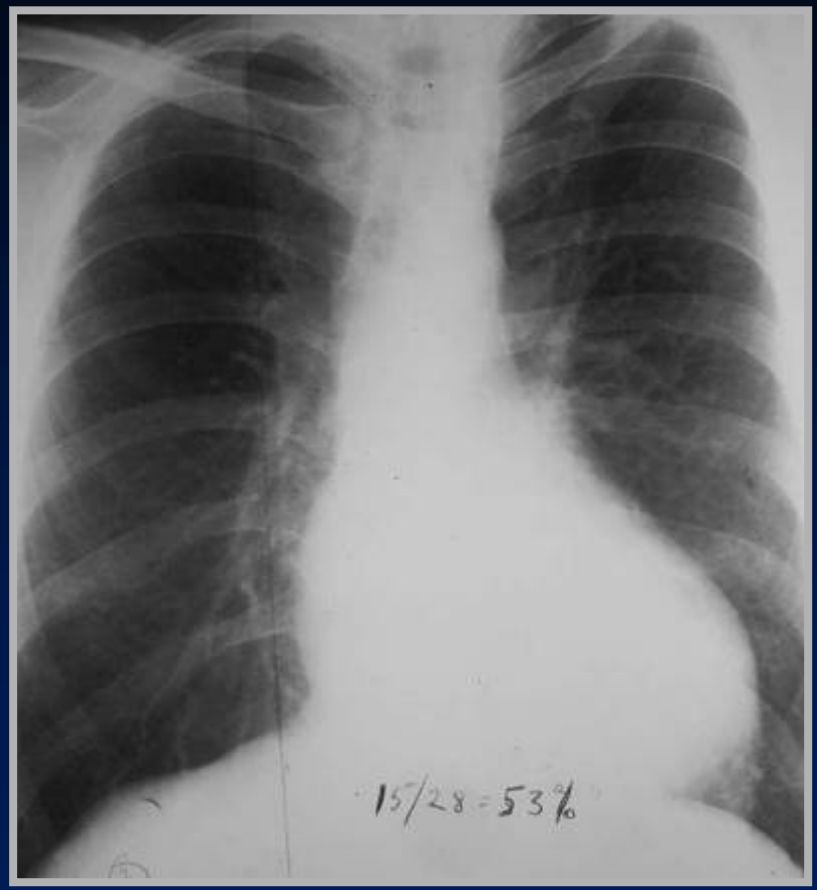
TAPVR-infracardiac type-MRI

What's the diagnosis?

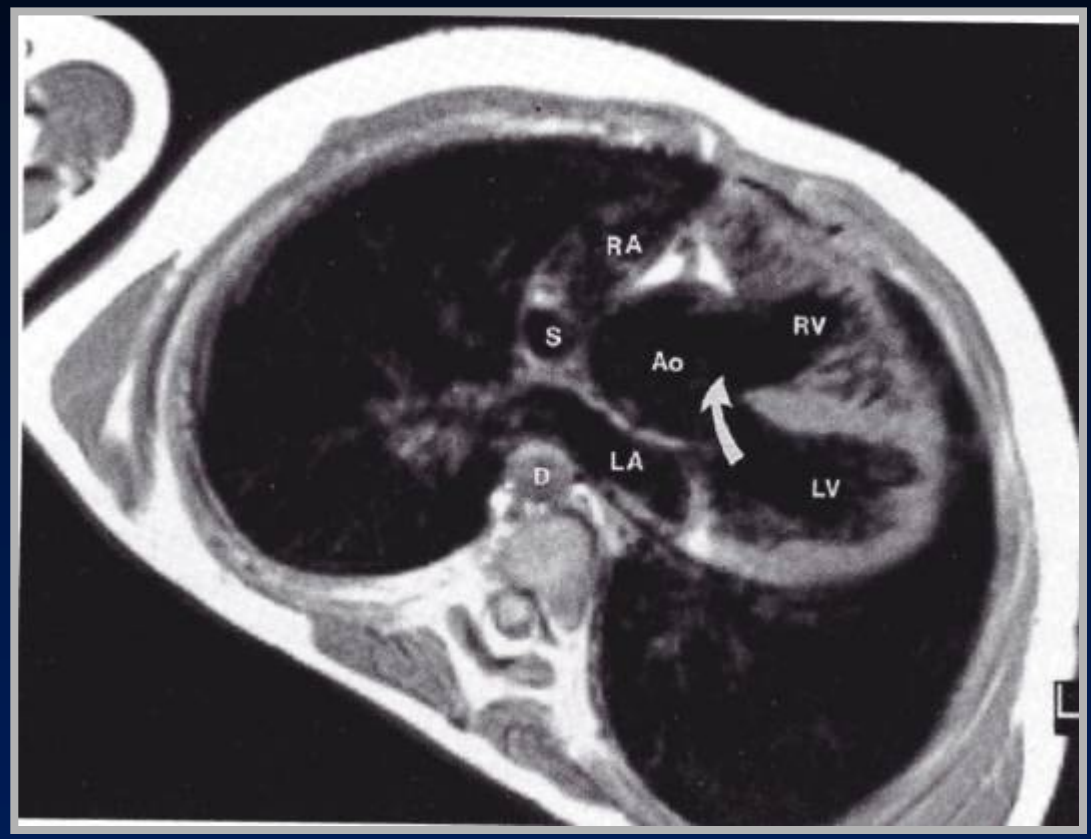
10 yo cyanotic male

Tetralogy of Fallot

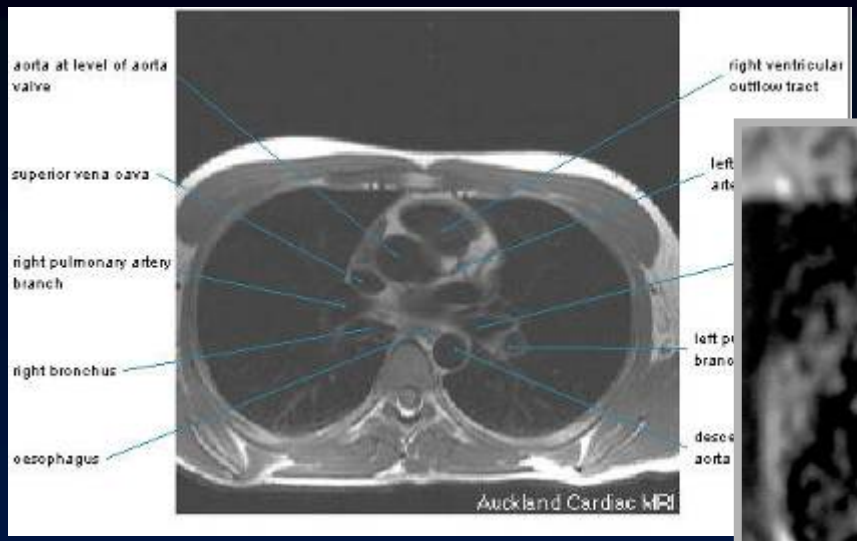
Other examples

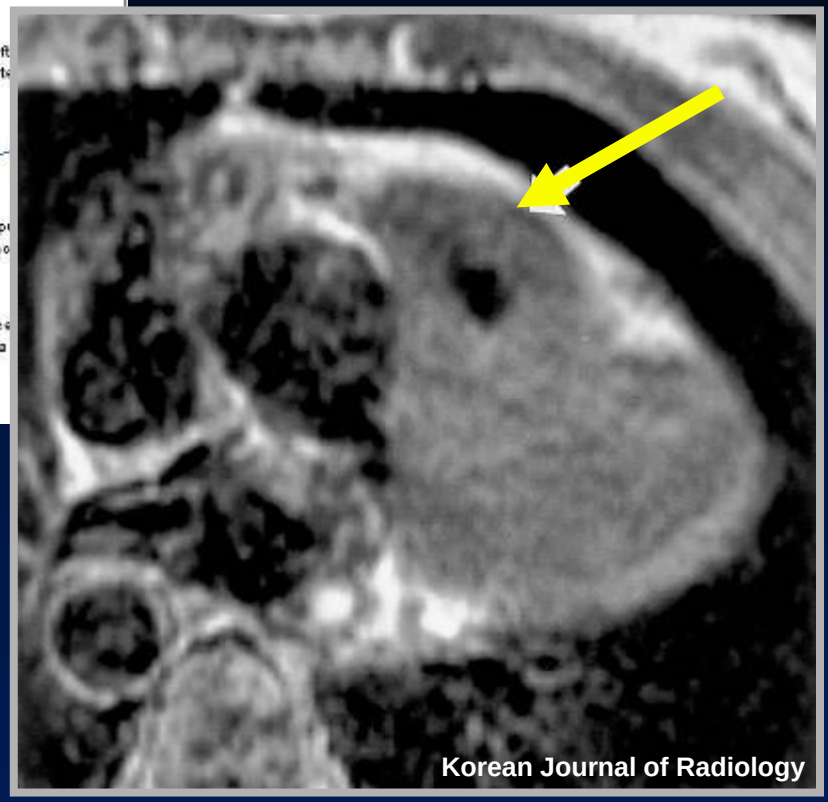


Tetralogy of Fallot



Tetralogy of Fallot-MRI
Overriding aorta, VSD

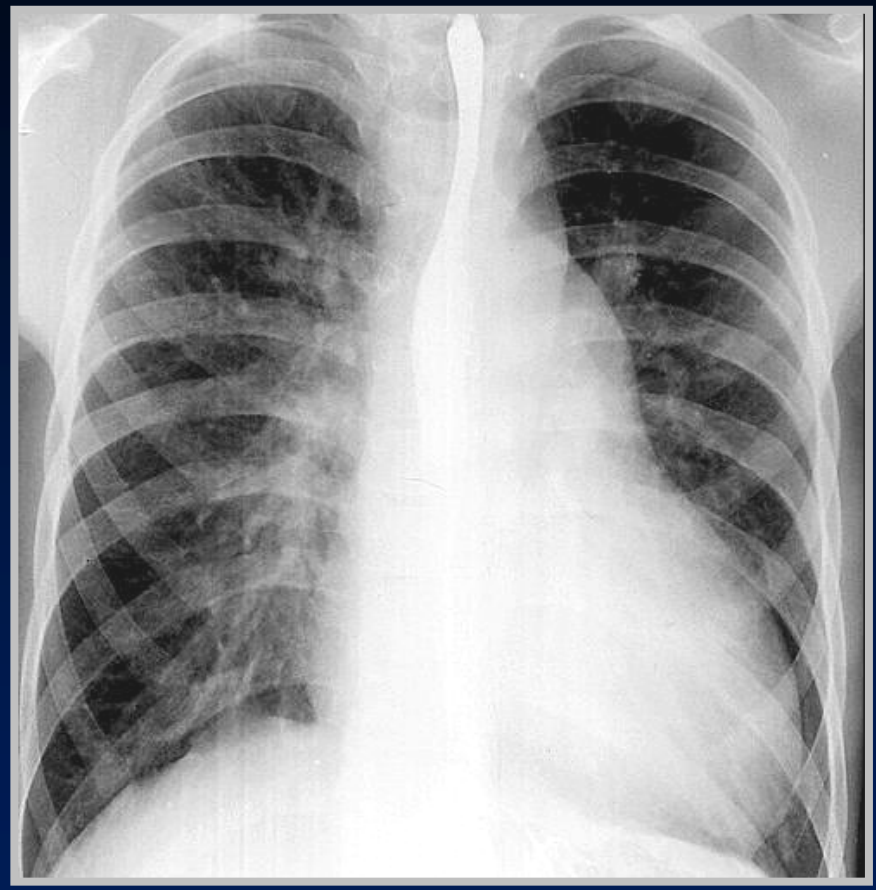




Axial spin-echo MR image shows severe infundibular pulmonic stenosis (arrow).

Tetralogy of Fallot

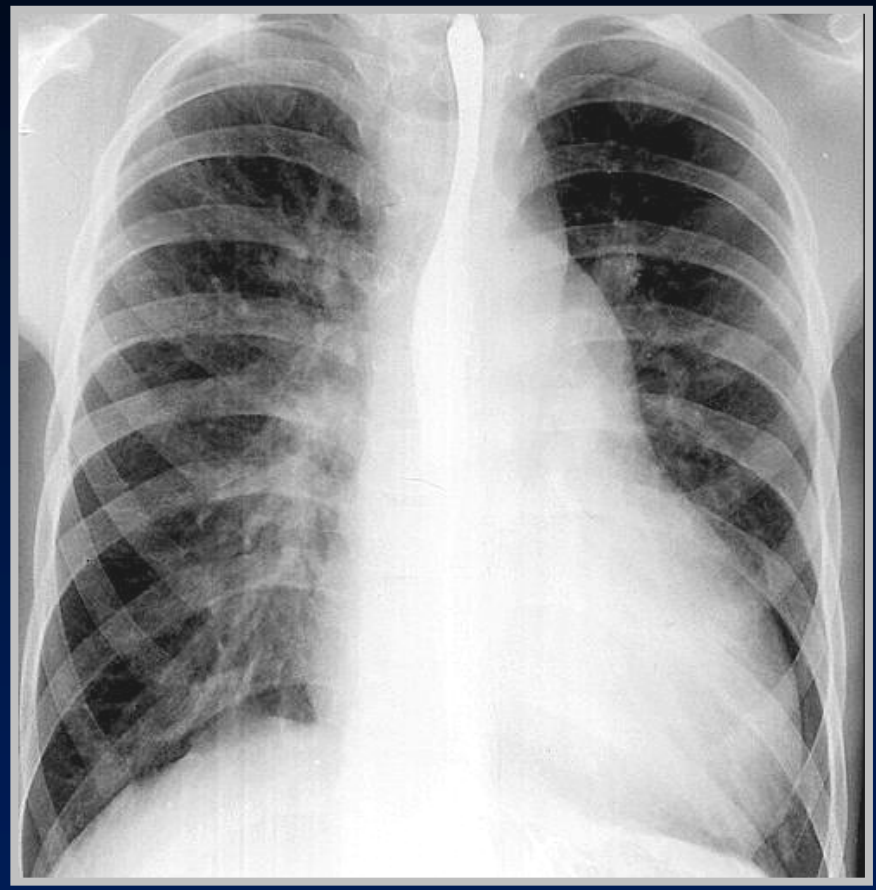
What's the diagnosis?



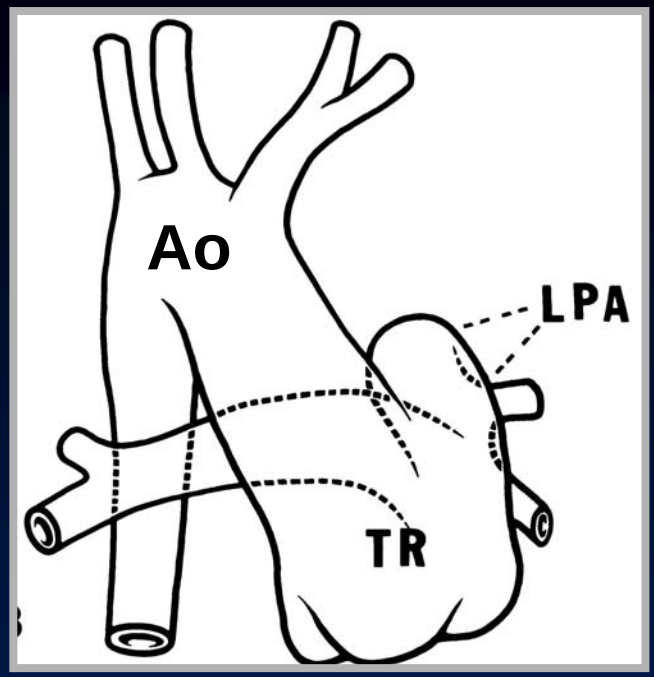
Radiology Resource and Review

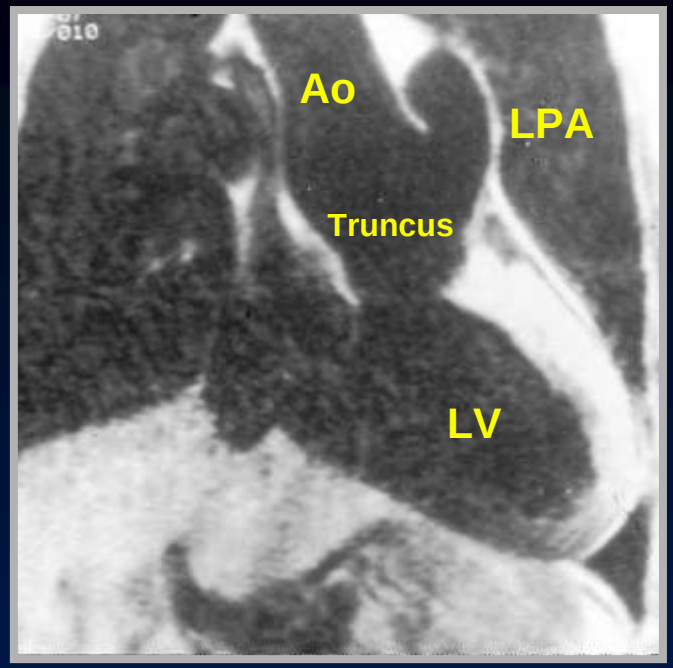
12 yo cyanotic male

Truncus arteriosus-Type 1

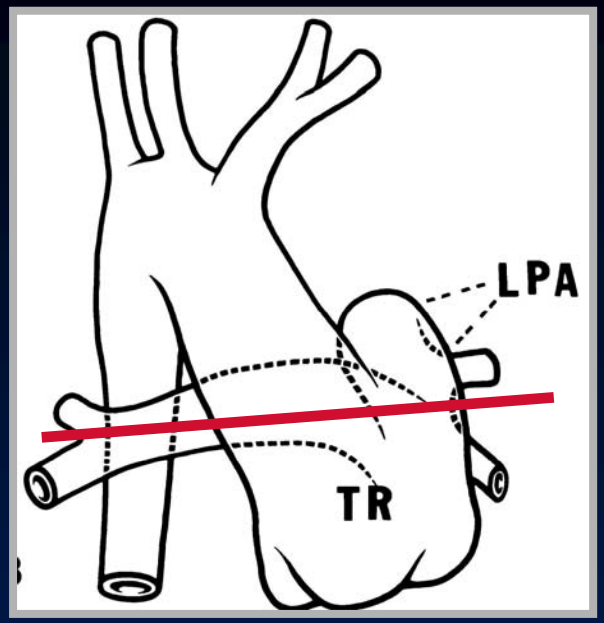


Radiology Resource and Review





Truncus Type 1



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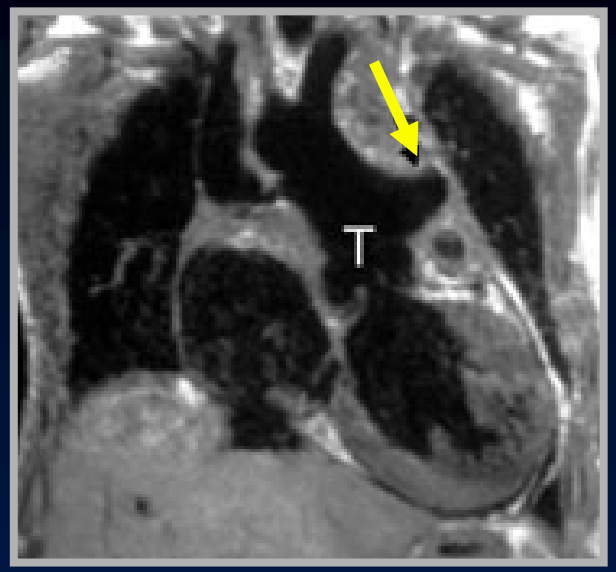
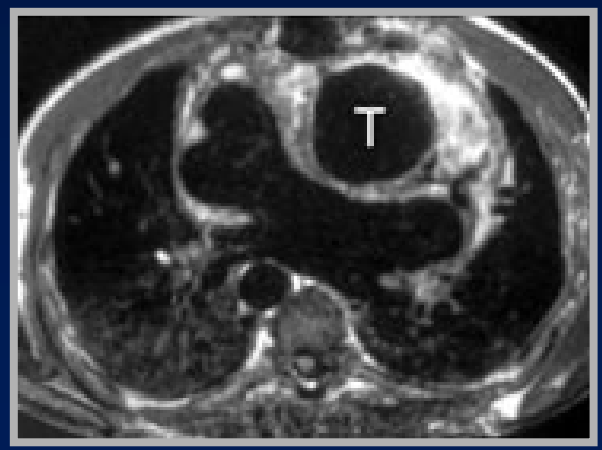


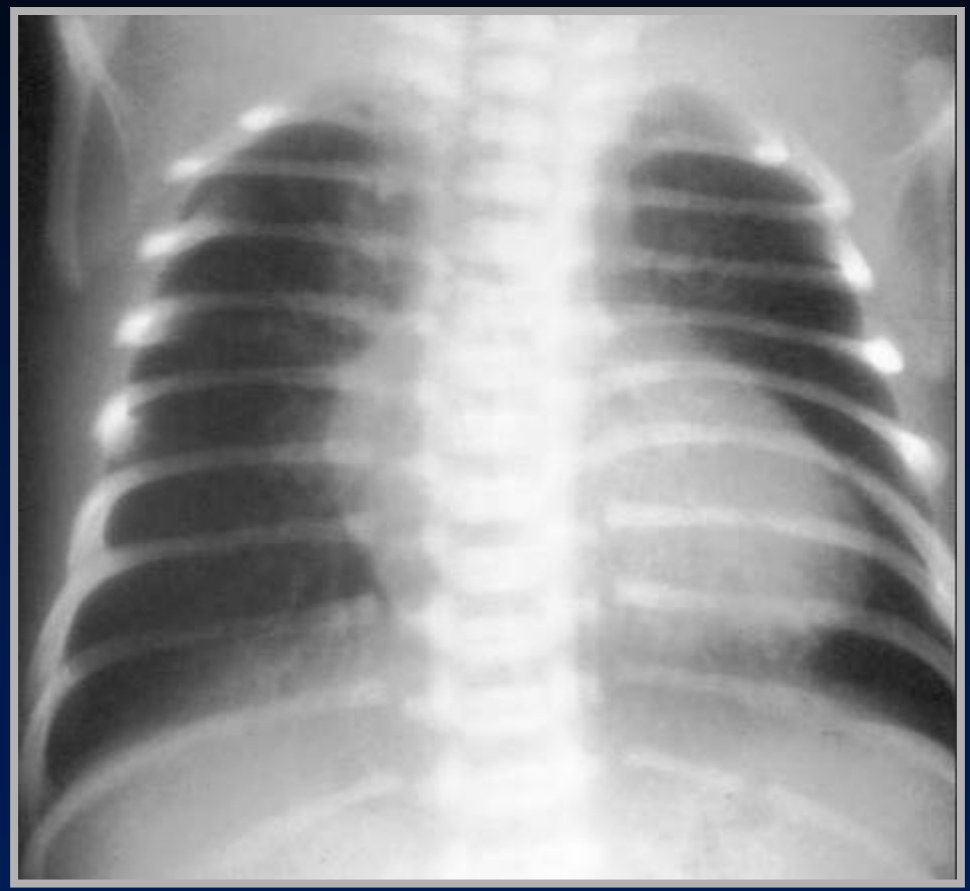
Single large artery (T) arising from the heart.
Pulmonary artery (arrow) originates from the left side of the truncus
There is a right aortic arch



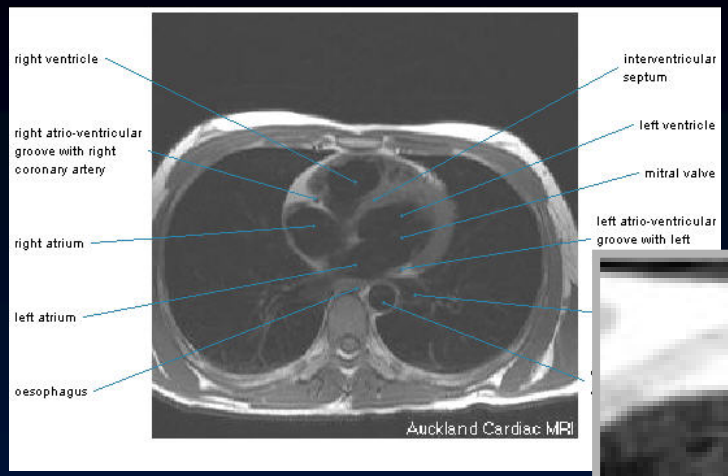
Amersham

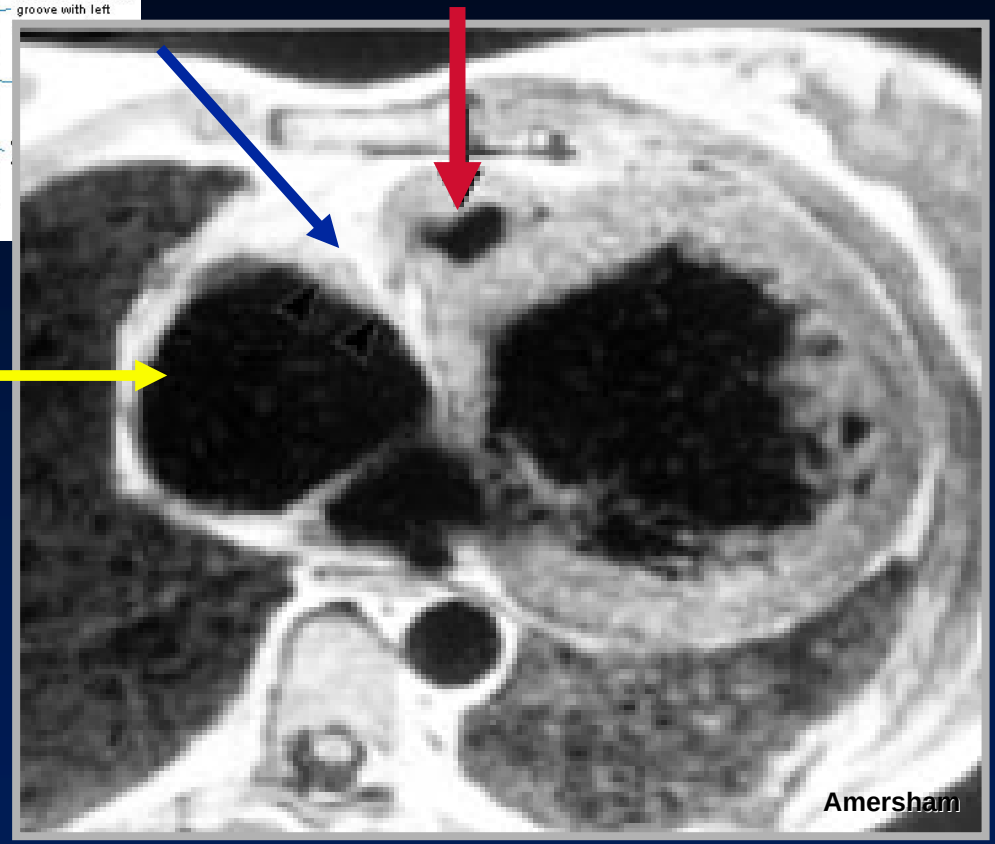
Truncus Arteriosus Type 1-MRI

Truncus Type II



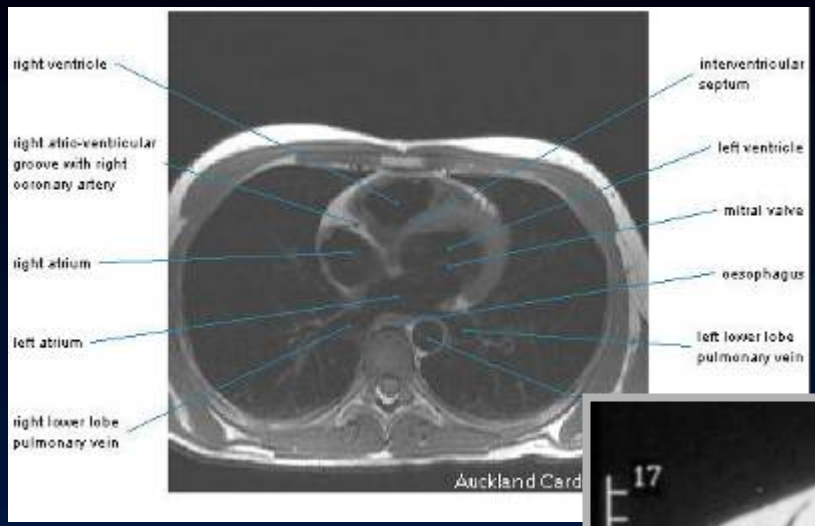
Truncus Type III





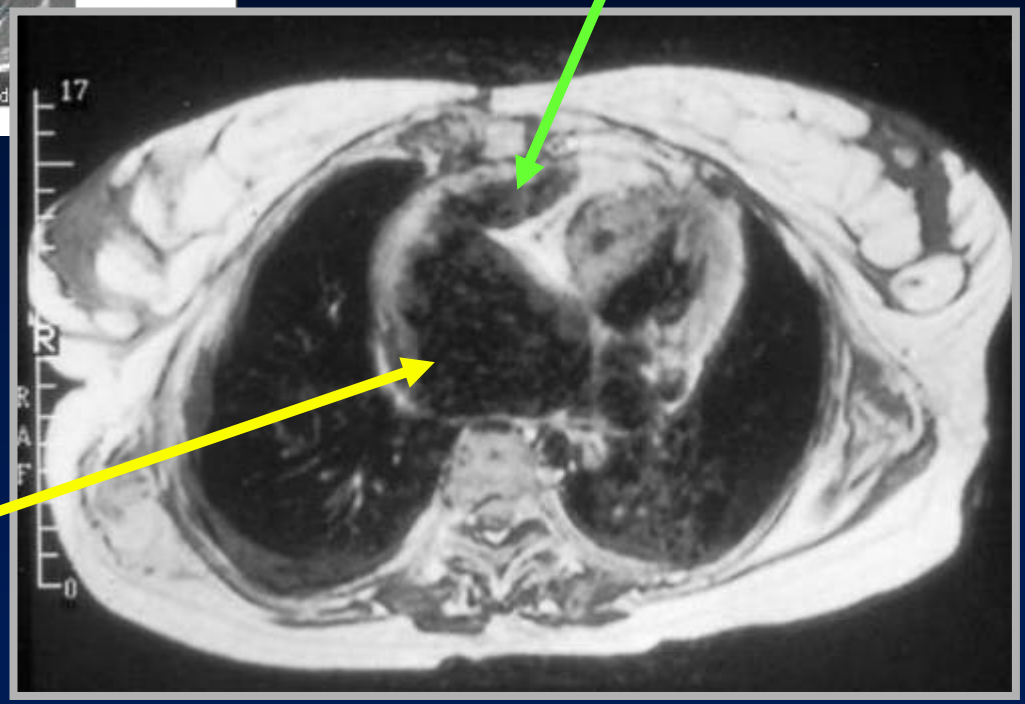
ECG-gated spin-echo transaxial image demonstrates a bar of muscle and fat (blue arrow) (tricuspid atresia) separating the right atrium (yellow arrow) from the hypoplastic right ventricle (red arrow)

Tricuspid atresia-MRI



Small right ventricle

Enlarged right atrium



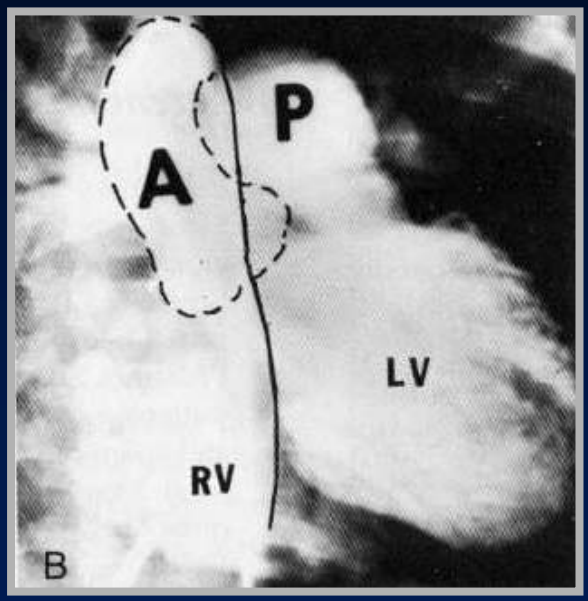
Tricuspid atresia-MRI

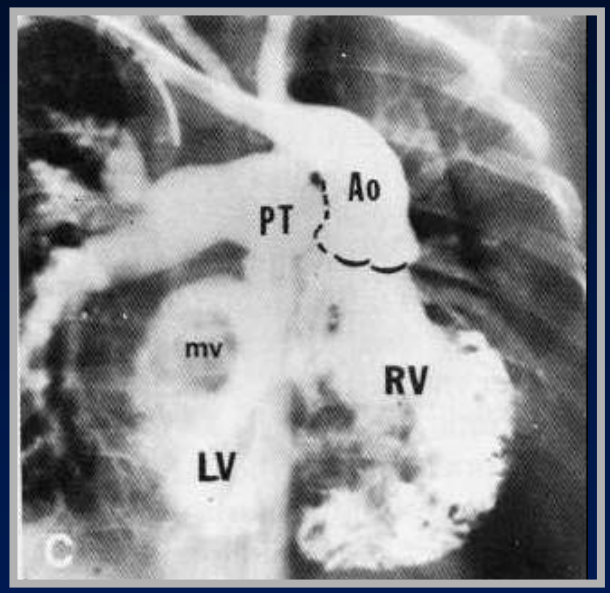
What's the diagnosis?

3 mos old cyanotic male

Transposition of the Great Vessels

In Transposition, pulmonic valve is





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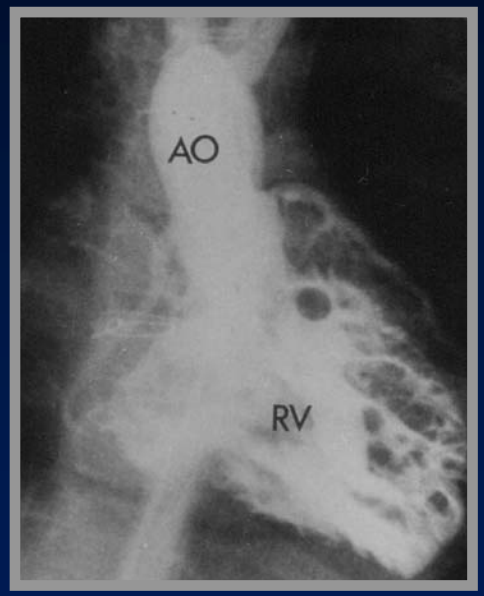
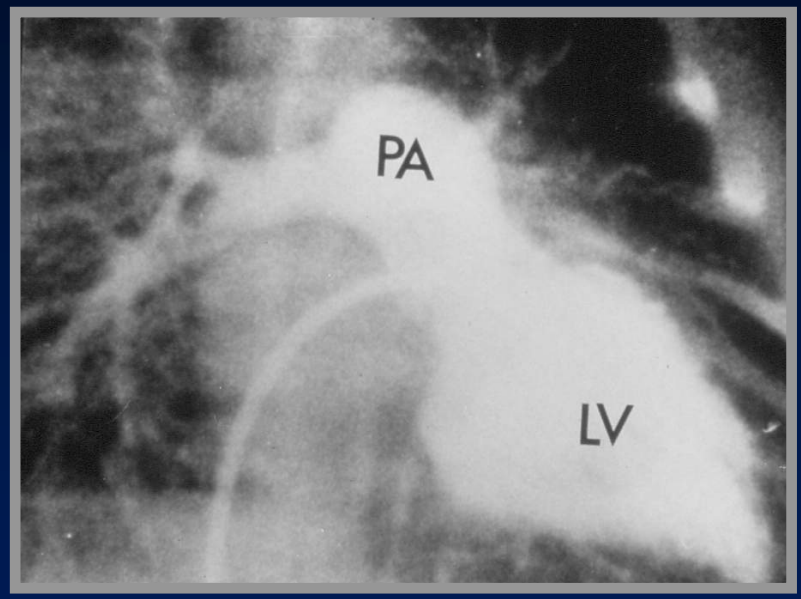
Normal

Corrected Transposition

- **Posterior**
- **Medial**
- **Inferior**
- **To the aortic valve**

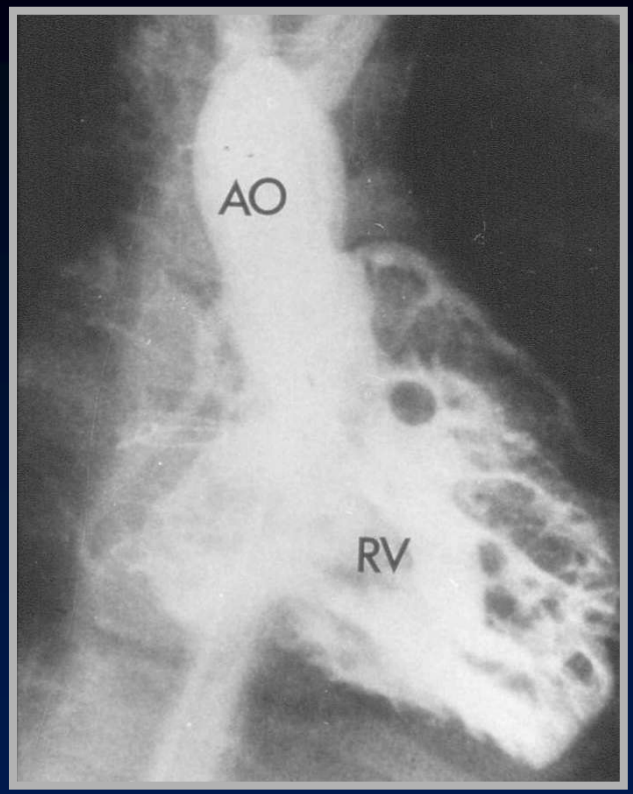
Anatomic Ventricles

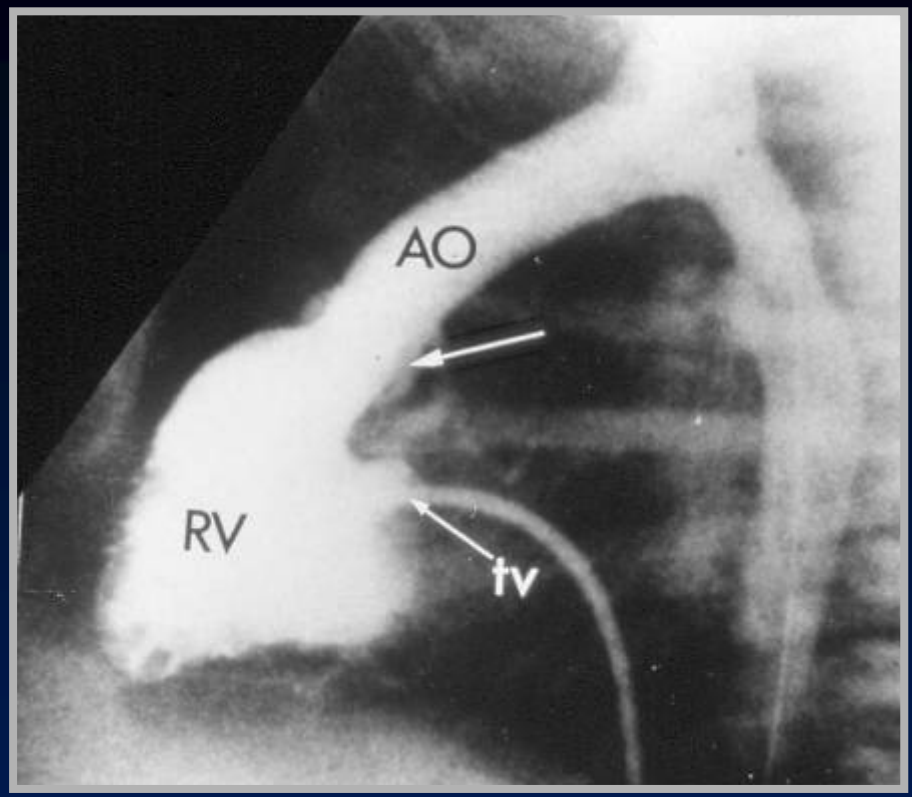




Trabeculated ventricle-Anatomic Right

Smooth ventricle-Anatomic Left





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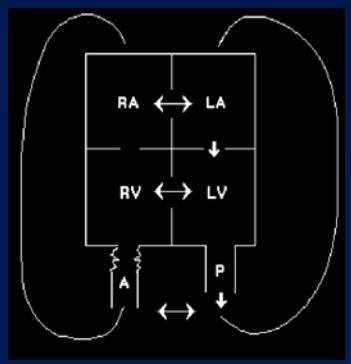
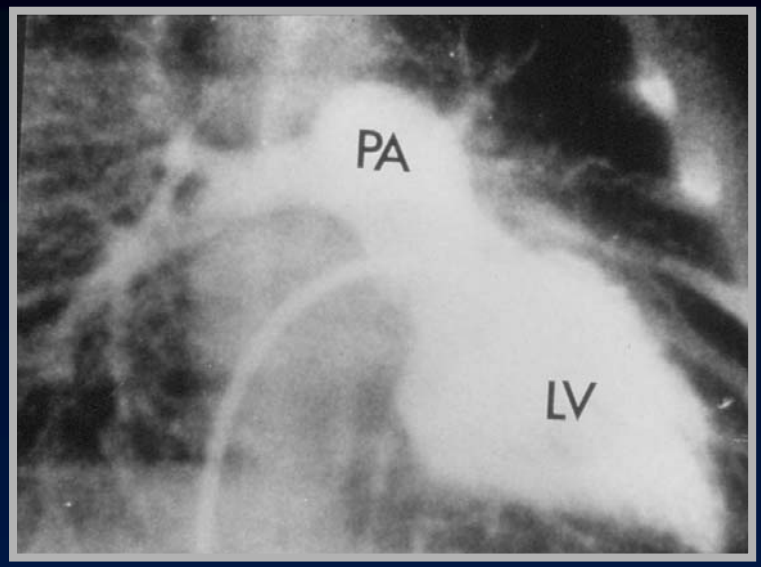
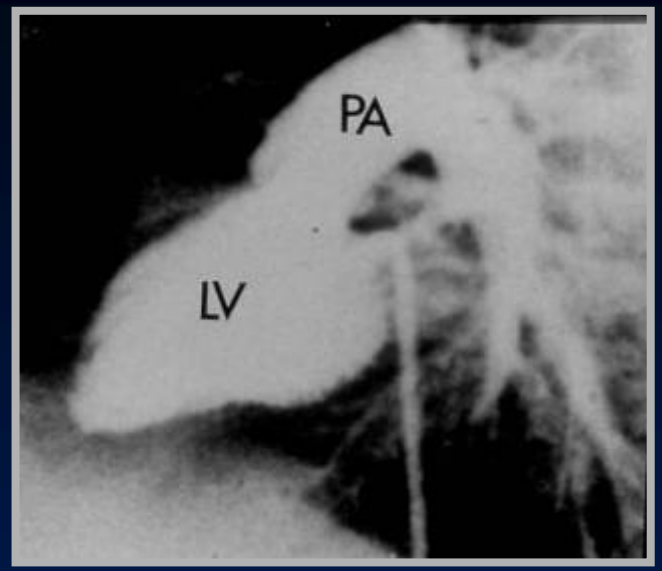


Transposition of the Great Vessels - RVgram





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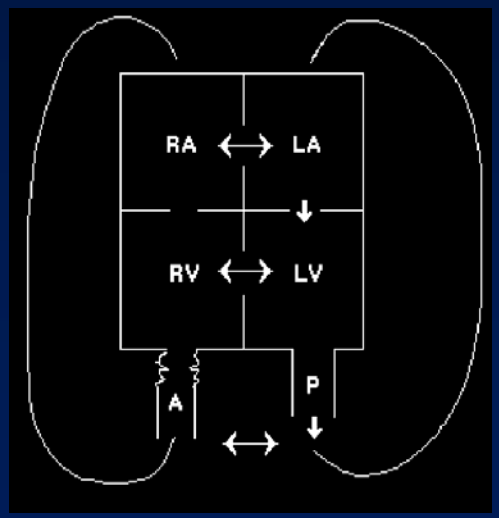
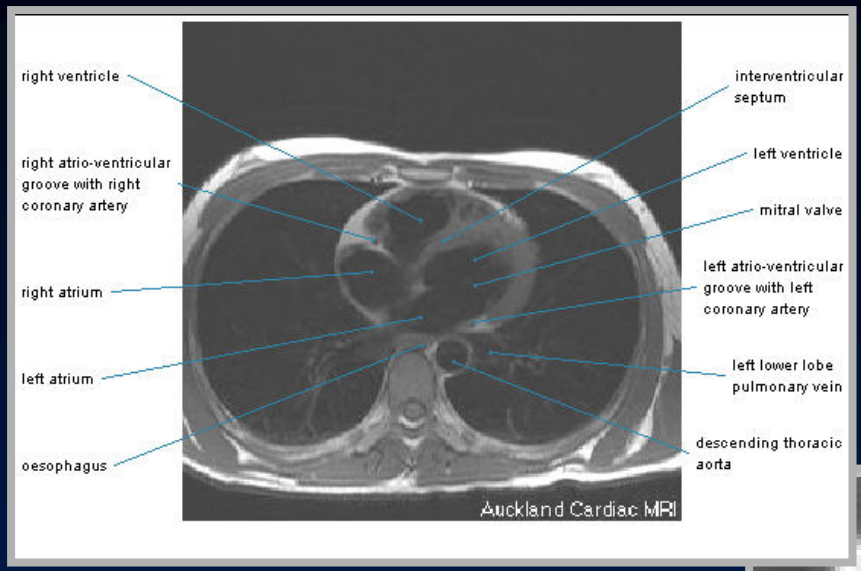


Transposition of the Great Vessels - LVgram



Oblique axial spin-echo image shows displaced attachment (thick arrow) of the posterior leaflet (thin arrows)

Korean Journal

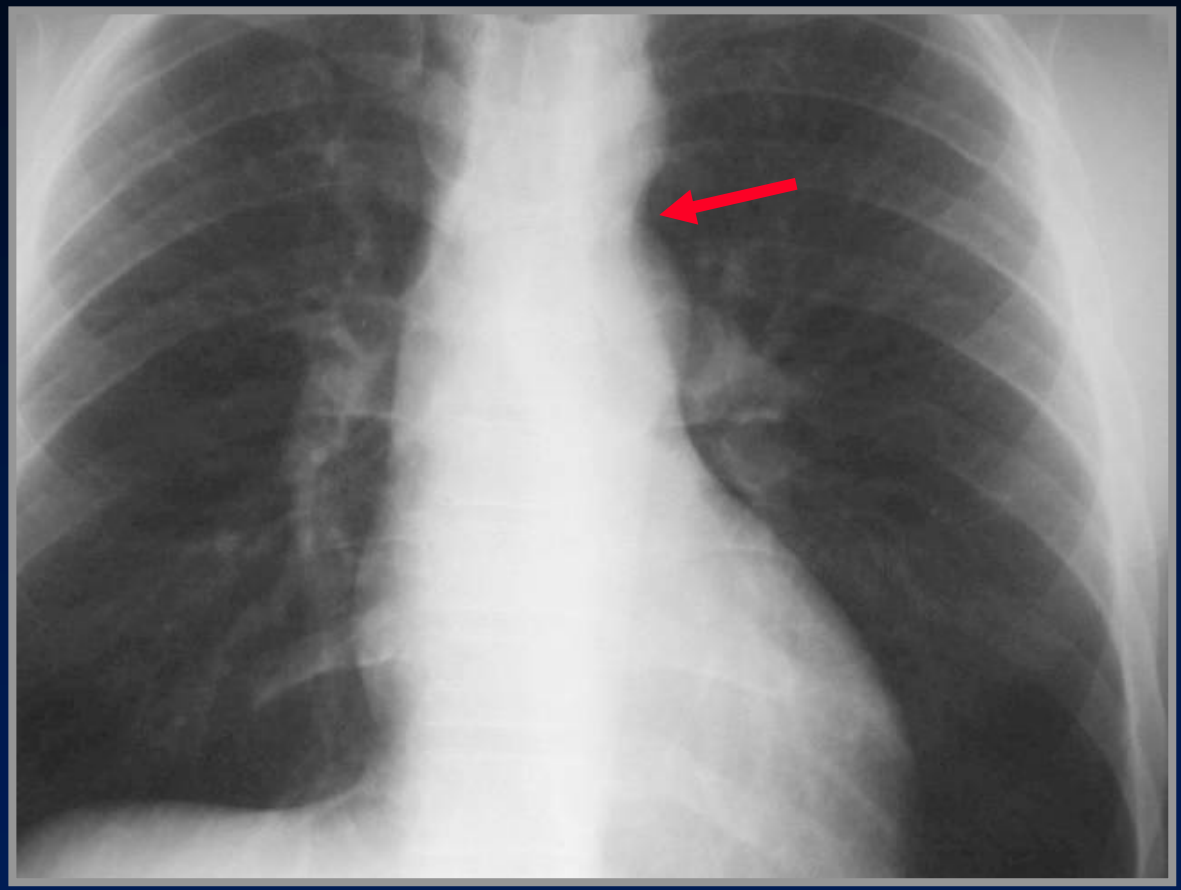
Ebstein's Anomaly

What's the diagnosis?

Acyanotic adult

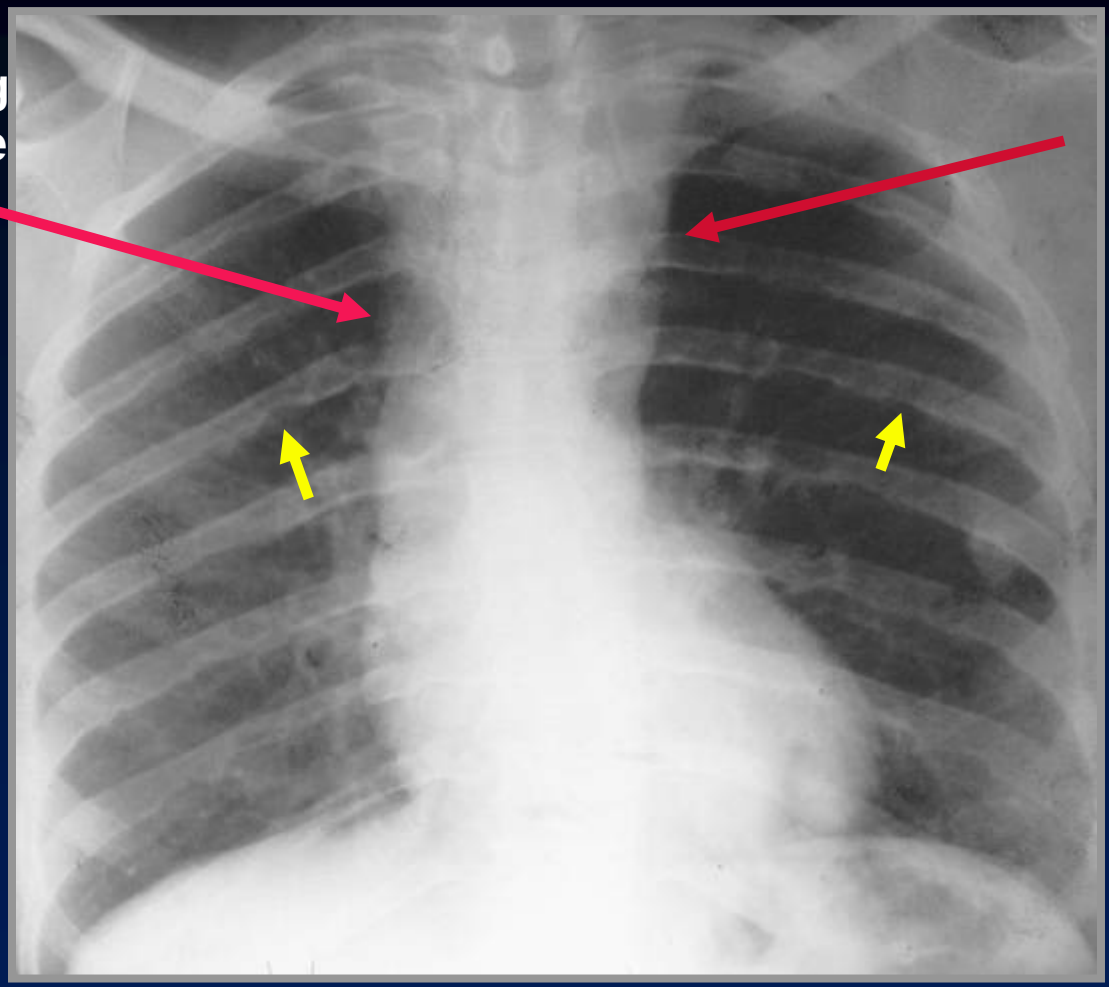
Coarctation of the aorta

Coarctation of the aorta



Arrow points to indentation representing area of coarctation with dilated aorta (or LSCA) above and post-stenotic dilatation below coarct

Ascending Ao may be dilated, normal or small

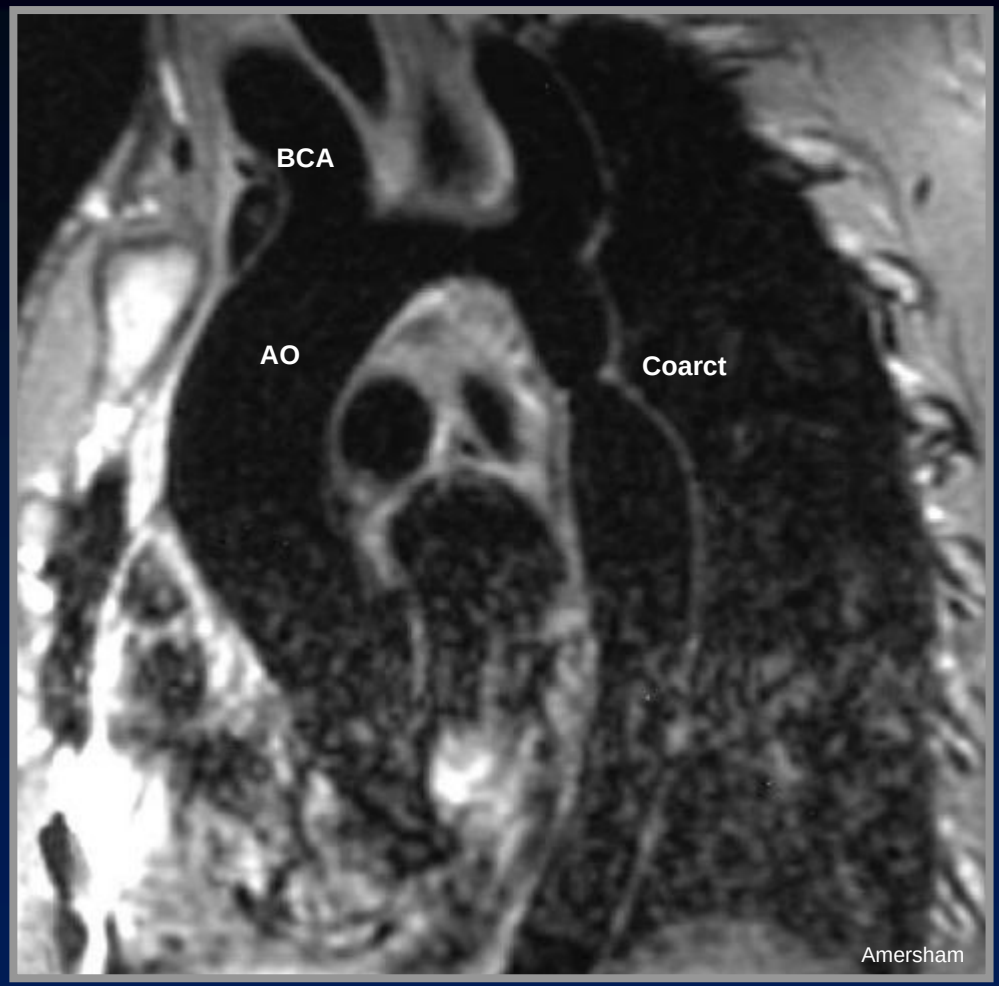


Convexity above aortic knob due to dilated LSCA or Aorta proximal to coarct

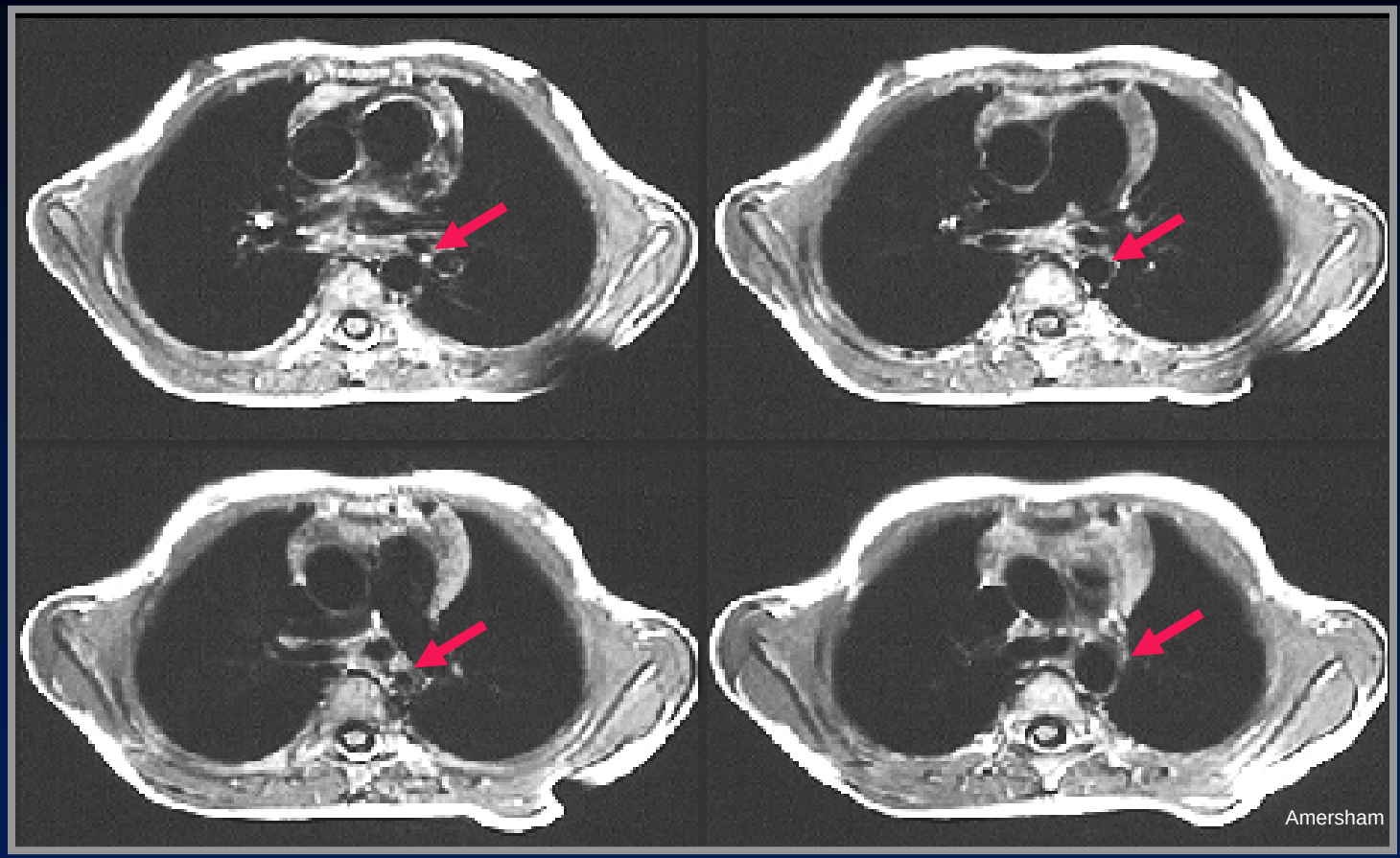
Yellow arrows point to rib-notching

Coarctation of the Aorta

Contrast enhanced MRA shows long segment coarctation of the aorta

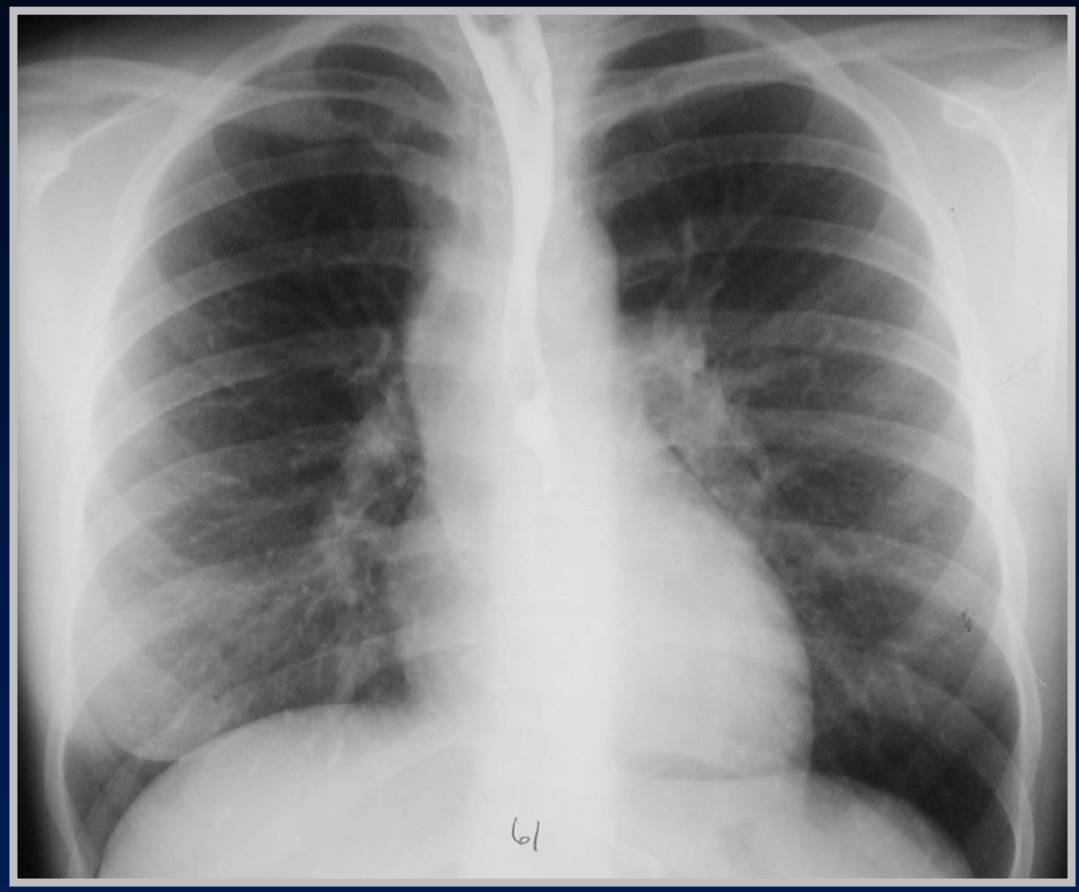


Oblique sagittal spin-echo-Coarctation of the Aorta



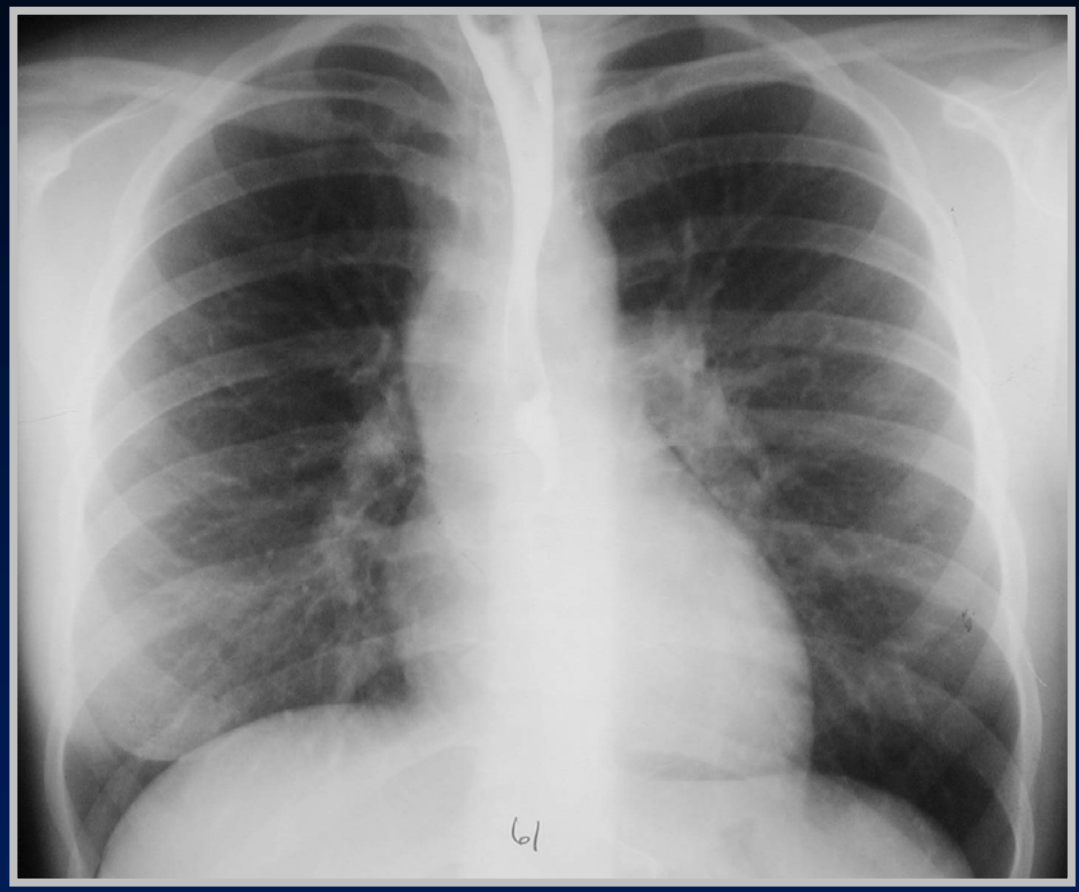
Axial spin-echo MRI-Coarctation of the Aorta

What's the diagnosis?

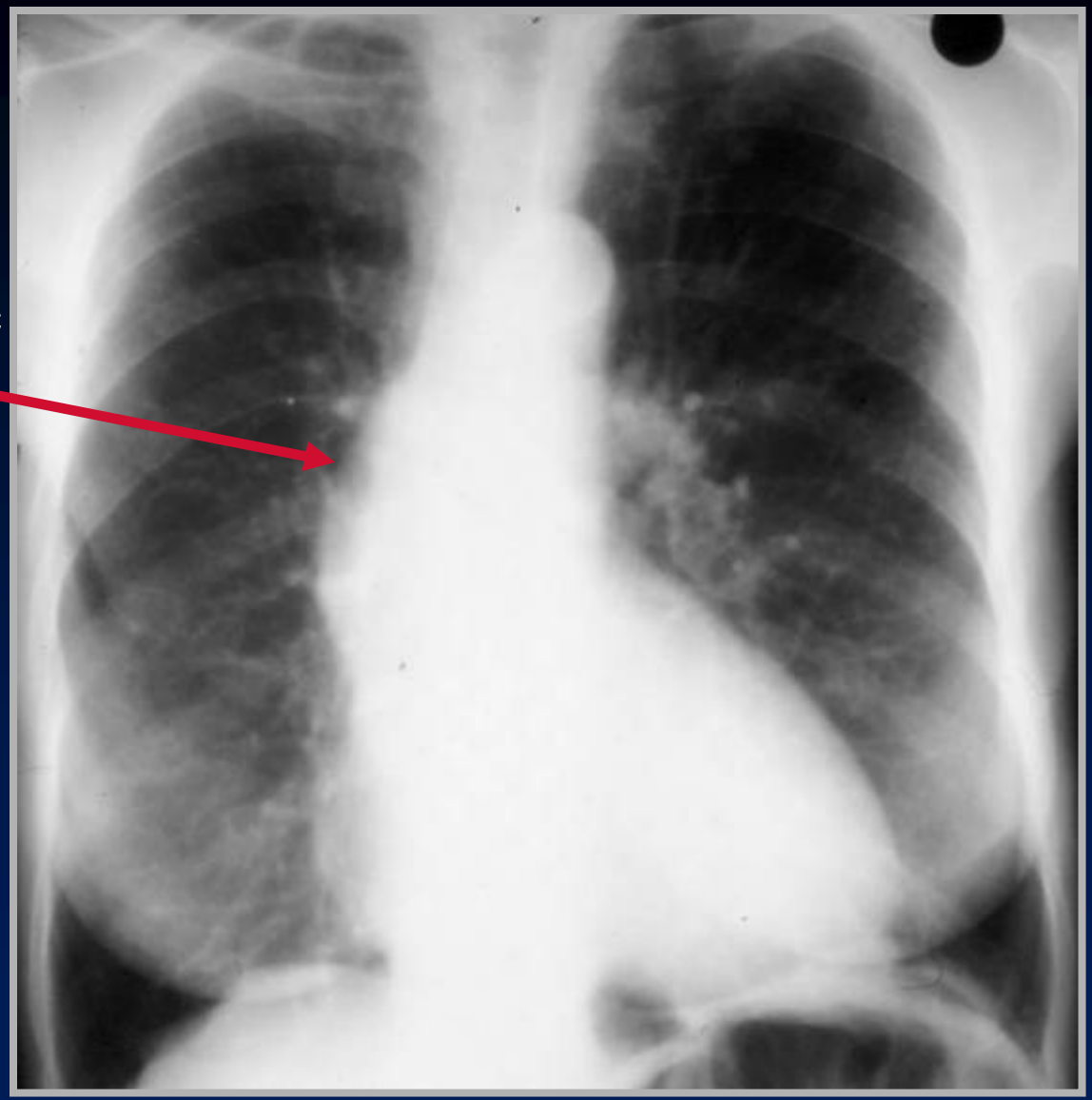


Acyanotic adult

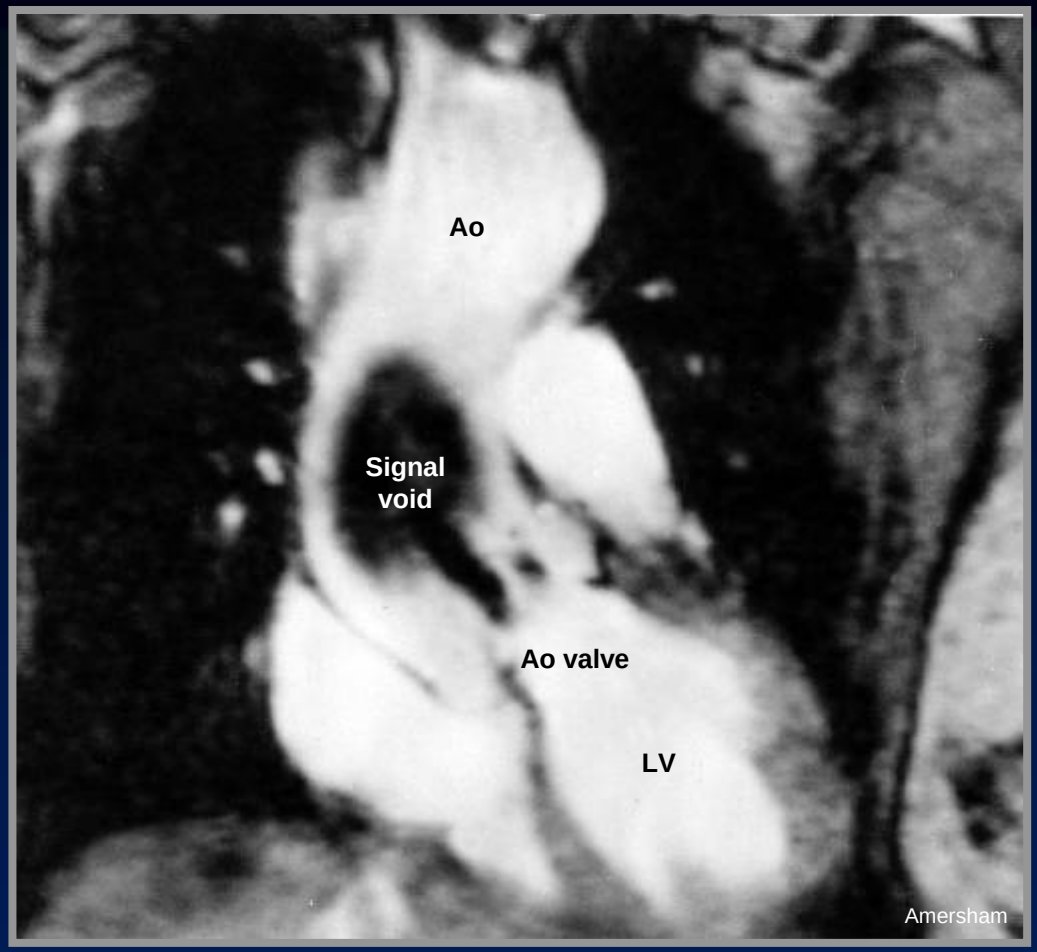
Aortic Stenosis



Prominence of ascending aorta from post-stenotic dilatation



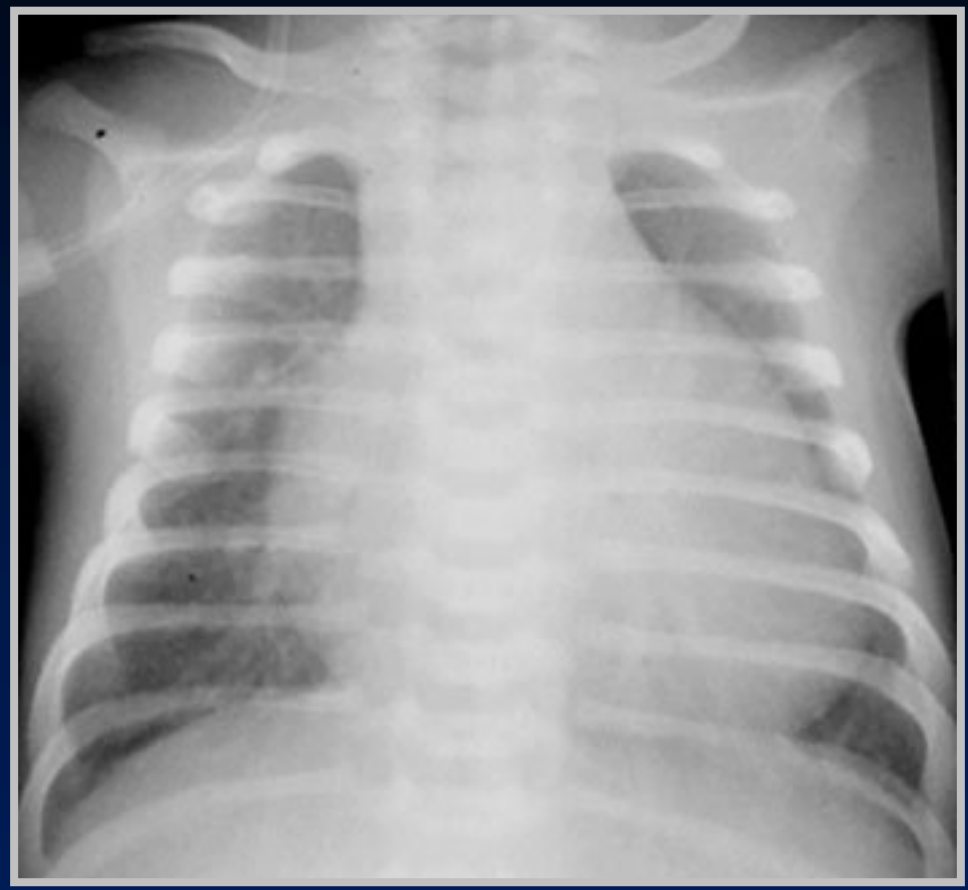
Aortic stenosis



Aortic Stenosis

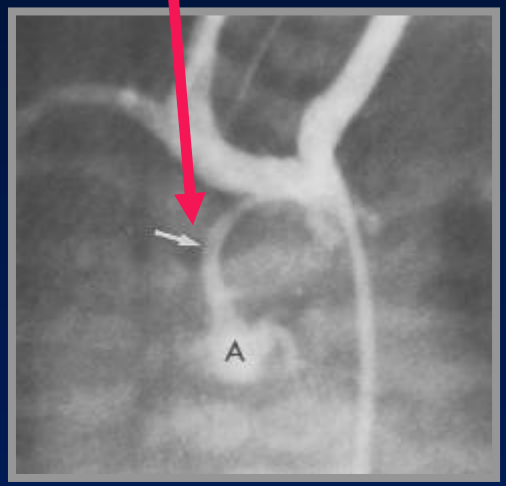
Coronal cine MRI image demonstrates a systolic signal void originating at the stenotic aortic valve. Ascending aorta is dilated

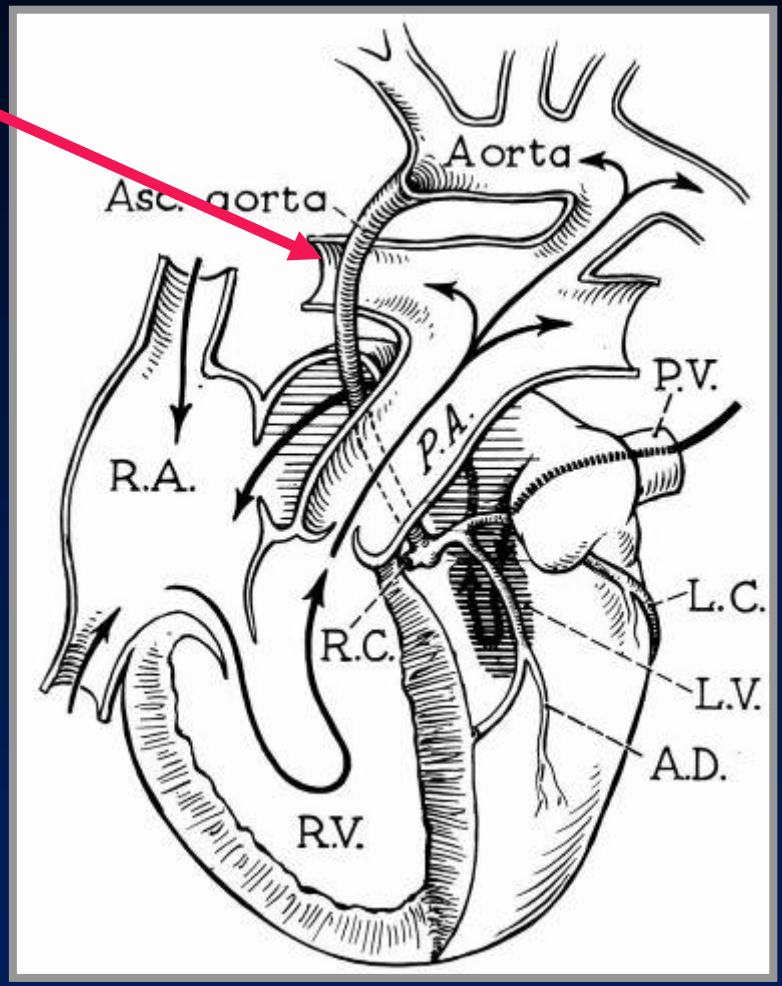
Hypoplastic Left Heart Syndrome



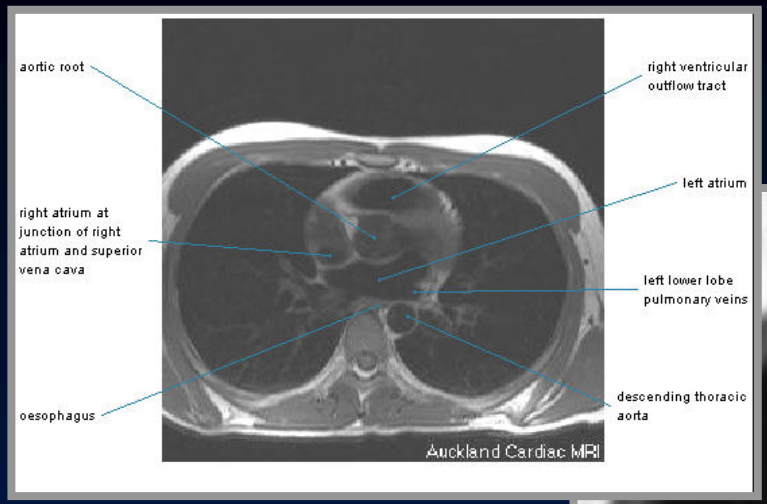
Hypoplastic Left Heart Syndrome

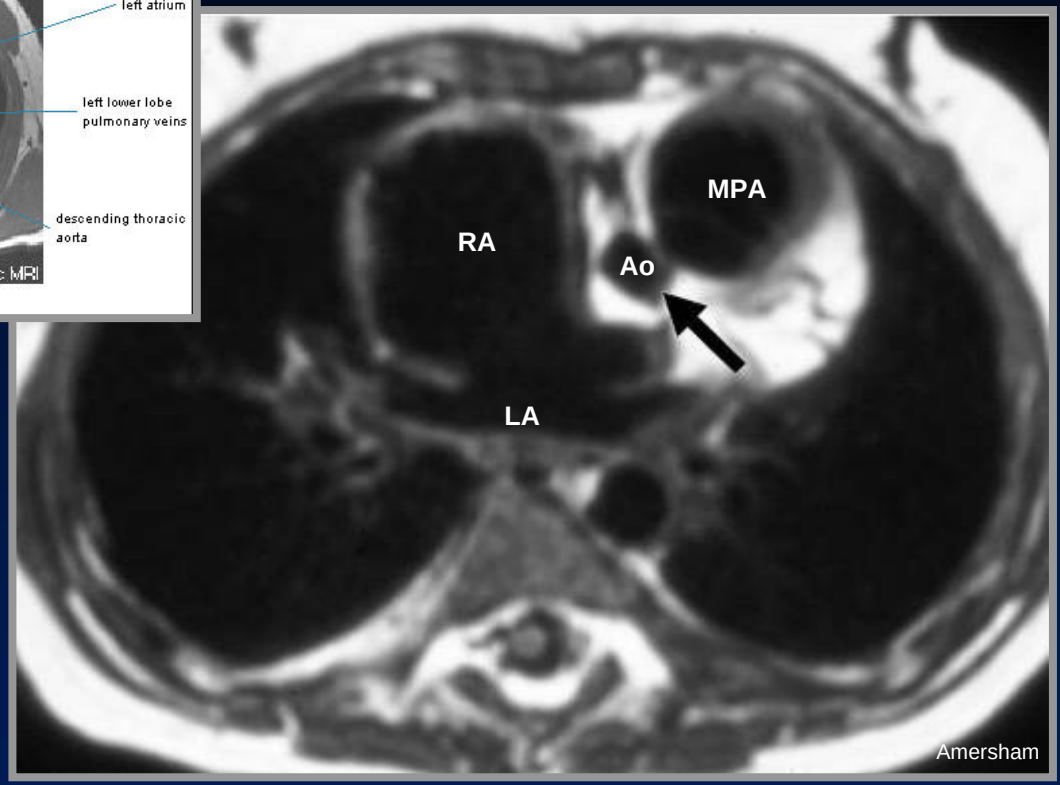
Atretic aorta





Neufeld, HN, Circulation, 1962

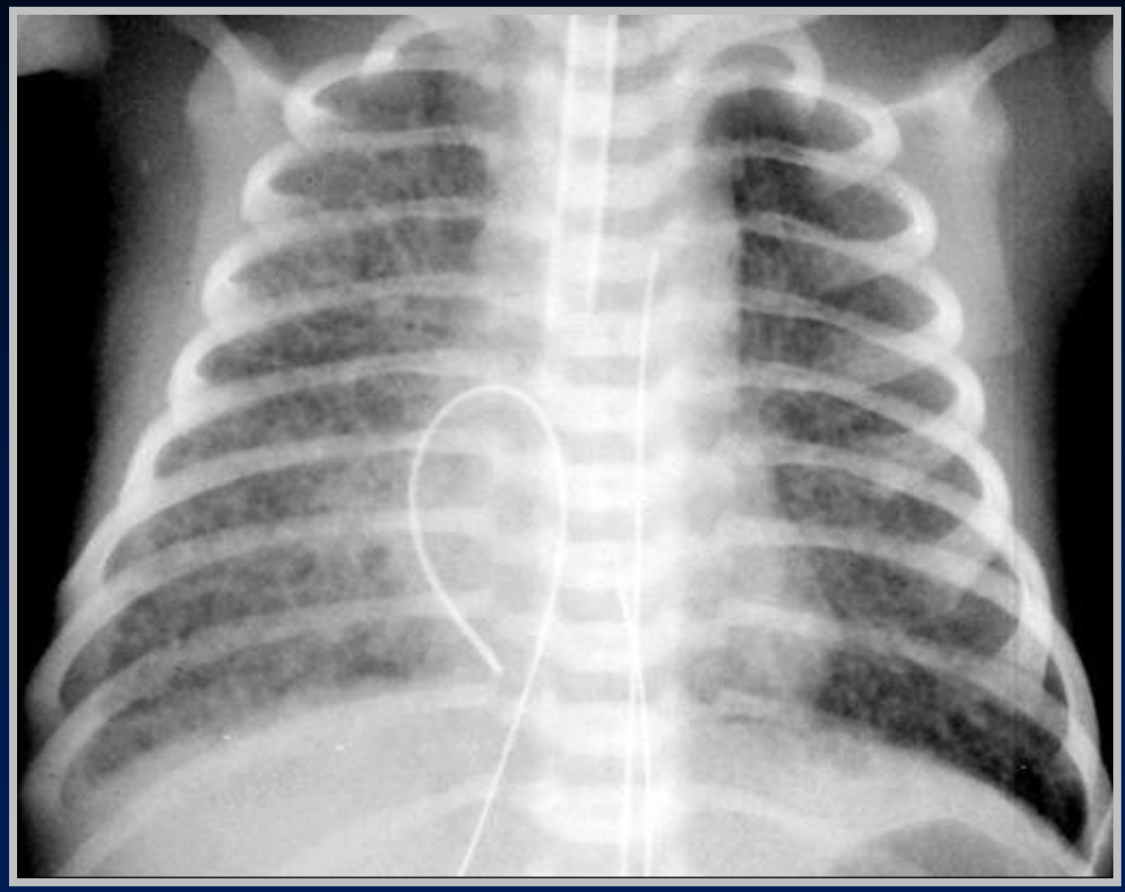




Hypoplastic Left heart Syndrome

Gated spin echo at base of heart shows hypoplastic aorta (arrow) posterior and right of main pulmonary artery

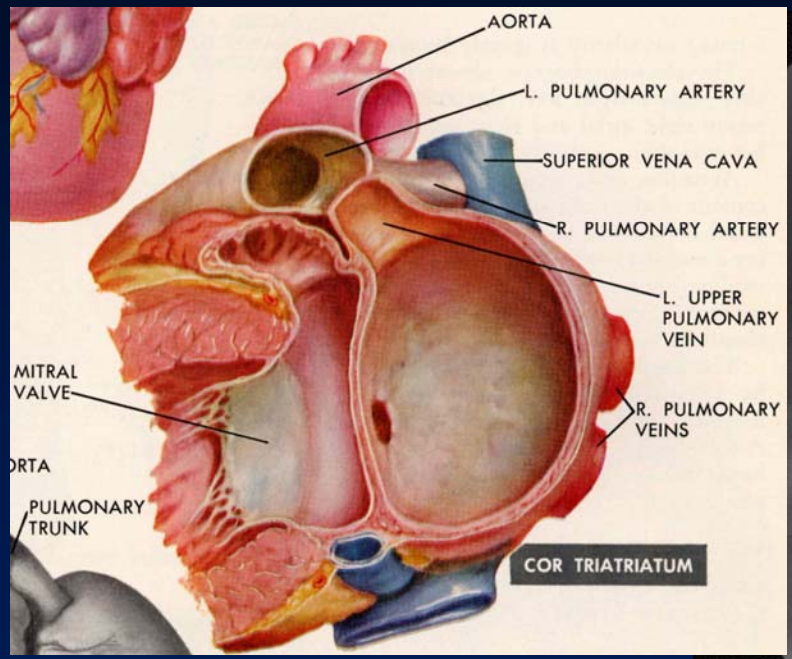
Cor triatriatum

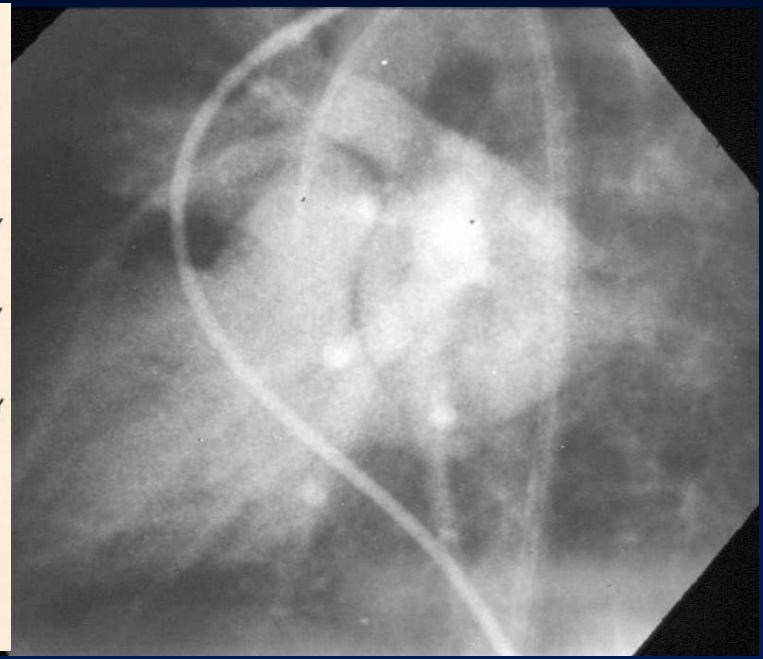


Radiology Resource and Review

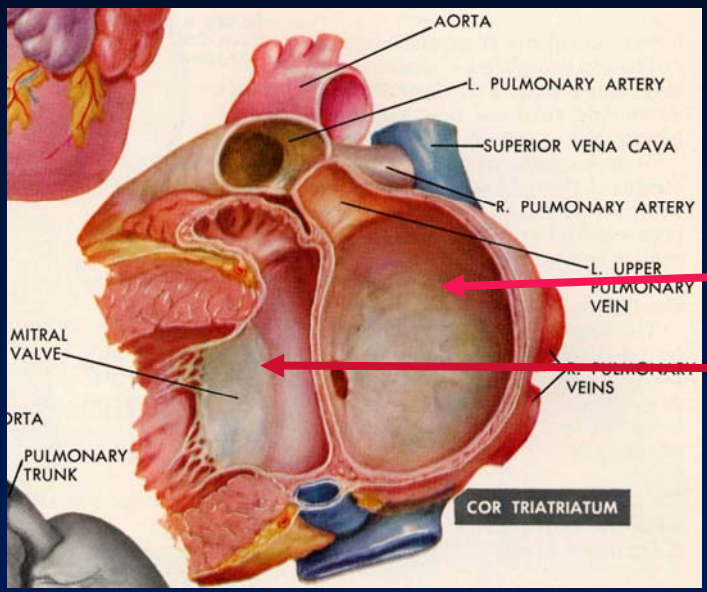
Frontal radiograph demonstrates CHF

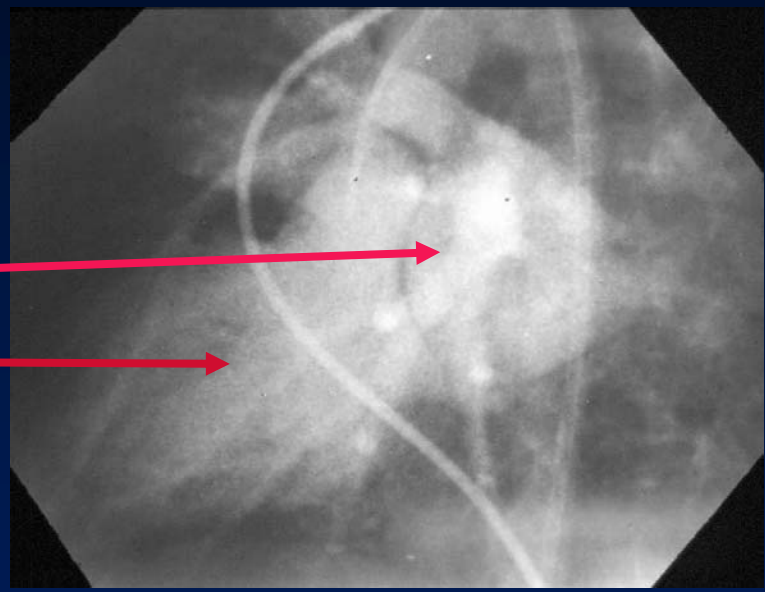
Cor Triatriatum - angiography

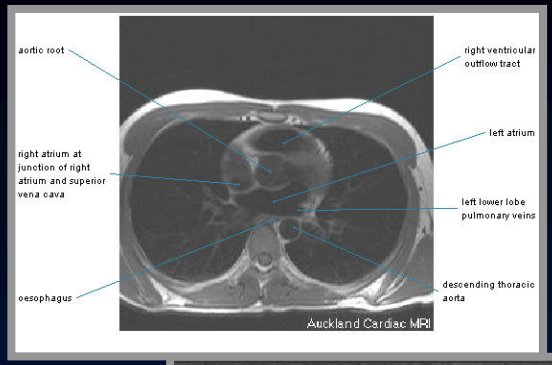


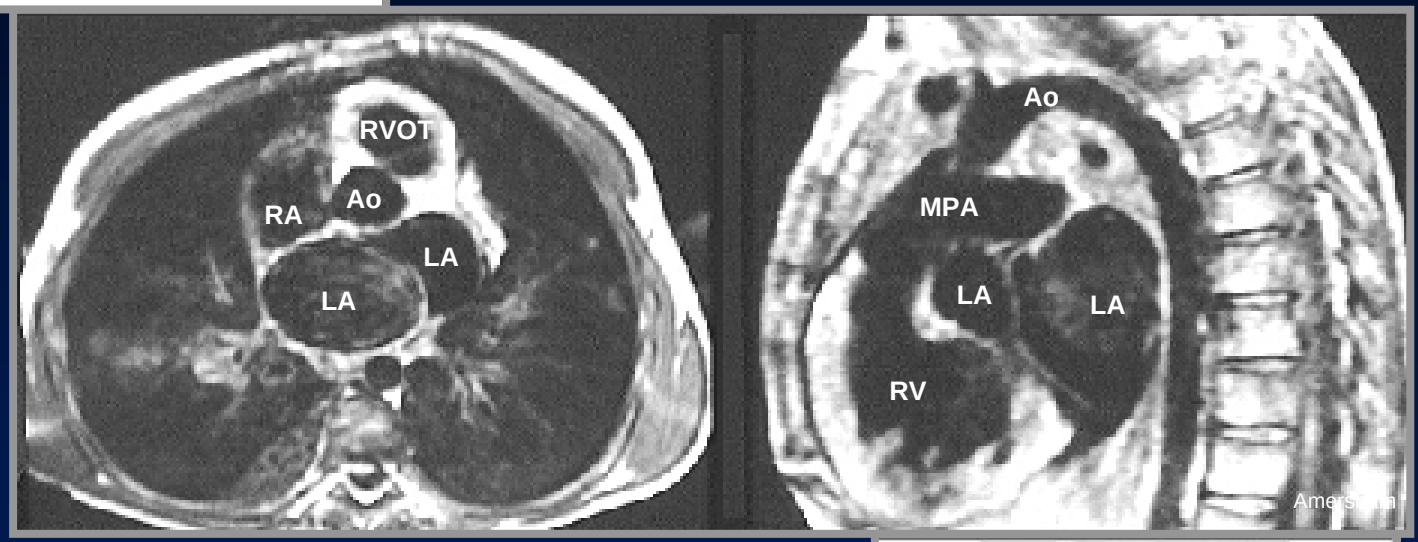


Cor Triatriatum - angiography

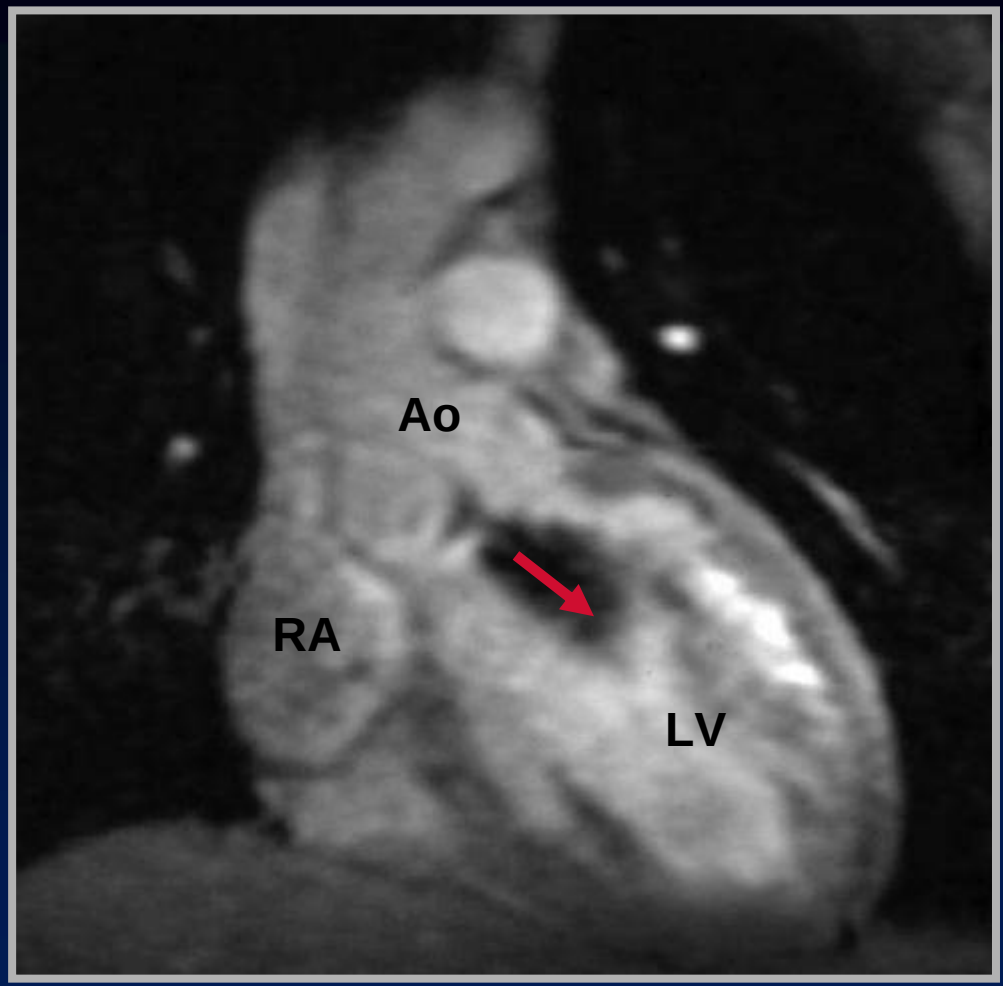








Cor Triatriatum



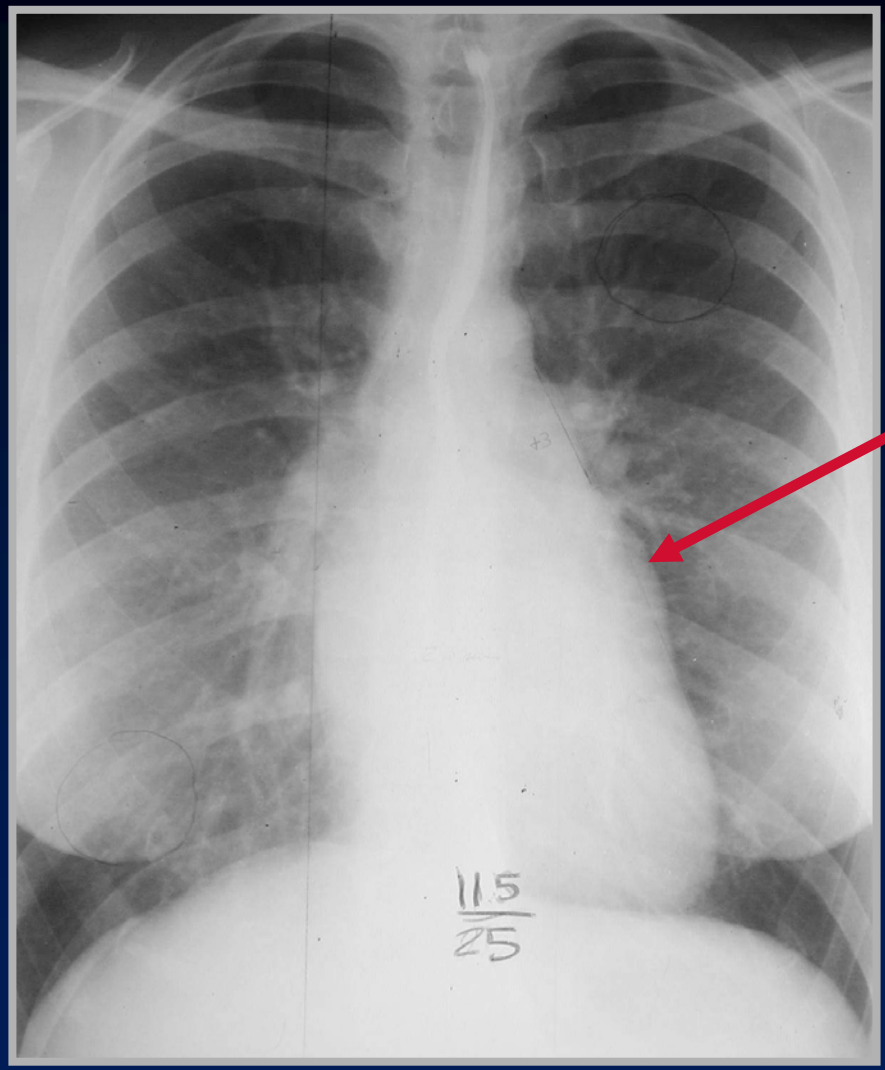
Aortic Regurgitation

Cine MR image during diastole shows signal void emanating from the aortic valve

What's the diagnosis?

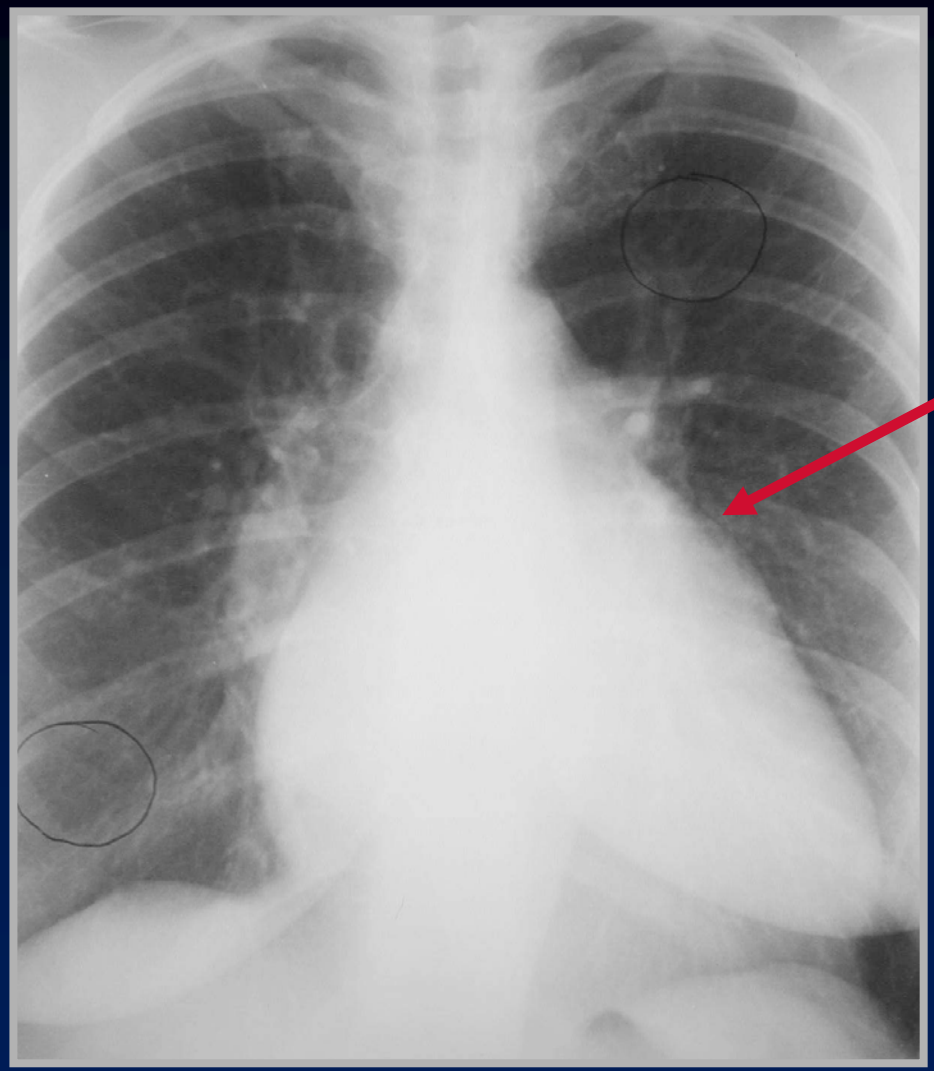
Acyanotic adult

Mitral Stenosis



Convexity from enlarged left atrial appendage

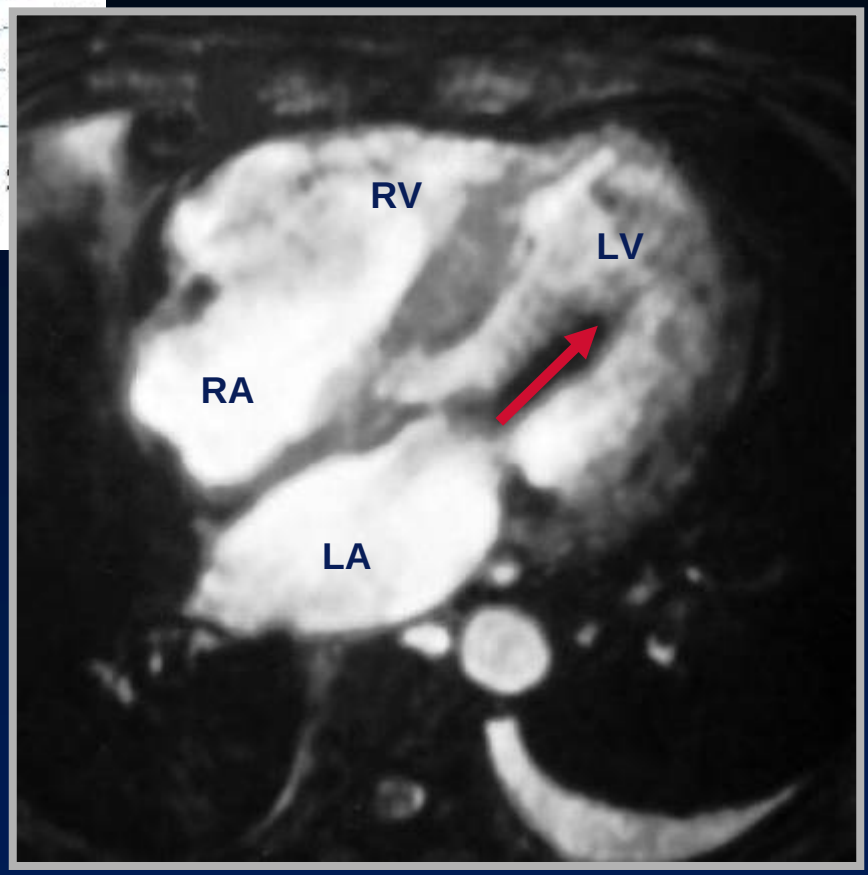
Mitral Stenosis



Convexity from enlarged left atrial appendage

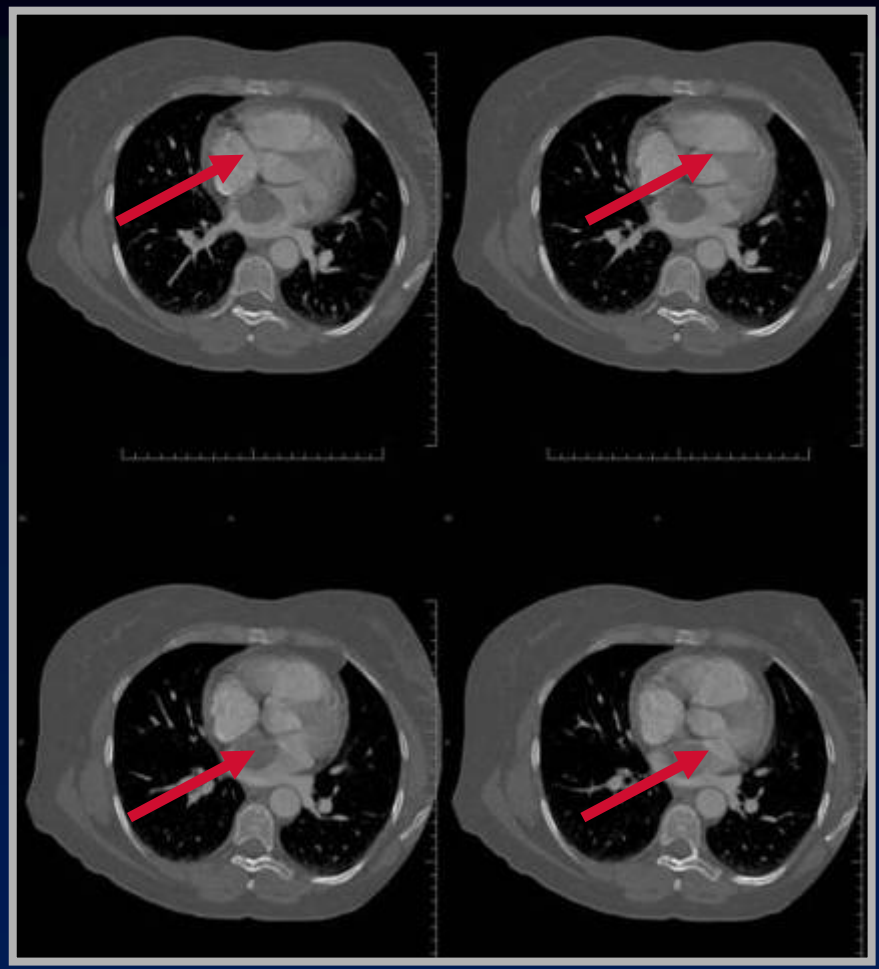
Mitral Stenosis

Upper lobe vessels equal to or larger than size of lower lobe vessels = Cephalization



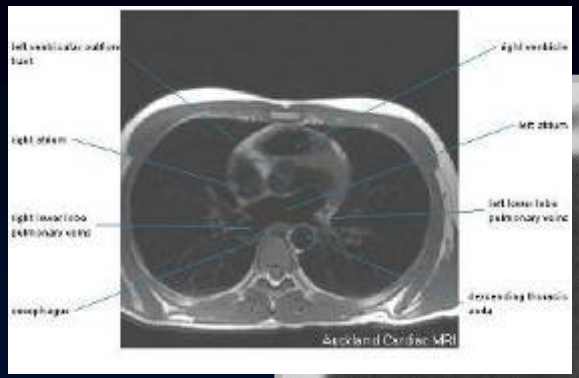
Mitral Stenosis

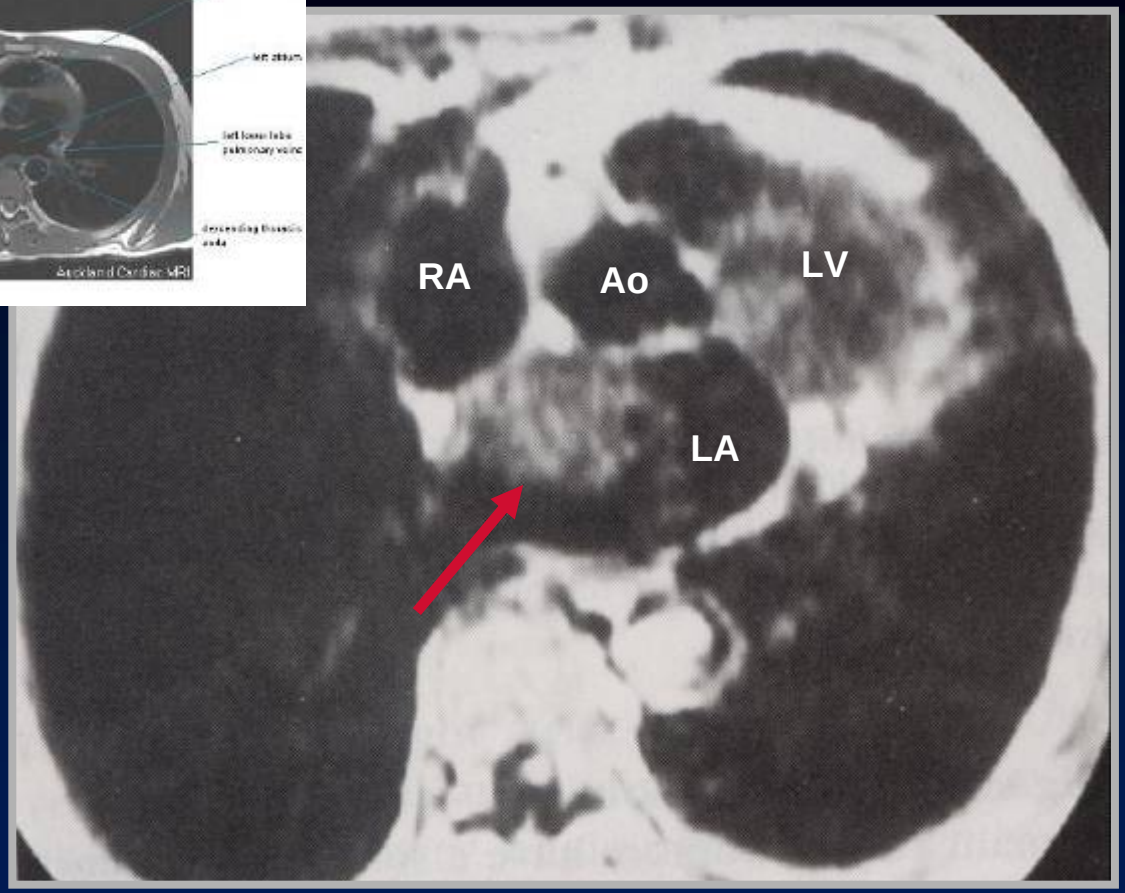
Cine MR image in axial plane demonstrates a diastolic signal void emanating from the mitral valve



Left Atrial Myxoma

Contrast-enhanced CT shows large filling defect in lumen of LA





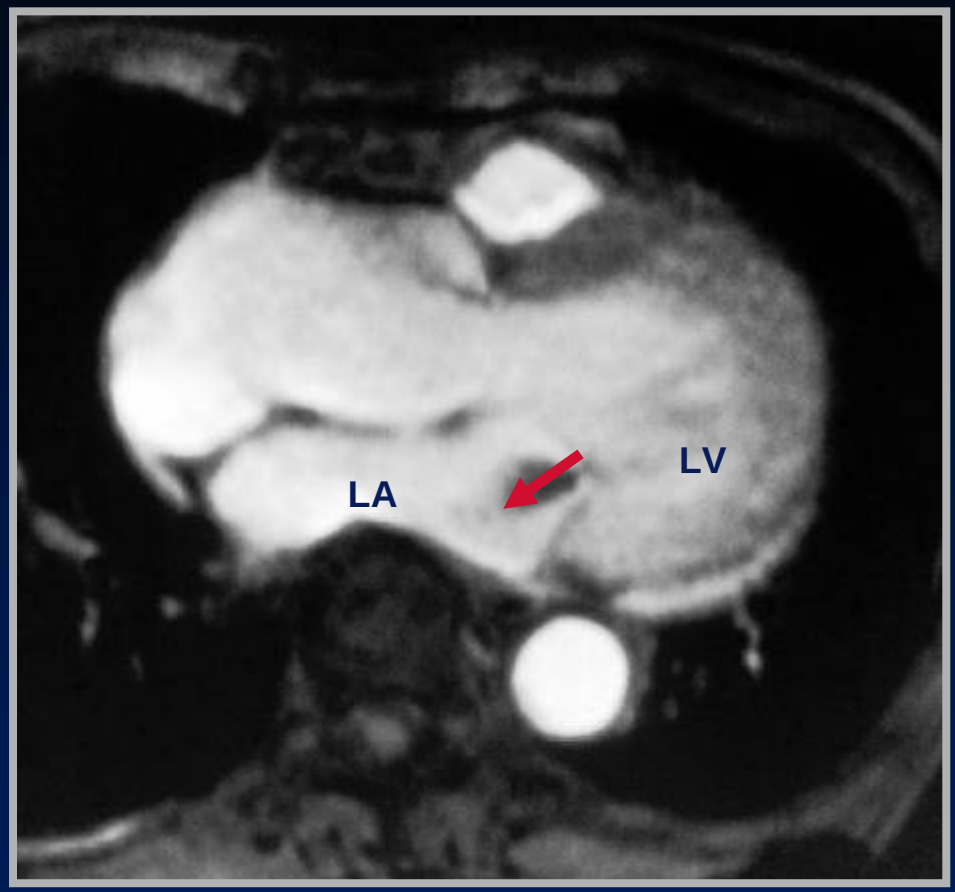
Left Atrial Myxoma

Cine MRI shows soft tissue mass arising from wall of left atrium and projecting into lumen

What's the diagnosis?

Acyanotic adult

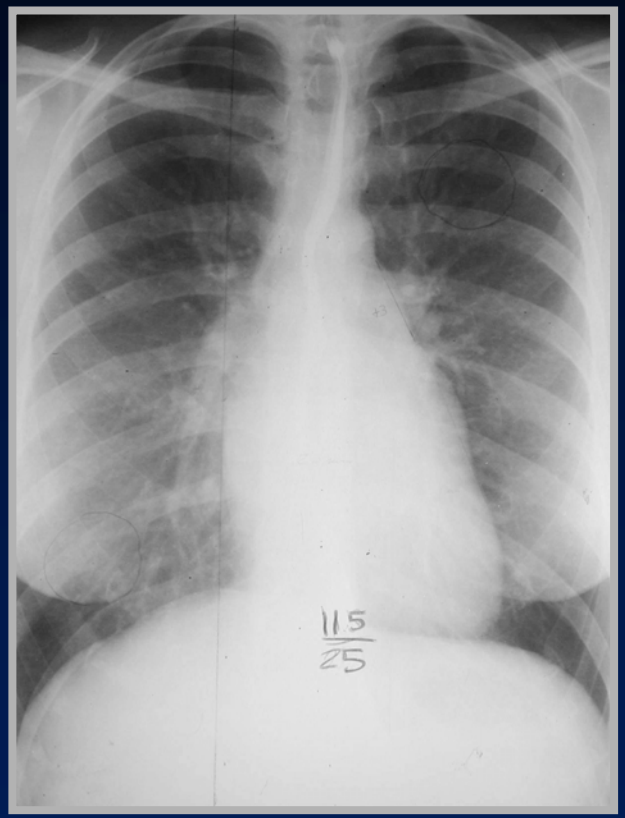
Mitral regurgitation



Mitral Regurgitation

Cine MR image in axial plane during systole depicts a signal void emanating from the mitral valve

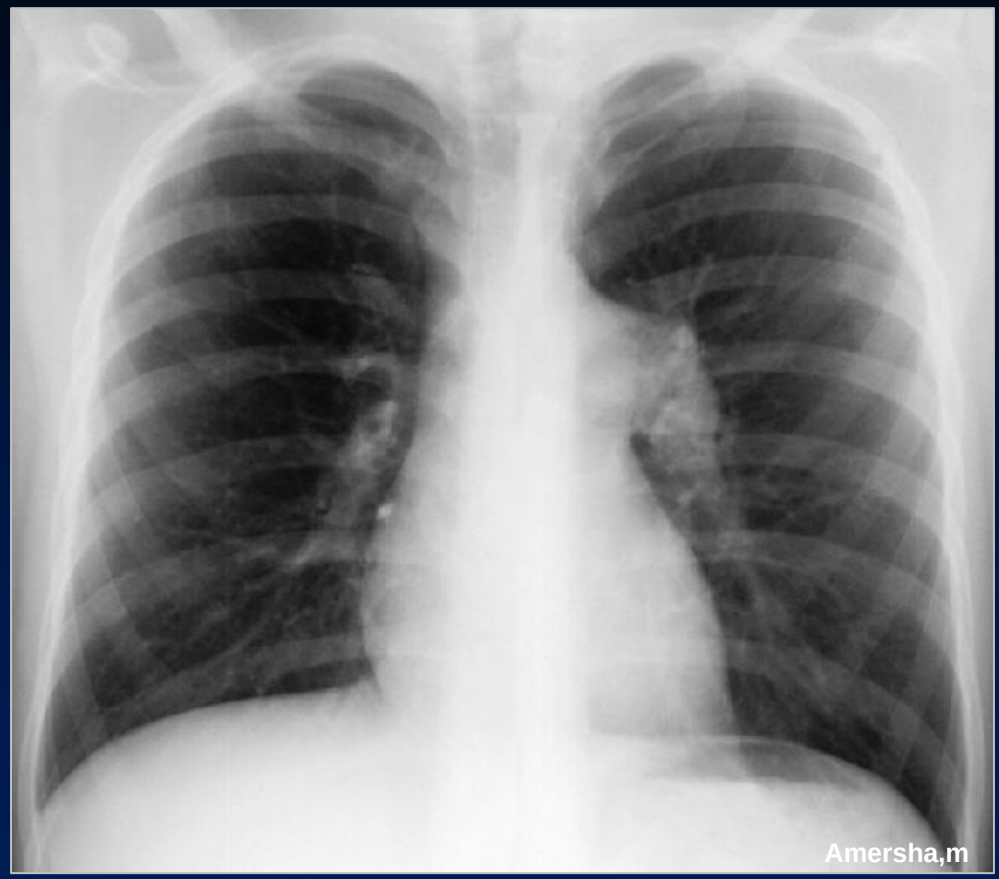
Difference in heart size – MS and MR



Mitral Stenosis

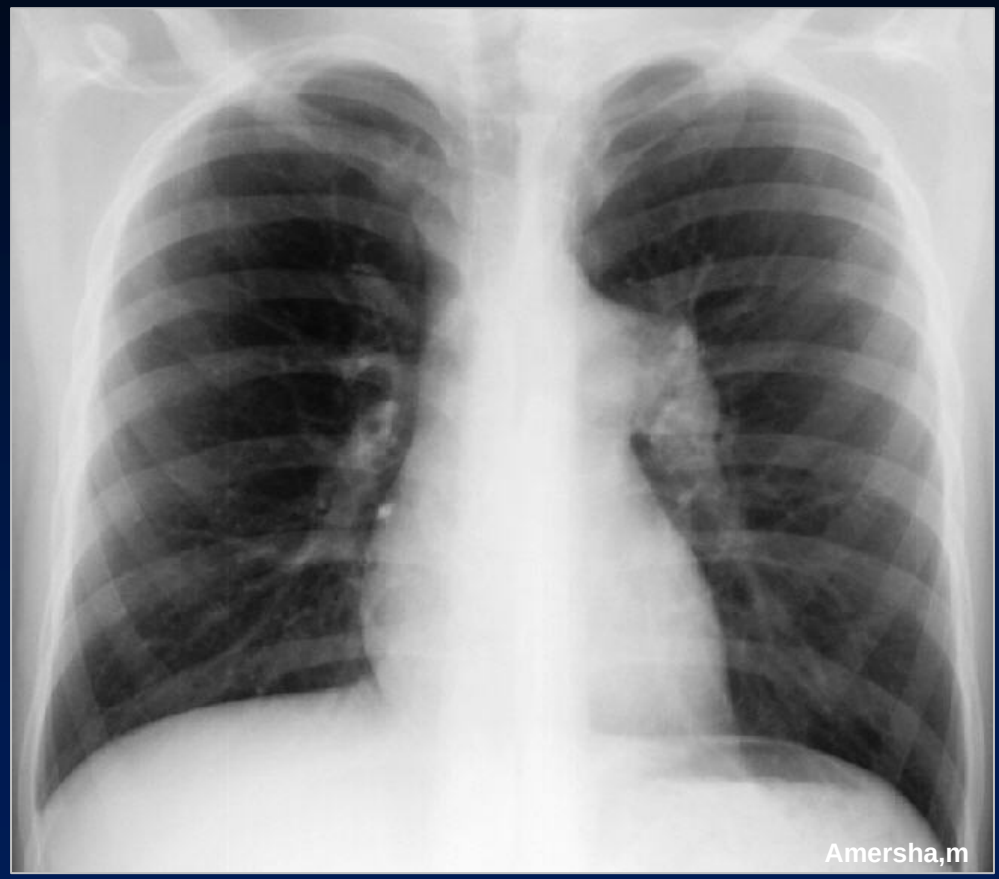
Mitral Regurgitation

What's the diagnosis?

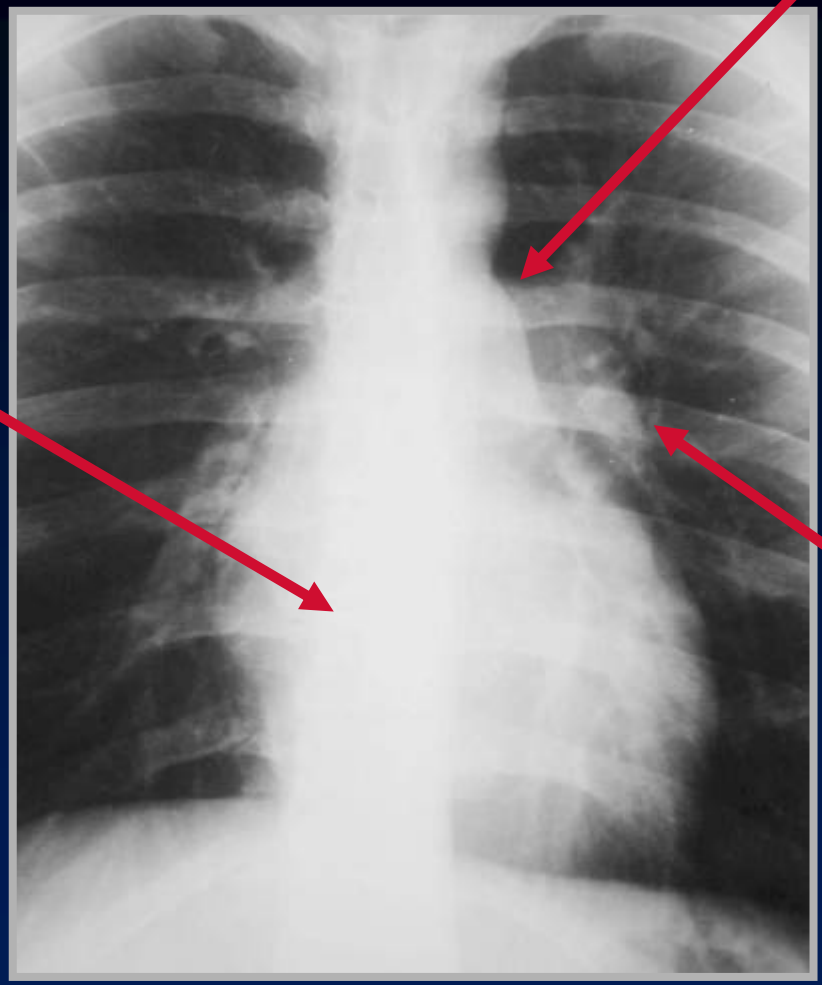


Acyanotic adult

Pulmonic stenosis



Prominent main pulmonary artery segment



Normal-sized heart

Enlargement of left pulmonary artery

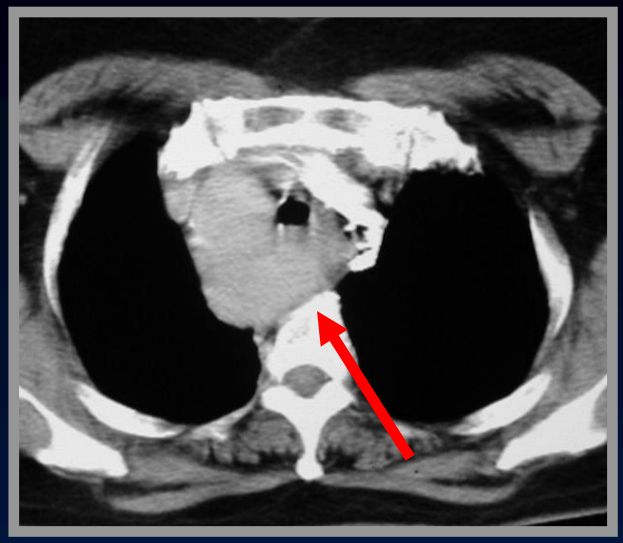
Pulmonic Stenosis

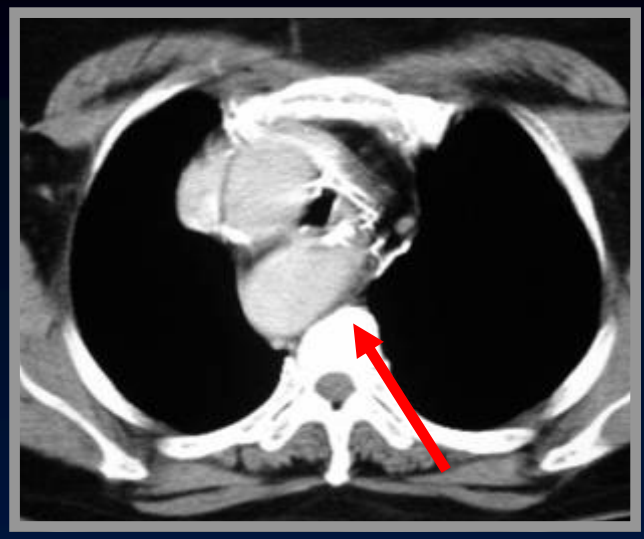
What's the diagnosis?

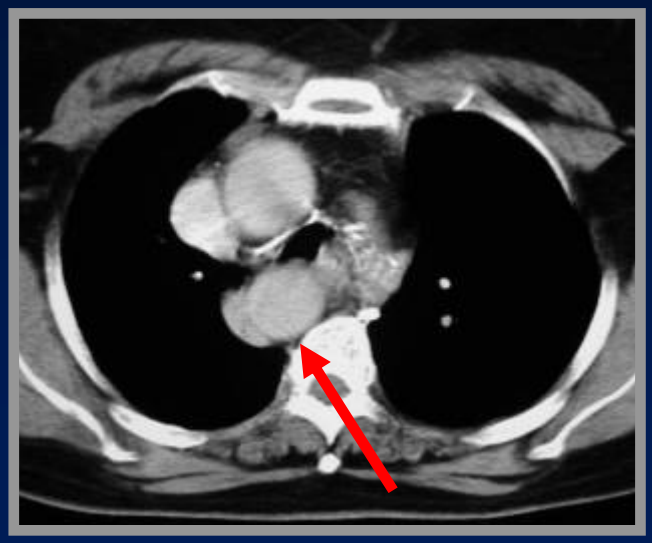
Acyanotic adult

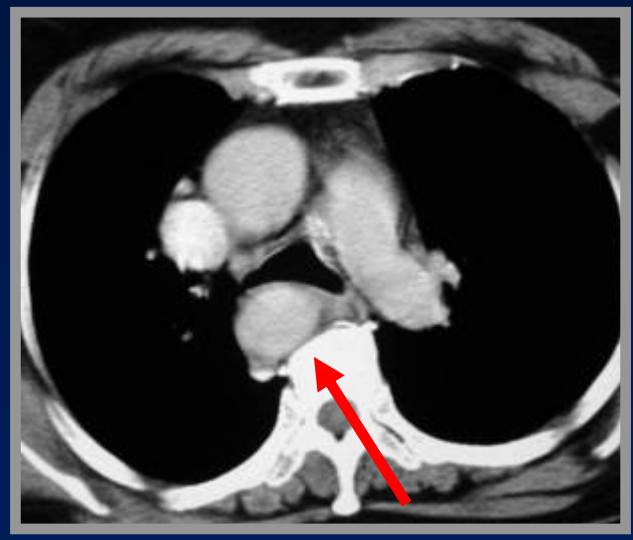
Right Arch with Aberrant Left SCA

Trachea is bowed forward by aberrant left subclavian artery (arrow)



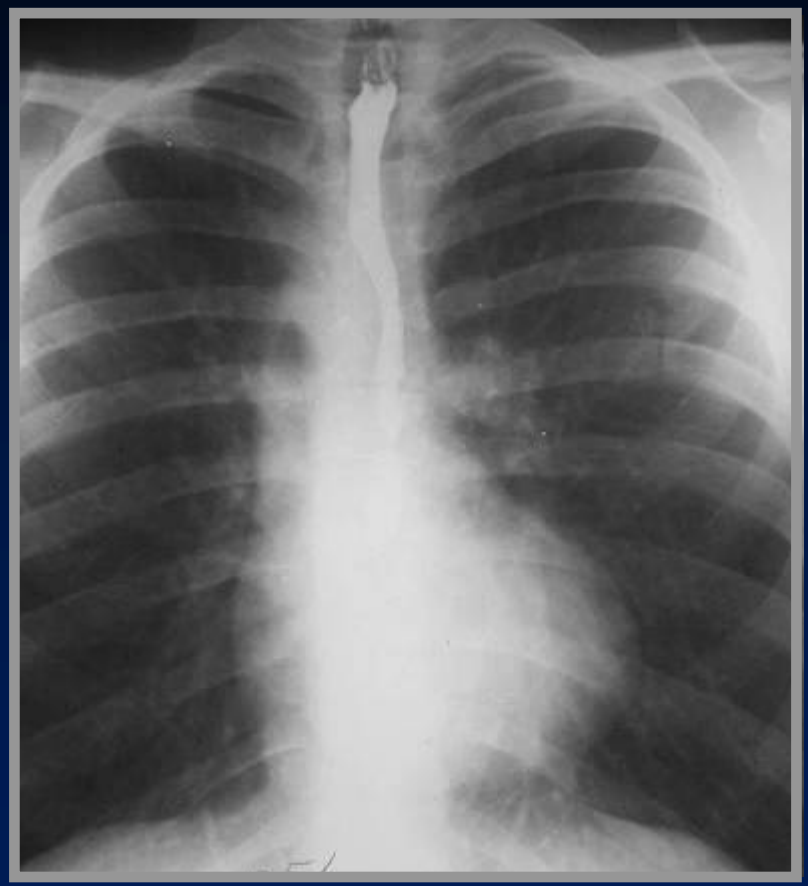






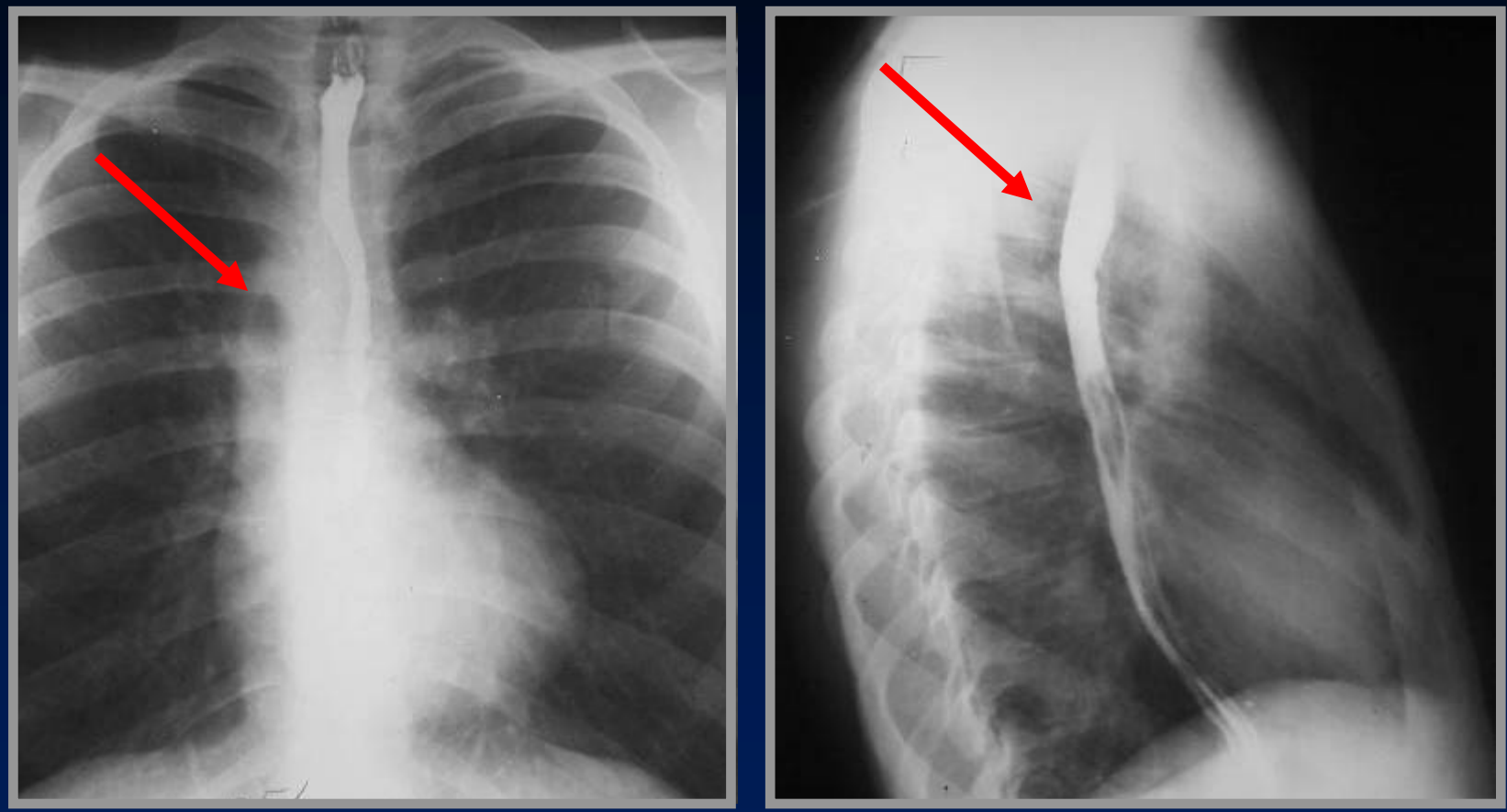
Right Aortic Arch with Aberrant Left Subclavian (Arrows)

What's the diagnosis?

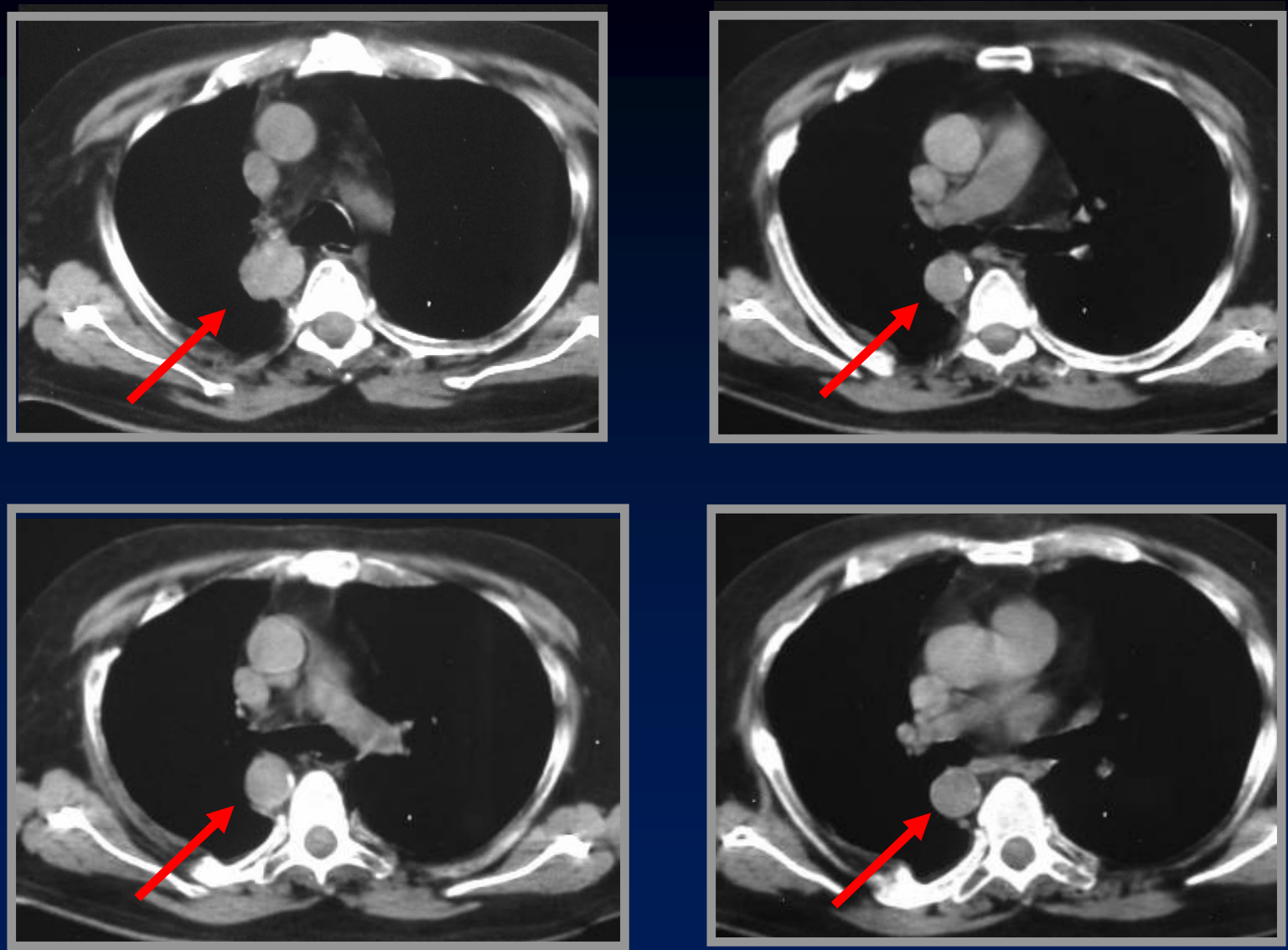


36 yo cyanotic female

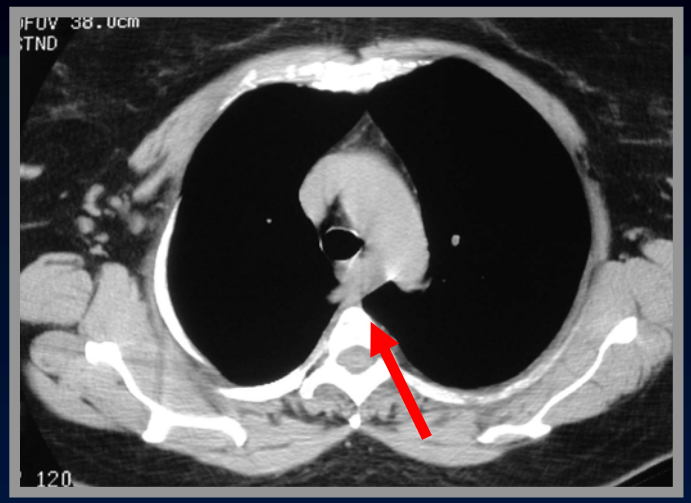
Mirror image Right aortic arch with TOF

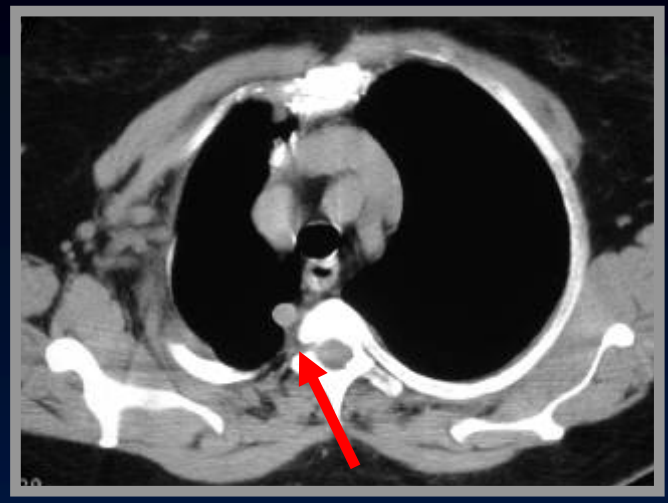


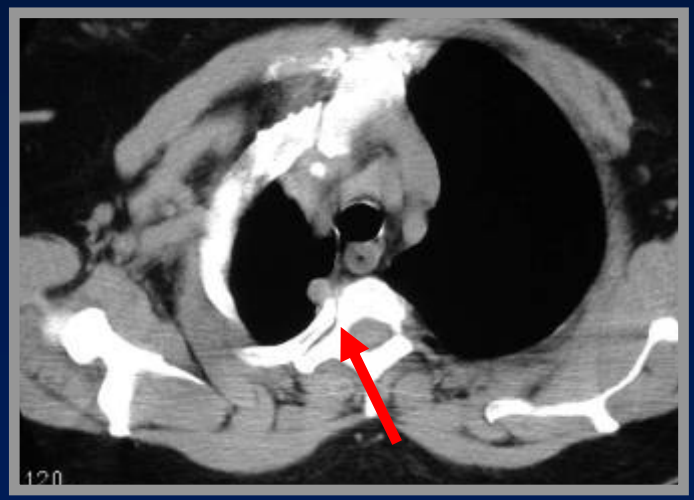
Trachea is not bowed forward

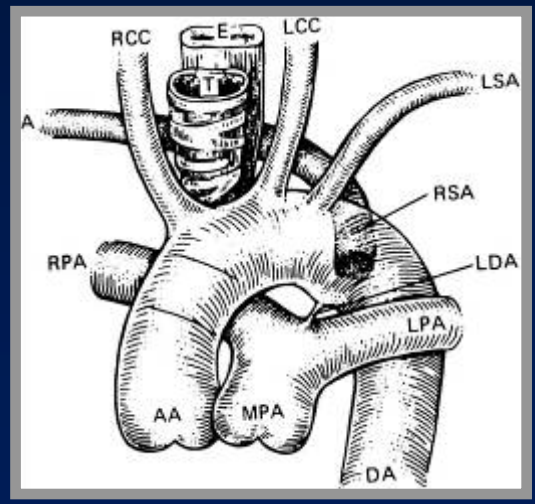


Mirror Image Right Aortic Arch

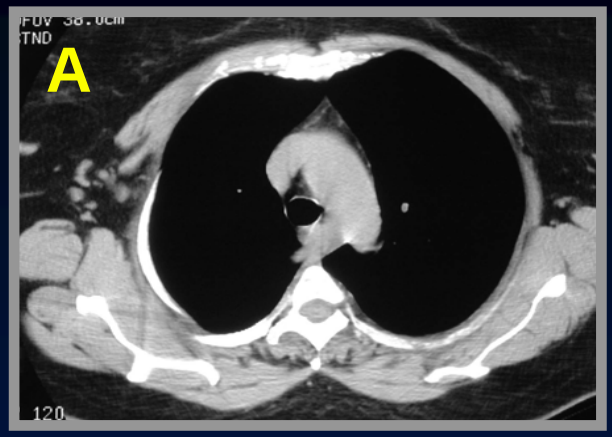


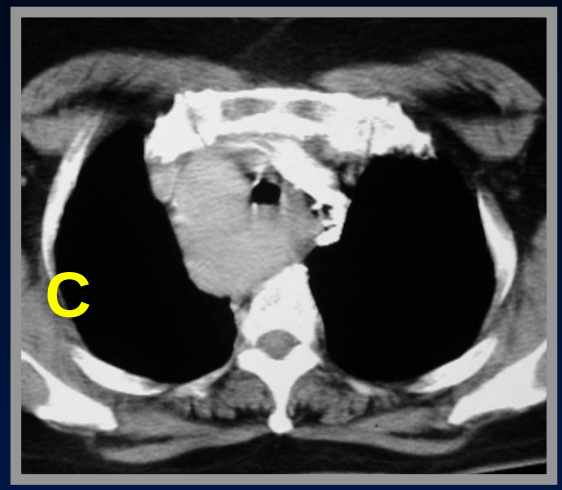


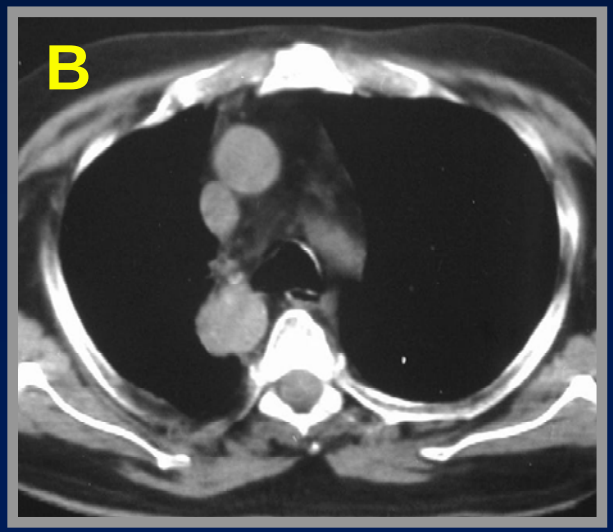




Left Aortic Arch with Aberrant R SCA

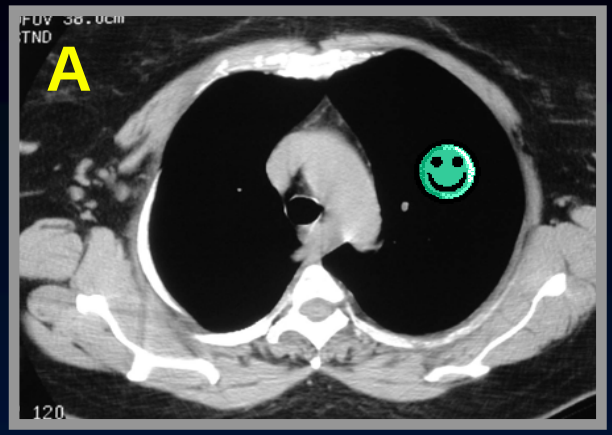




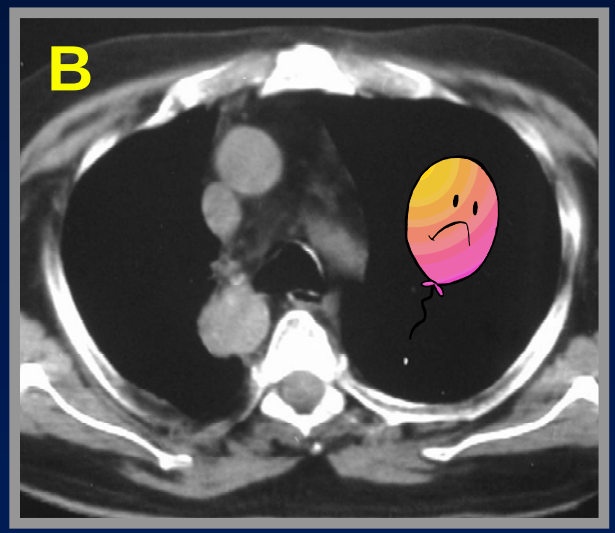


Review-

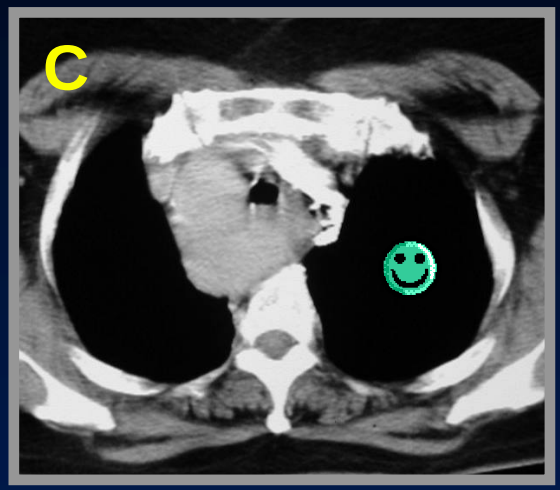
Name the abnormalities. Are they the “good” or “bad” variety?



Left Aortic Arch
with Aberrant R SCA

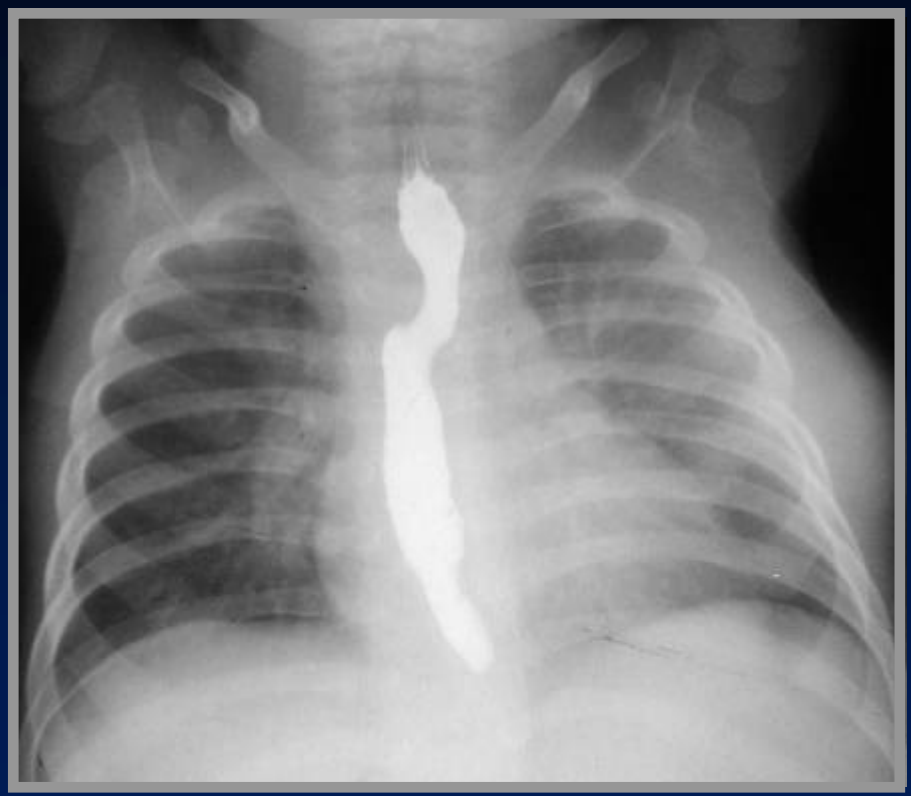


Mirror Image
Right Aortic Arch



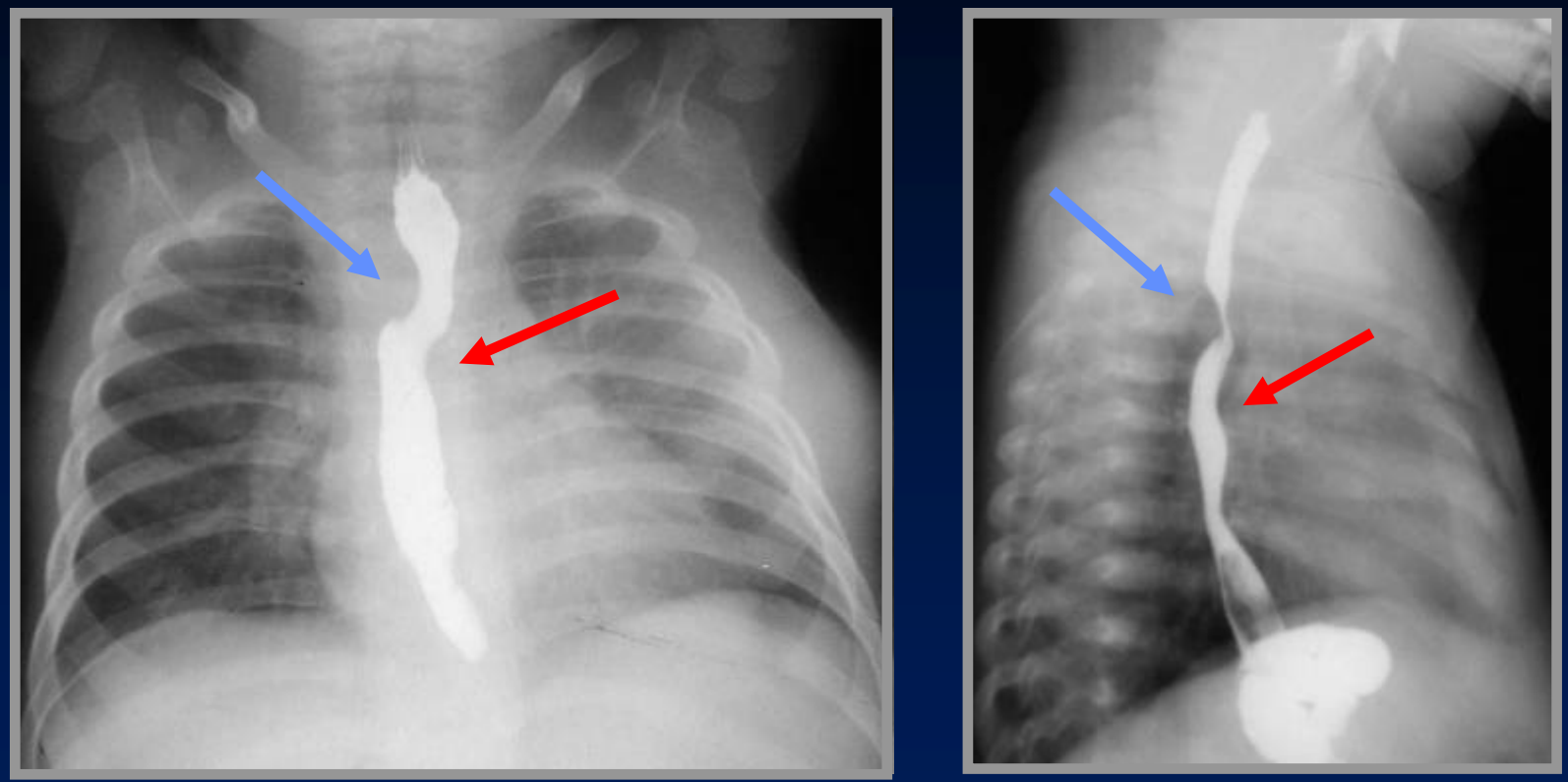
Right Aortic Arch with
Aberrant Left Subclavian

What's the diagnosis?



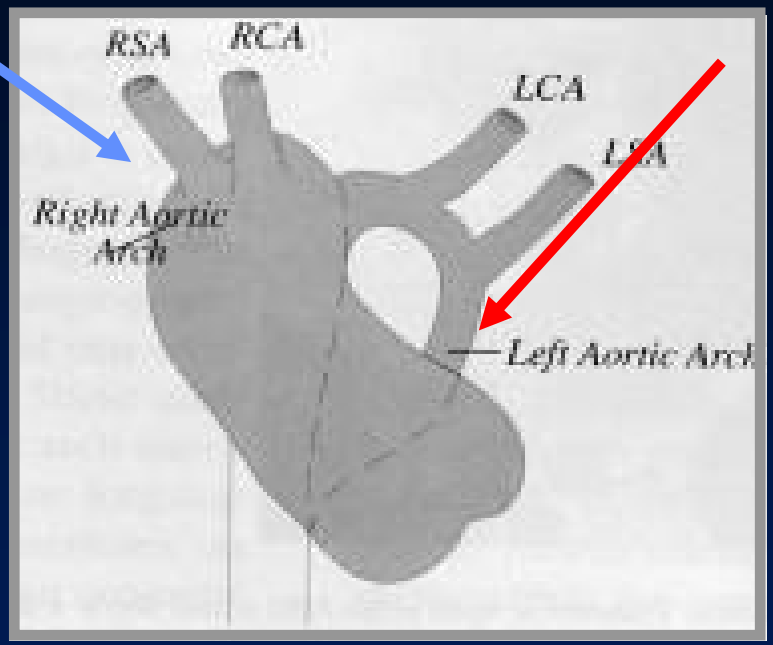
2 month old with stridor

Double aortic arch

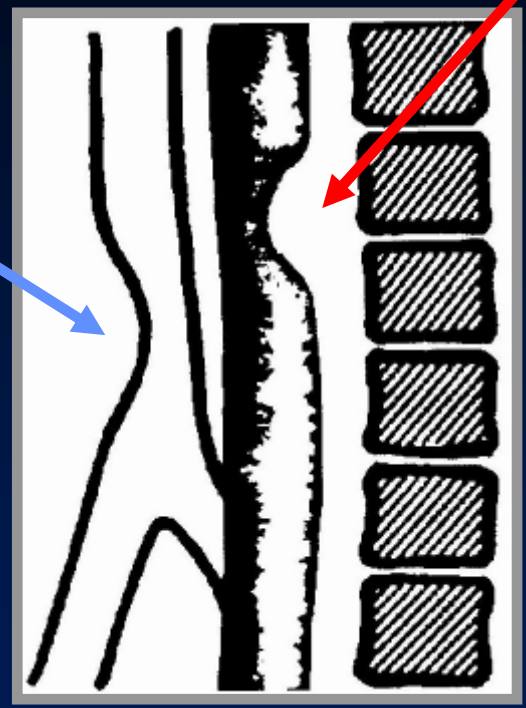


Right arch is larger and higher

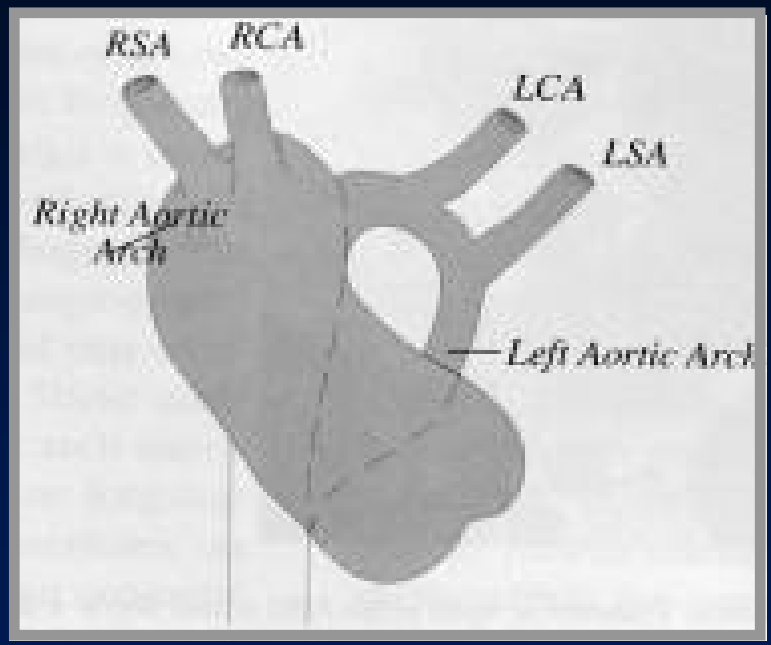
Left arch is smaller and lower



Miller-requisites

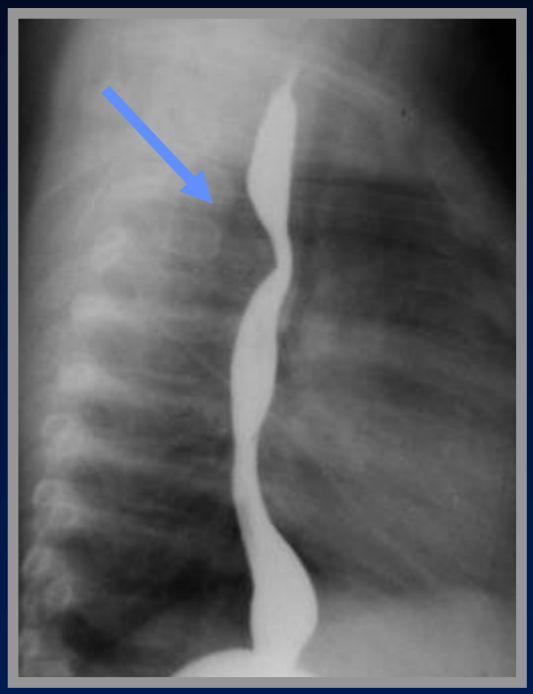


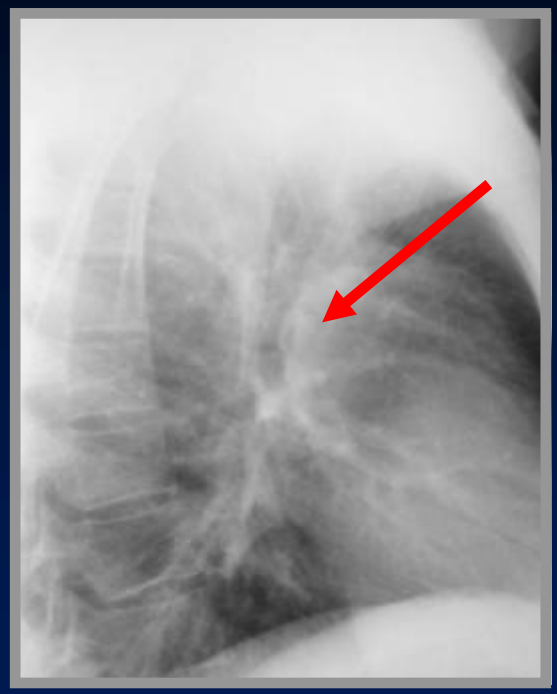
Double Aortic Arch

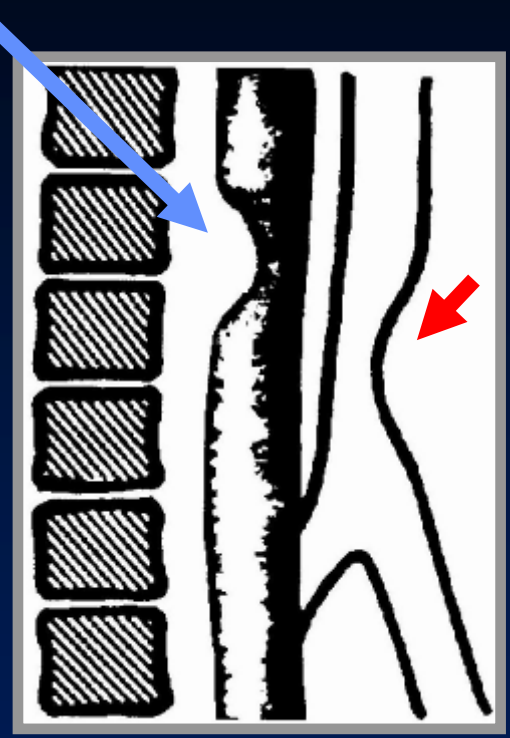


Miller-requisites

Double Aortic Arch-angiographic appearance



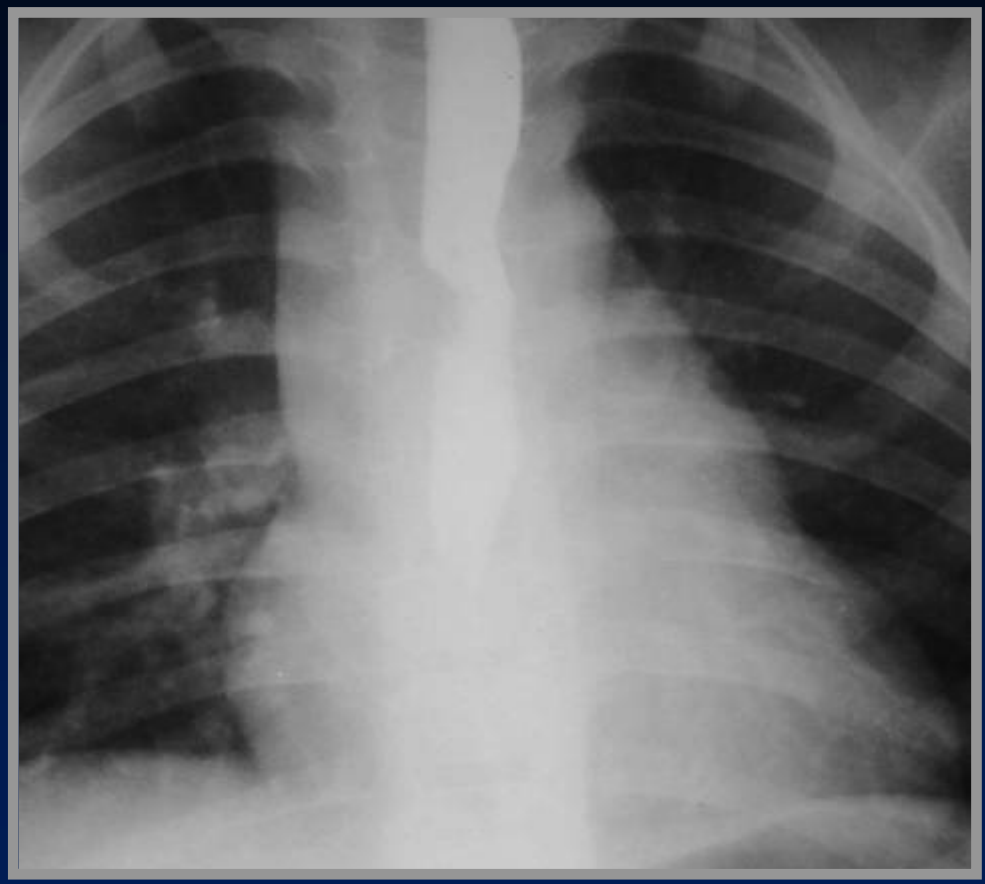




Dahnert

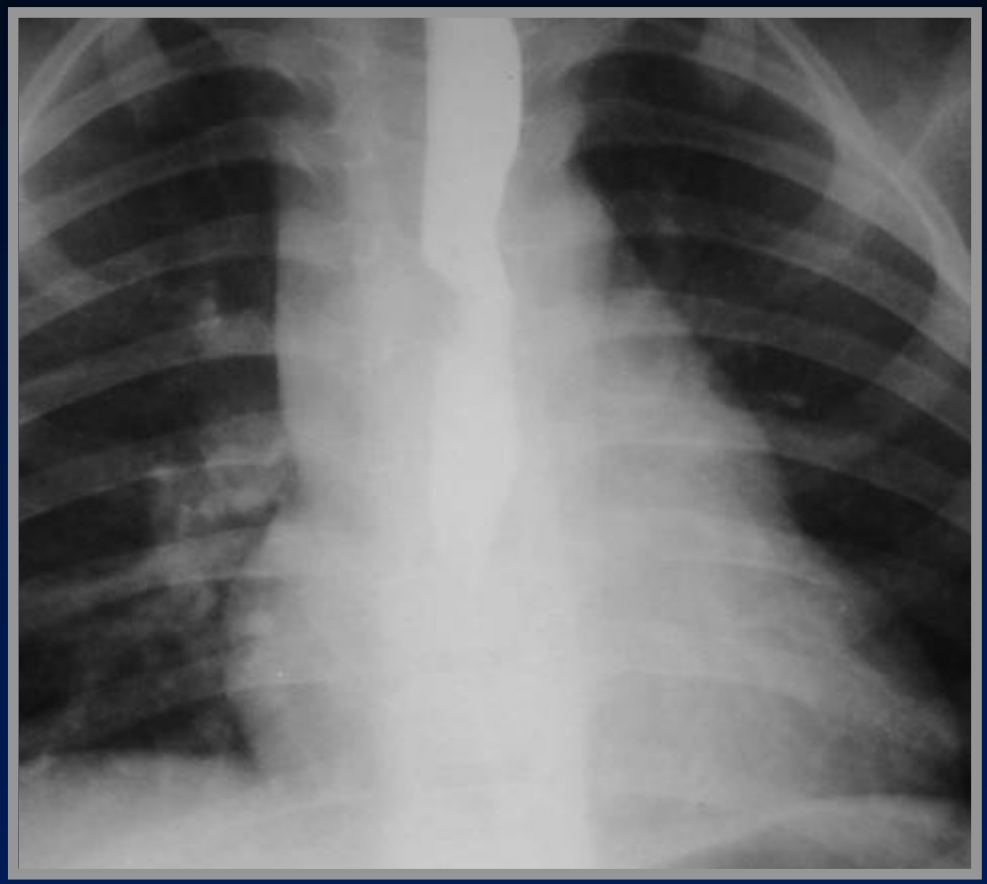
Double Aortic Arch
Impressions on Trachea and Esophagus

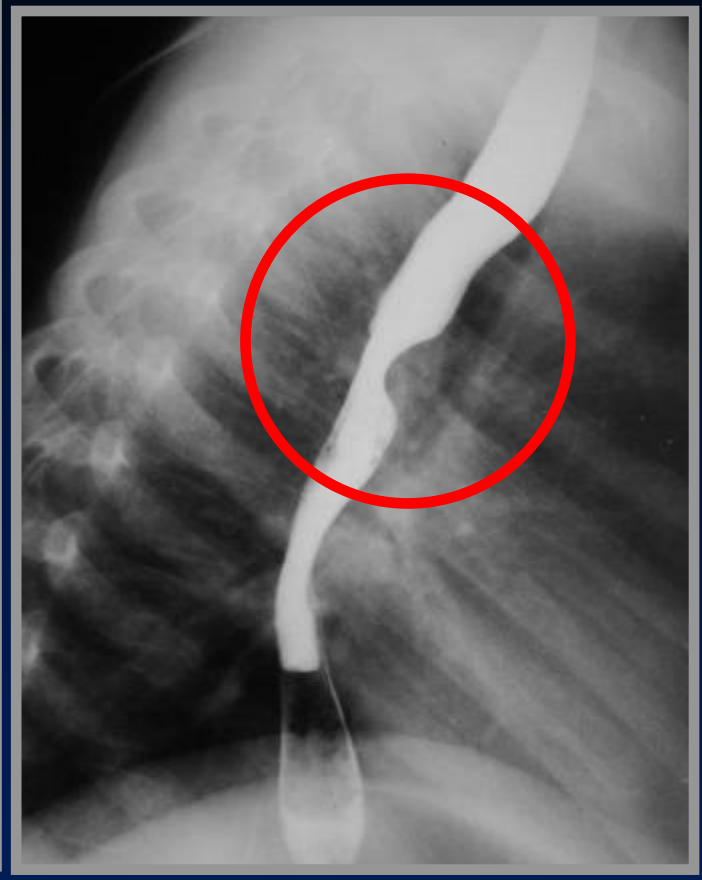
What's the diagnosis?

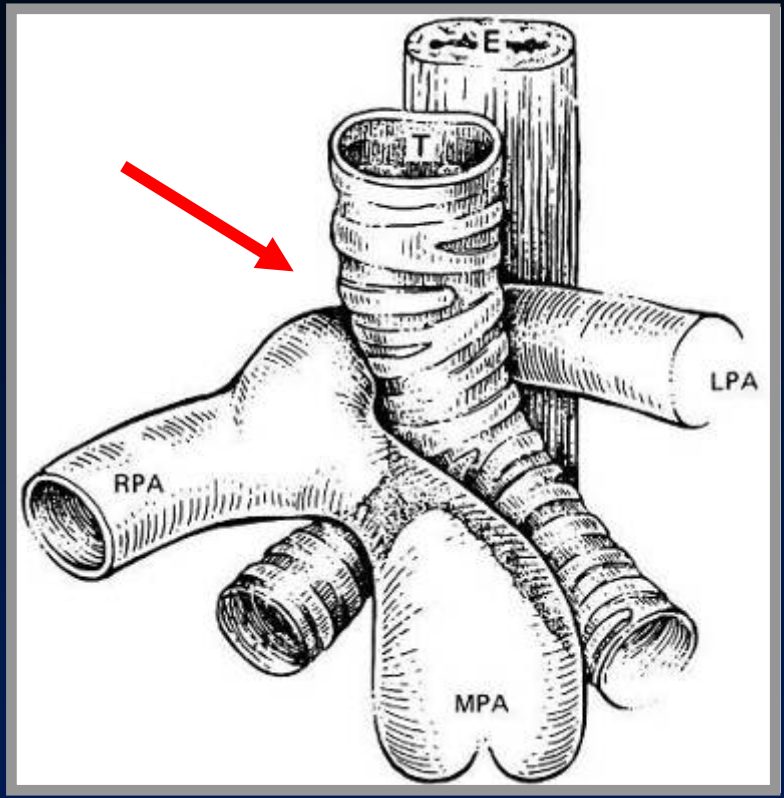


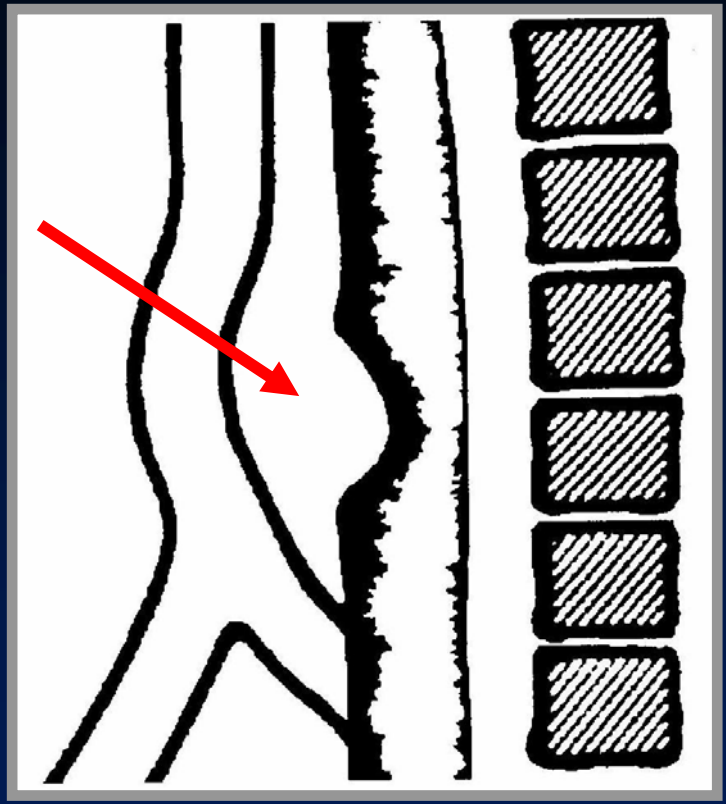
4 month old with stridor

Pulmonary Sling





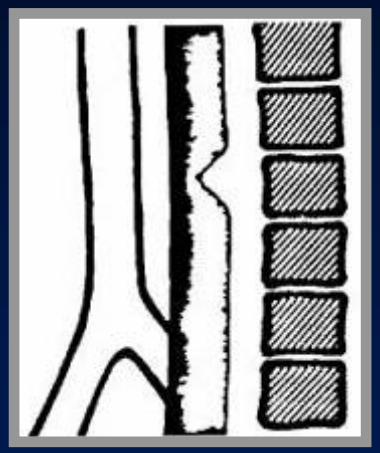




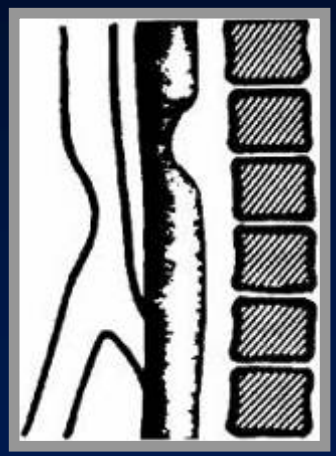
Dahnert

Pulmonary Sling

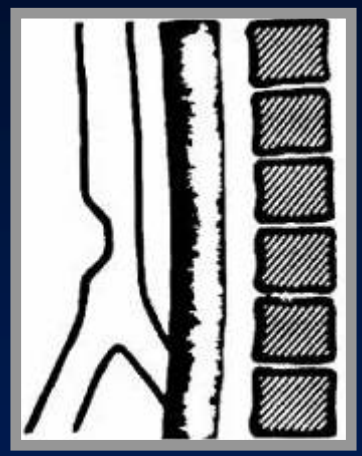
Tracheal/esophageal impressions



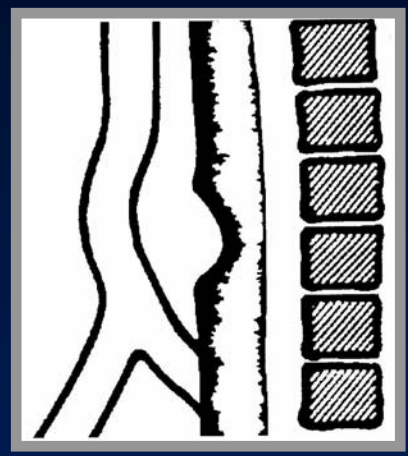
Aberrant SCA



Double Ao Arch



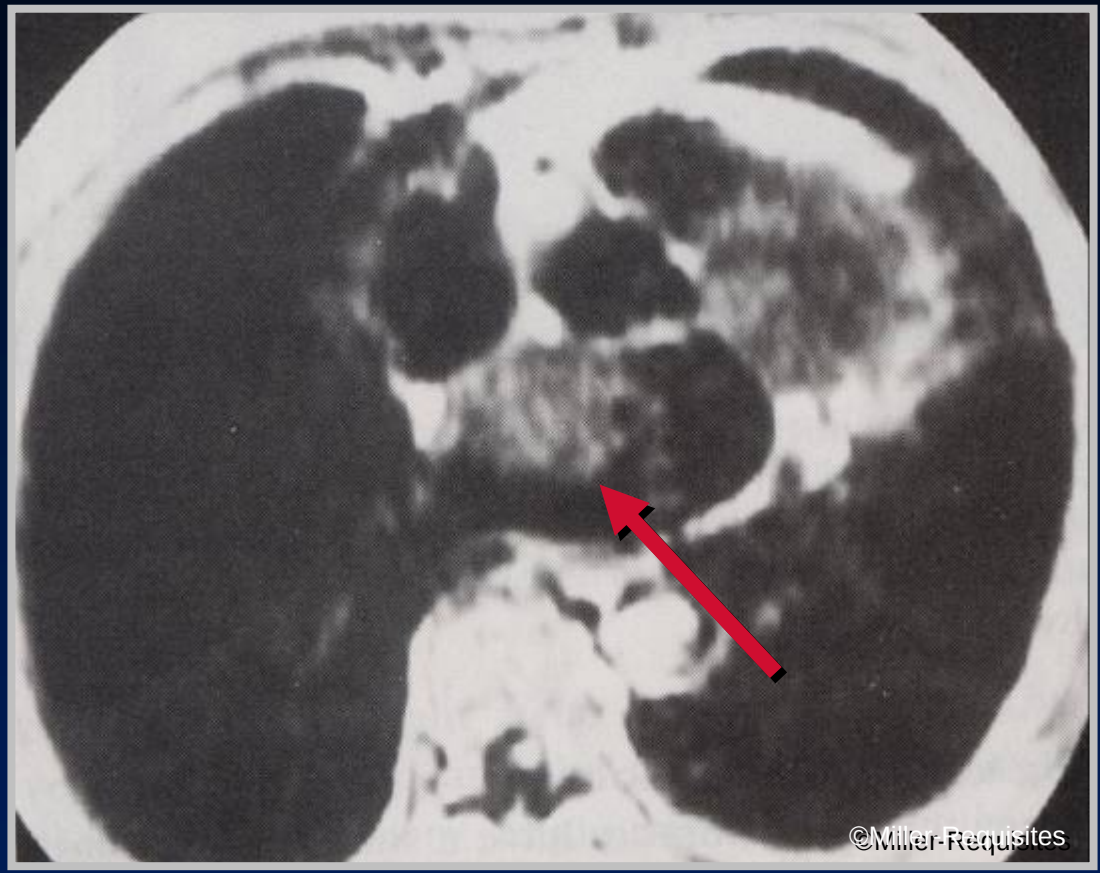
Isolated Anomalies (Rare)



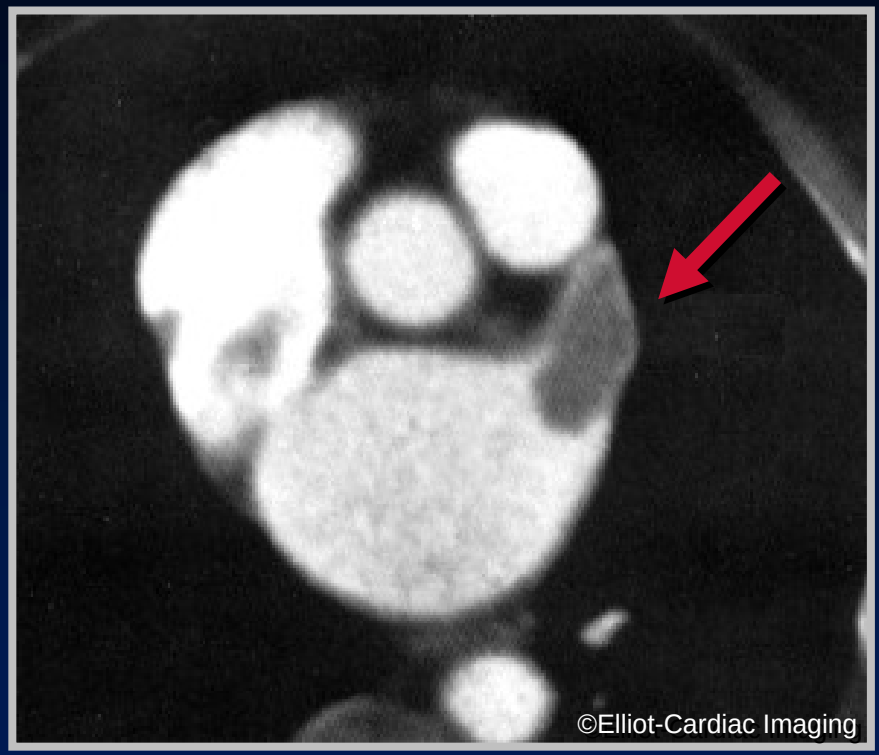
Dahnert

Pulmonary Sling

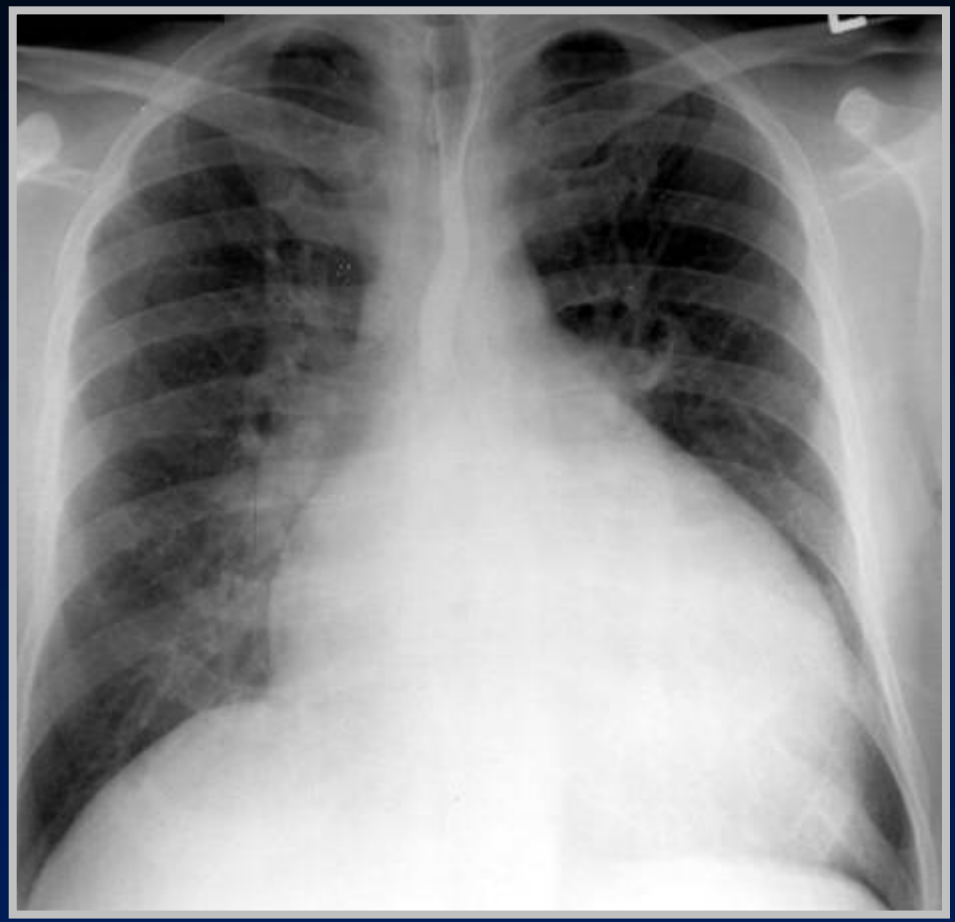
If you see cases like these, you passed…



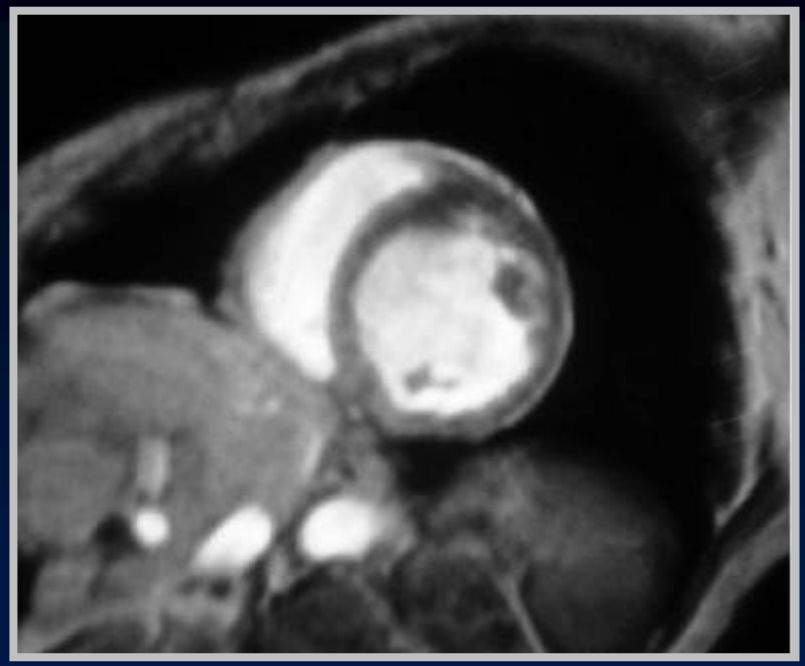
Myxoma in Left Atrium

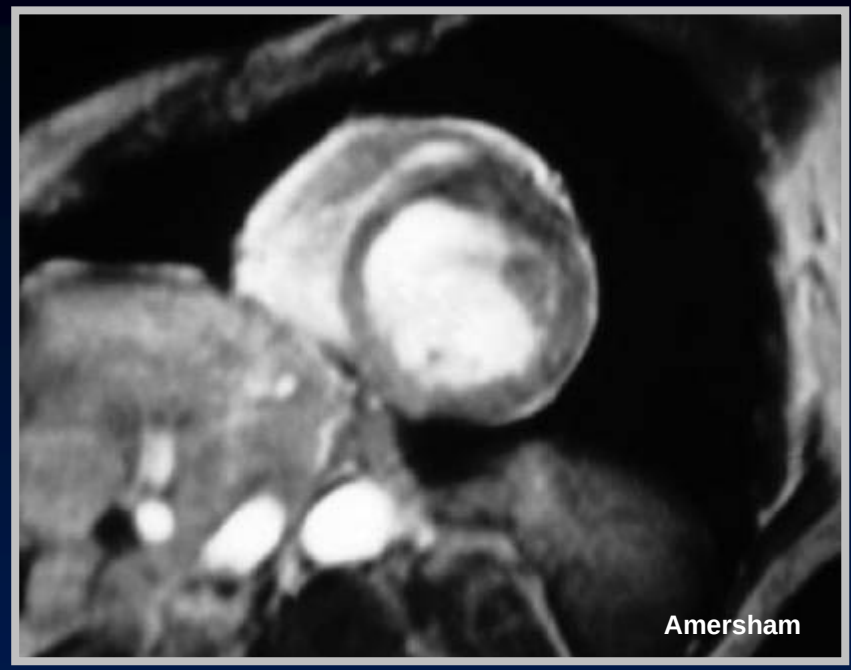


Thrombus in left atrial appendage



Dilated Cardiomyopathy



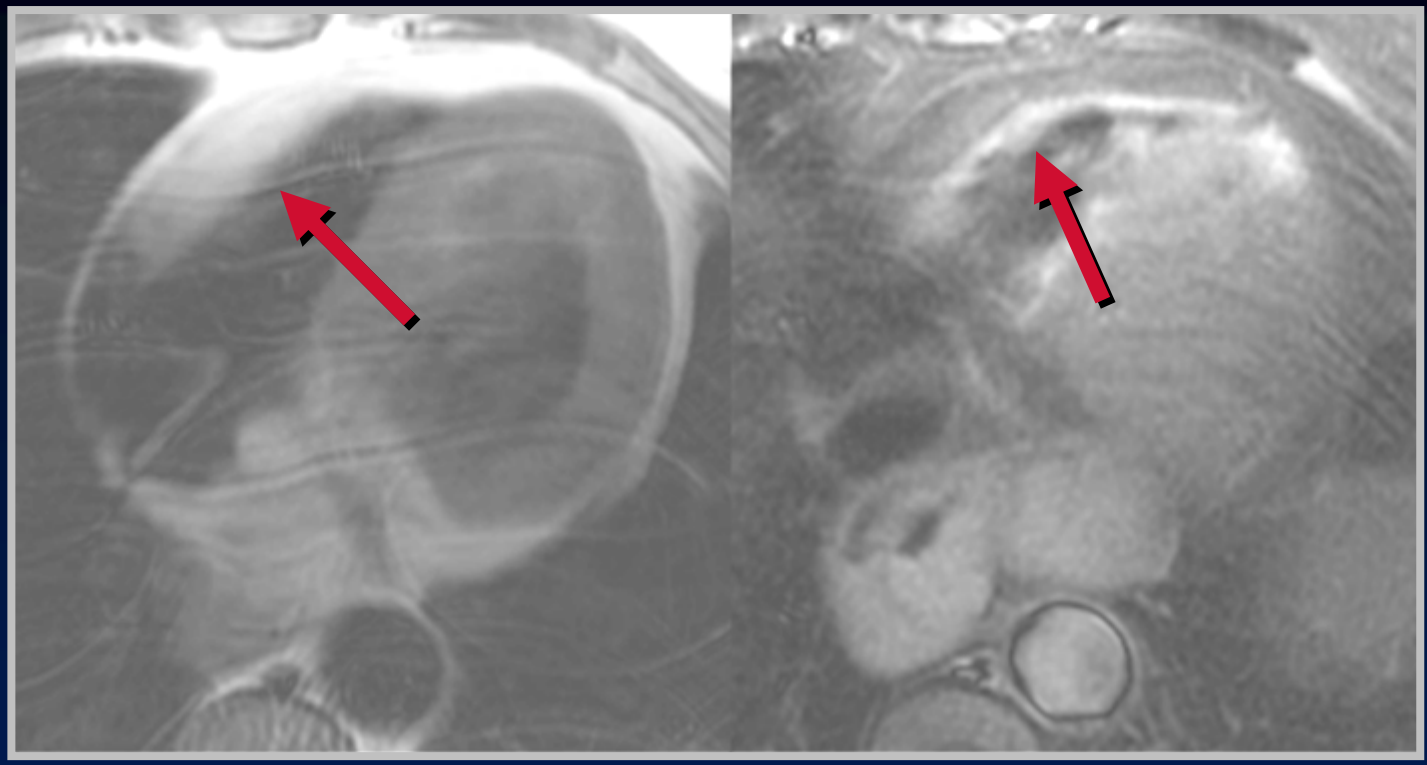


End systole

End diastole

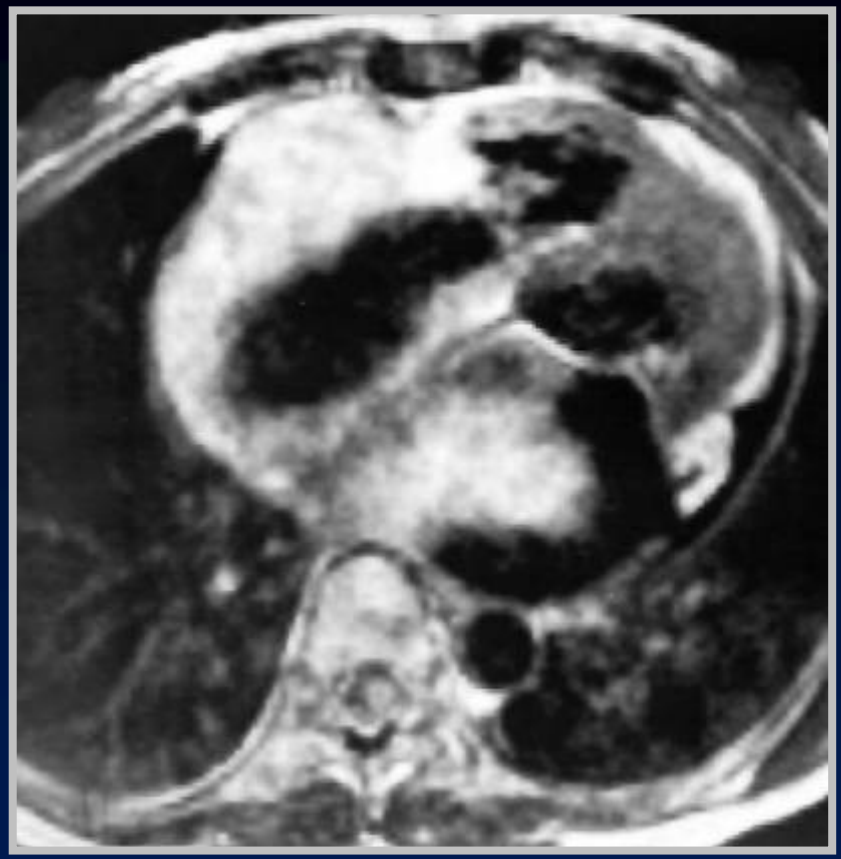
Dilated Cardiomyopathy

Cine MR images in the short axis plane show little change in size between end diastole and end systole



Arrhythmogenic Right Ventricular Dysplasia

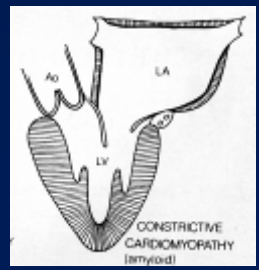
Left-thickening and replacement of RV anterior wall by fatty tissue. Fat suppression (right) - loss of signal in RV anterior wall, confirming fatty nature of these changes



Amersham

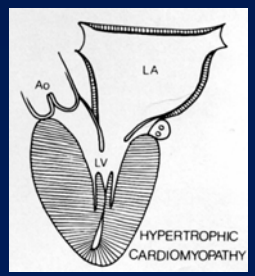
Restrictive cardiomyopathy

ECG-gated spin-echo image - enlargement of both atria and normal size of ventricles with thickened walls

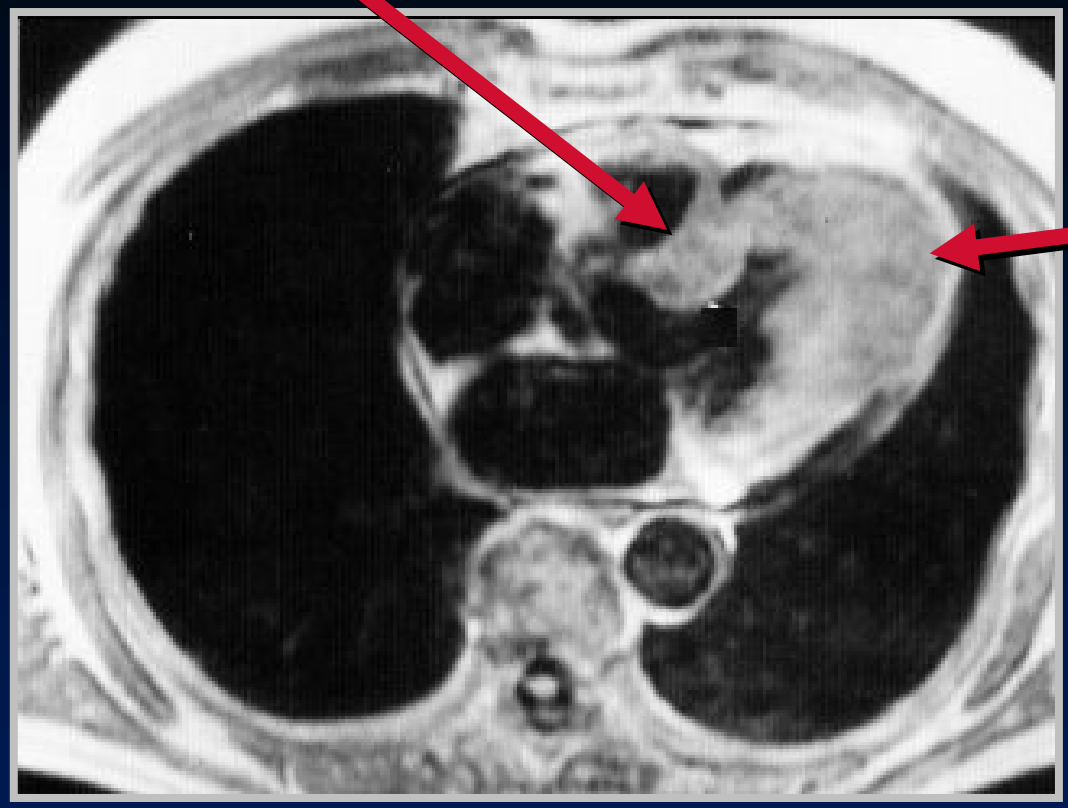


Hypertrophic Cardiomyopathy

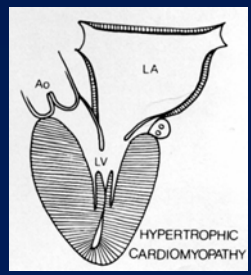
ECG-gated spin-echo image in coronal plane - severe symmetrical hypertrophy of LV



Asymmetric septal hypertrophy

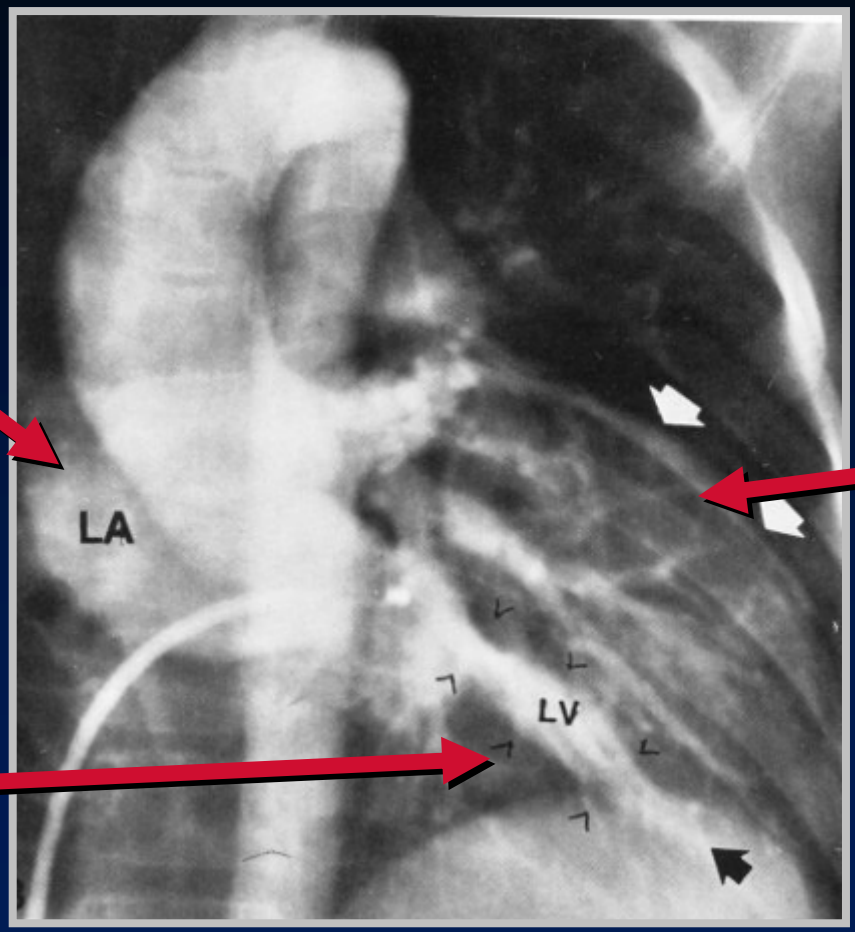


Thickened apex



Hypertrophic Cardiomyopathy

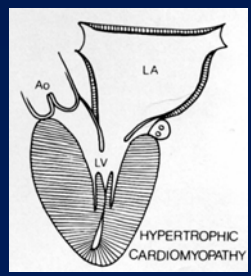
Mitral Regurgitation From SAM

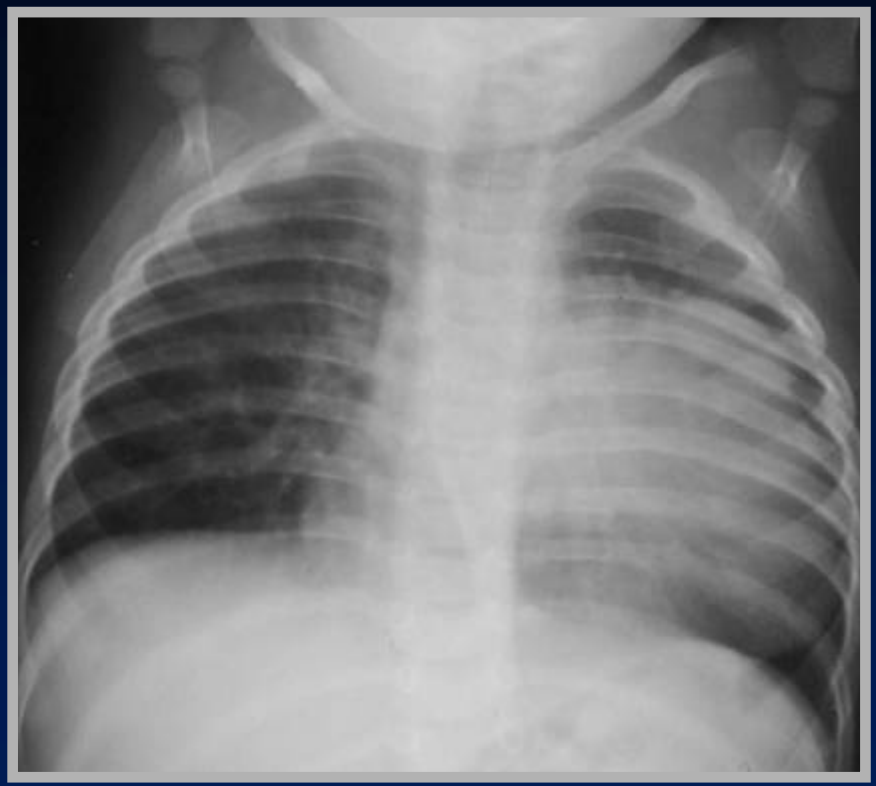


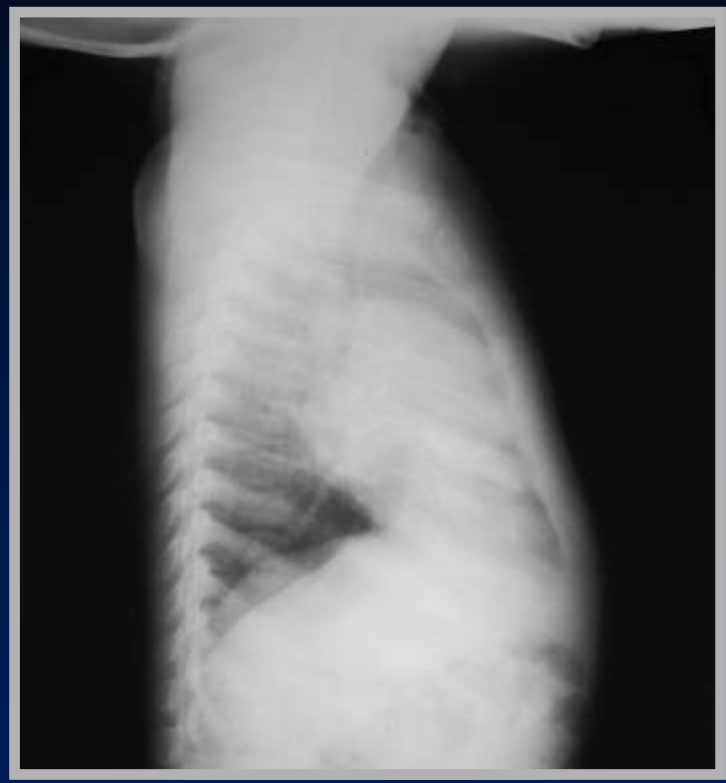
Marked wall thickening

Almost complete emptying of LV

Hypertrophic Cardiomyopathy







Congenital Defect in the Pericardium

Cardiac Malpositions

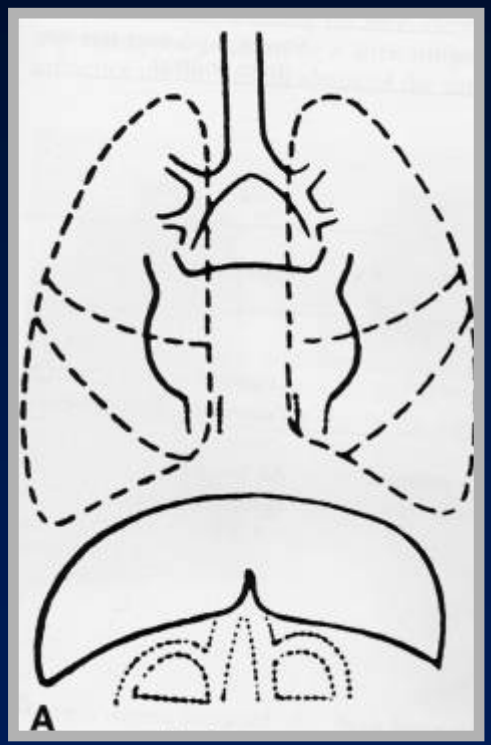
Cardiac Malpositions
Types

- Situs solitus with dextrocardia
- Situs inversus with levocardia
- Situs inversus with dextrocardia

Rule of Thumb

- If aortic arch/apex of heart are on opposite sides from stomach bubble, high incidence of CHD

Asplenia
Bilateral Right-sidedness



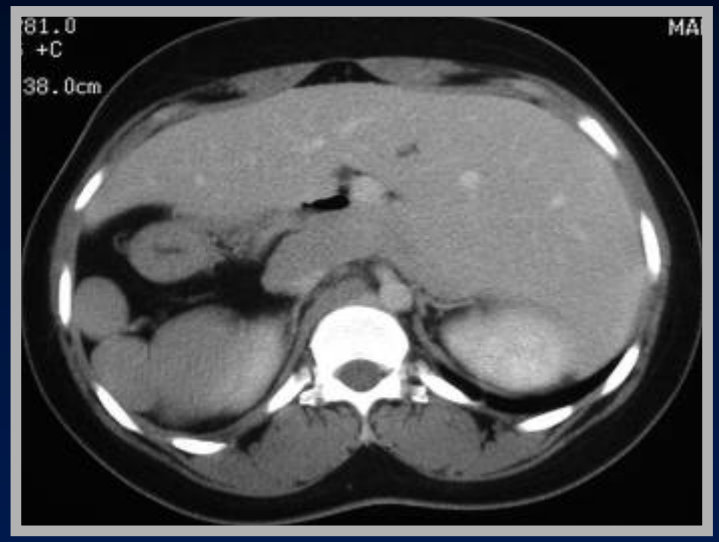
- Male
- Cyanotic
- High risk of infection
- Severe cardiac abnormalities
  - Transposition
  - TAPVR

Polysplenia
Bilateral left-sidedness

- Female
- Abnormalities are more benign
  - Azygous continuation of IVC
  - Bilateral superior vena cava
  - PAPVR
  - ASD

Asplenia/Polysplenia

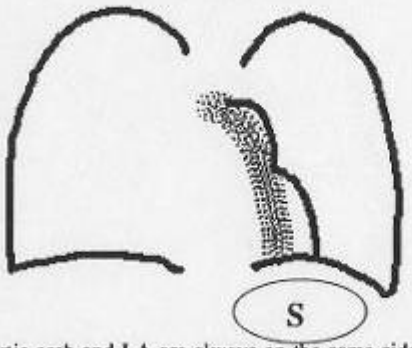
- Asplenia – bad boy
- Polysplenia – good girl



Situs Ambiguous-polysplenia

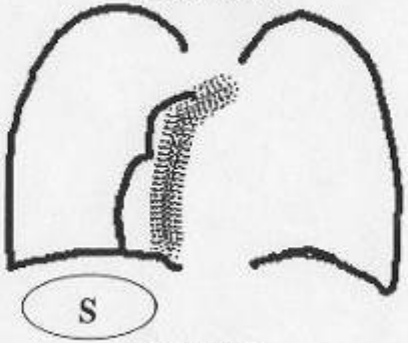
CARDIAC MALPOSITIONS

Situs solitus



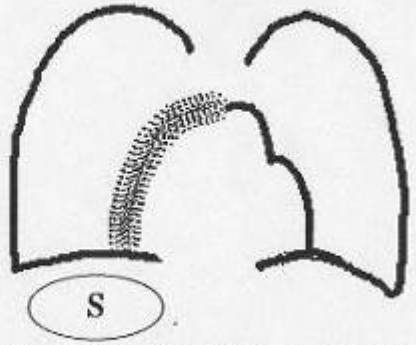
Aortic arch and LA are always on the same side except with isolated R arch
0.6-0.8% CHD

Situs inversus with dextrocardia



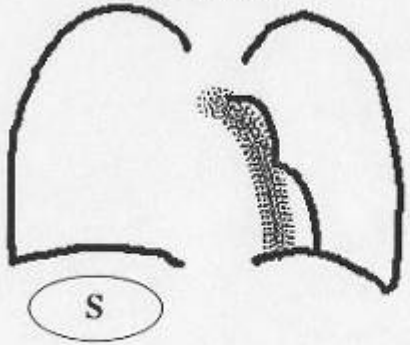
3-5% CHD
Most common is corrected transposition (Kartegeners)

Situs inversus with levocardia

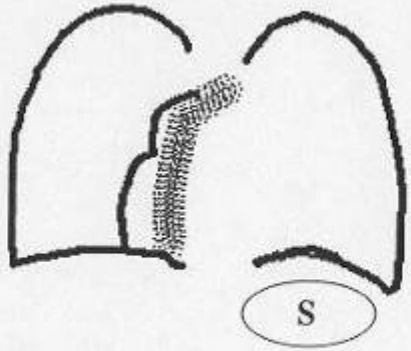


Rare, but 95-100% CHD; no specific prevalence. If asplenia, 100% have common ventricle. Interruption of IVC common.

Situs solitus with malposition of the stomach

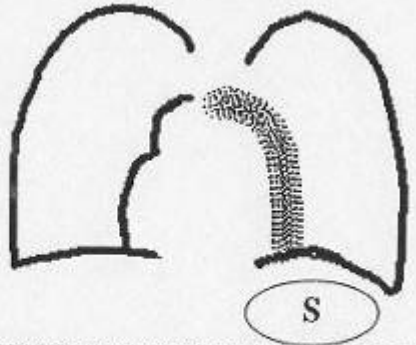


Situs inversus with malposition of the stomach



R/O asplenia
Most have CHD (L→R shunt)
Most with polysplenia and azygous continuation of IVC

Situs solitus with dextrocardia



95% CHD of which 80% are corrected transposition. If cyanosis with shunt vessels, then tricuspid atresia. If cyanosis and ↓vasc, then corrected transposition. If asplenia, 100% have common ventricle. Interrupted IVC common.

Click here for downloadable version of this chart
http://www.learningradiology.com/notes/cardiacnotes/cardiacmalpositionspdf.pdf

Good Luck