Fetal Education Series

Tuesday 14th September, 2021

Children's Mercy Hospital, Kansas City MO

Prenatal Diagnosis of Coarctation

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Objectives

- Review the aortic arch anatomy and prenatal aortic arch physiology.
- Review the imaging approach for the prenatal diagnosis of coarctation of the aorta.
- Review the echocardiographic characteristics of fetal coarction.
- Review some representative cases of fetal coarctation.

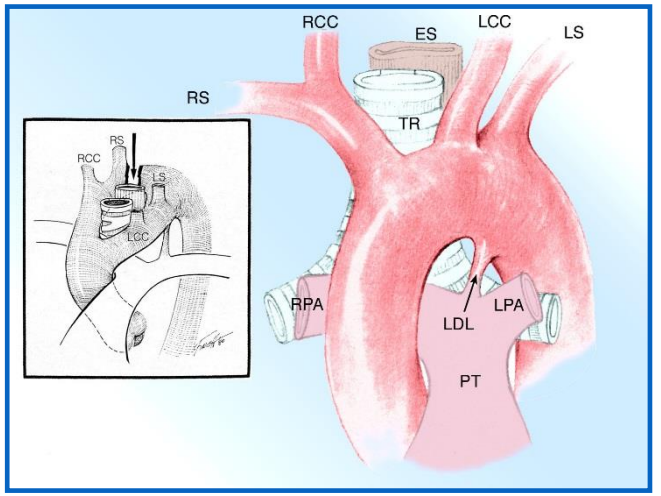
Aortic Arch

- Aortic arch: the part of the aorta that transitions from the ascending to the descending aorta

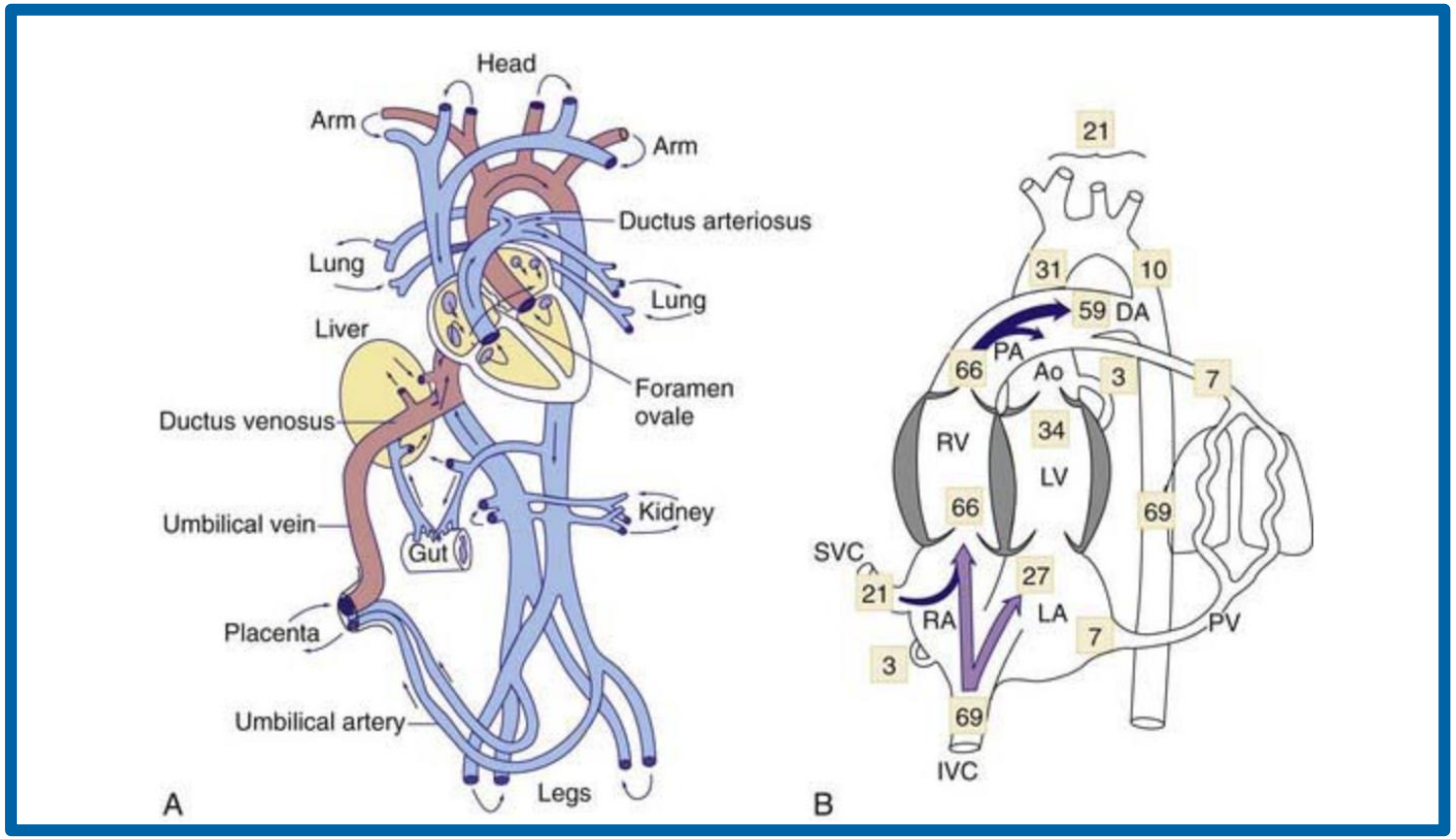
- Aortic arch anomalies:

  - Anomalies of the position or the branching pattern of the aortic arch alone or in combination

  - Aortic arch anomalies of size and patency



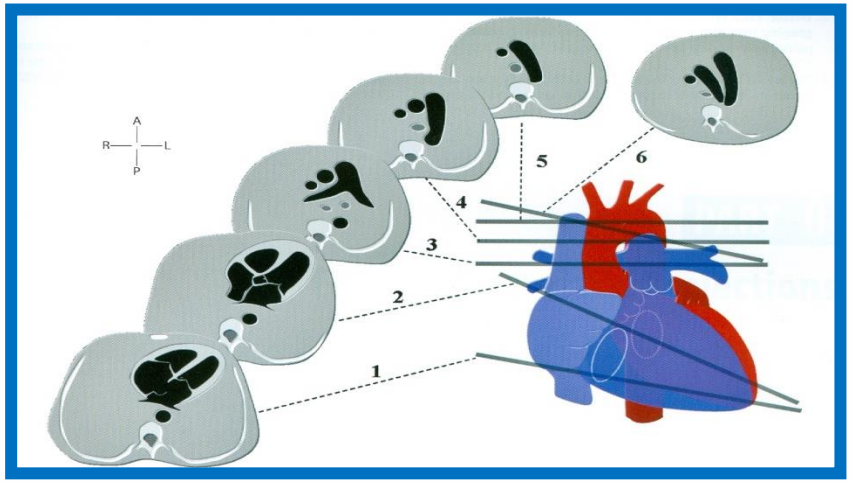
Physiology of the Fetal Circulation

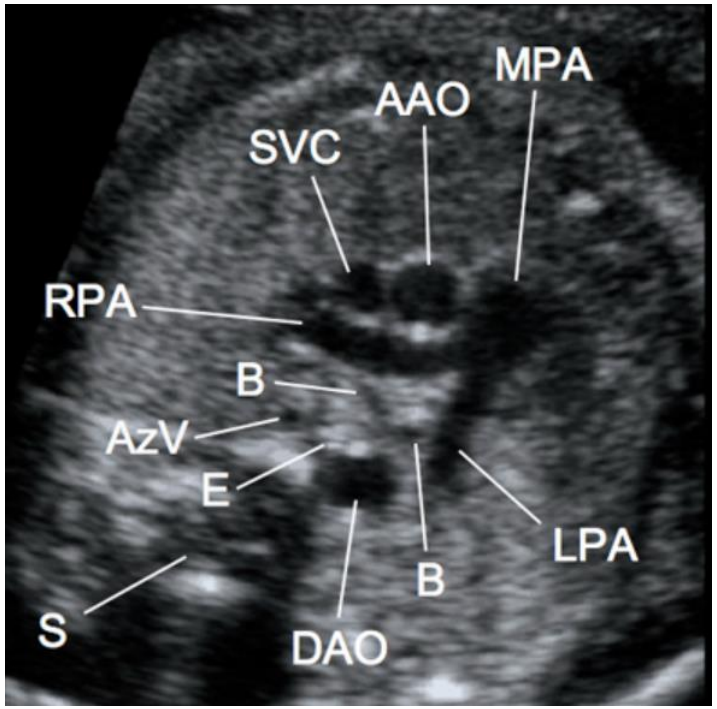


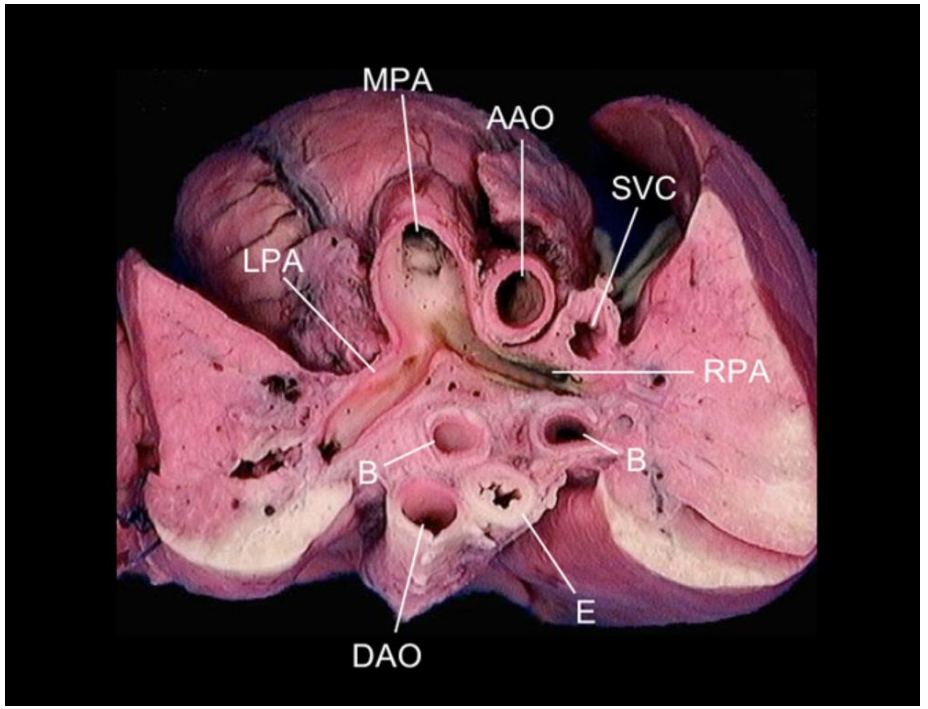
Evaluation of the Aortic Arch

- The left- or right- sidedness of the aortic arch relative to the trachea and main bronchus
- The branching pattern of the head and neck arteries of the aortic arch (absence/presence of an aberrant subclavian artery)
- The left- or right- sidedness of the ductus arteriosus
- The size of the aortic arch segments
- The sidedness of the descending aorta

How do we do it with a fetal echo?







From '*Echocardiographic anatomy in the fetus*' E.Chiappa et al, Springer Verlag, 2008

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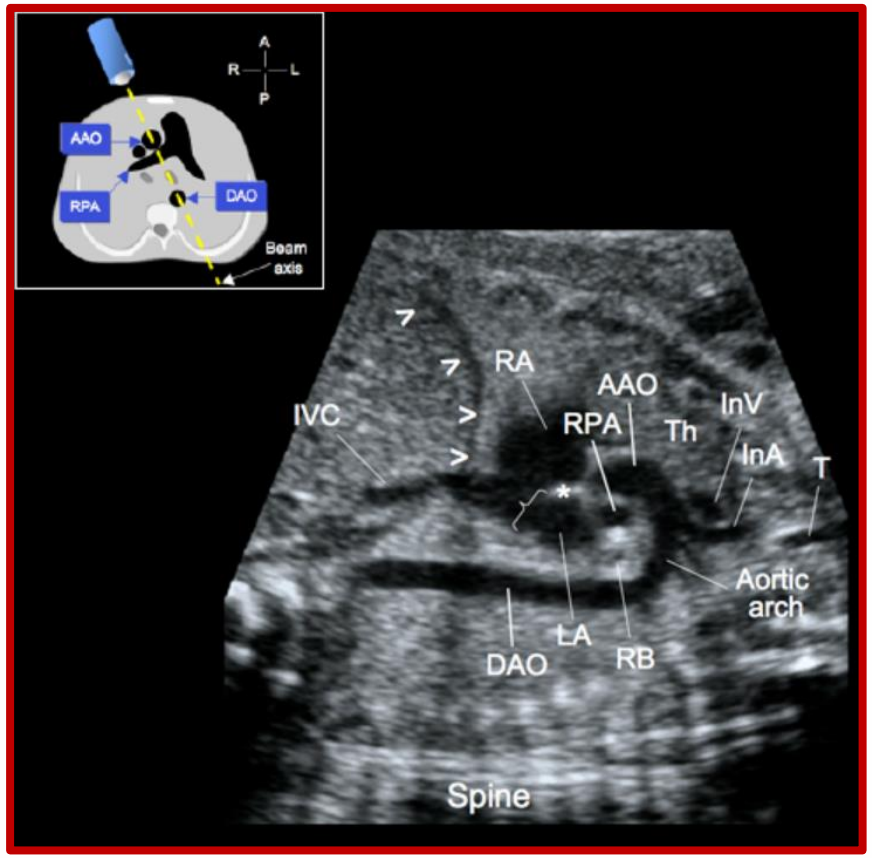

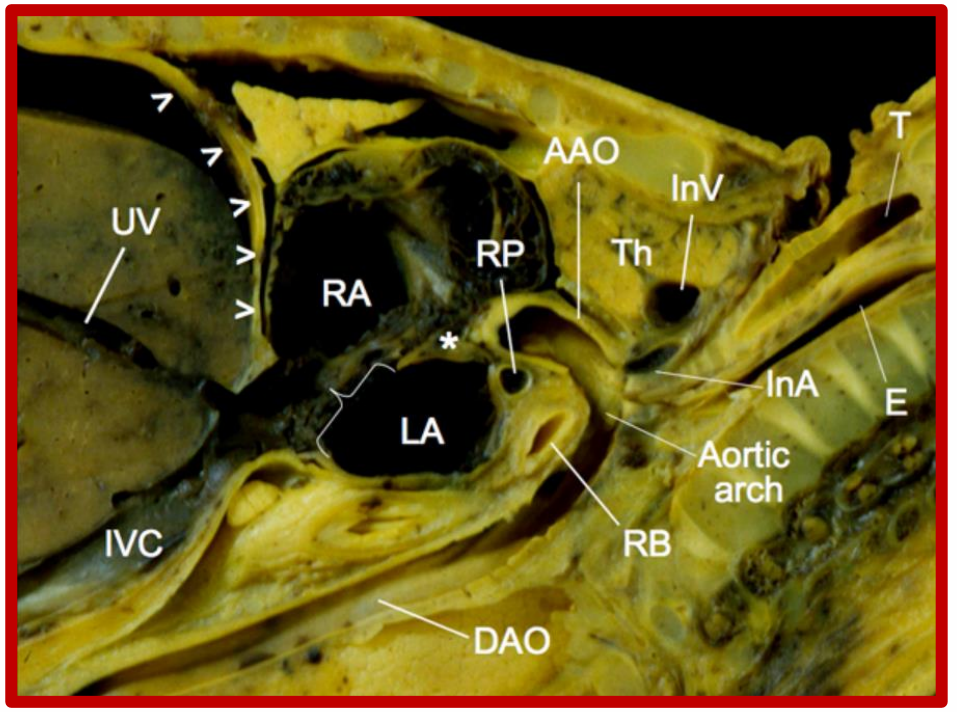

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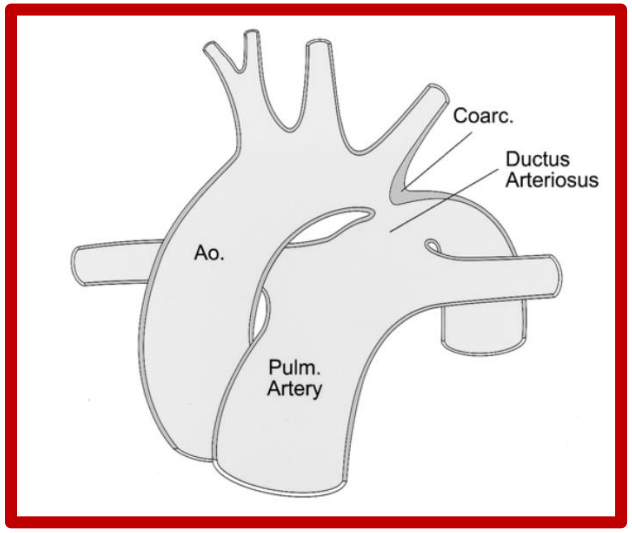
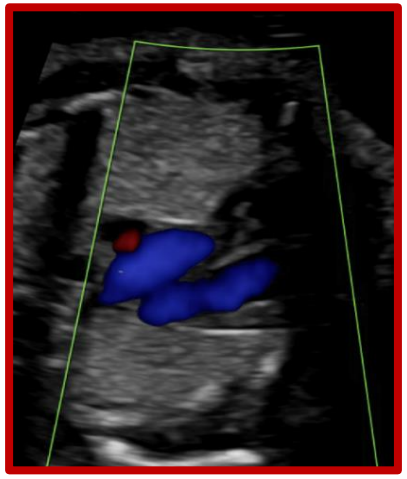
Coarctation of the aorta

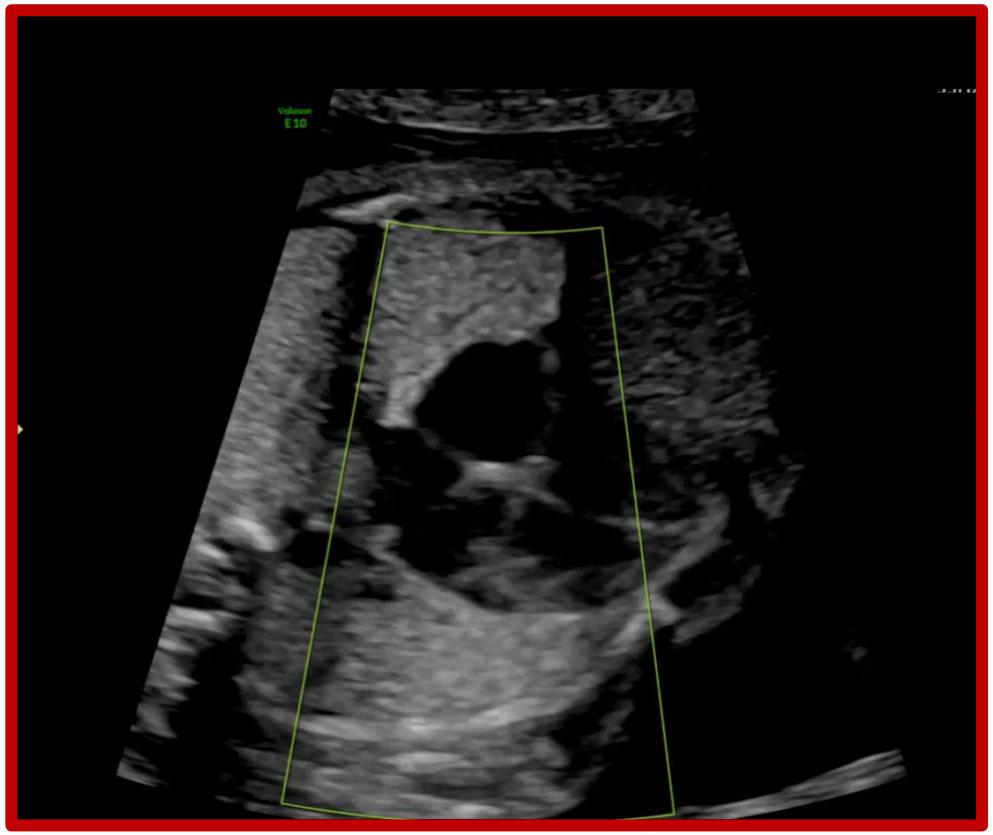
- A narrowing of the lumen of the aortic arch (usually at the isthmus, hypoplasia)
- Occurs in 0.3 per 1000 live births, accounts for 6-8 % (5%) of CHD, is more frequent in males, occurs in Turner's syndrome and there is a genetic substrate
  - Hemodynamic theory
  - Ductal tissue theory
- Only 10-15% of the fetal CO passes through the isthmus
- Even in the current era only 30 - 50% is diagnosed
- One-to-two thirds of the suspected fetuses actually develop it



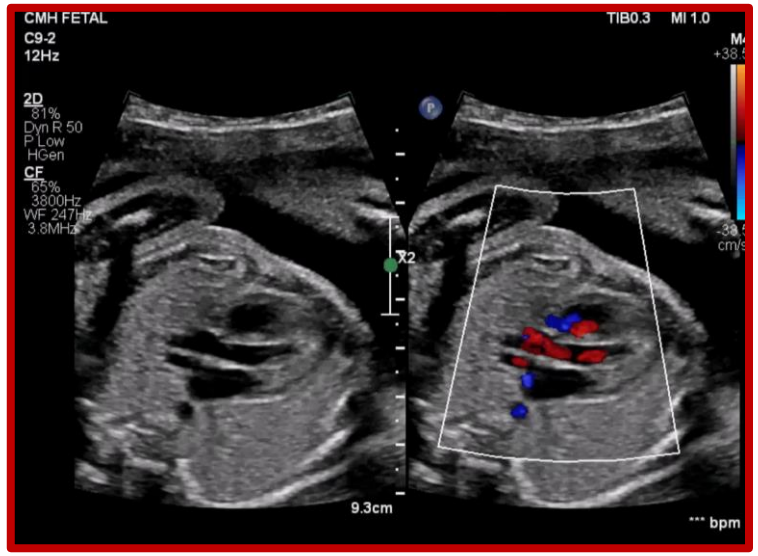
From, 'Nadas Pedatric Cardiology' , Philadelphia PA , Saunders Elsevier

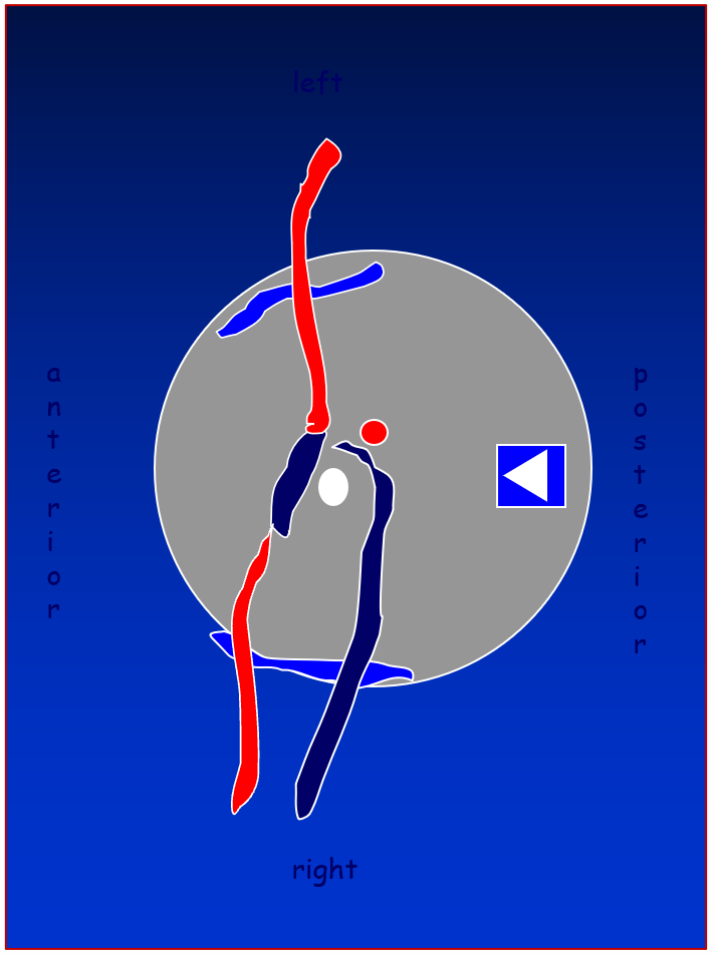
Transverse Sweep to Three Vessels



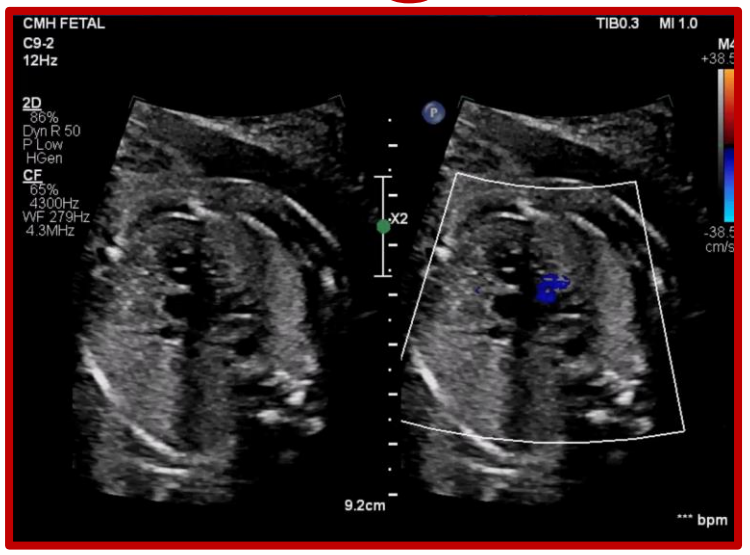


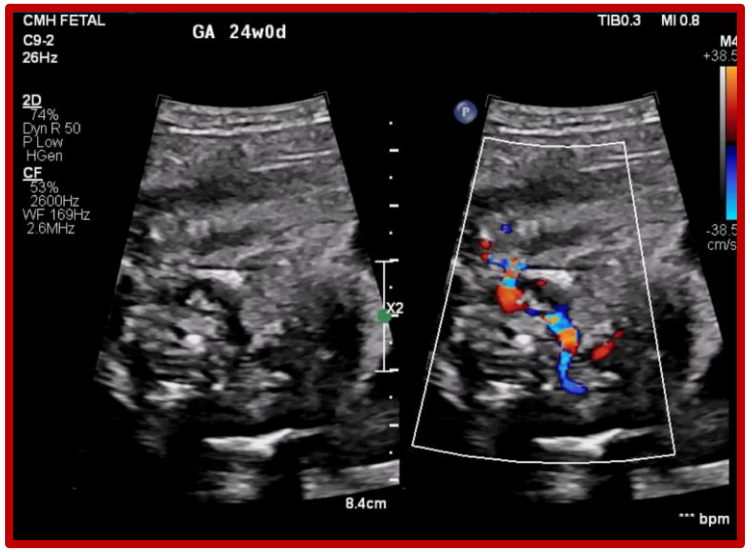
Evaluate the Aortic Branching





Fetal Medicine Foundation, Prof K. Nikolaides





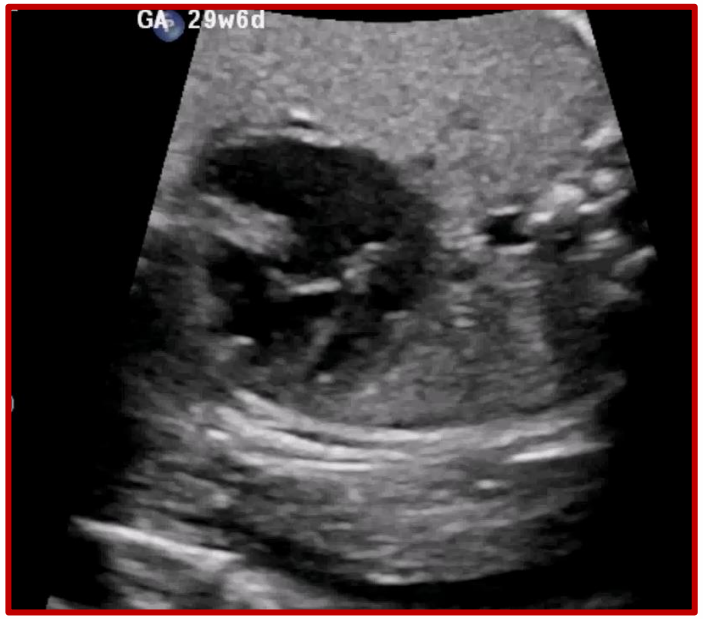
Corctation - What to look For

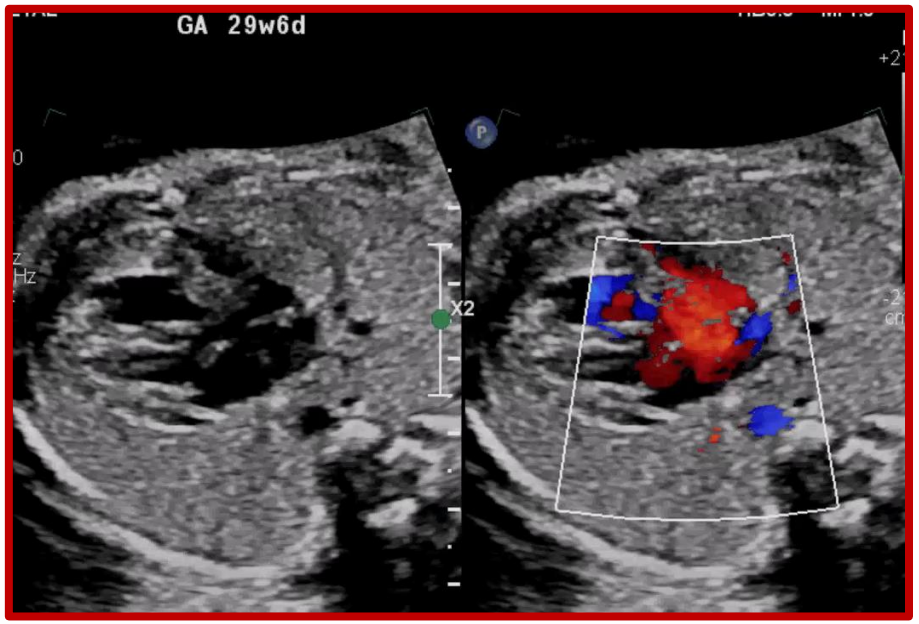
- RV – LV asymmetry
- Intracardiac and other signs
  - Narrow LVOT
  - VSD with posterior malalignment
  - Unbalanced AVC
  - DORV
  - Dilated coronary sinus
- Hypoplasia or tortuosity of the isthmus
- Use 2D, color and flow Doppler

LV – RV asymmetry in the fetus

- Coarctation
- Bicuspid Aortic Valve
- Structural Mitral Valve disease
- LSVC to coronary sinus
- Interrupted IVC with azygos continuation
- TAPVR or PAPVR
- CNS anomalies
- Genetic syndromes
- Normal fetus

Corctation - What to look For





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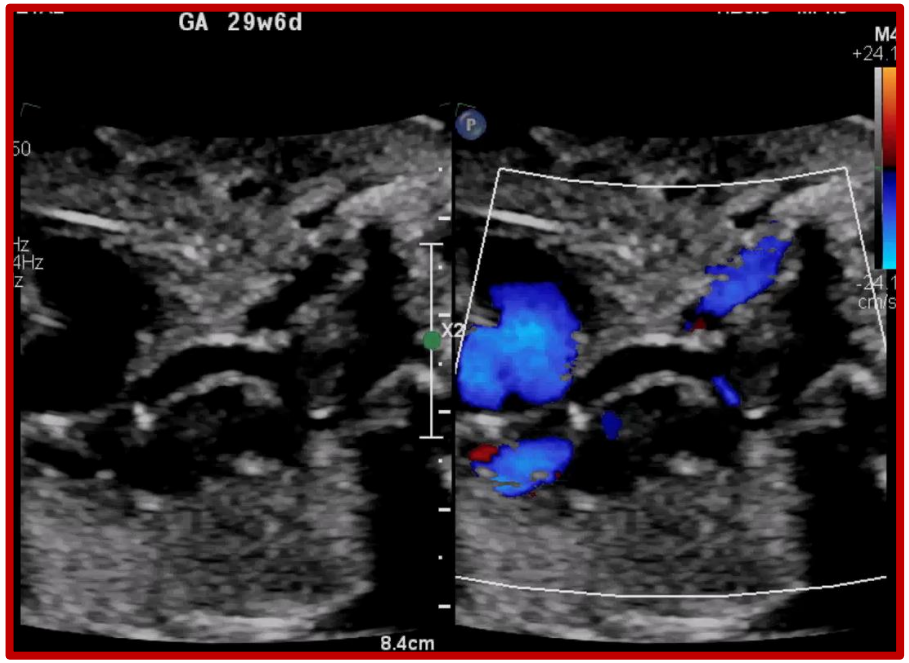

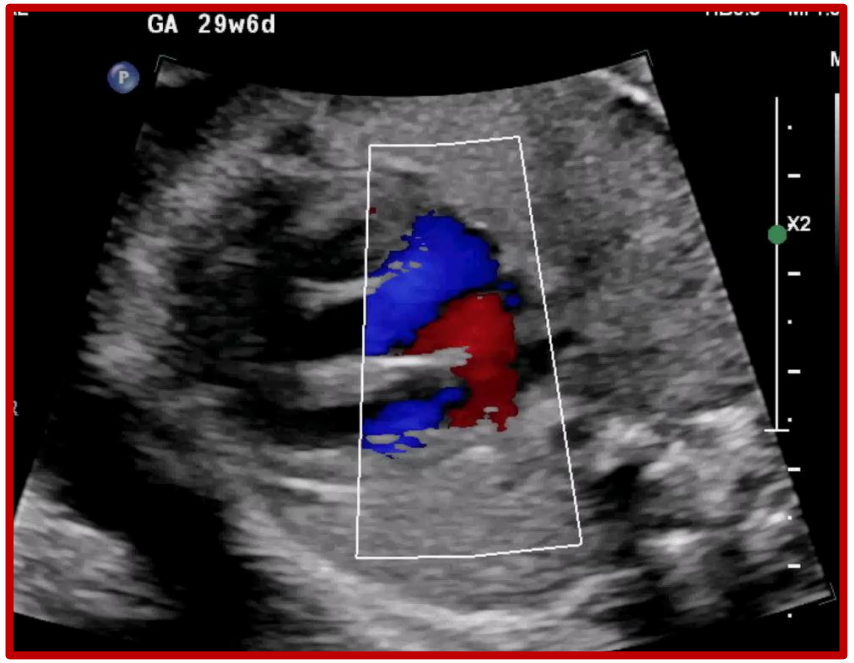

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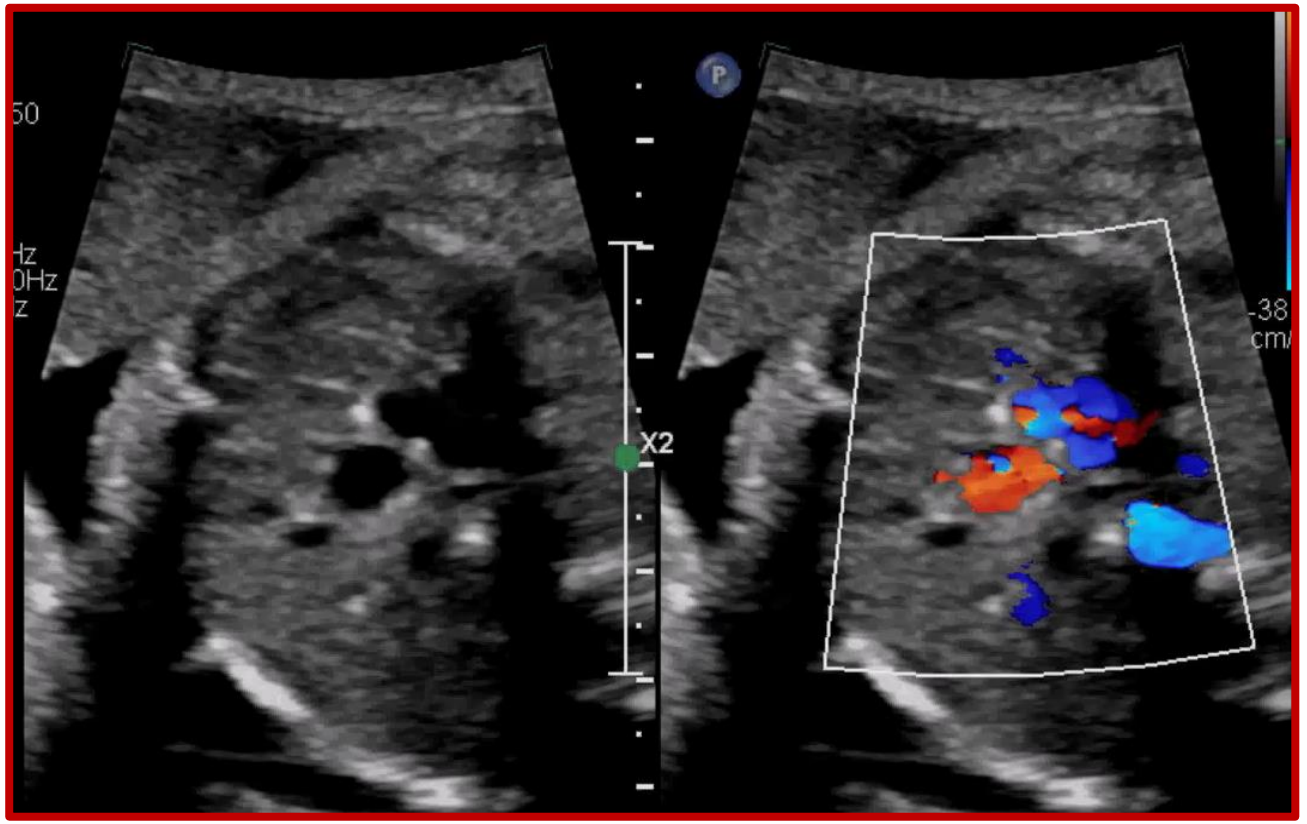
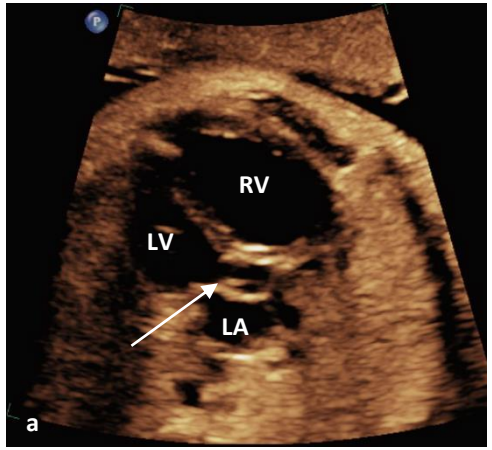
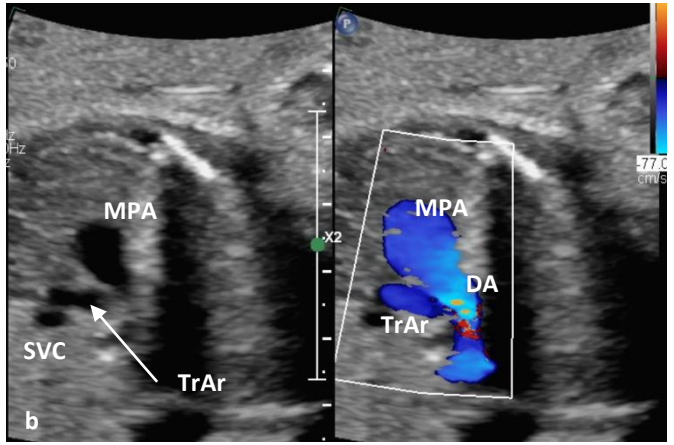
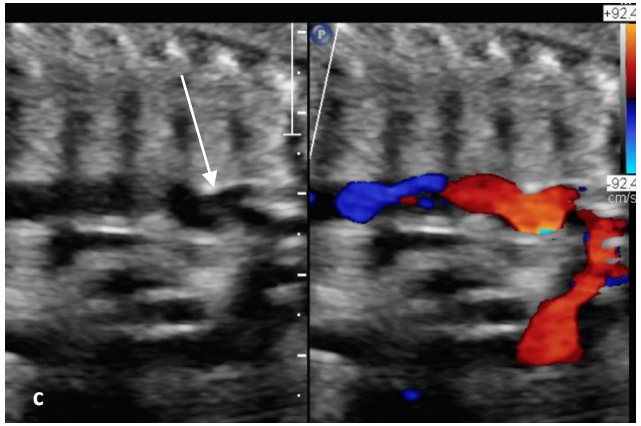
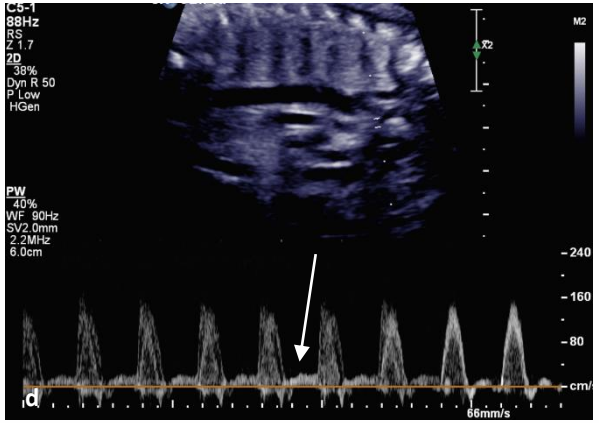


Coarctation in the fetus









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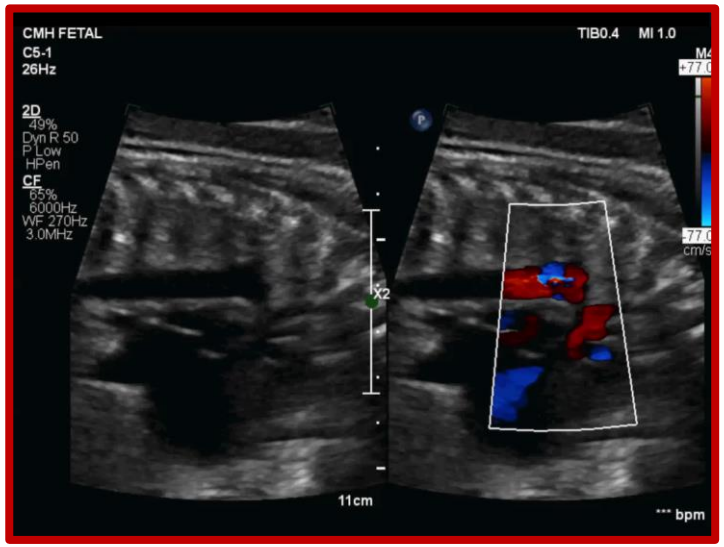

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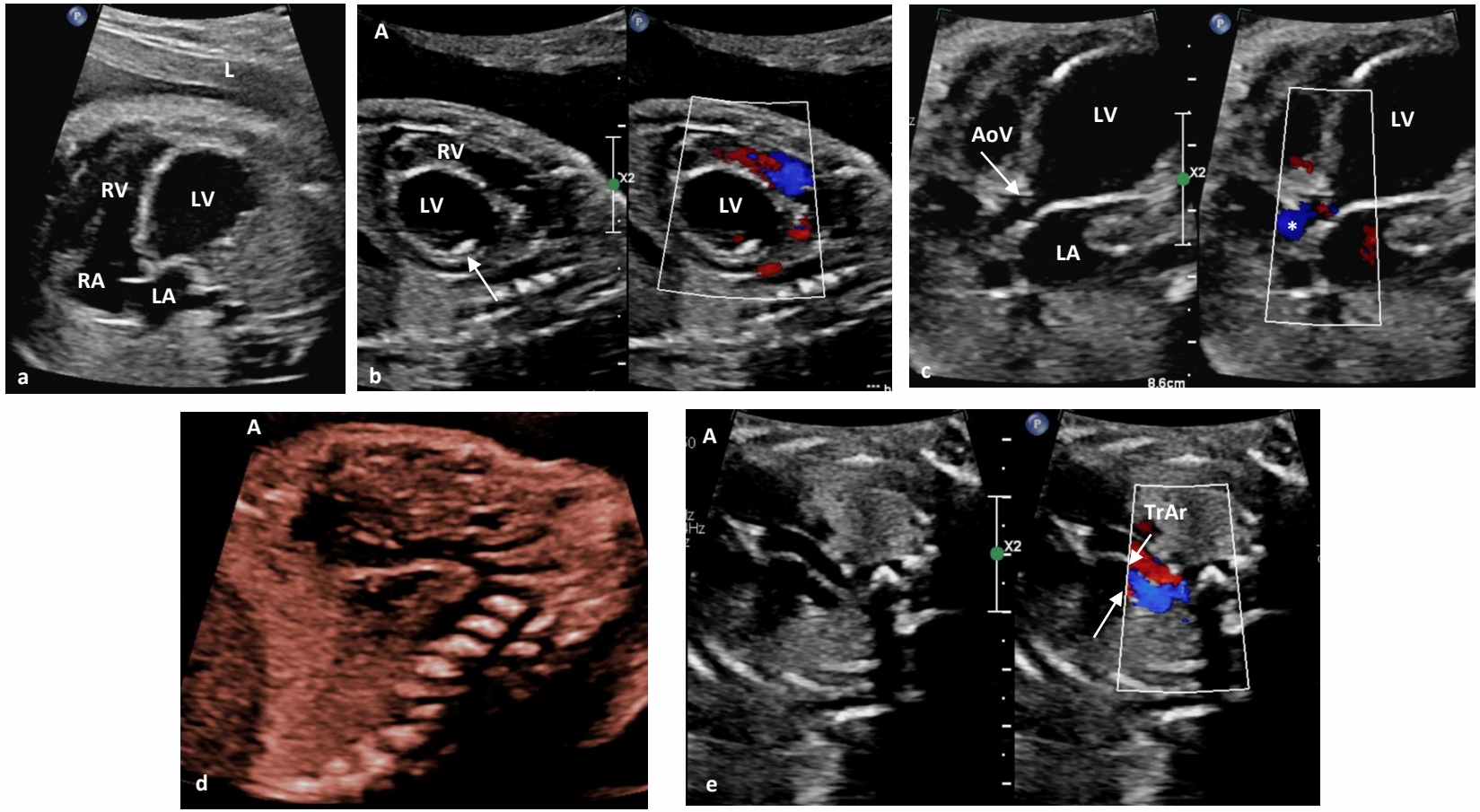

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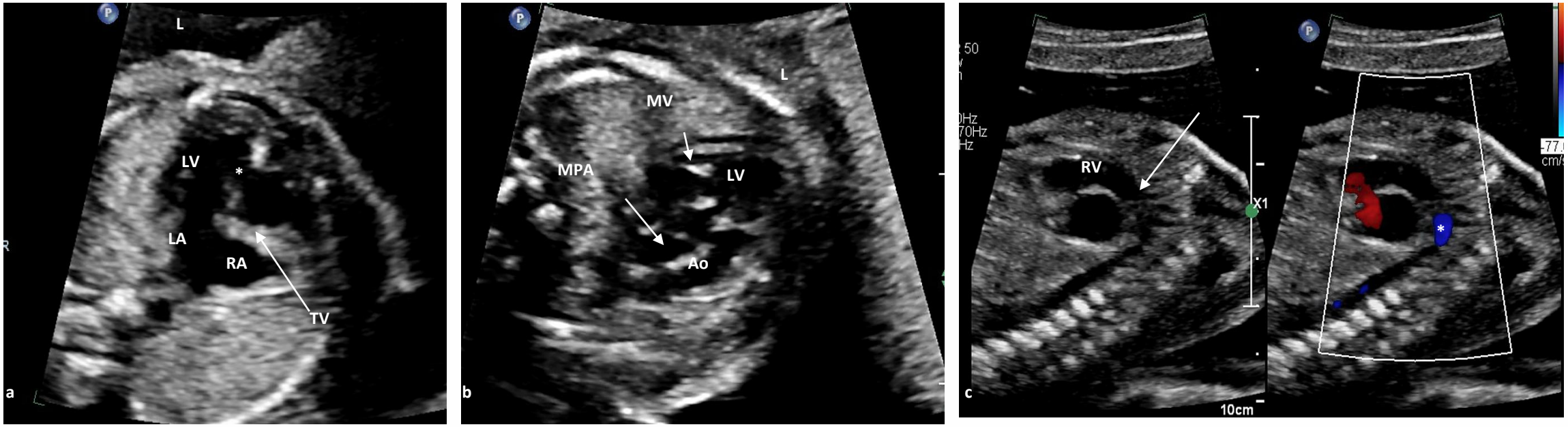

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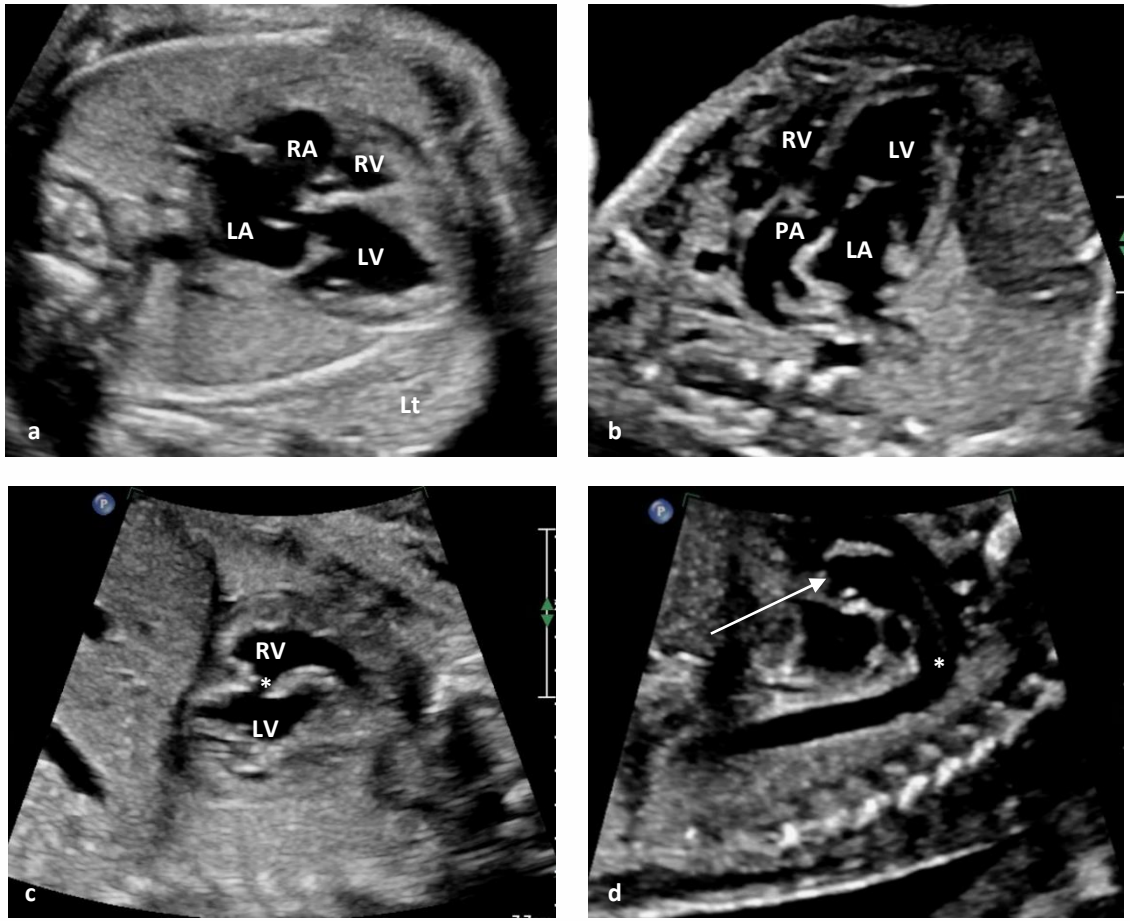

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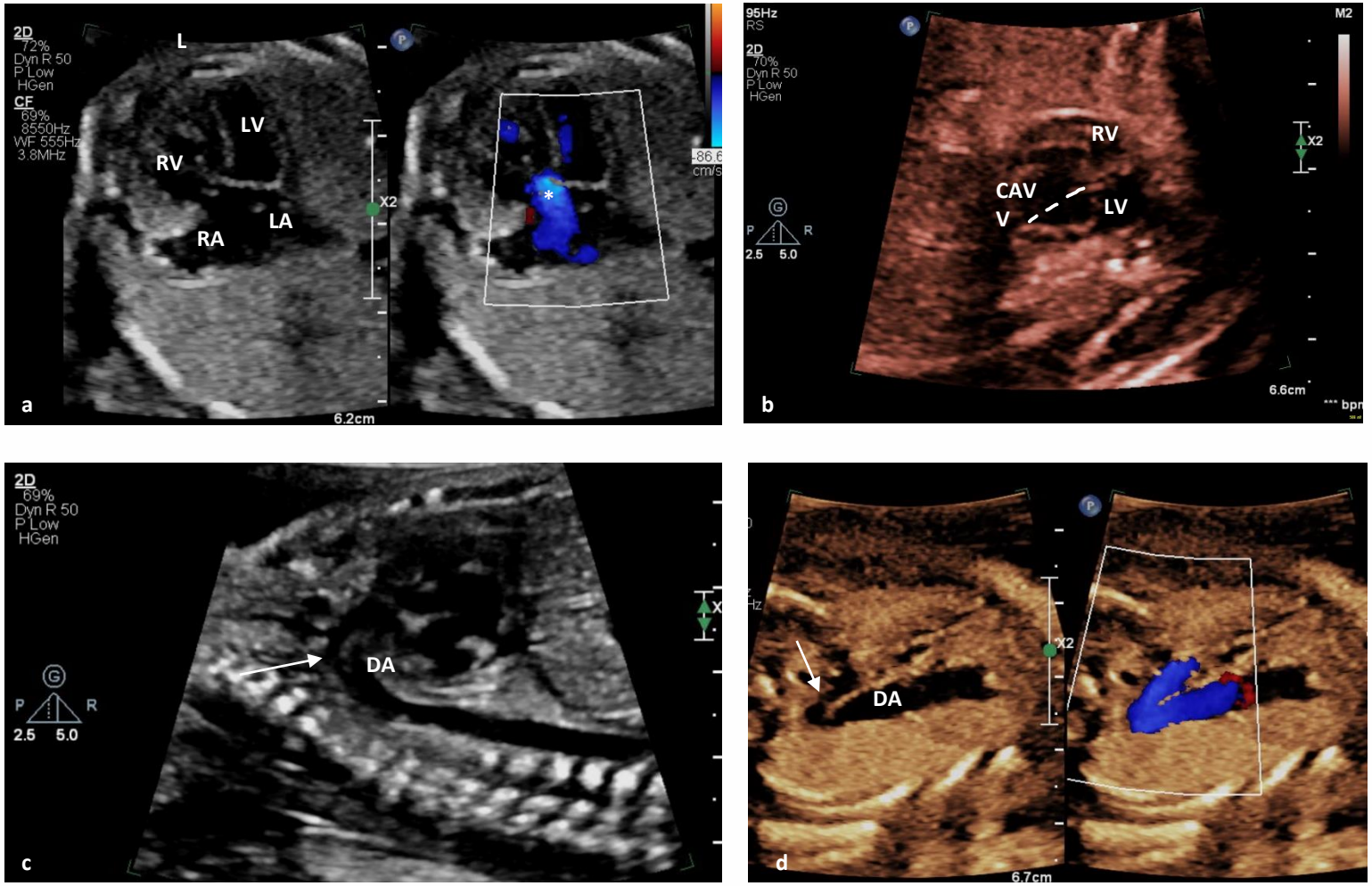
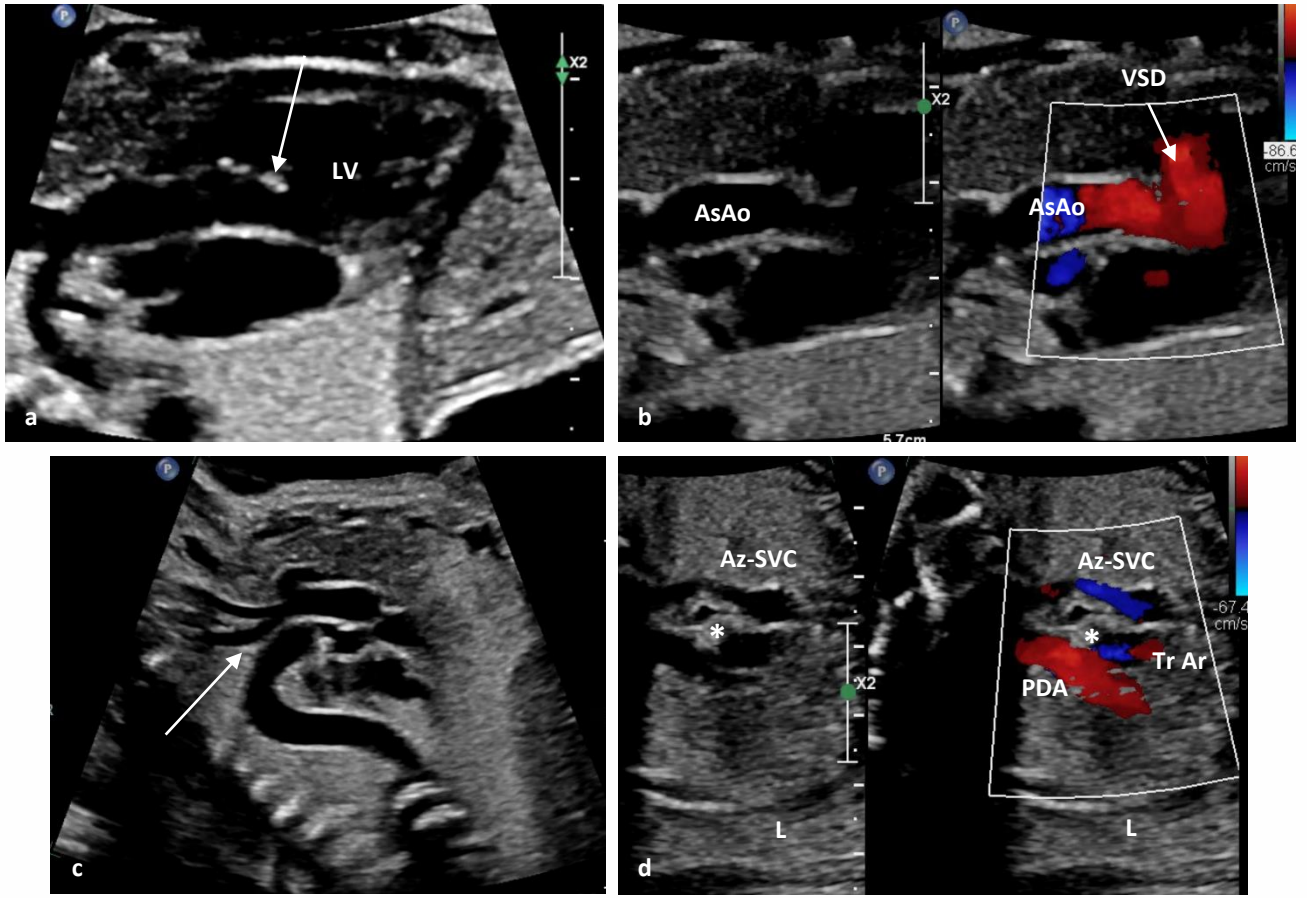


Coarctation in the fetus - IAA



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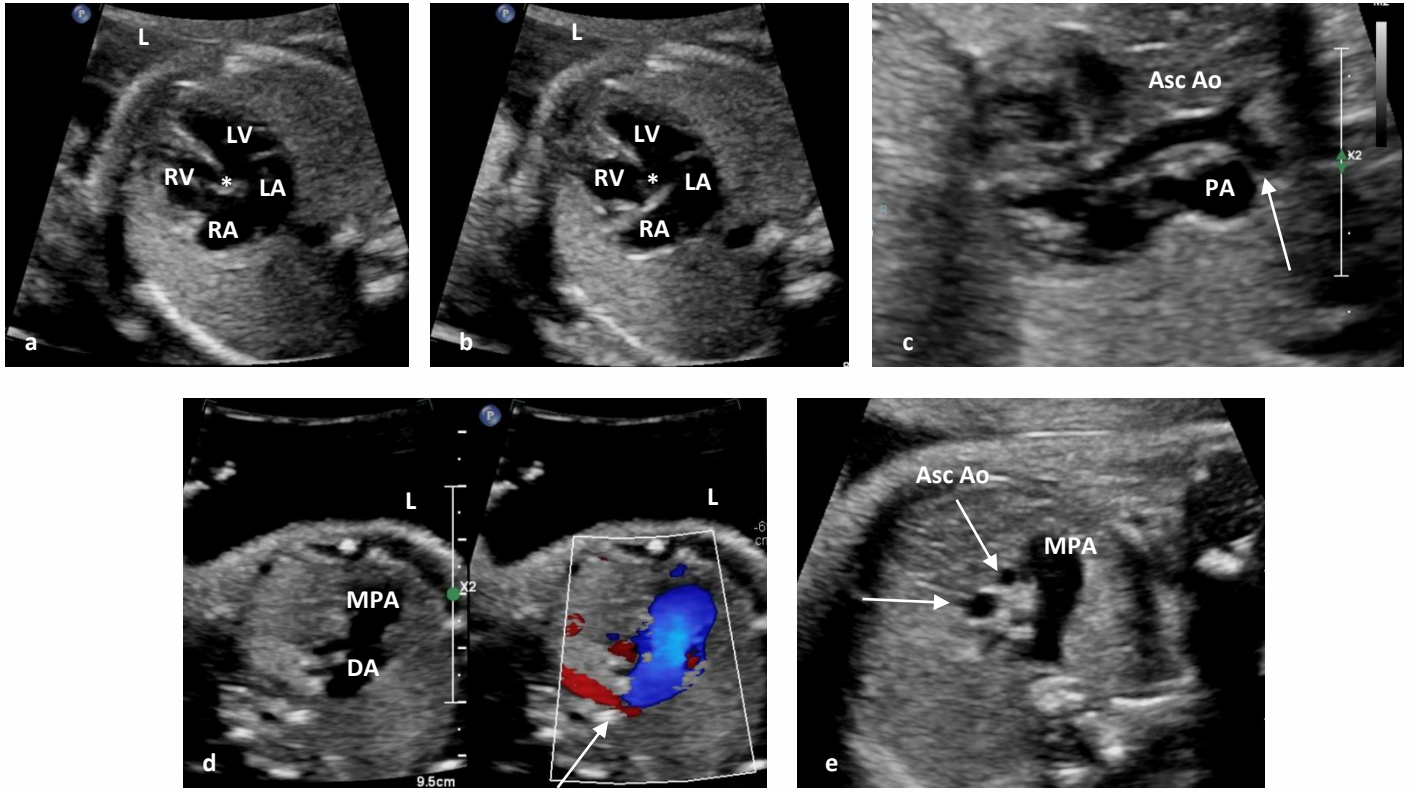


Coarctation - Relevant findings

- Bidirectional flow at the atrial septal level
- Absence of growth of the isthmus in serial exams
- Visualization of a shelf or discrete narrowing
- Continuous forward flow in the isthmus on color Doppler imaging
- Low-velocity persistent forward flow with low PI on PW Doppler imaging
- Aortic isthmus z-score <-2 on 3V view, and tracheal view
- Isthmus to ductus arteriosus diameter ratio < 0.74 on the 3VV or 3V-tracheal view
- Transverse aortic arch diameter <3 mm when GA > 30 wks
- AoV to PV annulus ratio less than 0.6 in the VOT views and MV to TV annulus ratio <0.6 in the four chamber view
- MPA-to-AsAo ratio of more than 1.6

Coarctation – Why is it important?

- Delivery planning
- Postnatal management
- Genetic counseling

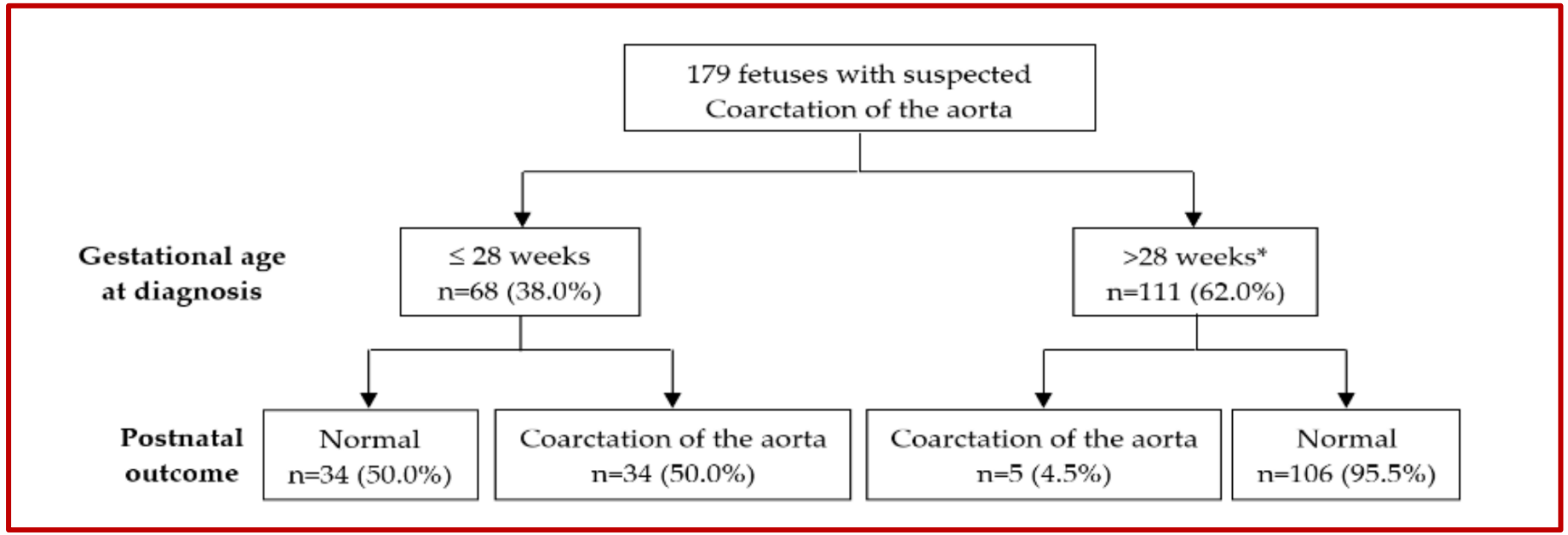
Coarctation – Counseling

- Mention co-existing anatomic anomalies
- Explain possibility of
- Mention co-existing genetic anomalies

Coarctation – Genetics

- Turner syndrome
- PHACE association
- 22q.11 deletion
- VACTERL association
- Kabuki syndrome

Coarctation – Timing of Diagnosis



2021, Journal of Clinical Medicine, Gomez-Montes et al


LOVE WILL.