

Third Trimester Spectral Doppler in 2020

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Spectral Doppler is useful in many conditions:

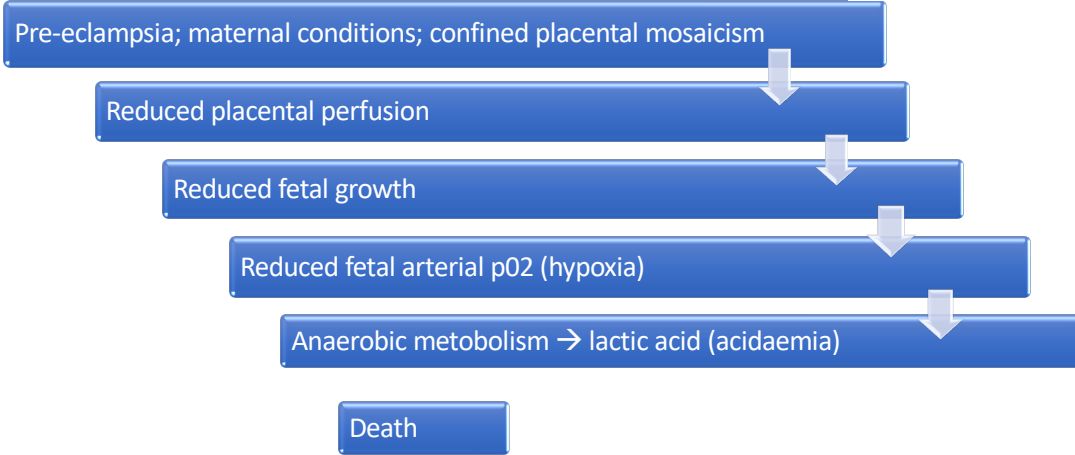
- **Placental insufficiency**
- **Fetal anaemia**
- Twin pregnancy
- Fetal cardiac disease

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Placental insufficiency

Table 2: Maternal conditions associated with IUGR.

Hypertension
Pre existing diabetes
Connective tissue disease (such as SLE)
Significant cardiac or respiratory disease, anemia
Inflammatory bowel disease
Thrombophilia (particularly antiphospholipid syndrome)
Malnutrition
Smoking, alcohol, drug use
High altitude



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Size does matter

Reduced fetal growth

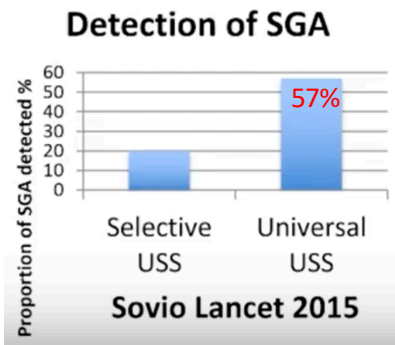
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But its not a perfect way to detect FGR

Screening for fetal growth restriction with universal third trimester ultrasonography in nulliparous women in the Pregnancy Outcome Prediction (POP) study: a prospective cohort study

Ulla Sovio, Ian R White, Alison Dacey, Dharmindra Pasupathy, Gordon C S Smith

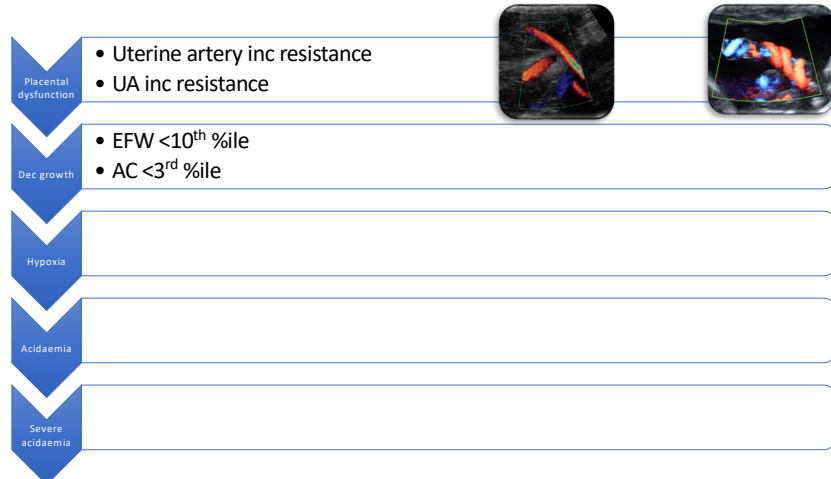
Lancet 2015



- Inaccuracies
 - Intra & inter observer variability
 - unreliable EDD
- Can be small and healthy
- Can be >10th centile and FGR

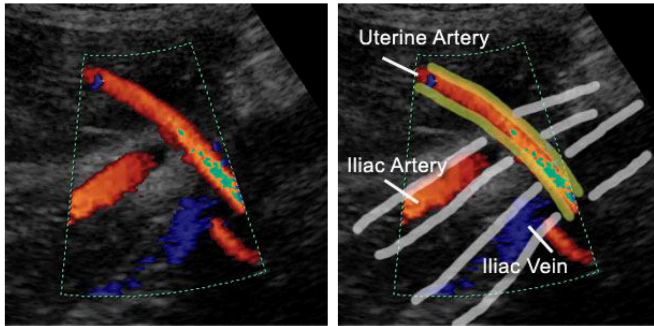
5

Size is only one part of the puzzle

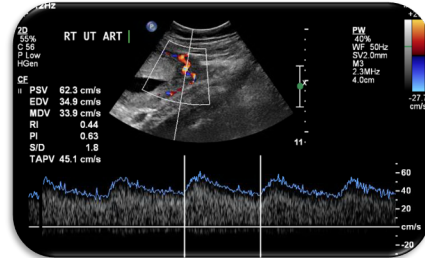


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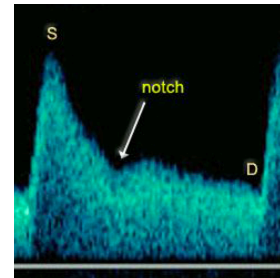
Uterine artery



Site of insonation of uterine artery ("crossing over")



normal

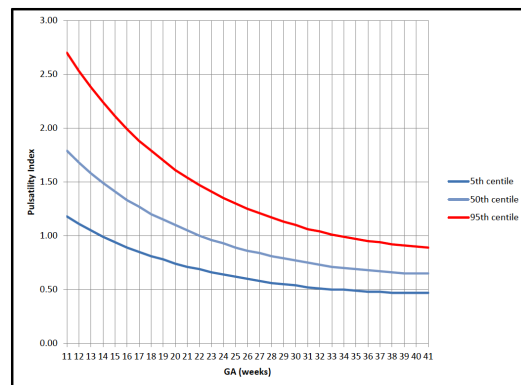


abnormal

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Uterine artery

- Reference range
 - Mean PI >95th centile
- Reproducible
- Predictor of poor outcome
 - FGR
 - Pre-eclampsia
 - Prematurity (iatrogenic)

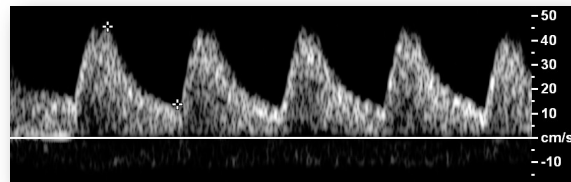
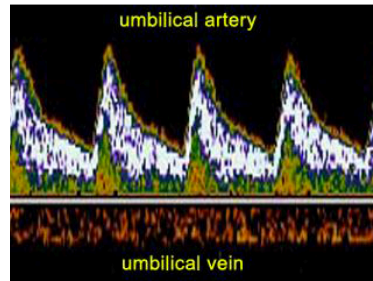


Gómez O, Figueroa F, Fernández S, Benassar M, Martínez JM, Puerto B, Gratacós E. Reference ranges for uterine artery mean pulsatility index at 11–41 weeks of gestation. *Ultrasound Obstet Gynecol* 2008; 32: 128–132.

- Does routine use in T3 improve outcomes?

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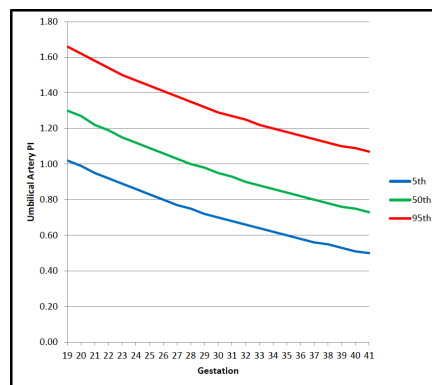
Umbilical artery



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Umbilical artery

- Reference range
 - PI >95th centile
 - Absent or reversed EDF
 - Reproducible
 - Use lowest
 - Predictor of poor outcome
 - Neonatal acidosis
 - adverse perinatal outcome
- Figueras 2014



Acharya G, Wilsgaard T, Berntsen GK, Maltau JM, Kiserud T. Reference ranges for serial measurements of umbilical artery Doppler indices in the second half of pregnancy. Am J Obstet Gynecol. 2005 Mar;192(3):937-44.

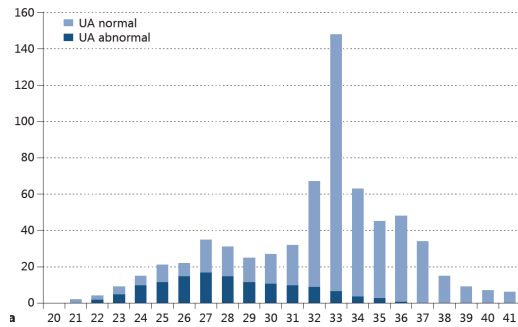
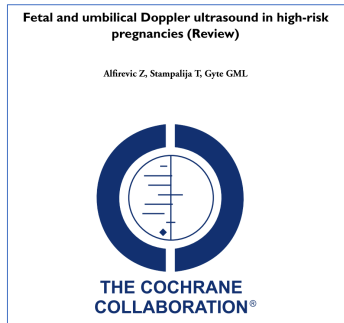
- Does routine use improve outcomes?

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Umbilical artery

• 'Routine' use improves outcomes

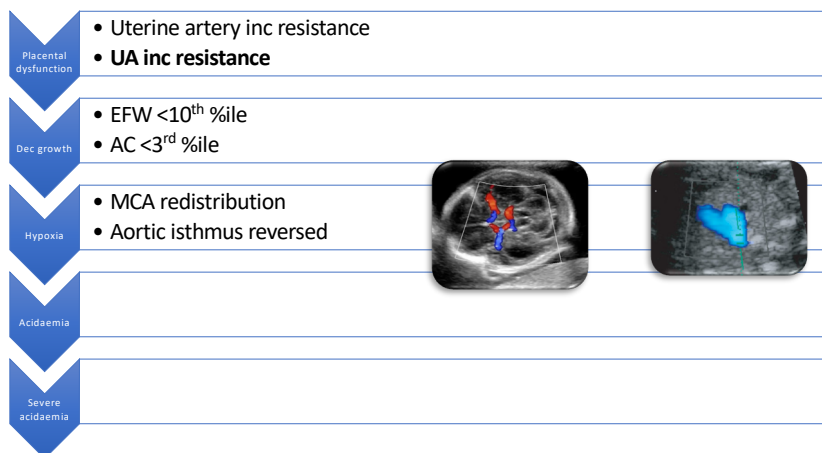
- 29% reduction in perinatal deaths
- NOT as useful after 35 wks



Figueras Fetal Diagn Ther 2014

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FGR



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Middle cerebral artery

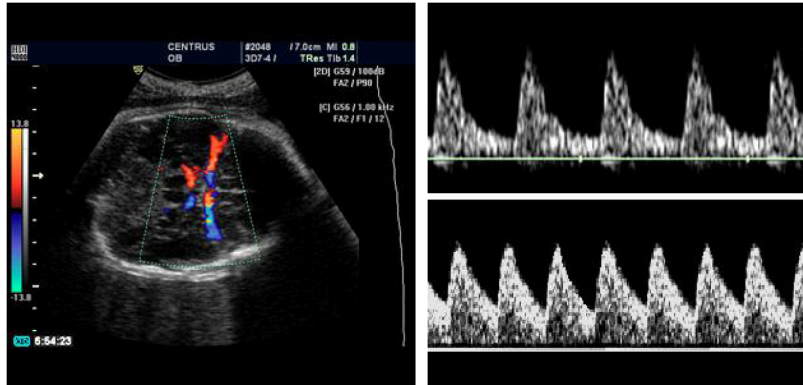
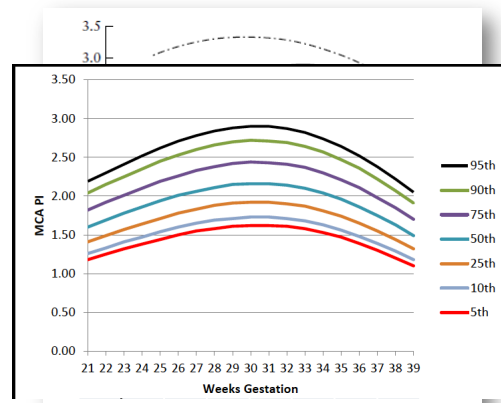


Figure 3: Color Doppler examination of the circle of Willis (left). Flow velocity waveforms from the middle cerebral artery in a normal fetus with low diastolic velocities (right, top) and in a growth-restricted fetus with high diastolic velocities (right, bottom).

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Middle cerebral artery

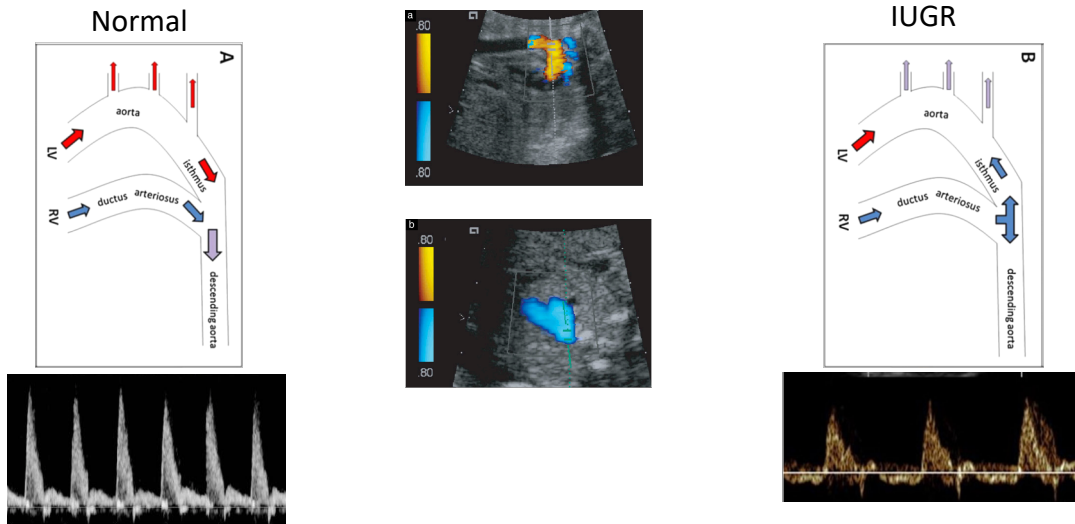
- Reference range
 - Many
 - PI <5th centile
- Reproducible?
 - Position, movement, pressure
- Predictor of poor outcome
 - Inc CS (x6)
 - Poorer neuro scores
- Improves outcomes?



Ebbing C, Rasmussen S, Kiserud T. Middle cerebral artery blood flow velocities and pulsatility index and the cerebroplacental pulsatility ratio: longitudinal reference ranges and terms for serial measurements. *Ultrasound Obstet Gynecol*, 2007. 30(3): 287-96.

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Aortic Isthmus



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Aortic Isthmus

- Reference range
 - Yes
 - Use reversed flow
- Reproducible
- Predictor of poor outcome
 - Inc neuro impairment
- Improves outcomes?

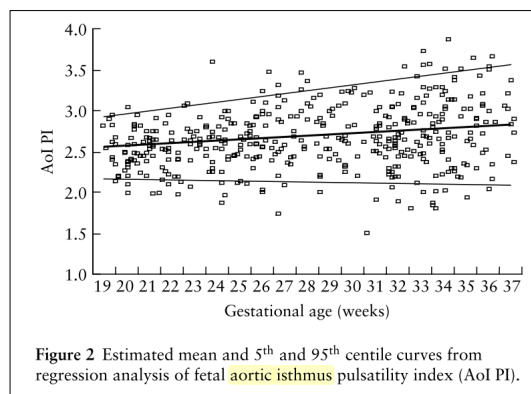
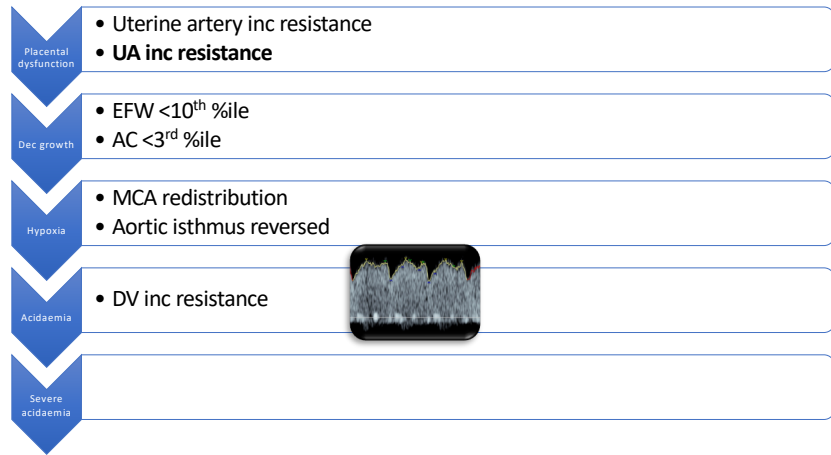


Figure 2 Estimated mean and 5th and 95th centile curves from regression analysis of fetal aortic isthmus pulsatility index (AoI PI).

Del Rio et al UOG 2006

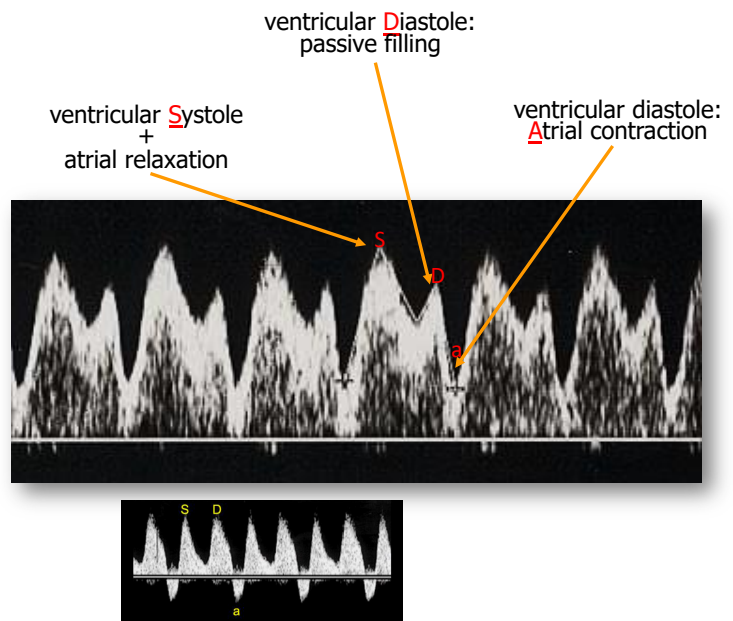
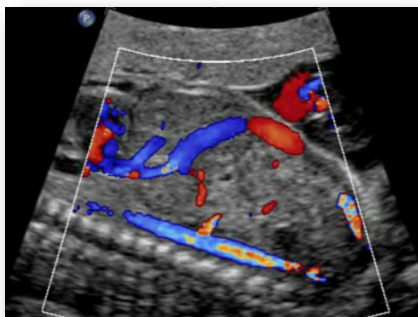
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FGR



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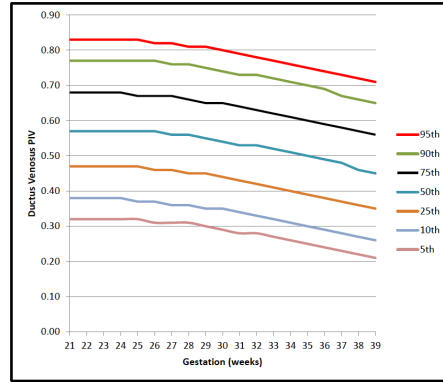
Ductus Venosus



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Ductus venosus

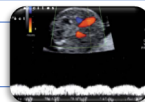
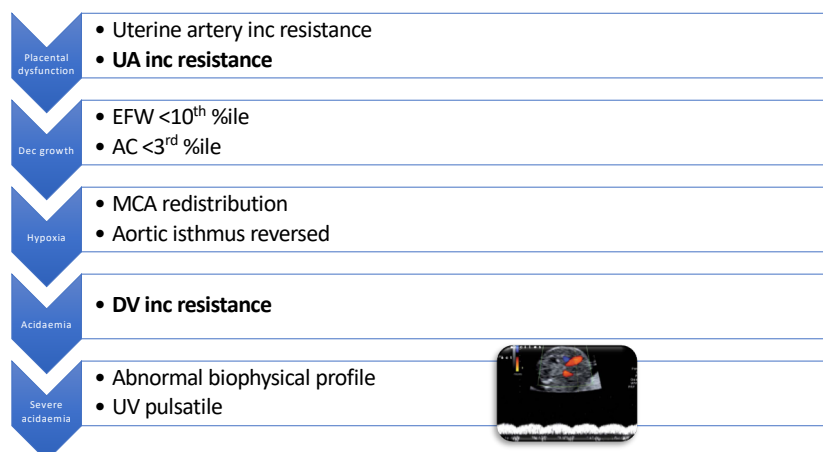
- Reference range
 - >95th centile
 - Reversed 'a' wave
- Reproducible
 - Fetal breathing
- Assoc with poor outcomes
 - Severe acidaemia
 - Predicts fetal demise
- **Improves outcomes**



Kessler, J., Rasmussen, S., Hanson, M. and Kiserud, T. Longitudinal reference ranges for ductus venosus flow velocities and waveform indices. *Ultrasound Obstet Gynecol* 2006, 28: 890–898.

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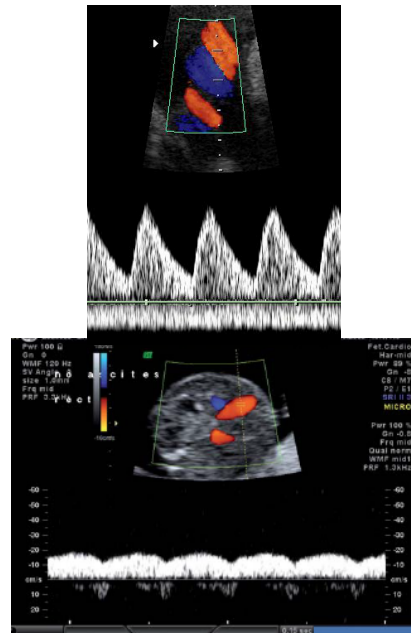
FGR



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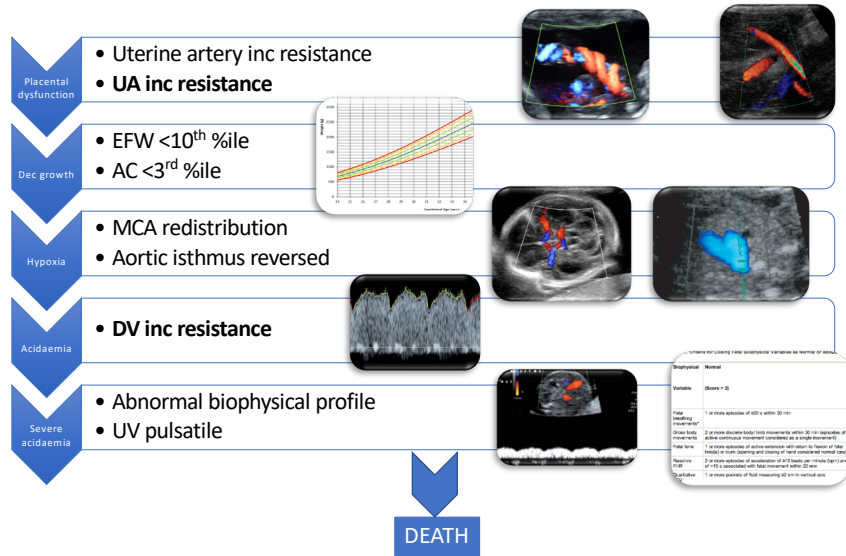
Umbilical Vein

- Too late!
- Occurs close to the onset of late decelerations on CTG
- Occurs with fetal acidaemia, and endocrine changes
- Neonatal mortality up to 60%



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FGR



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Abnormal Dopplers - timing

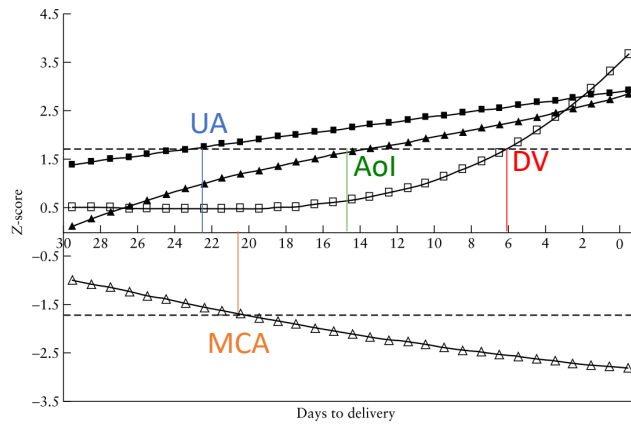
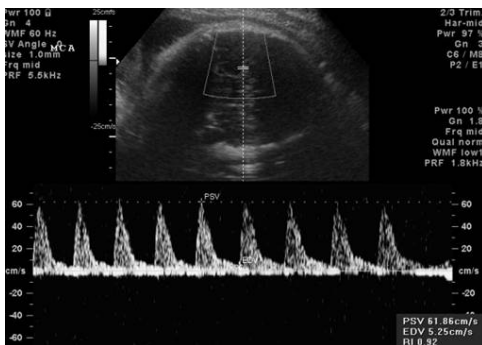


Figure 1 Regression lines indicating trends over time of pulsatility indices in the aortic isthmus (▲), ductus venosus (□), umbilical artery (■) and middle cerebral artery (△) before delivery: horizontal dashed lines indicate the 5th and 95th centiles.

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Fetal anaemia

- Anaemia is associated with a hyperdynamic circulation → inc blood flow velocity
- MCA is easiest to measure, most reproducible



perinatology.com

Expected Peak Velocity of Systolic Blood Flow in the MCA as a Function of Gestational Age

Home > Calculators > MCA Peak Systolic Velocity

The proximal middle cerebral artery is enlarged to occupy more than 50% of the image and is sampled 2 mm after its origin from the internal carotid artery. The angle of the ultrasound beam and the direction of blood flow should be zero degrees. The risk of anemia is highest in fetuses with a pre-contraction peak systolic velocity of 1.5 times the median or higher.

ENTER:

Gestational age (weeks)

Observed MCA Peak Systolic Velocity (cm/sec)

Calculate Clear Form

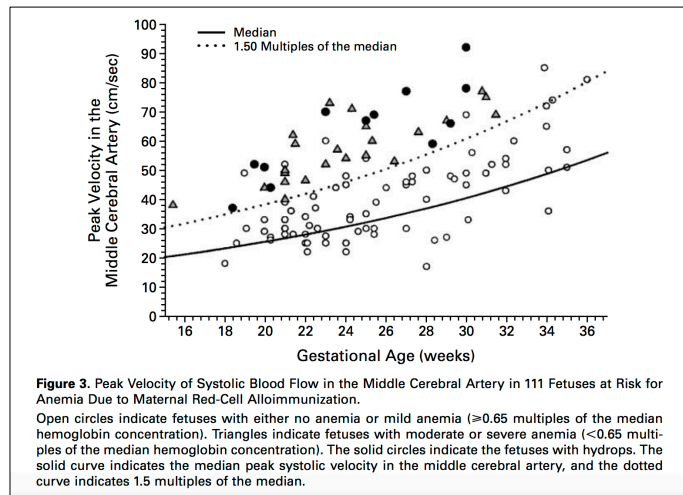
Calculations:

The Median Peak Systolic Velocity for this age is

Your measurement is Multiples of Median

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Fetal anaemia - PSV



Cut off 1.5 MoM

- Sensitivity 100%
- False pos 12%

Mari et al, NEJM 2000

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Fetal anaemia - tips

- PSV measurement is VERY dependent on angle of insonation
 - Repeat multiple times to obtain most accurate reading
- MCA PSV becomes less accurate after ≥ 2 blood transfusions
 - Due to inc viscosity of donor blood
 - Inc false pos rate
 - Timing of subsequent transfusions should be based on Hct declining 1-2%/day

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