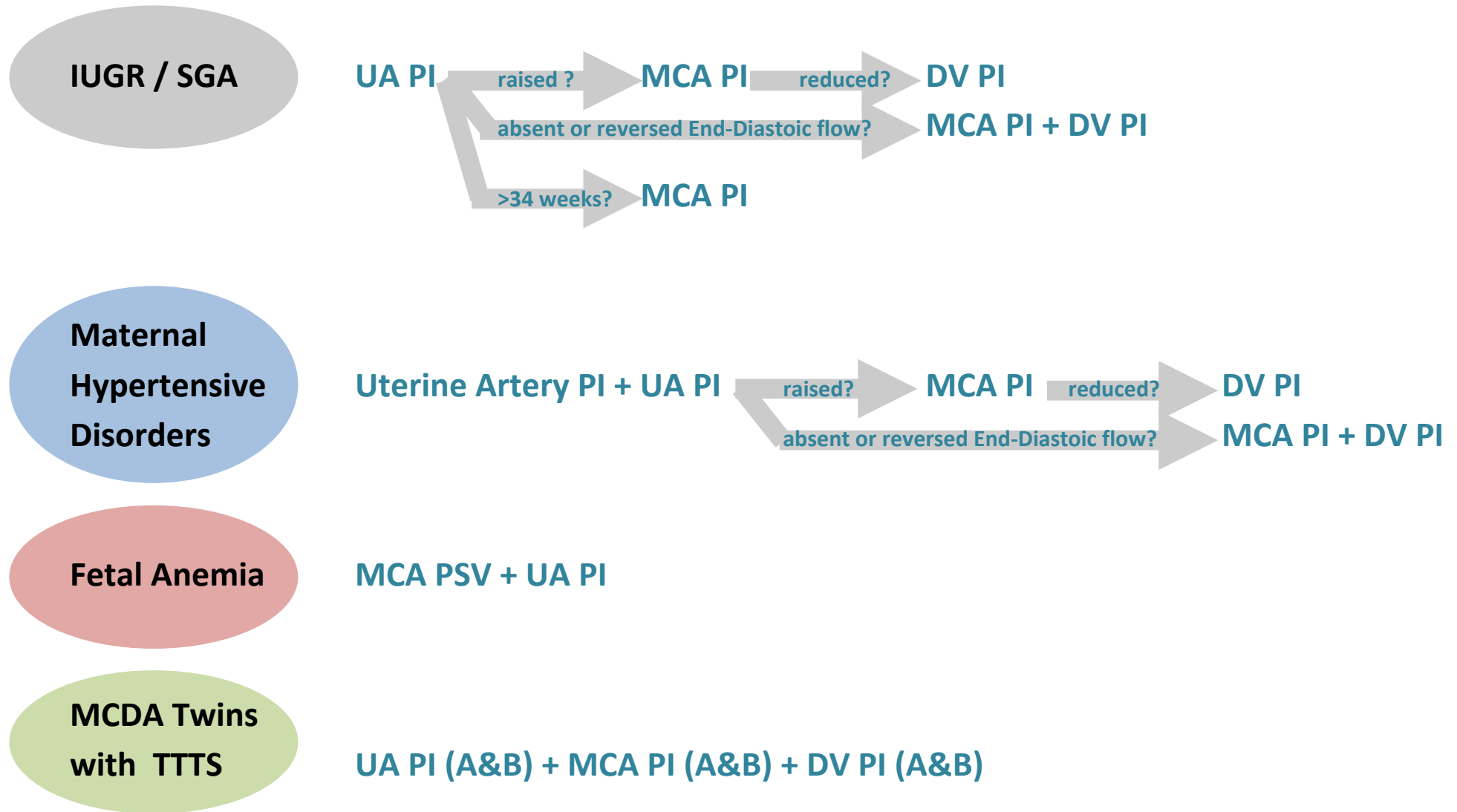


Which Doppler Test When? A basic guide.



Umbilical Artery (UA) PI Assessment

Indications:

- SGA (AC or EFW < 10th percentile but normal interval growth)
- IUGR (AC and EFW < 10th percentile and reducing EFW% on serial scans)
- Maternal vascular disorders
- Current clinical status: essential hypertension, hypertensive disorder of pregnancy
- Prior history: IUGR, hypertensive disorder of pregnancy, intrauterine fetal death
- Decreased movements, abnormal BPP
- Specific request by a consultant obstetrician

Not indicated:

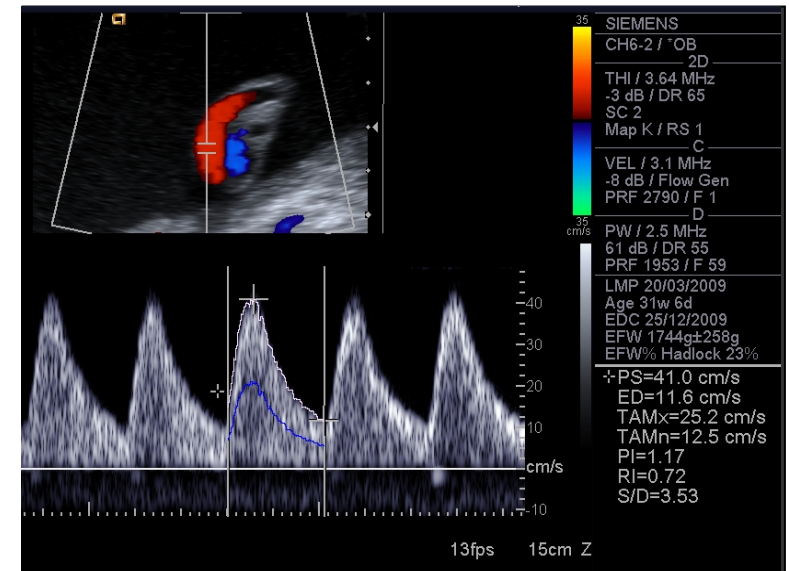
- Routine screening of normal gestations with no maternal or fetal risk factors

How to do it:

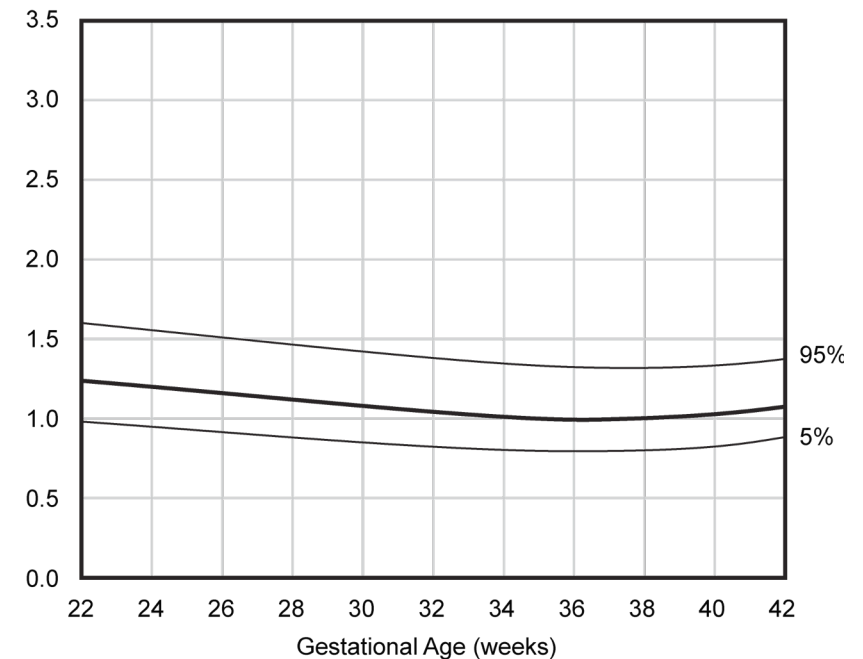
- Perform assessment during fetal quiescence
- Identify a loop of umbilical cord on color Doppler
- Use high PRF to avoid aliasing and conservative gain to avoid color bleeding
- Avoid sampling near the fetal or placental cord insertion
- Position the sample volume in a portion of the cord coursing parallel to PW beam
- Optimize spectral Doppler baseline and PRF to get a large waveform
- If EDV is low, ensure wall filter is low
- If ratios are abnormal, repeat test 3x in different parts of the cord and average the PI

Common pitfalls:

- Poor Doppler angle and poor optimization leading to fuzzy waveform which is hard to measure
- End-diastolic component in raised PI not visualized due to filter. Reduce filter
- End-diastole not well visualized when EDV near baseline because of venous contamination
Readjust sampling to avoid capturing adjacent UV



Umbilical Artery PI



MCA Doppler PI Assessment

Indications:

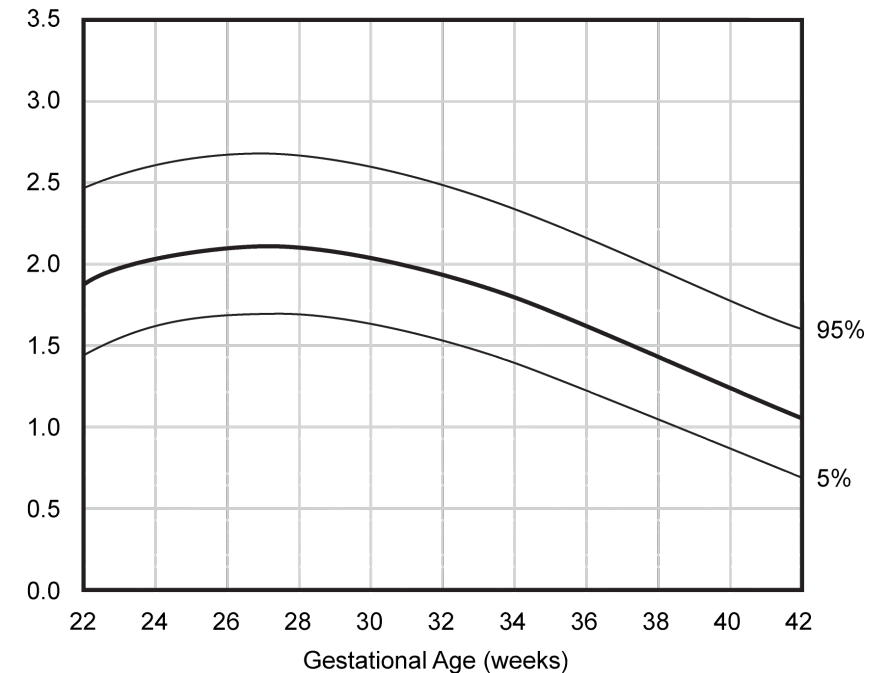
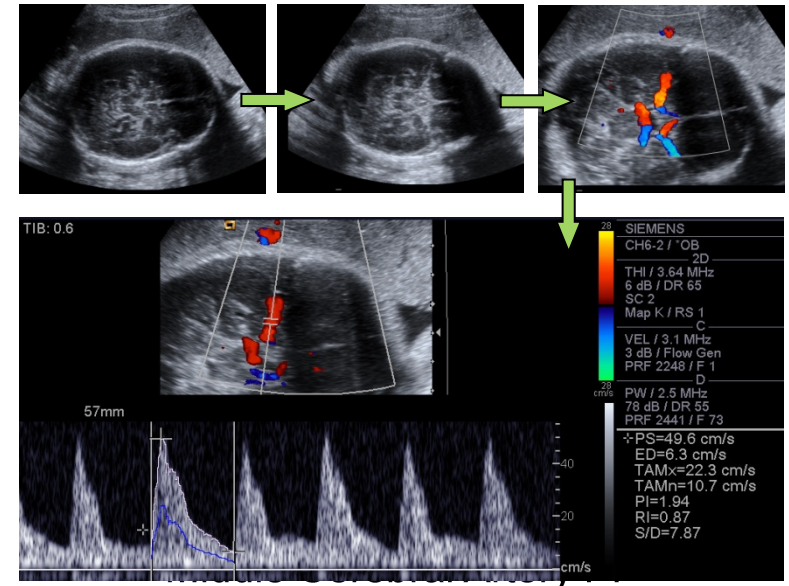
- Raised UA PI (>95th percentile)
- SGA (AC or EFW<10th percentile but normal interval growth) in patient after 34 weeks GA

How to do it:

- Perform assessment during fetal quiescence
- Always keep Tib<1 by reducing the acoustic output power
- Start with a BPD view
- Move caudally to visualize the butterfly shape of suprasellar cisterns and the sphenoid
- Activate color Doppler to visualize the MCA
- Assess the MCA which is closer to the transducer
- Move anteriorly to align the MCA flow direction as parallel with PW beam as possible
- Use the coronal suture/sphenoid fontanel as an acoustic window
- Ideal interrogation angle is 0 degrees but 30 degrees or less is acceptable
- Position a small (0.5-1mm) sample volume 1/3 of the way down the MCA
- Optimize spectral Doppler baseline and PRF to get a large waveform

Common pitfalls:

- Poor Doppler angle and poor optimization leading to fuzzy waveform which is hard to measure
- Gate too close to MCA origin where multidirectional contamination from ACA and PCoA occur
- Sample positioned too peripherally in the MCA where velocities fall
- PCA misidentified as MCA



DV Doppler PI Assessment

Indications (any of the following):

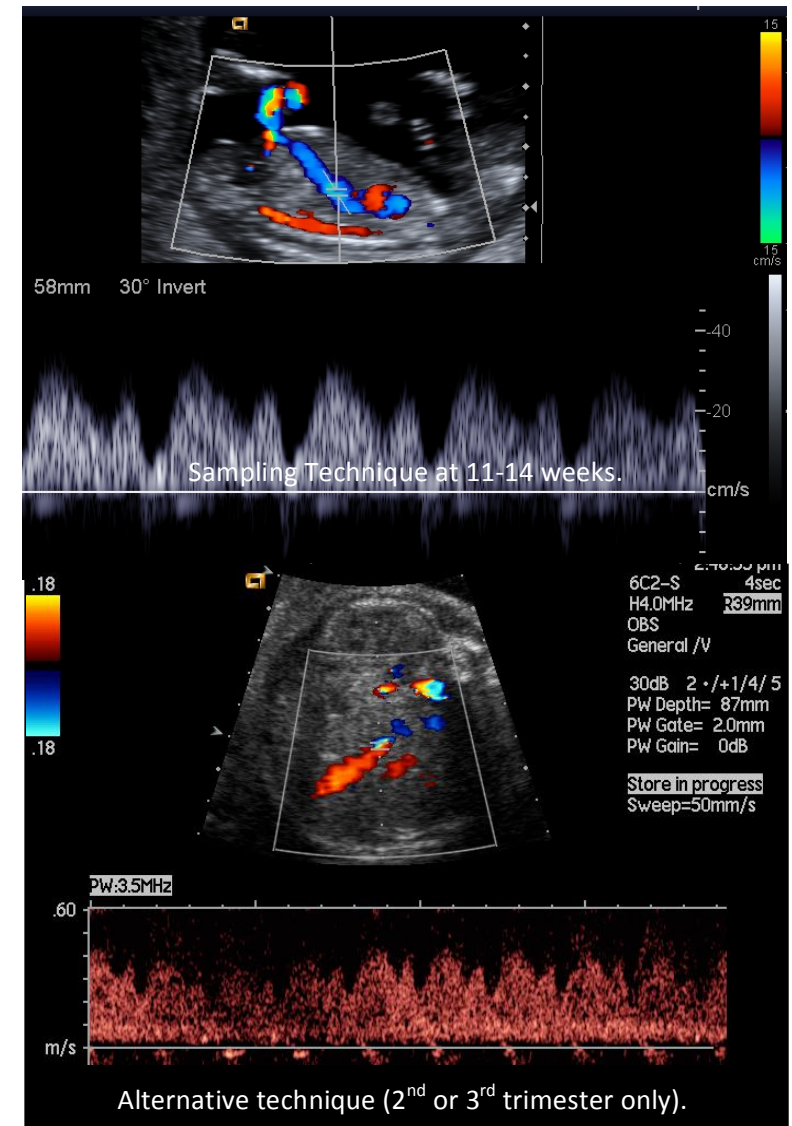
- Adjunct to 11-14 week scan (registered operators only)
- Raised UA PI (>95th) and reduced MCA PI
- Fetal cardiac abnormality (structural anomaly, abnormality of rate/rhythm)

How to do it at 11-14 weeks:

- Always keep Tlb<1 by reducing the acoustic output power
- Fetal Medicine Foundation Criteria:
- Fetal quiescence
- SAG approach, thorax and abdomen to occupy whole image
- Activate color Doppler and align Umbilical vein, DV and HRT
- 0.5-1mm gate placed in the inlet of DV not the outlet
- Doppler Angle must be 0-30degrees
- Filter low 50-70Hz, sweep speed high
- Optimize Spectral Doppler baseline and PRF to get a large waveform

How to do it in the second or third trimester:

- Perform assessment during fetal quiescence
- Always keep Tlb<1 by reducing the acoustic output power
- SAG approach and Doppler angle 0-30 degrees may not be achievable
- TRV approach is acceptable as long as DV well visualized and Doppler angle is 0-60degrees
- Activate color Doppler to identify DV at the end of UV
- Enlarge the image
- 0.5-1mm gate placed in the inlet of DV
- Filter low 50-70Hz, sweep speed high
- Optimize Spectral Doppler baseline and PRF to get a large waveform
- If PI>95th percentile, assess umbilical vein for pulsatility



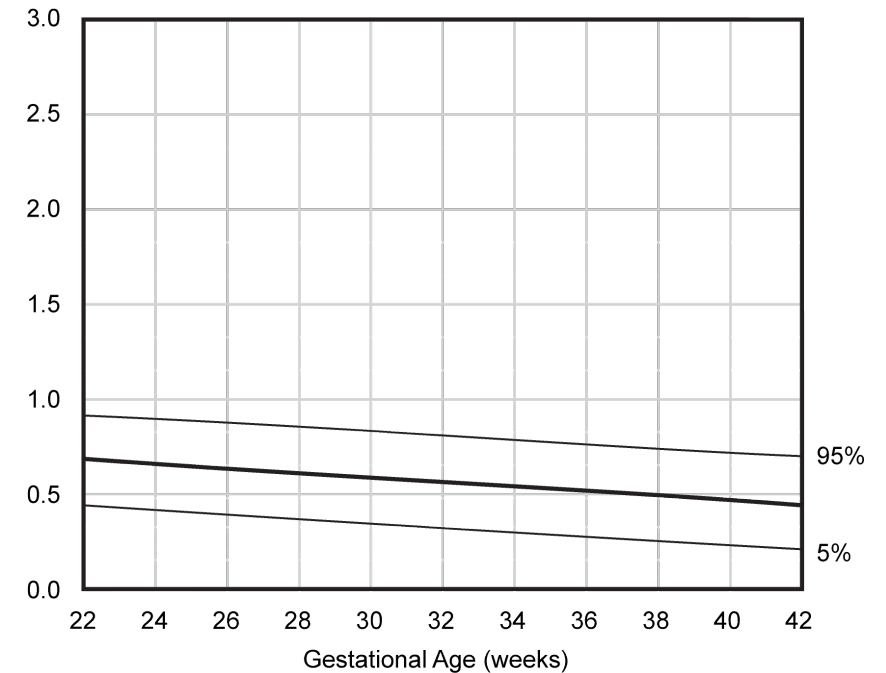
Common Pitfalls

- PRF too low and color gain too high leading to difficulty in DV identification amongst other vessels
- Sample size too large, leading to contamination from other vessels
- Sample not placed at the inlet of the DV
- Adjacent Hepatic vein or Celiac Axis misidentified as DV
- Poor Doppler angle and poor optimization leading to fuzzy waveform which is hard to measure
- DV anomalies including agenesis may occur but are rare (<1% of high risk patients).

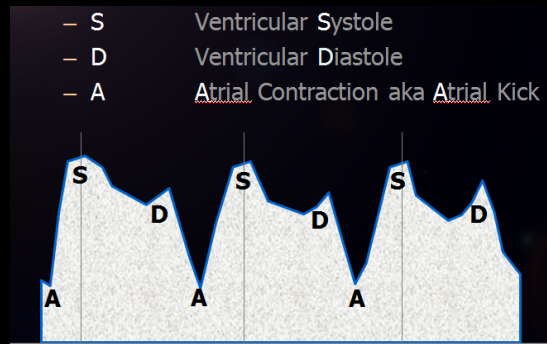
There are many DV anomalies, but they can be divided into two general categories:

- 1) UV drains directly into a systemic vessel (RA, IVC, Iliac Vein) without a DV shunt, or
- 2) UV terminates in the L Portal vein and all UV flow perfuses through the liver

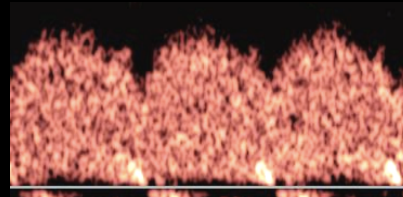
Ductus Venosus PI



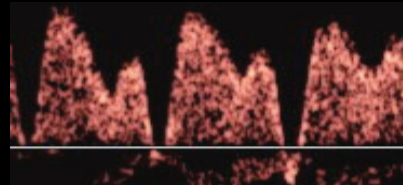
Ductus Venosus Waveform



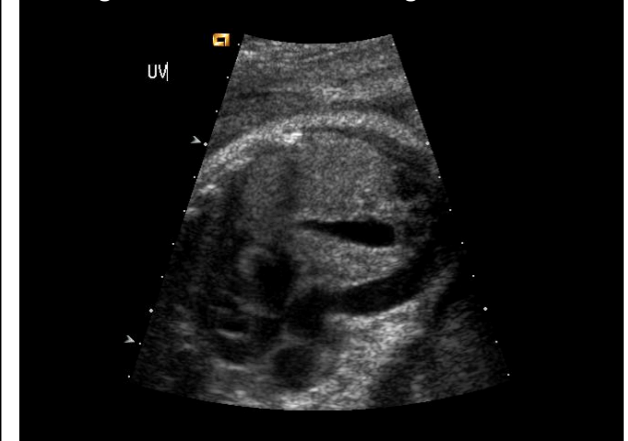
Normal Waveform



Abnormal Waveform



DV Agenesis with direct drainage of UV into RA



MCA PSV Assessment

Indications:

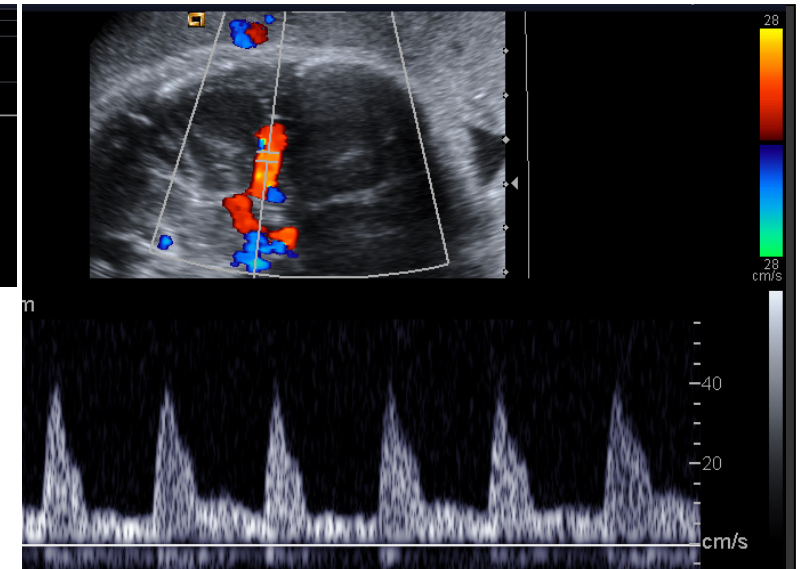
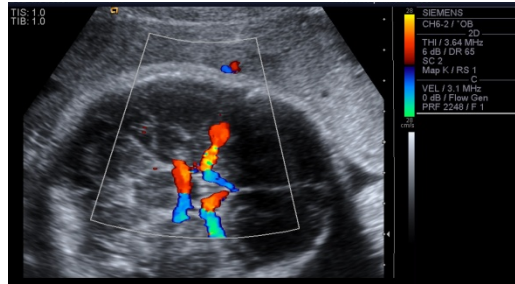
- Maternal-fetal isoimmunisation
- Any suspicion of fetal anemia
- Unexplained hydrops

How to do it:

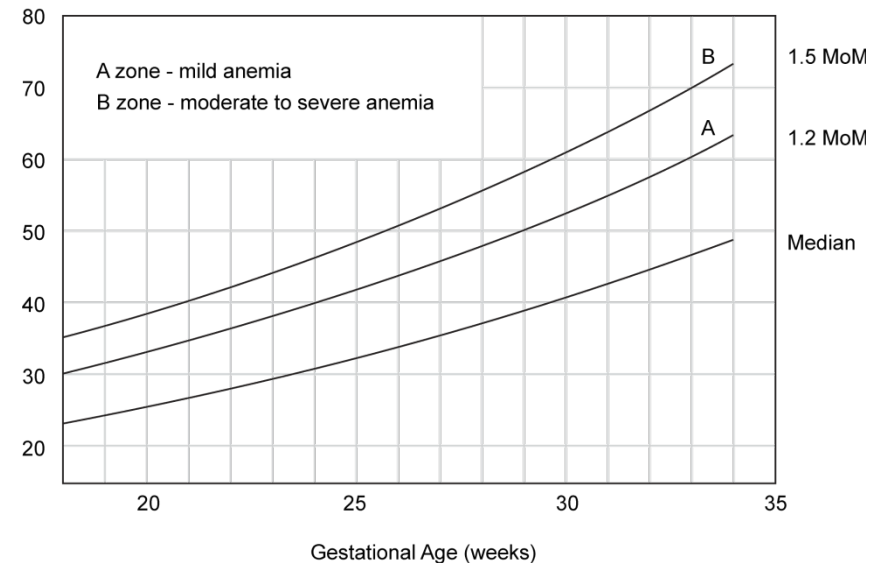
- Perform assessment during fetal quiescence
- Always keep Tlb<1 by reducing the acoustic output power
- Start with a BPD view
- Move caudally to visualize the butterfly shape of suprasellar cisterns and the sphenoid
- Activate color Doppler to visualize the MCA
- Investigate the MCA which is closer to the transducer
- Move anteriorly to align the MCA flow direction as parallel with PW beam as possible
- Use the coronal suture/sphenoid fontanel as an acoustic window
- Ideal interrogation angle is 0 degrees but 30 degrees or less is acceptable
- Position a small (0.5-1mm) sample volume 1/3 of the way down the MCA
- Optimize spectral Doppler baseline and PRF to get a large waveform
- If the Doppler angle is other than zero, angle correction must be used
- If PSV is elevated, repeat test 3x and use the highest value

Common Pitfalls

- Poor Doppler angle and poor optimization leading to fuzzy waveform which is hard to measure
- Gate too close to MCA origin where multidirectional contamination from ACA and PCoA occur
- Sample positioned too peripherally in the MCA where velocities fall
- PCA misidentified as MCA
- Failure to angle-correct at angles other than 0 leading to underestimation of PSV



Middle Cerebral Artery PSV



Uterine Artery PI Assessment

Indications:

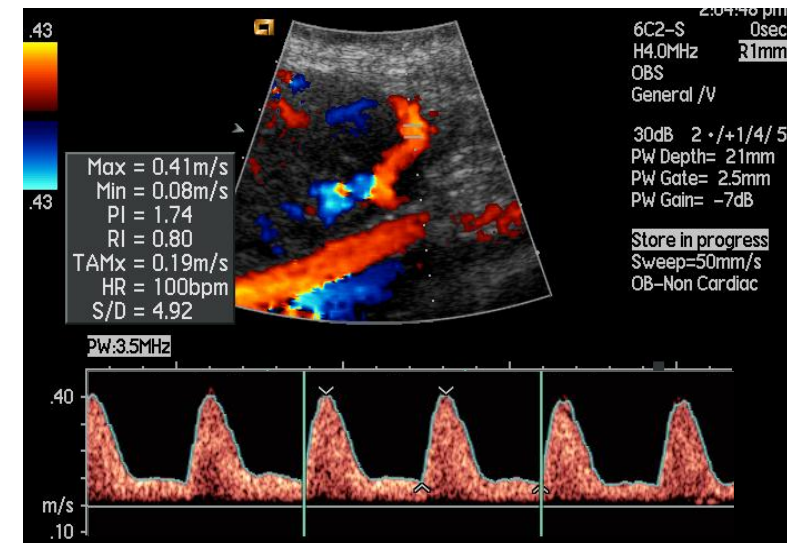
- Screen high-risk patients at 20 weeks. If abnormal, follow-up at 24 weeks.
- Low PAPP-A (<0.5MoM)
- Early onset IUGR
- Essential hypertension
- Current or past history of hypertensive disorder in pregnancy
- Past history of IUGR or Intrauterine fetal death

How to do it:

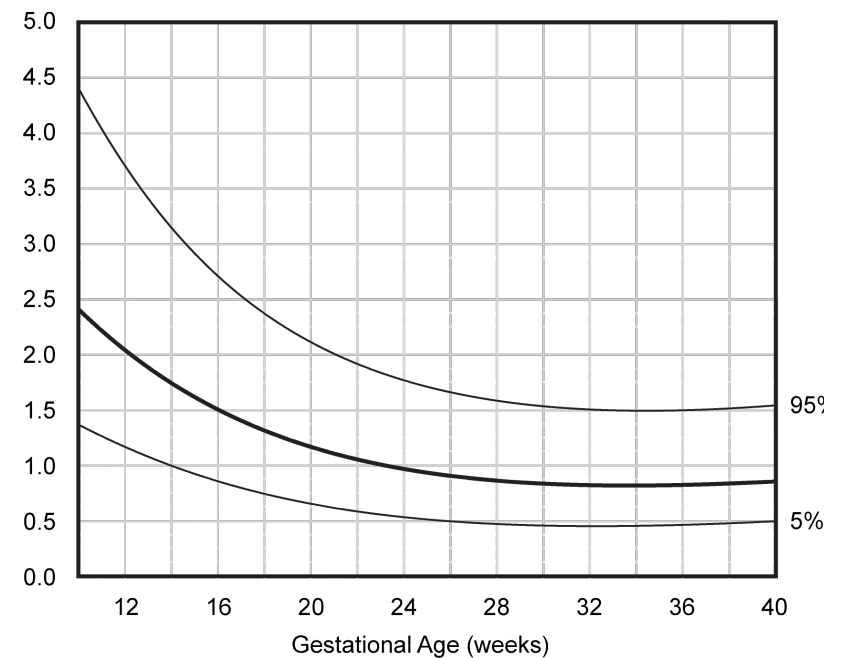
- Use color Doppler and commence at the cervix
- Move towards the iliac fossa to visualize the EIA
- The Uterine Artery usually crosses the EIA anteriorly and superiorly
- Select a portion of the UT artery which courses at favourable angle 0-60 degrees
- Optimize Spectral Doppler baseline and PRF to get a large waveform
- Notching after 24 weeks is abnormal

Common Pitfalls:

- Failure to identify uterine artery by not scanning inferior enough



Uterine Artery PI



Special considerations in twin gestations:

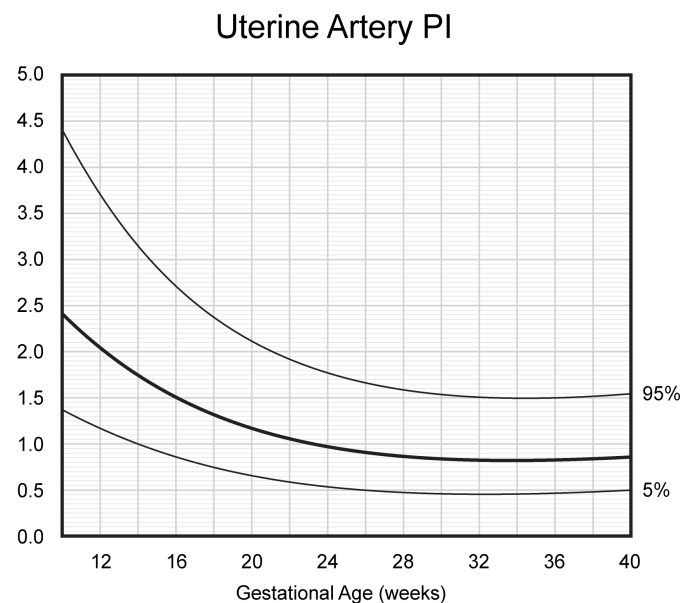
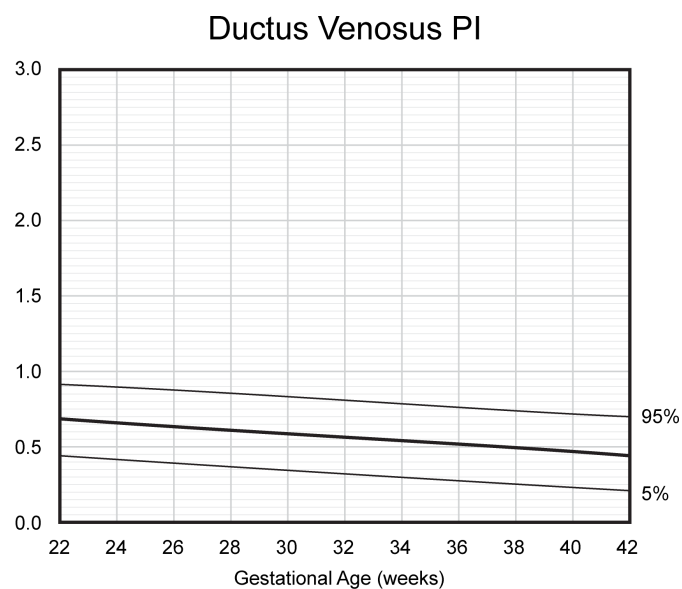
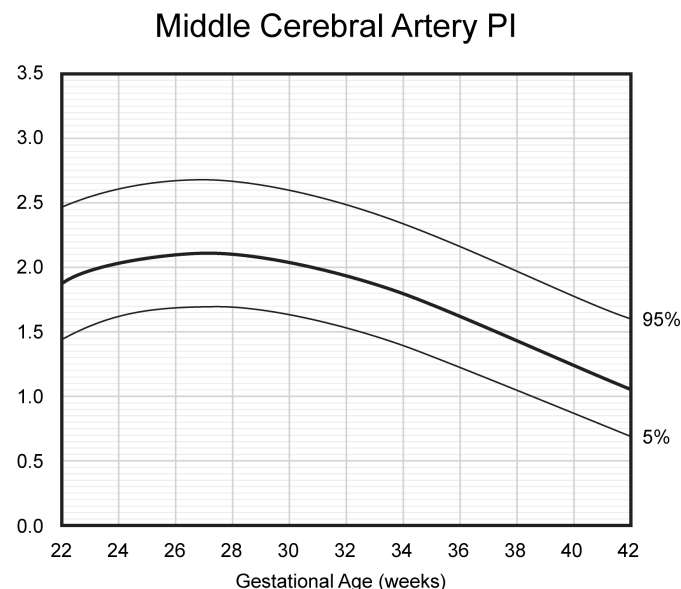
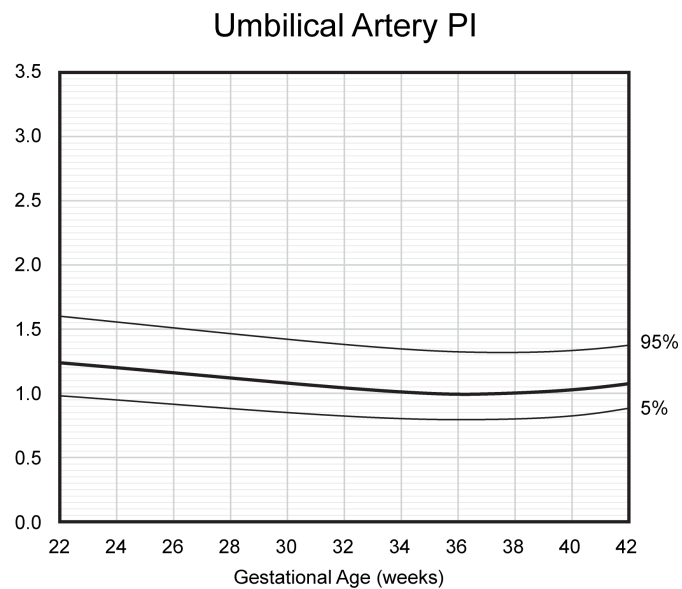
- DCDA Twins, treat as individual singletons
- MC Twins at time of Nuchal: DV PI is a good predictor of early TTTS
- MC Twins in second-third trimester with no evidence of TTTS: no Doppler tests
- MC Twins at any stage of TTTS and/or post laser ablation: UA PI, MCA PI, MCA PSV, DV PI

Special considerations in abnormal gestations:

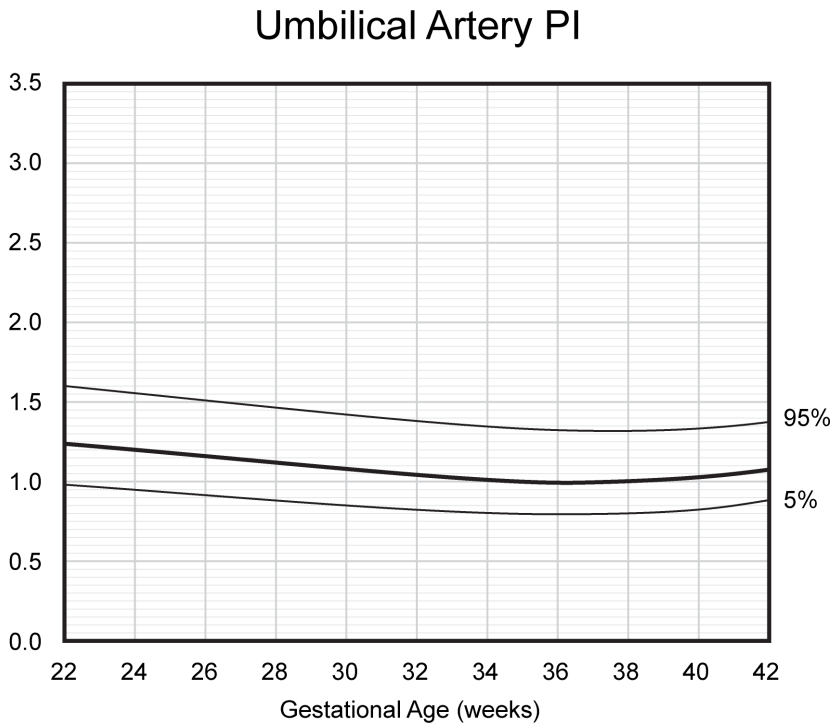
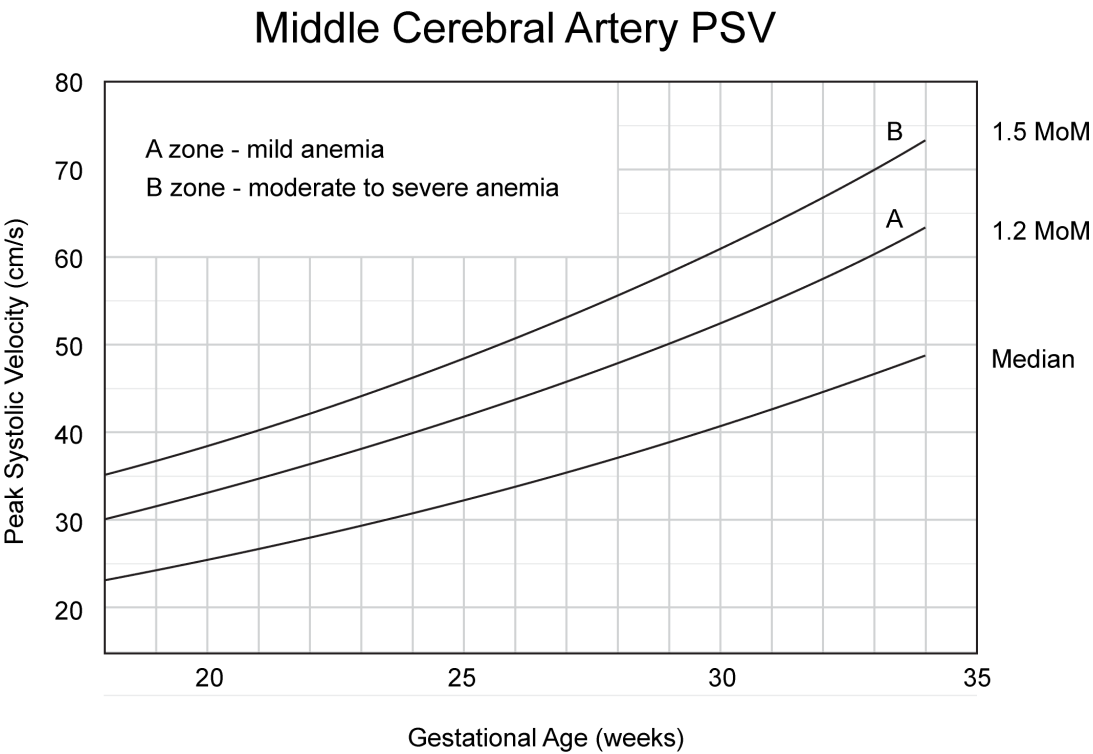
Any of the following structural anomalies should prompt investigation of UA PI, MCA PI, MCA PSV, DV PI:

- Hydrops
- Significant structural cardiac anomaly
- Vascular shunting lesions: chorioangioma, AVM, Sacro-coccygeal teratoma
- Chest masses esp when large (CPM, Sequestration)
- Any suspected neoplasms, fetal or placental

Essential IUGR and Maternal Hypertensive Disorders Charts



Essential Fetal Isoimmunisation Doppler Assessment Charts



Essential TTTS Charts

