Webinar Fetal Education Series

Tuesday January 12, 2021

Children's Mercy Hospital, Kansas City MO

The Fetal Echocardiogram

Maria Kiaffas, MD, PhD

Director, Fetal Cardiology

Assistant Professor, UMKC

BEST CHILDREN'S HOSPITALS U.S.News RANKED IN 10 SPECIALTIES

MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER

UMKC School of Medicine

Objectives

- Review the indications for a Fetal echocardiogram
- Review the current guidelines
- Review the standard imaging approach and techniques for evaluating the cardiac structures

Conclusions

- Use a systematic approach during your cardiac evaluation
- Know your fetal anatomy and use a critical eye
- Optimize your image (angle of insonation) for 2D, flow Doppler and adjust your color box and scale/PRF
- Pay attention to size discrepancy, valve motion and flow direction
- Let the inside of the heart and the great vessels‘talk to you’!

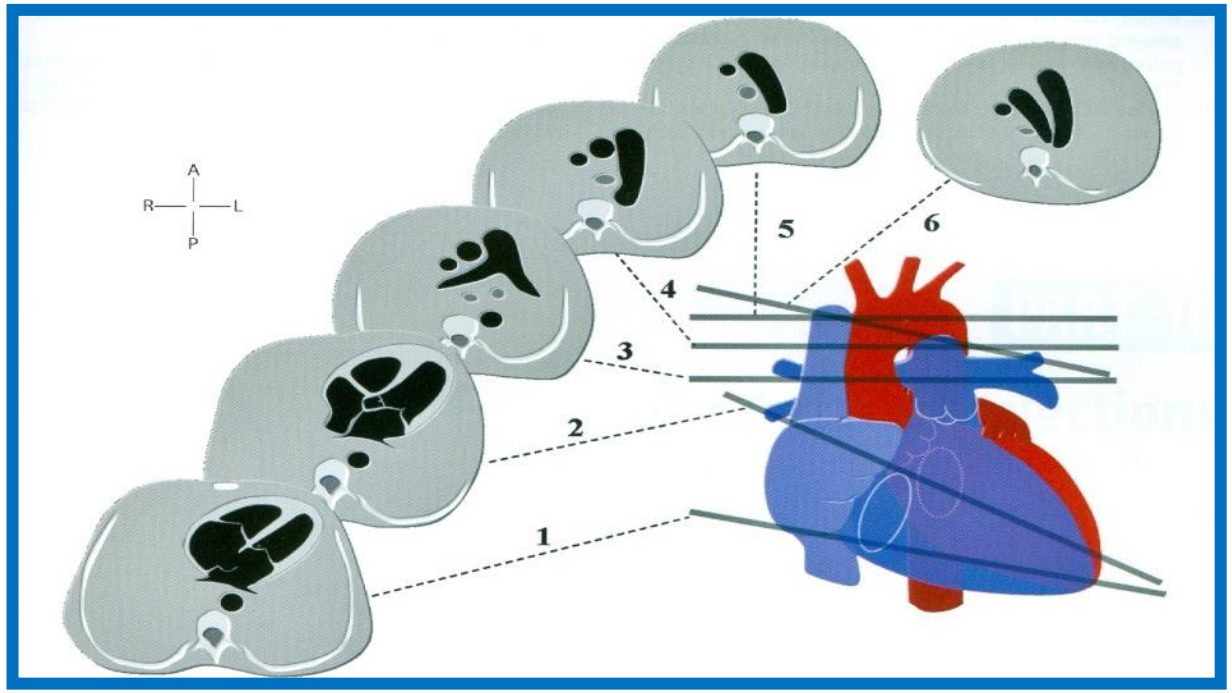
Indications

- Indications with higher risk profile (estimated >2% absolute risk)
  - Maternal pregestational diabetes mellitus
  - Diabetes mellitus diagnosed in the first trimester
  - Maternal phenylketonuria (uncontrolled)
  - Maternal autoantibodies (SSA/SSB$^+$)
  - Maternal medications
    - ACE inhibitors
    - Retinoic acid
    - NSAIDs in third trimester
  - Maternal first trimester rubella infection
  - Maternal infection with suspicion of fetal myocarditis
  - Assisted reproduction technology
  - CHD in first degree relative of fetus (maternal, paternal or sibling with CHD)
  - First or second degree relative with disorder with Mendelian inheritance with CHD association
  - Fetal cardiac abnormality suspected on obstetrical ultrasound
  - Fetal extracardiac abnormality suspected on obstetrical ultrasound
  - Fetal karyotype abnormality
  - Fetal tachycardia or bradycardia, or frequent or persistent irregular heart rhythm
  - Fetal increased NT >95% (≥3 mm)
  - Monochorionic twinning
  - Fetal hydrops or effusions

- Indications with lower risk profile (estimated >1% but <2% absolute risk)
  - Maternal medications
    - Anticonvulsants
    - Lithium
    - Vitamin A
    - SSRIs (only paroxetine)
    - NSAIDs in first/second trimester
  - CHD in second degree relative of fetus
  - Fetal abnormality of the umbilical cord or placenta
  - Fetal intra-abdominal venous anomaly

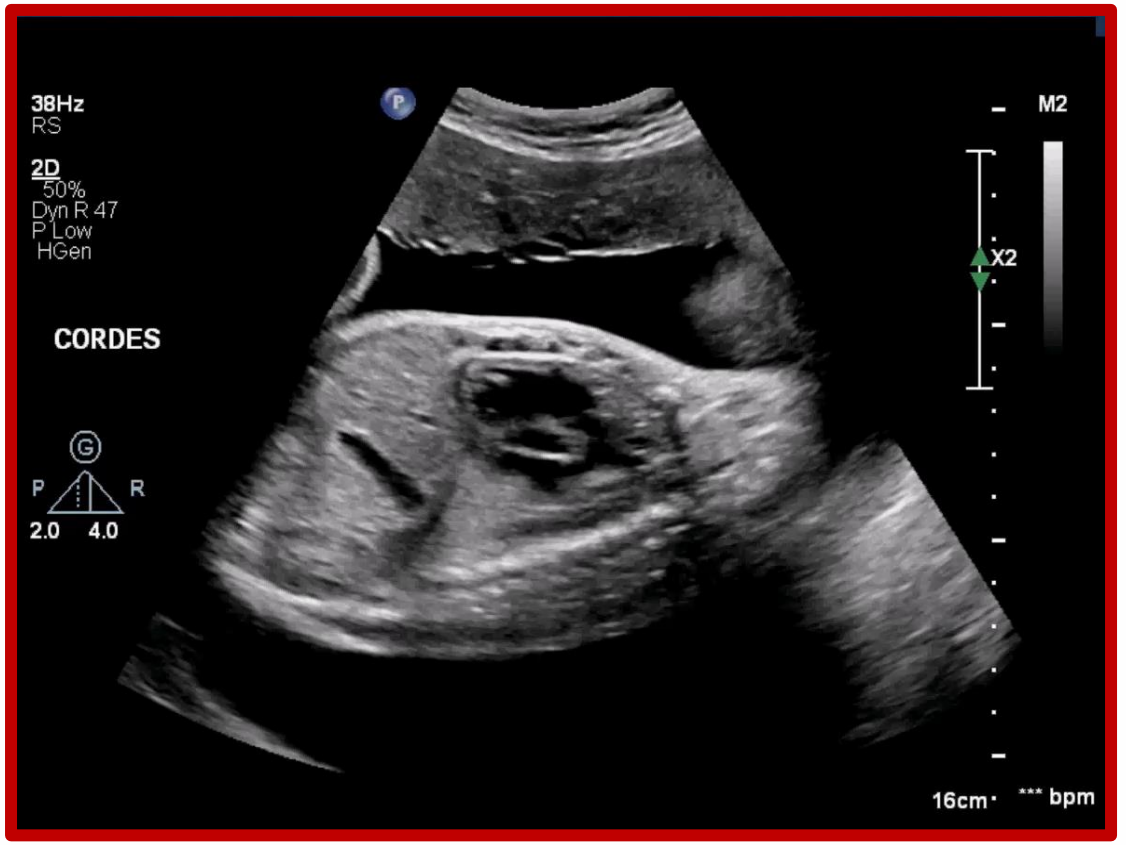
- Not indicated (≤1% risk)
  - Maternal gestational diabetes mellitus with HbA_{1c} <6%
  - Maternal medications
    - SSRIs (other than paroxetine)
    - Vitamin K agonists (Coumadin), although fetal survey is recommended
  - Maternal infection other than rubella with seroconversion only
  - Isolated CHD in a relative other than first or second degree

How do we do it in a fetal echo?



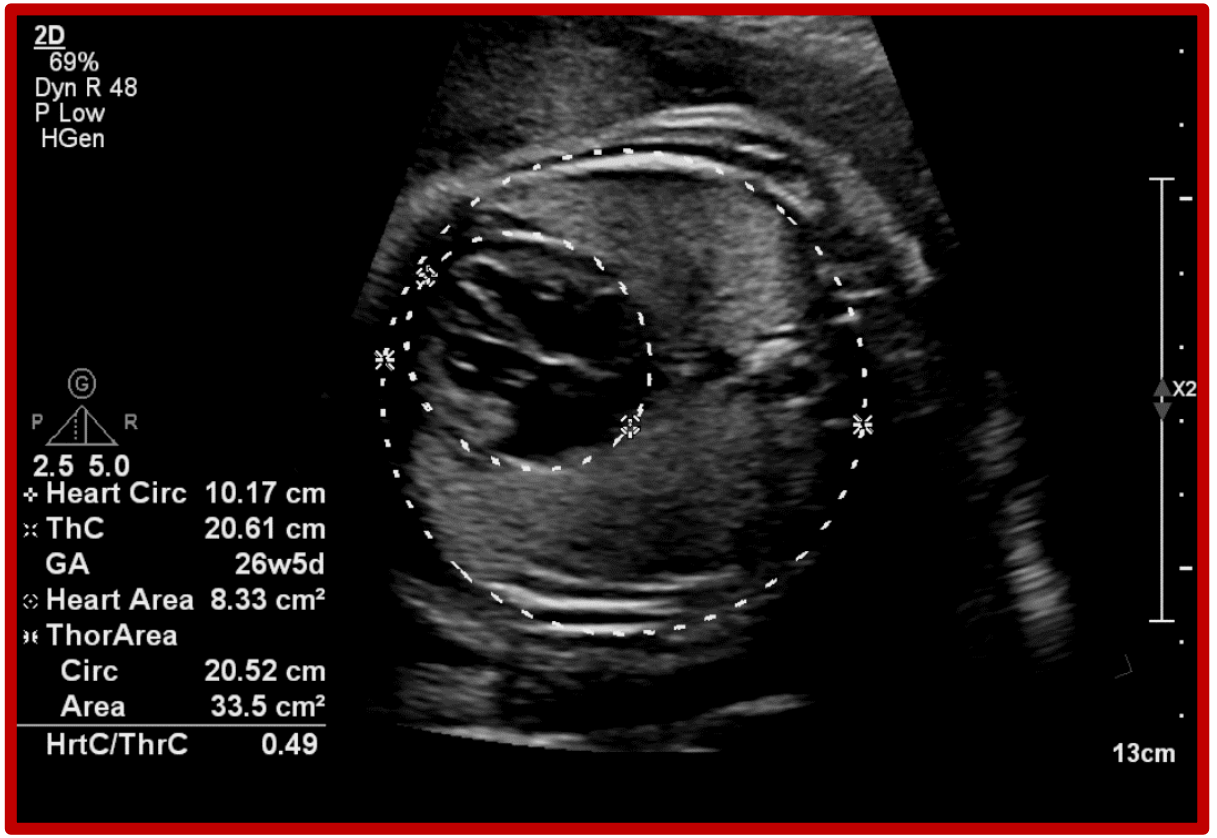
- Slow sweeps
- Optimized 2D images
- Color and flow Doppler

Visceral and Cardiac Situs



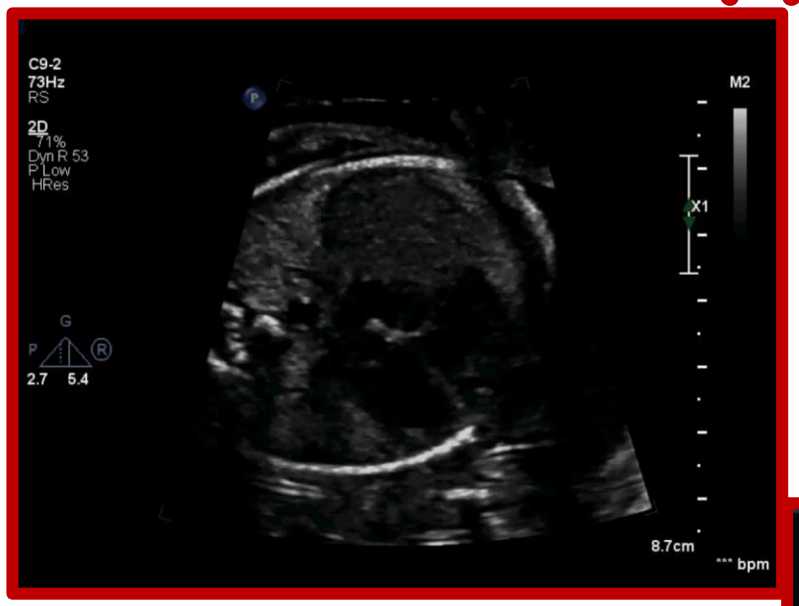
Cardiac position - Axis

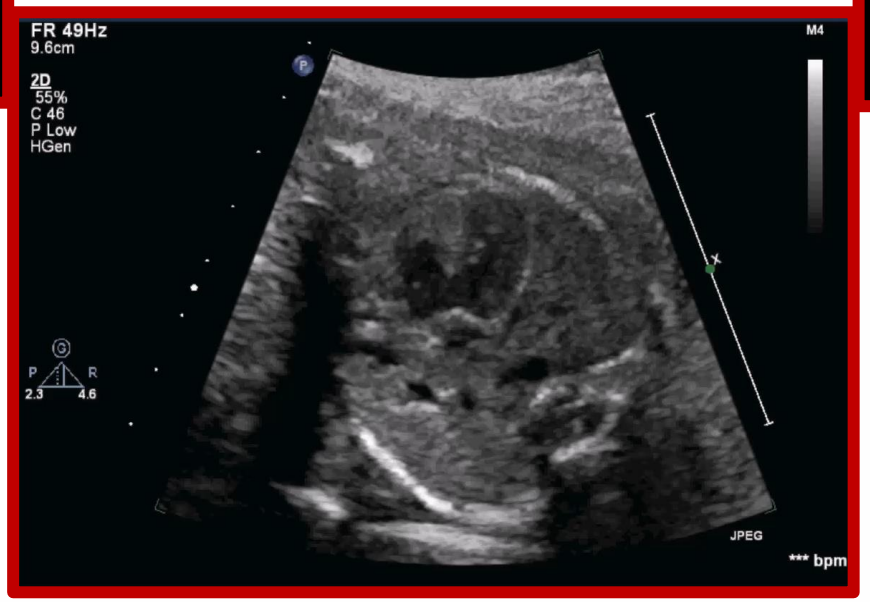
Normal axis, 45+/- 20°

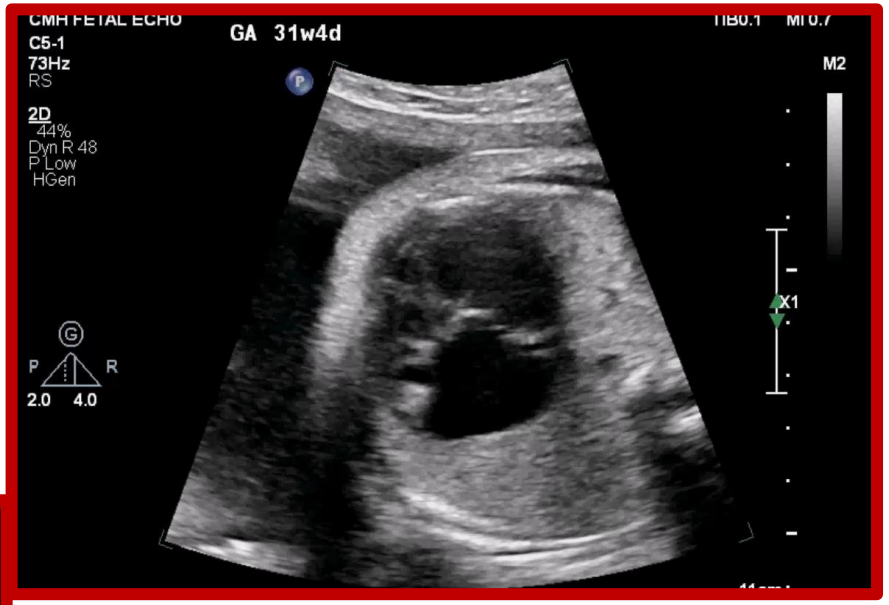


Normal CT ratio

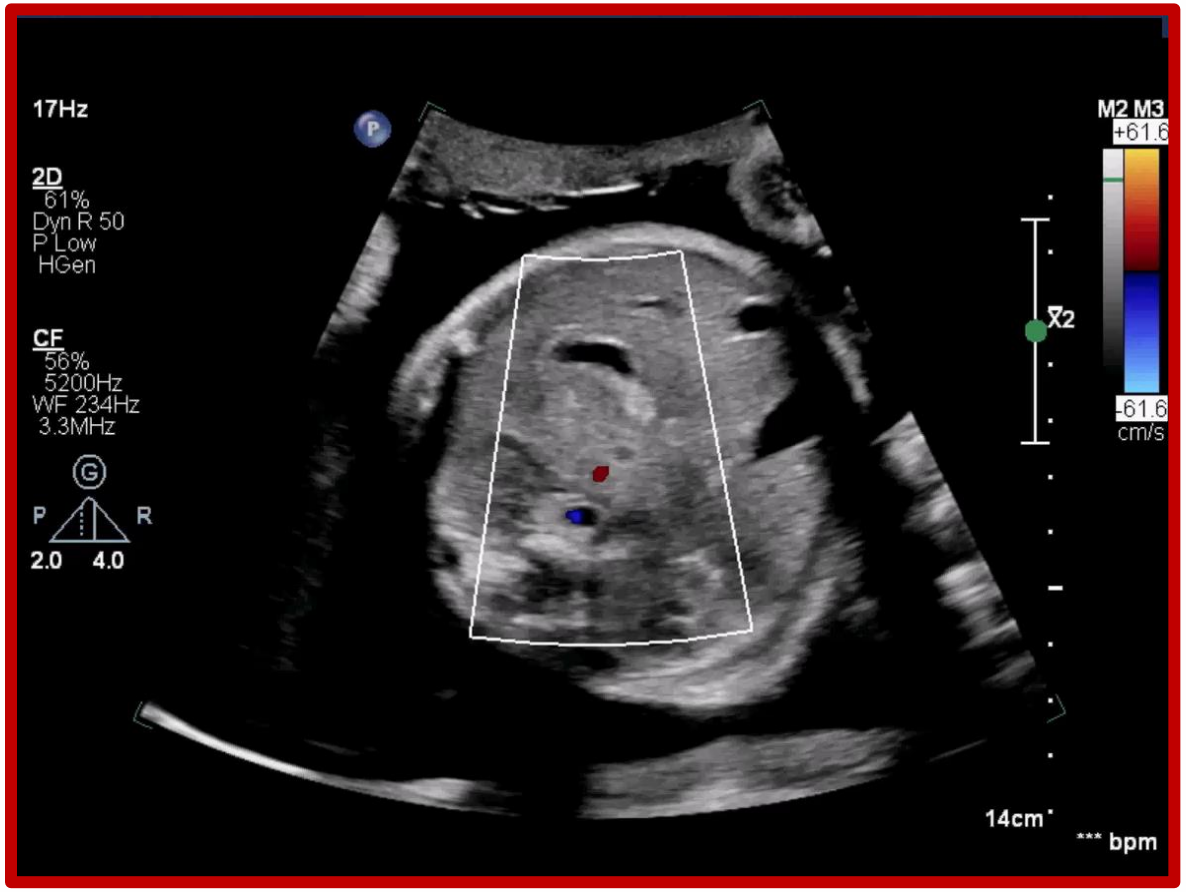
Abnormal Axis



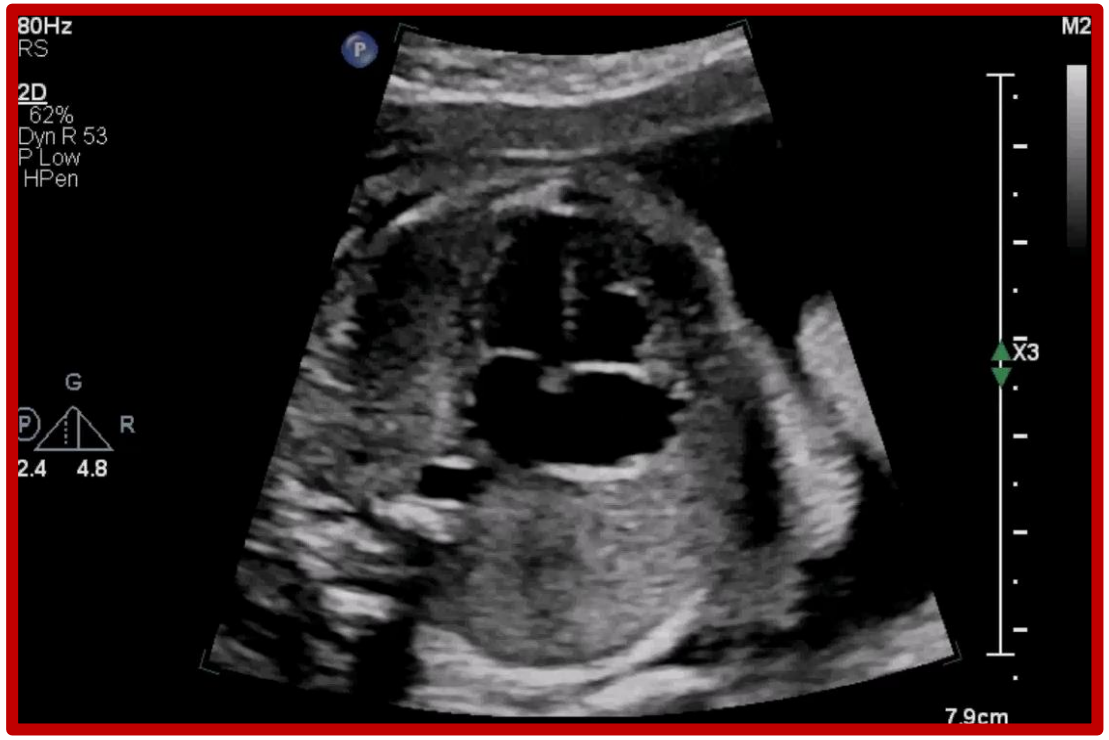




Scouting sweep

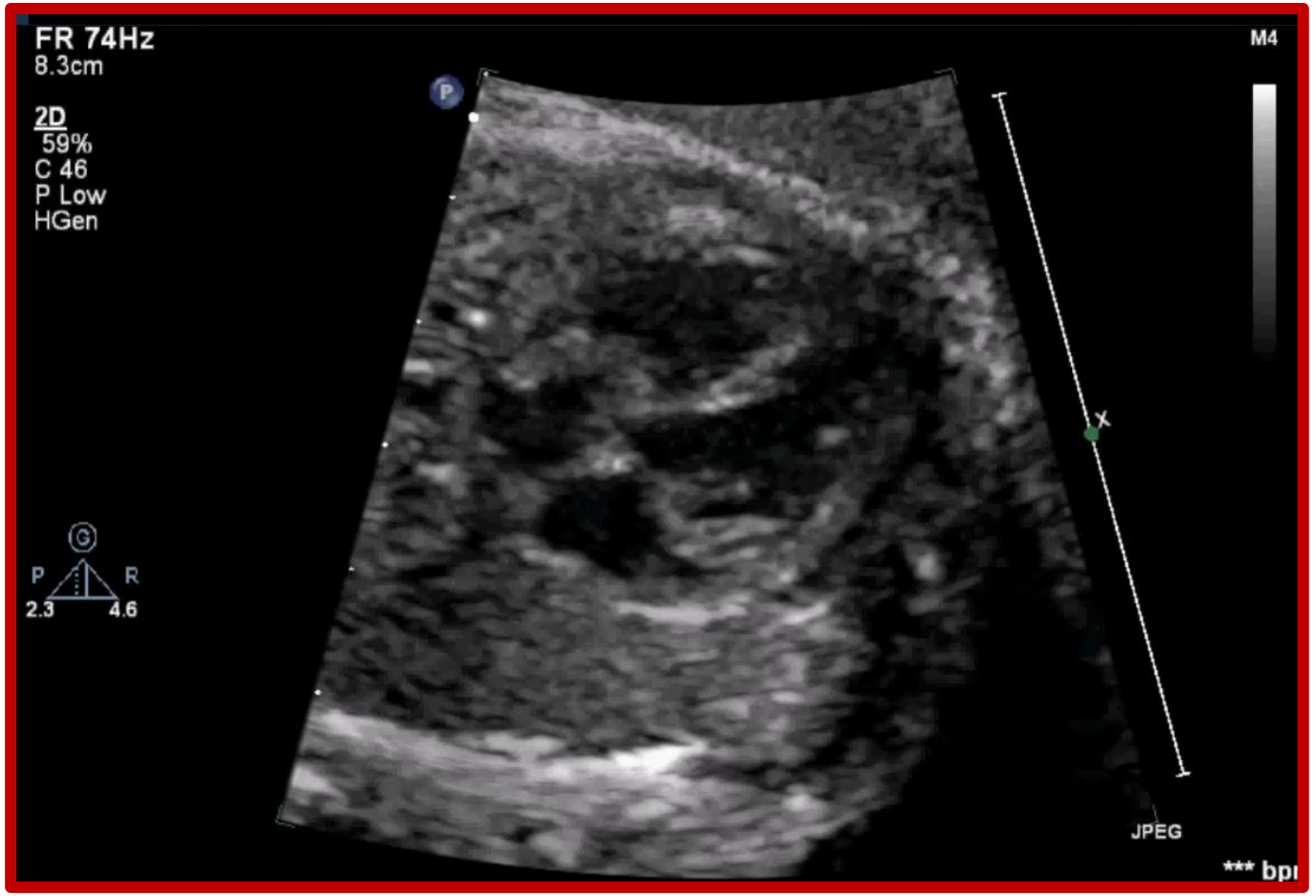


Four Chamber View

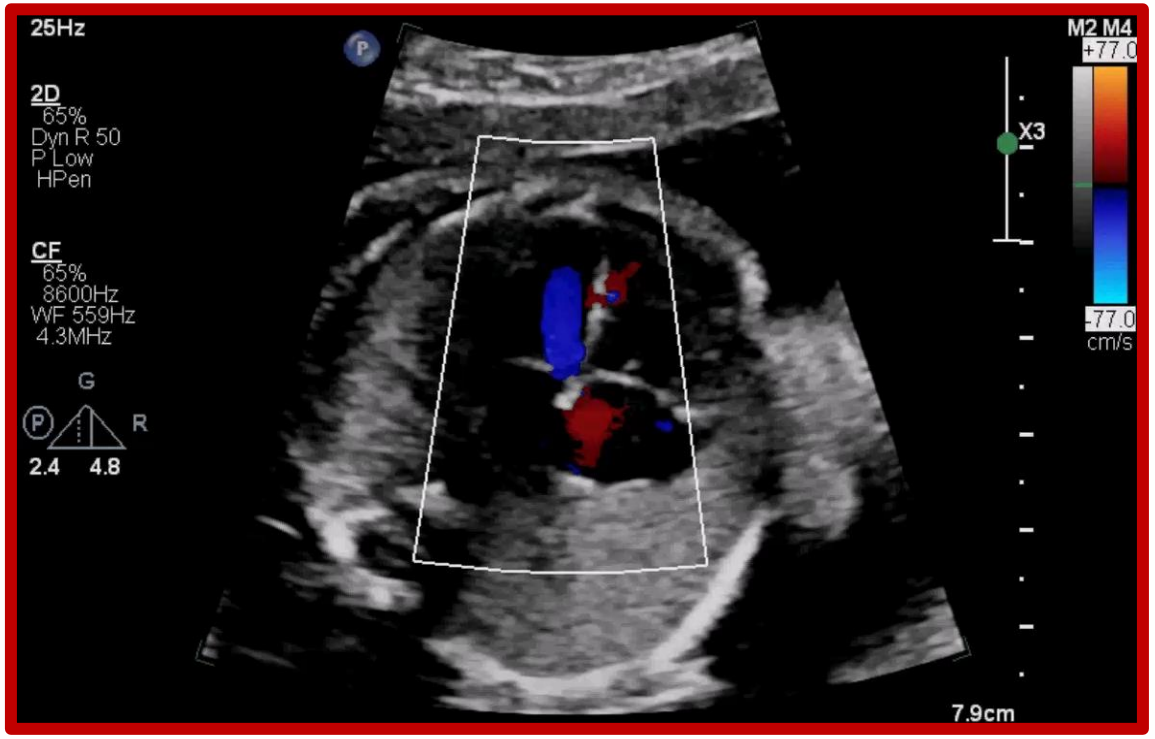


Apical

Four Chamber View



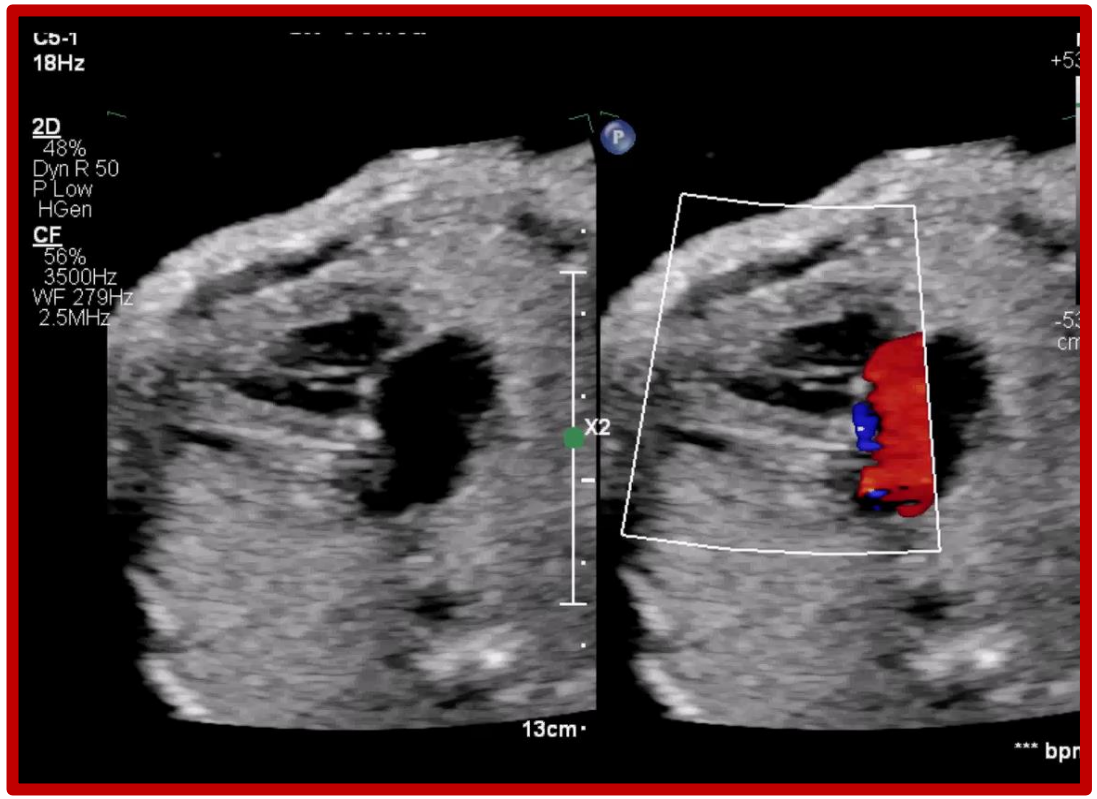
Four Chamber View



Apical Color

- Adjust the color box
- High PRF > 60 cm/sec
- Normal laminar flow
- Symmetrical inflow jets
- Watch for R jets

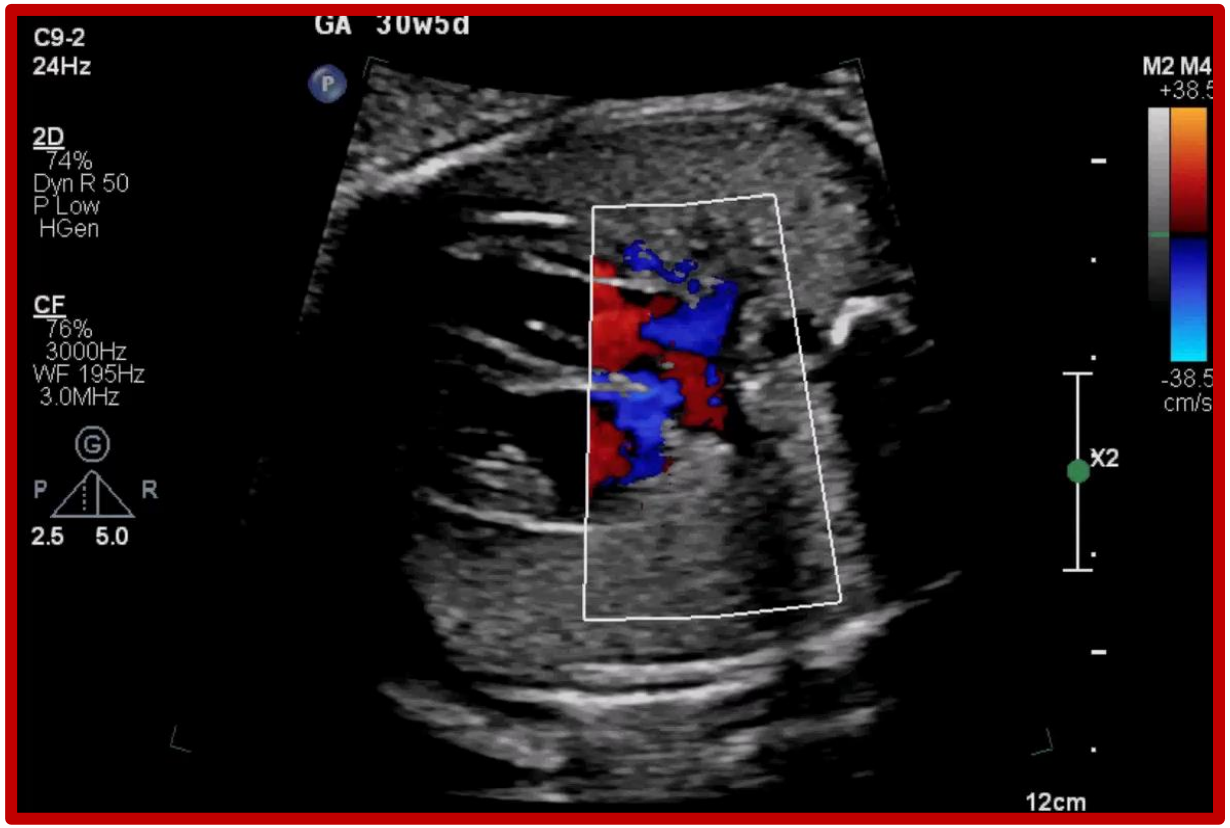
Four Chamber View



- Identify the ventricular characteristics
- Best for the septum
- Apex formation
- Scale – low PRF 30 cm/sec

Apical Subcostal

Four Chamber View

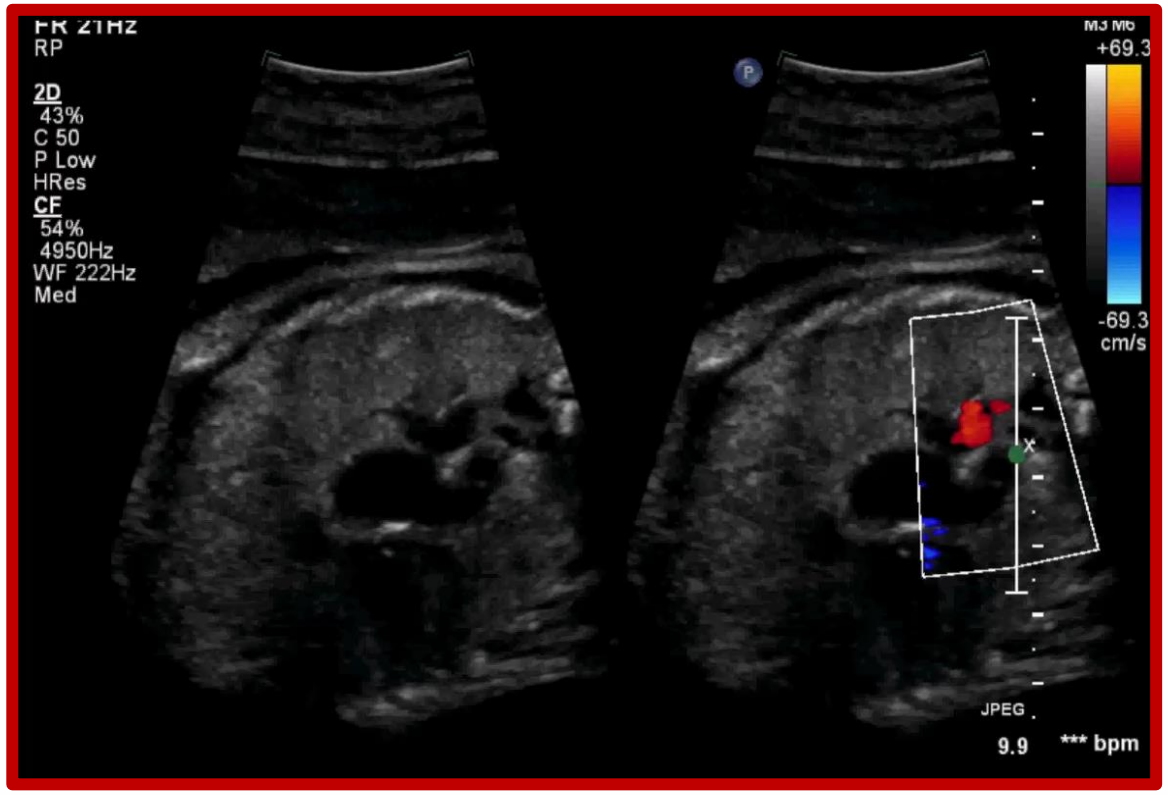


- Adjust the color box
- Low PRF < 30 cm/sec
- Follow the direction of flow to the MV inflow
- Optimize angle of insonation

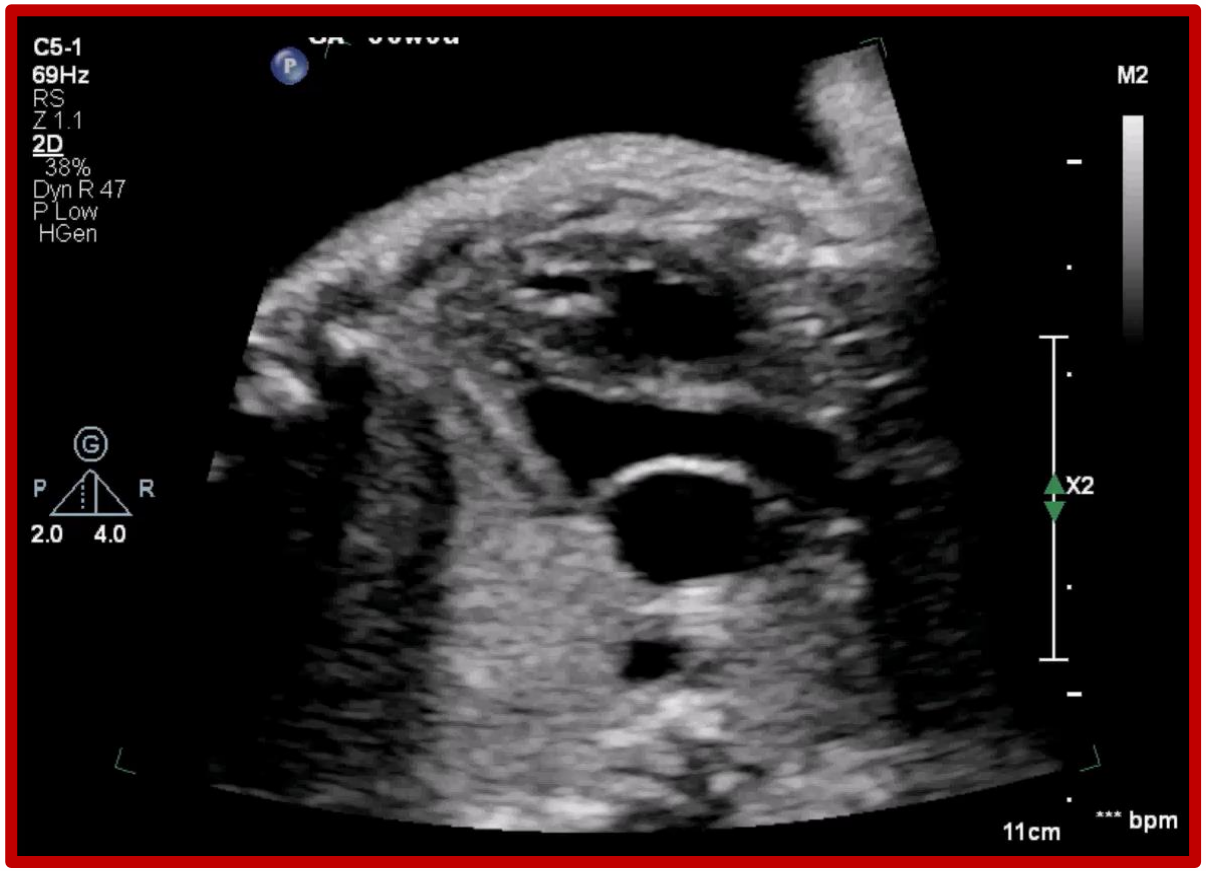
Four Chamber View – Pulmonary Veins

- No real PV connection to the LA
- Smooth – bare LA wall
- Increased LA – DsAo space
- Posterior confluence
- Atrial size discrepancy – RA dominance

Four Chamber View – Pulmonary Veins

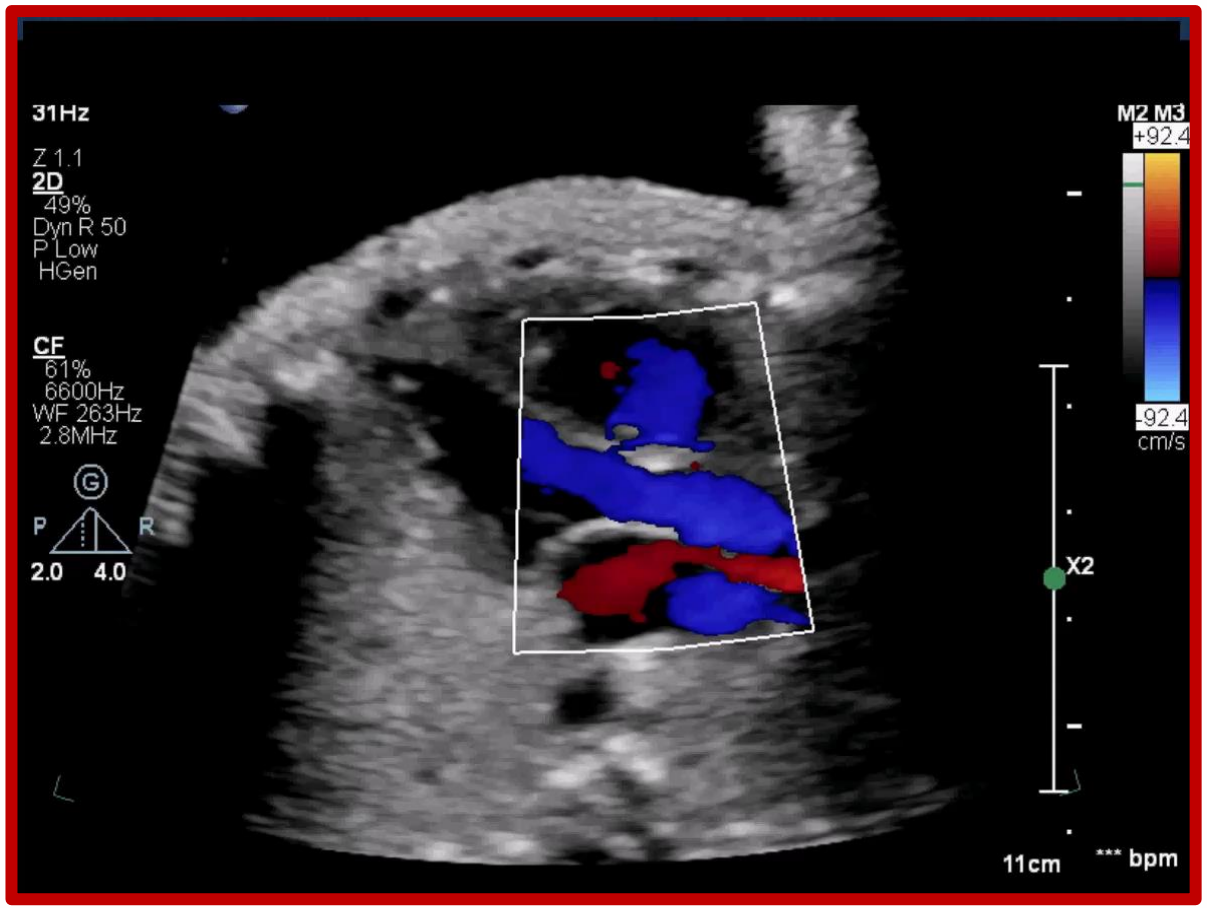


Left Ventricular Outflow Tract



- LVOT – AoV – AsAo same size
- Smooth transition of IVS to Ao
- Valves not echobright with normal excursion

LVOT – Color Doppler



- Optimize color angle
- Optimize scale – high PRF > 60-80 cm/sec
- Smooth laminar flow
- MV – LV – AoV – AscAo

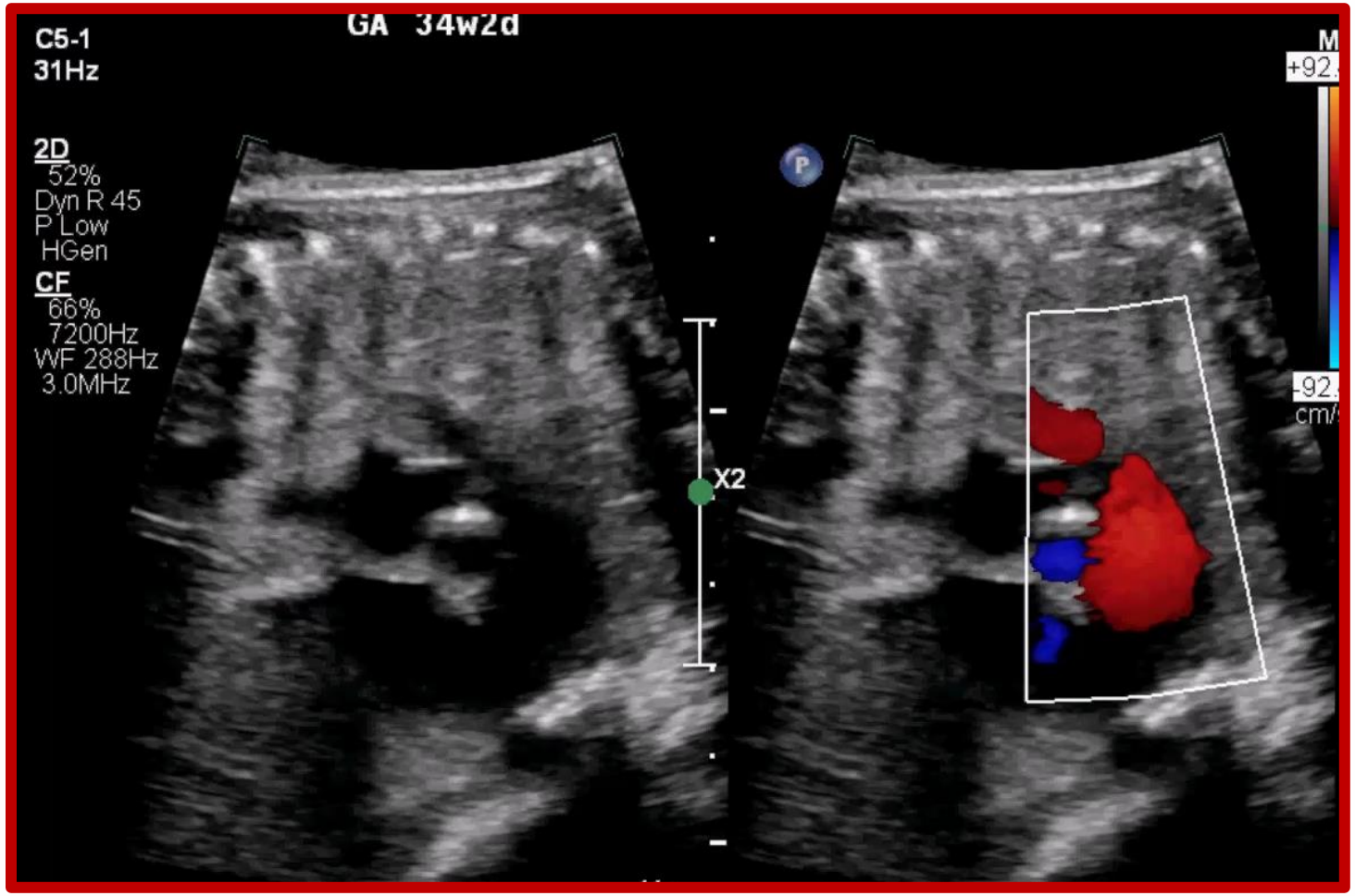
LVOT – Aortic Stenosis

LVOT– Overriding Aorta

Right Ventricular Outflow Tract –

- RA - TV – RV sinus and RVOT
- PV – AoV size symmetry
- Pulmonary branches - PDA

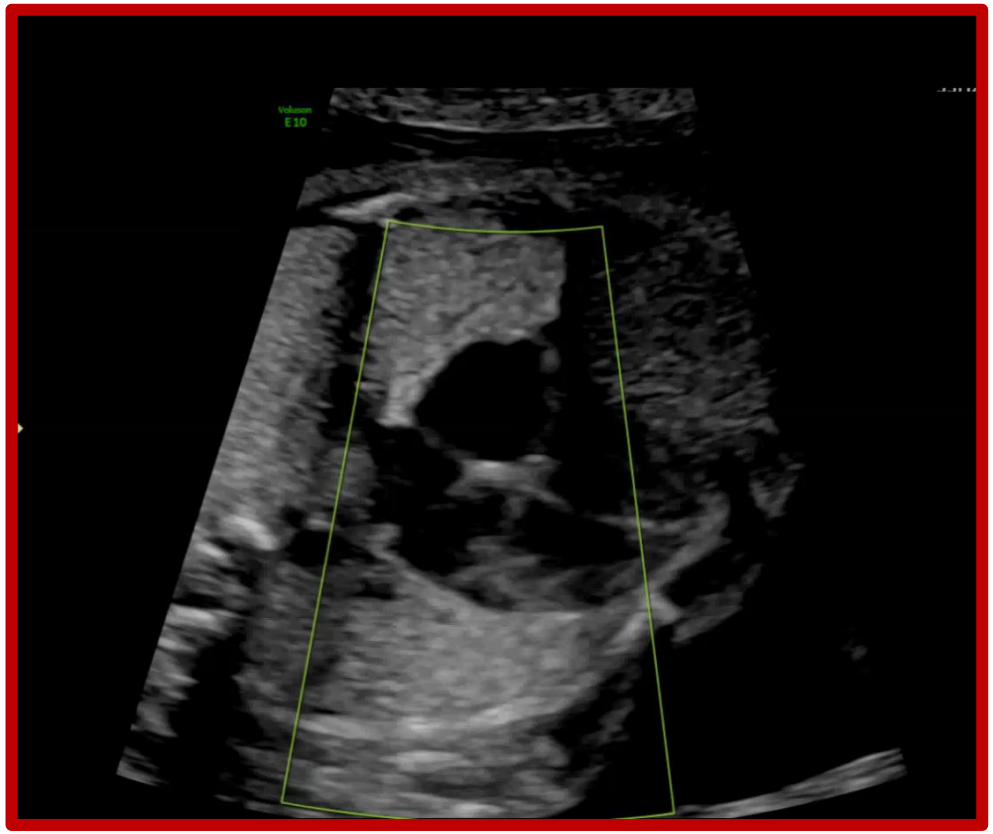
RVOT – Color Doppler

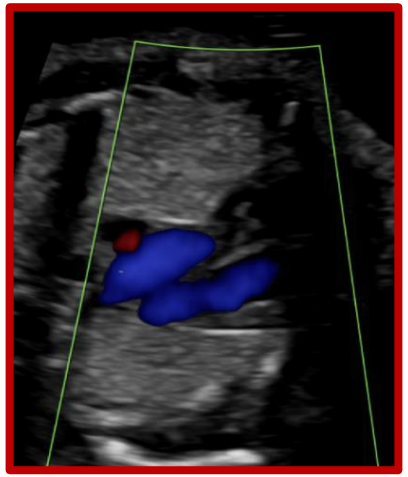


- Optimize color angle
- Optimize scale – high PRF > 60-80 cm/sec
- RA – TV – RV – PV – MPA
- Smooth laminar flow

Transverse Sweep to Three Vessels
Normally related great arteries

Transverse Sweep to Three Vessels

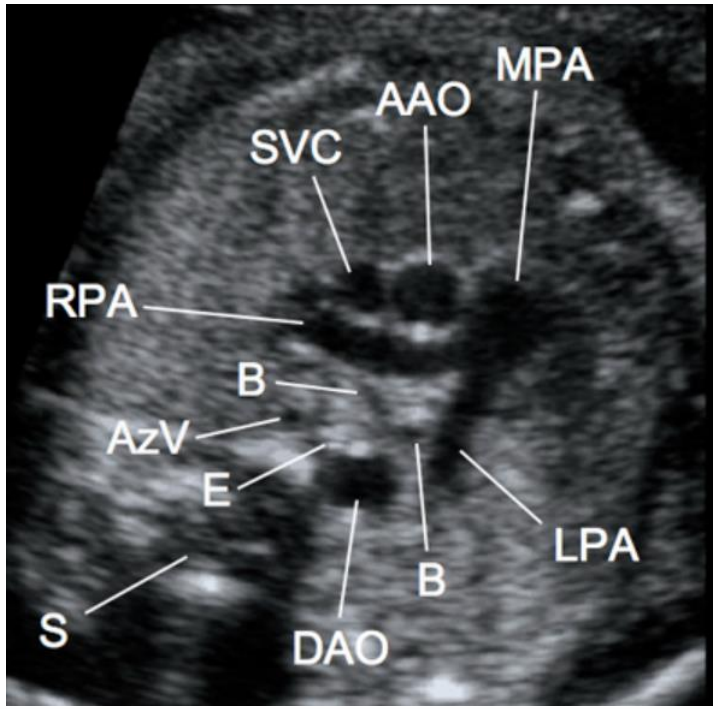


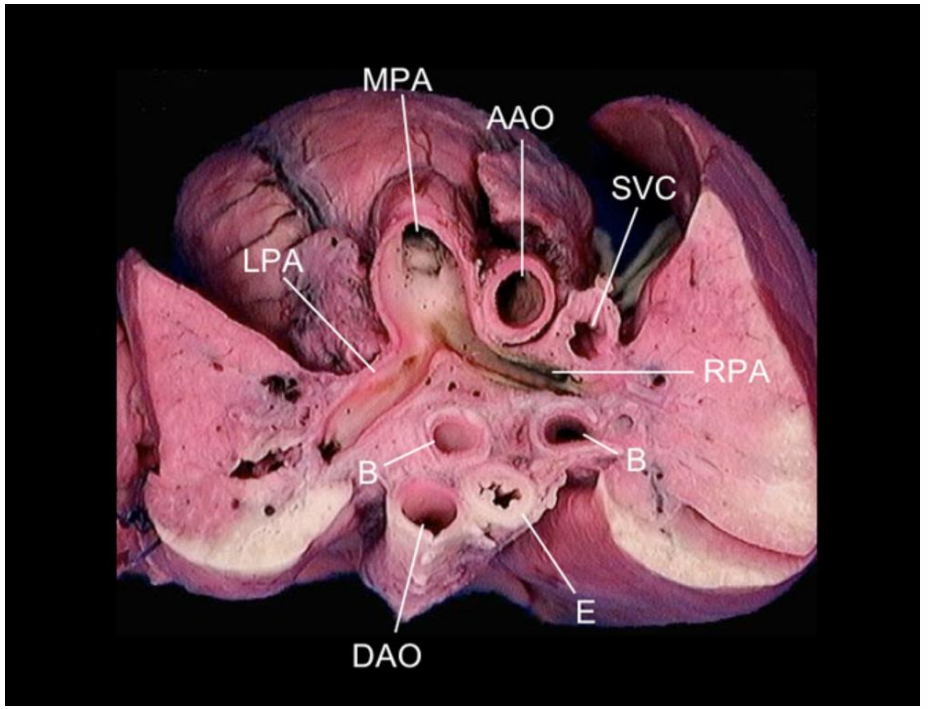


- Adjust box
- Optimize color angle
- Optimize scale – high PRF > 60 cm/sec
- Smooth laminar flow
- Same direction of flow high up

The Three Vessel View

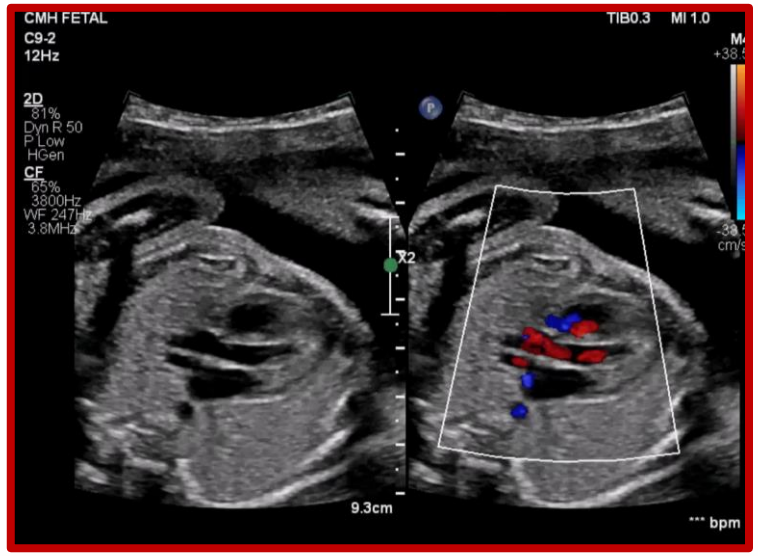
- How many vessels
- Size of vessels
- PA ≥ Ao > SVC
- Arch sidedness
- Direction of flow
- Presence – size of thymus

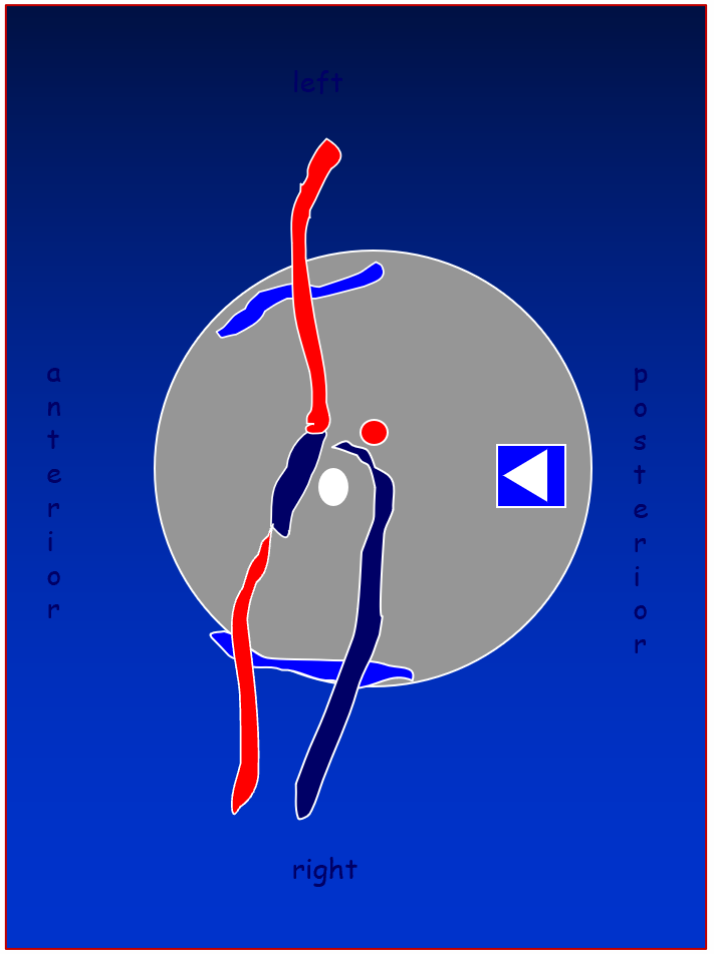




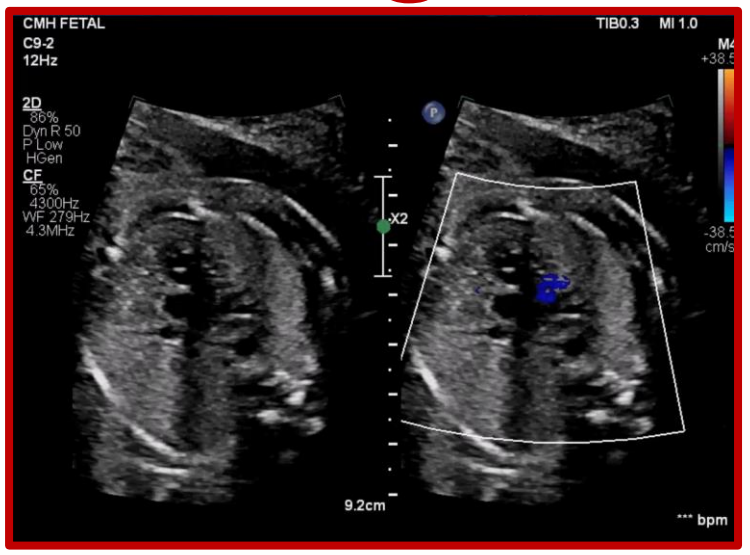
From '*Echocardiographic anatomy in the fetus*' E.Chiappa et al, Springer Verlag, 2008

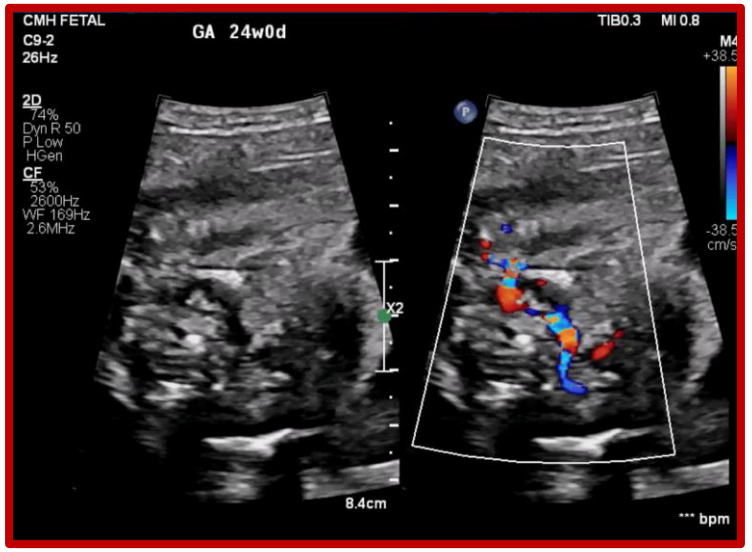
Evaluate the Aortic Branching



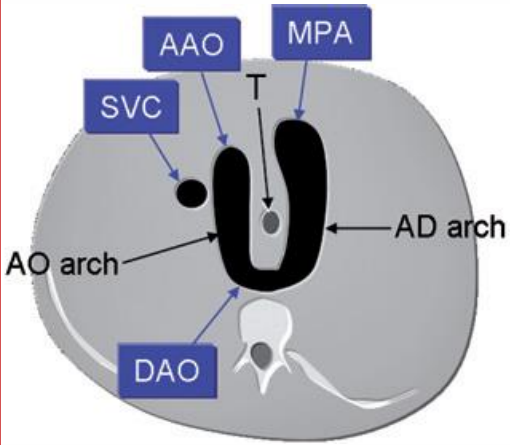


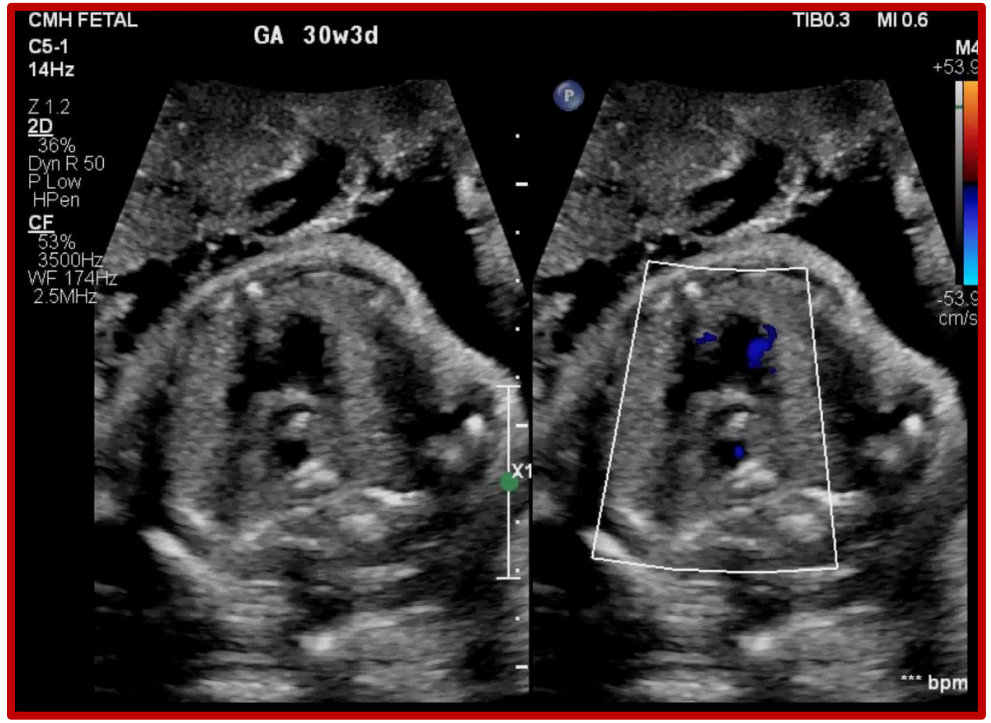
Fetal Medicine Foundation, Prof K. Nikolaides





Right Aortic Arch





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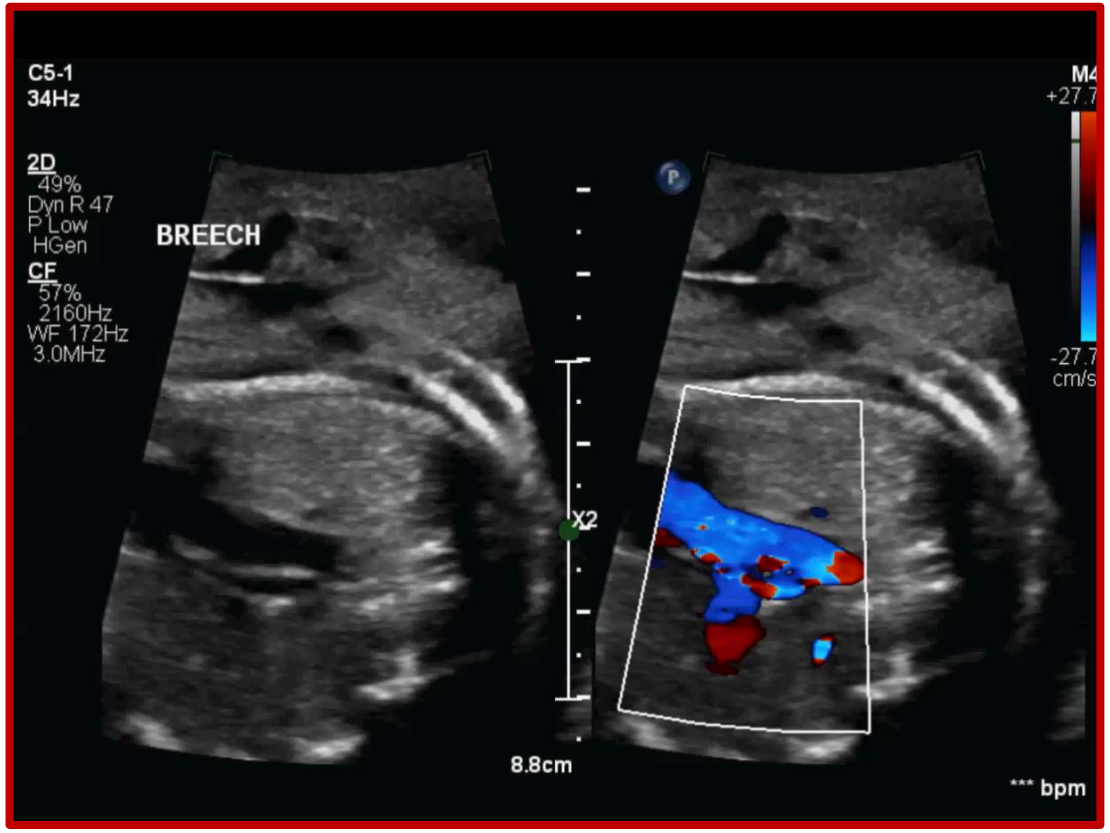
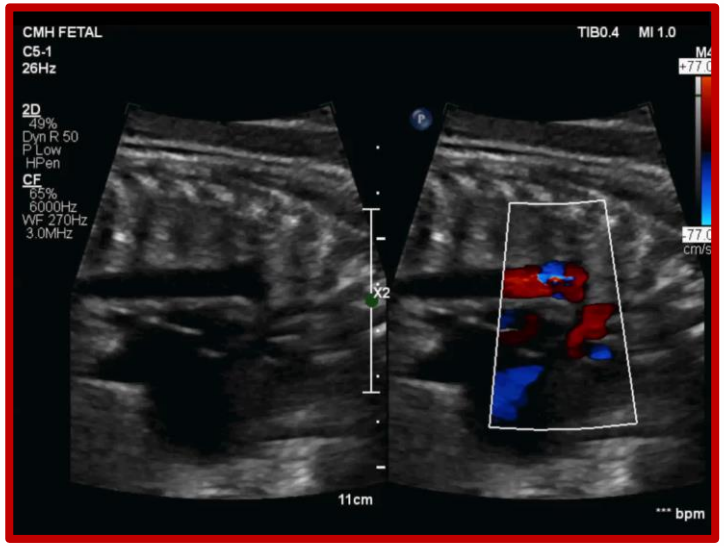
Small aortic arch



Coarctation in the fetus



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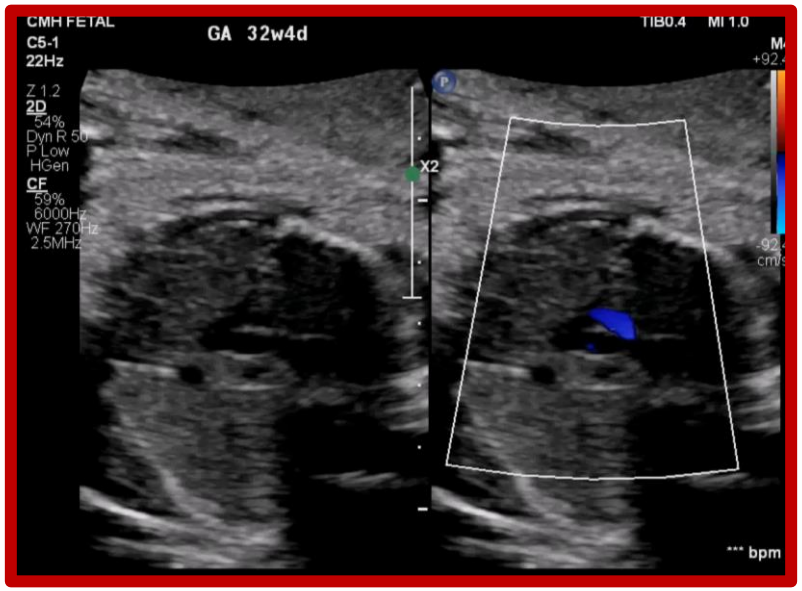

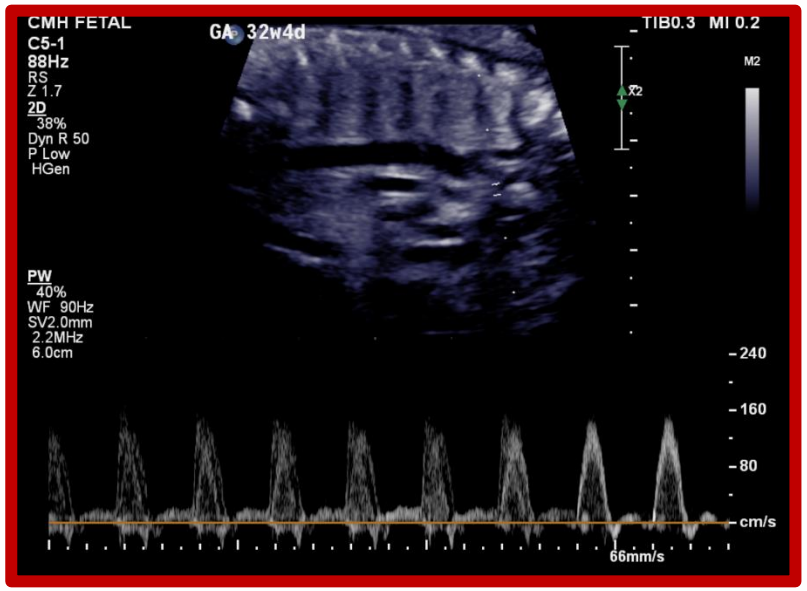


LOVE WILL.