# Imaging of the Placenta: Ultrasound

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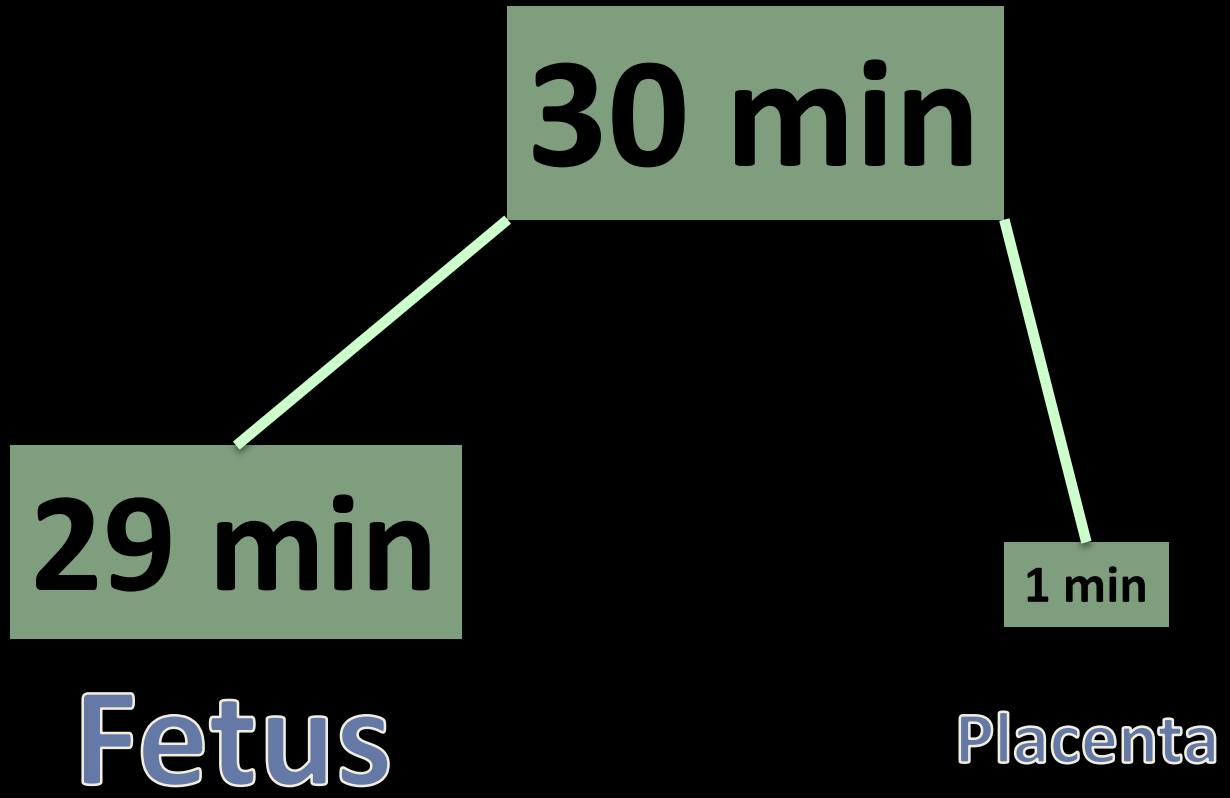
# Nothing to Disclose

# Today's Obstetric Ultrasound

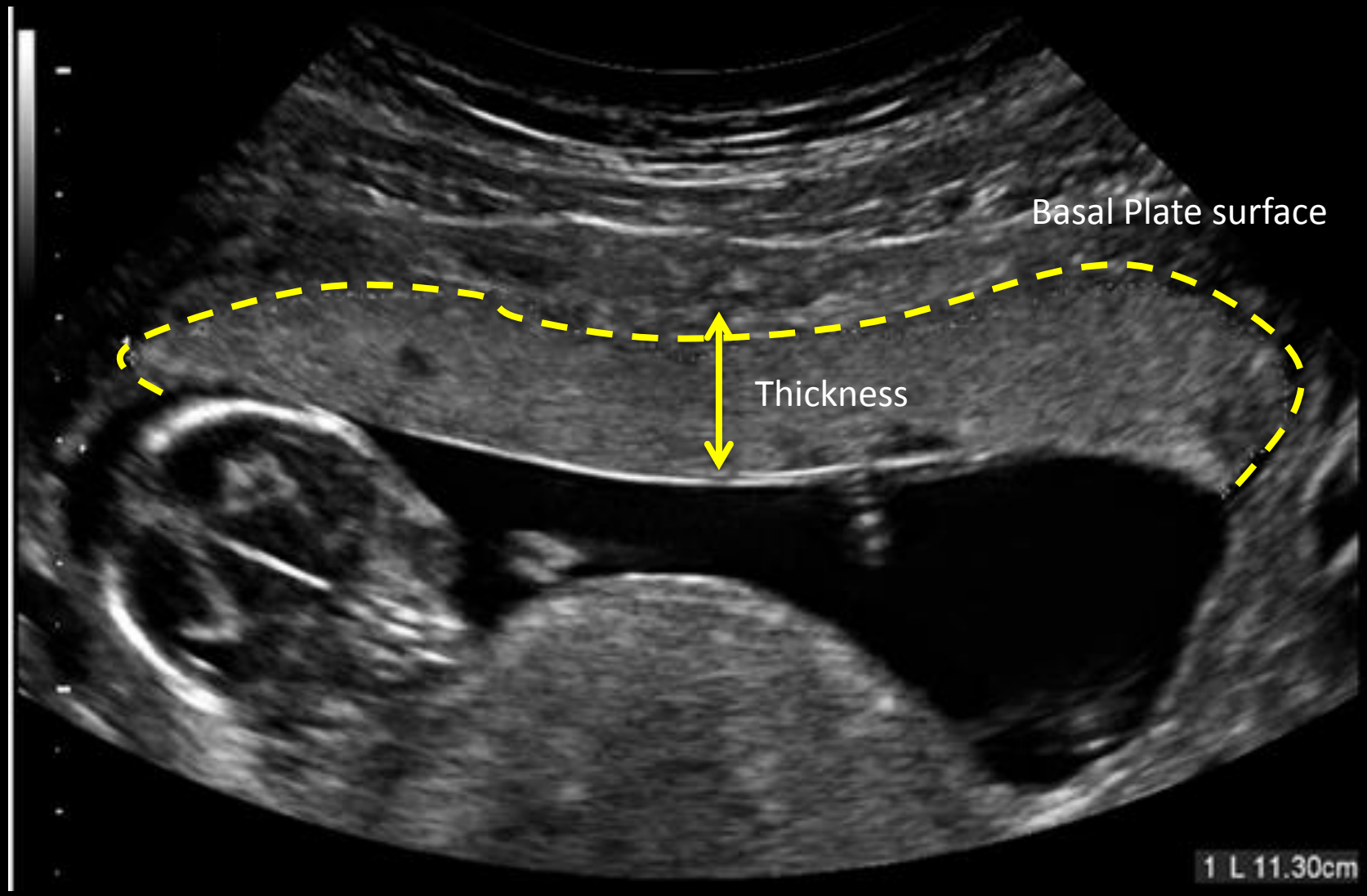


# Outline

- Placental Biometry
- Color and pulsed Doppler
- 3D Ultrasound
- Elasticity
- Limitations

# Placental Biometry

- Placental thickness
- Placental basal plate surface
- Placental volume

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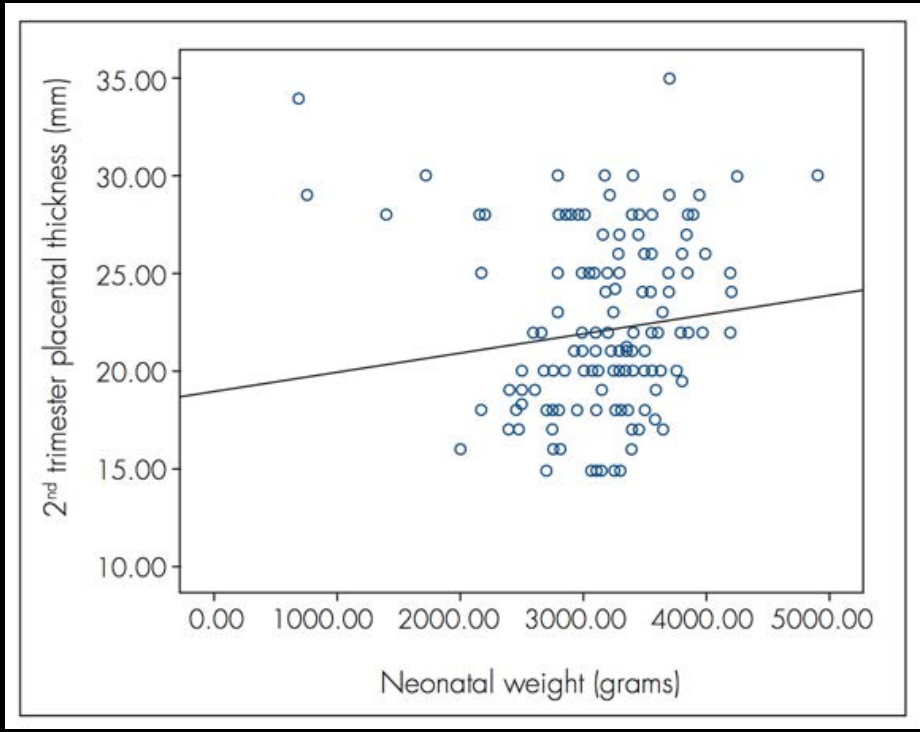
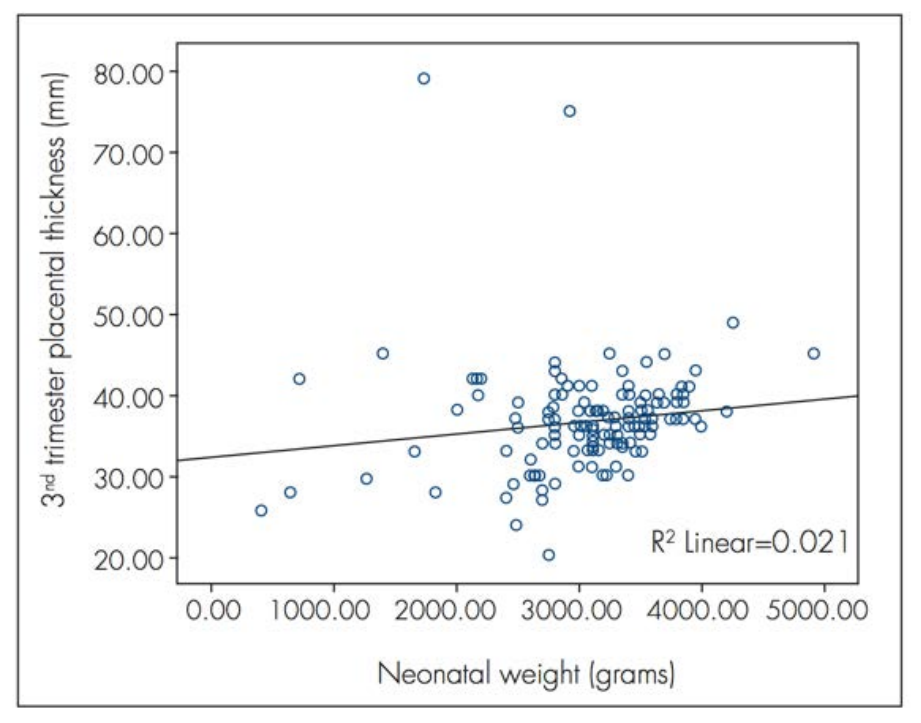
# Placental Thickness and Fetal Weight




Rev Bras Ginecol Obstet. 2013; 35(7):317-22

# Placental Biometry and Preeclampsia

**Table 2**
Comparison of the median for the placental endocrinologic and ultrasound measurements in normal controls (n = 42) and PE (n = 14).

| Variables | Controls | | PE | | *P* |
|---|---|---|---|---|---|
| | Median | LQ; UQ | Median | LQ; UQ | |
| Placental thickness (mm) | 18.7 | 16.0; 23.2 | 17.9 | 16.5; 21.0 | NS |
| Basal plate surface (mm2) | 431 | 329; 499 | 329 | 269; 356 | <0.01 |
| Placental volume (mm3) | 61.4 | 47.8; 92.6 | 48.6 | 38.1; 47.8 | NS |
| fβhCG (MoM) | 1.06 | 0.73; 1.58 | 1.14 | 0.55; 1.88 | NS |
| Inhibin A (MoM) | 0.96 | 0.79; 1.33 | 1.37 | 0.95; 1.62 | <0.01 |
| PAPP-A (MoM) | 1.08 | 0.76; 1.33 | 0.52 | 0.28; 0.89 | <0.001 |

Data are presented as median and lower quartile (LQ); upper quartile (UQ).

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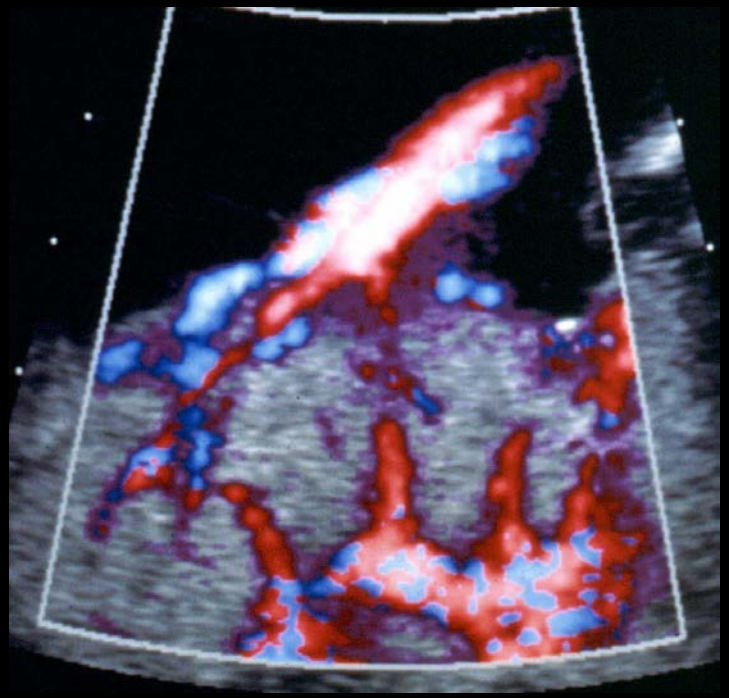
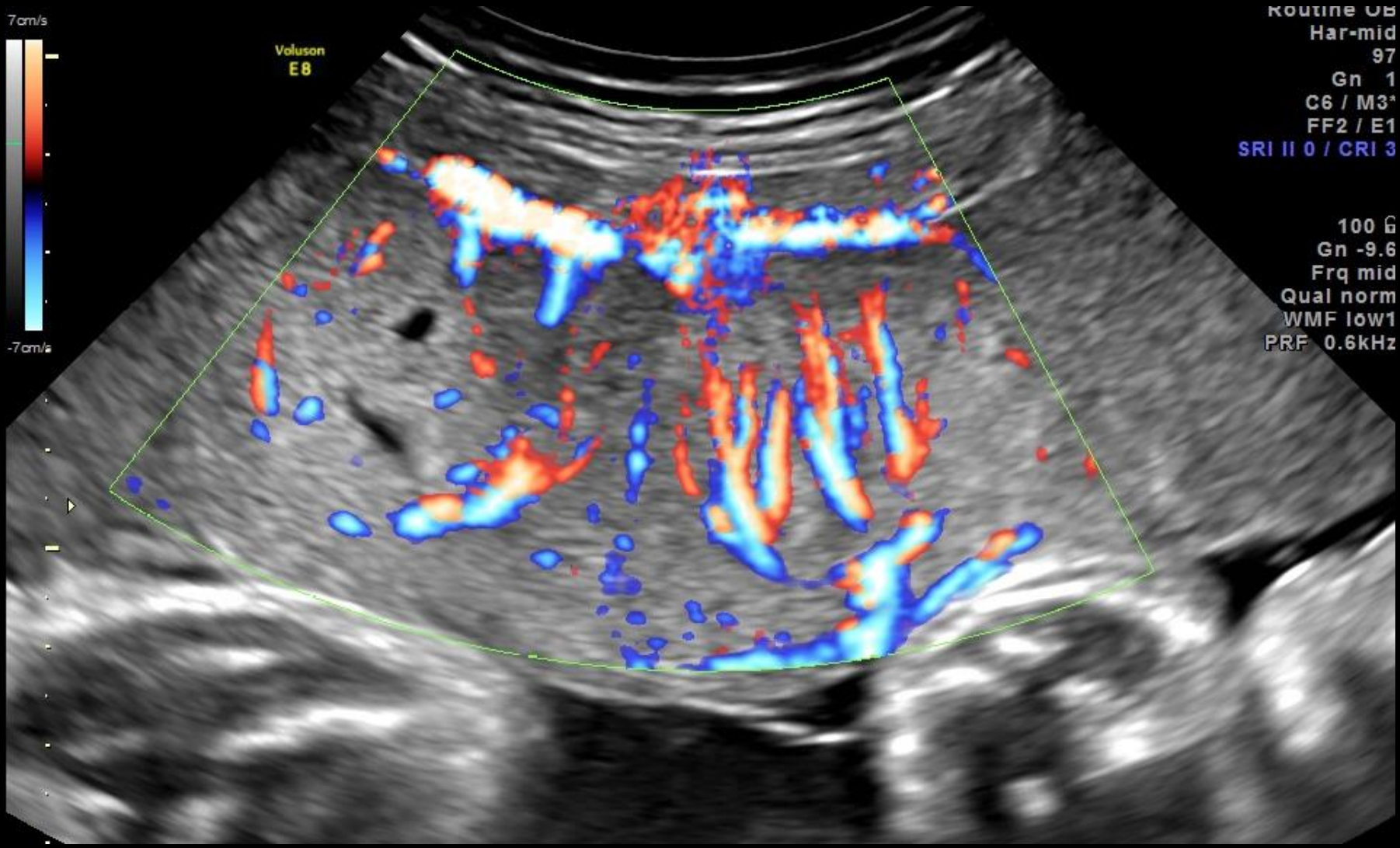
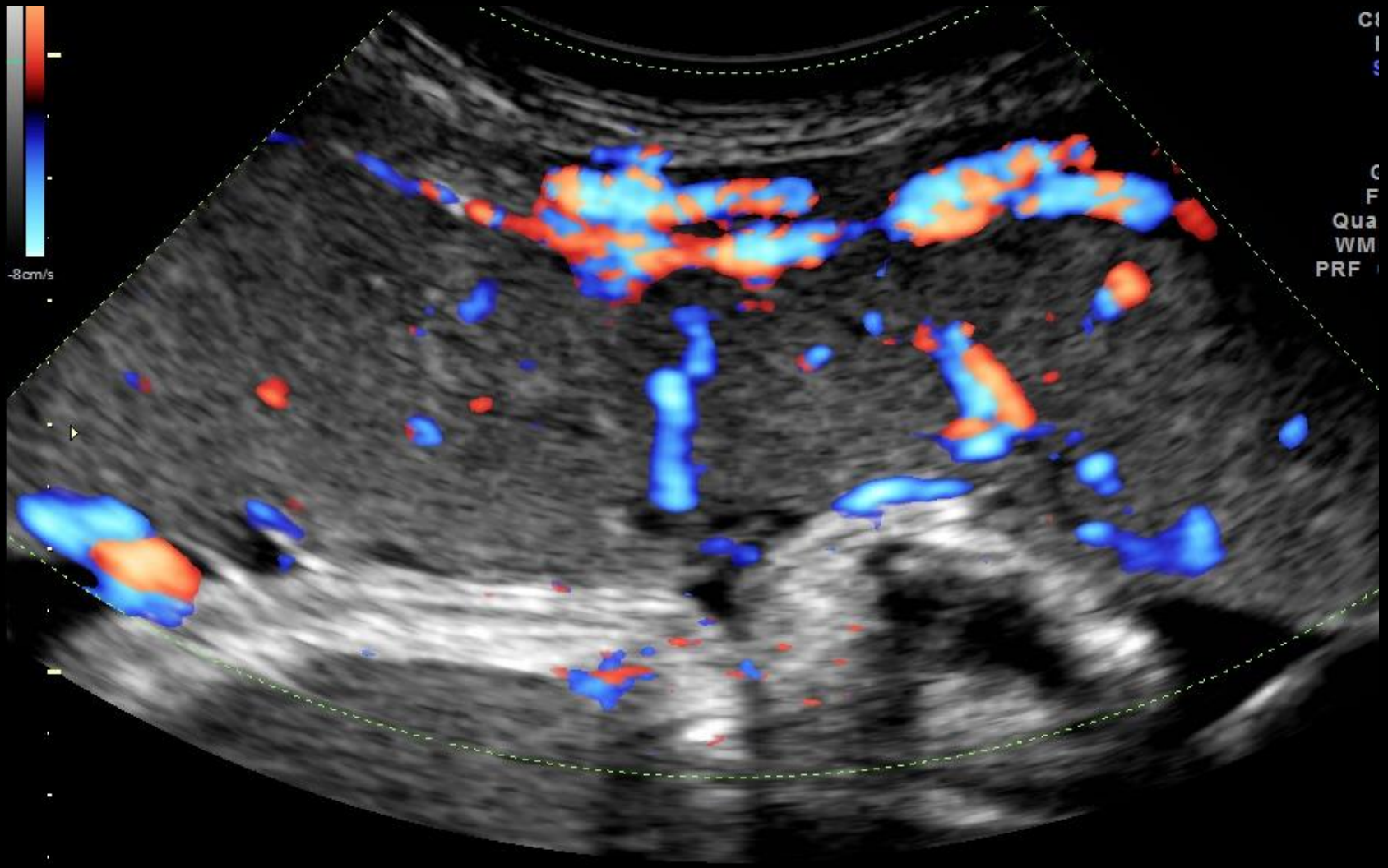
# Color and Pulsed Doppler

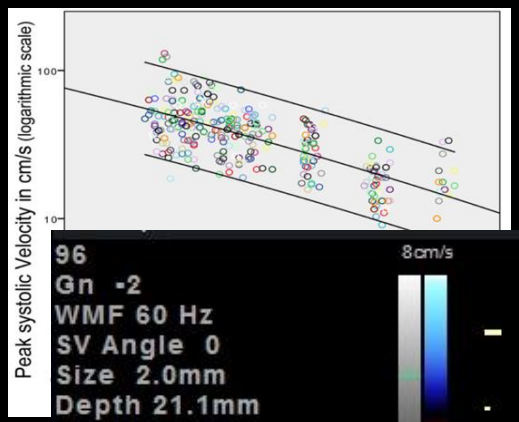
- Maternal vessels (spiral)
- Fetal vessels (chorionic)
- Uterine arteries
- Umbilical arteries
- Umbilical vein

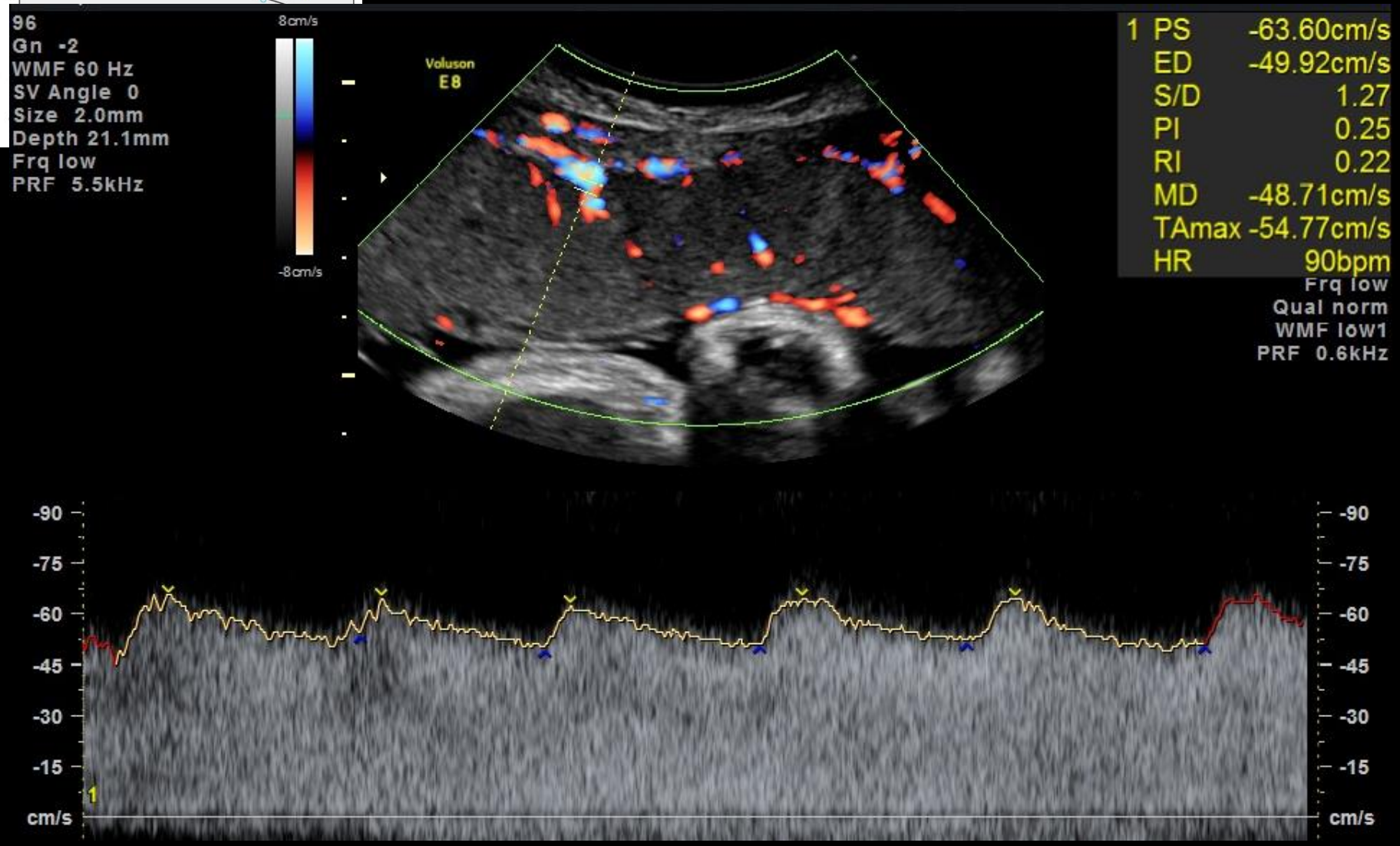



7cm/s
-7cm/s
Voluson
E8
Routine OB
Har-mid
97
Gn 1
C6 / M3*
FF2 / E1
SRI II 0 / CRI 3
100
Gn -9.6
Frq mid
Qual norm
WMF low1
PRF 0.6kHz


-8cm/s

# Maternal Vessels

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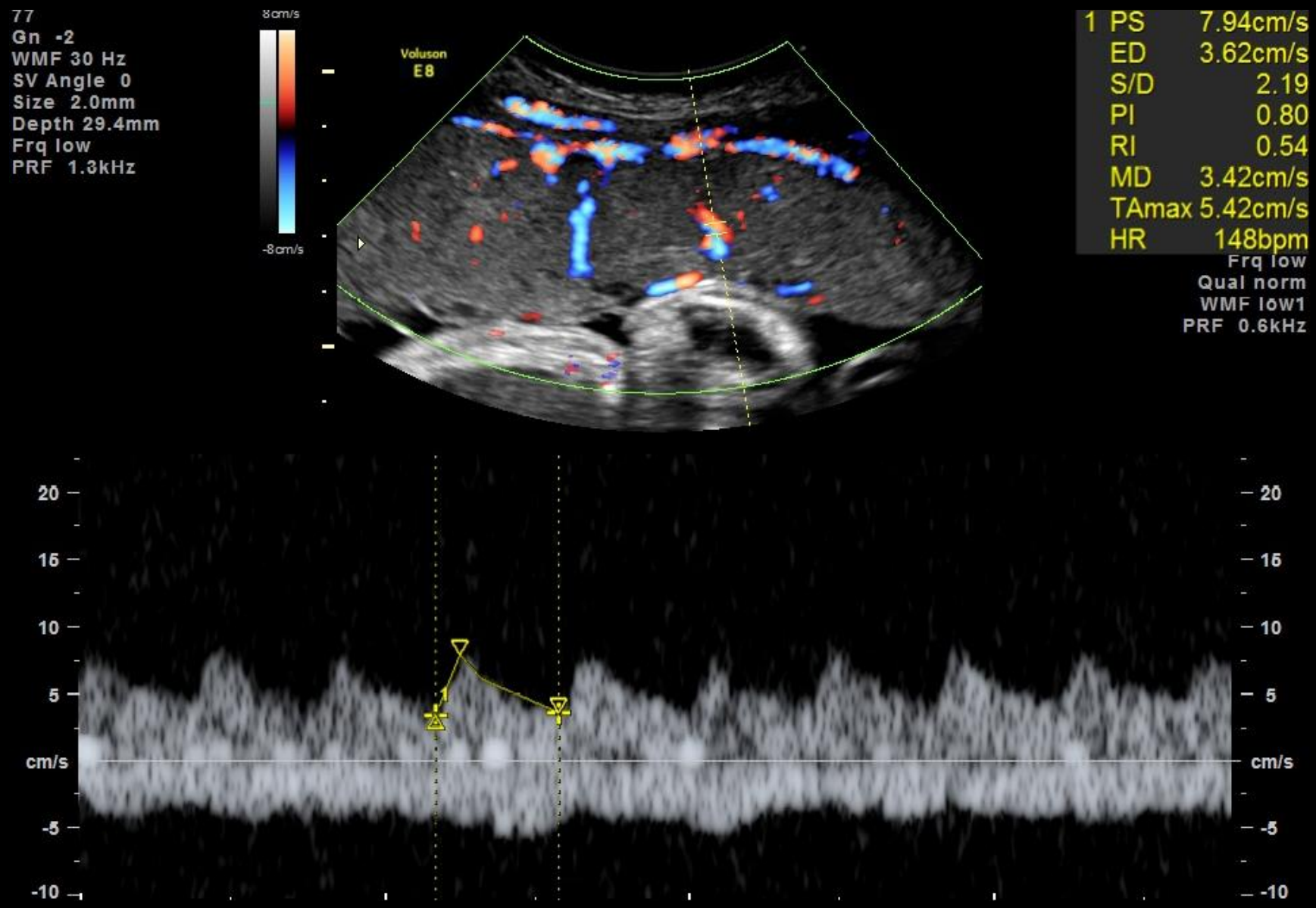
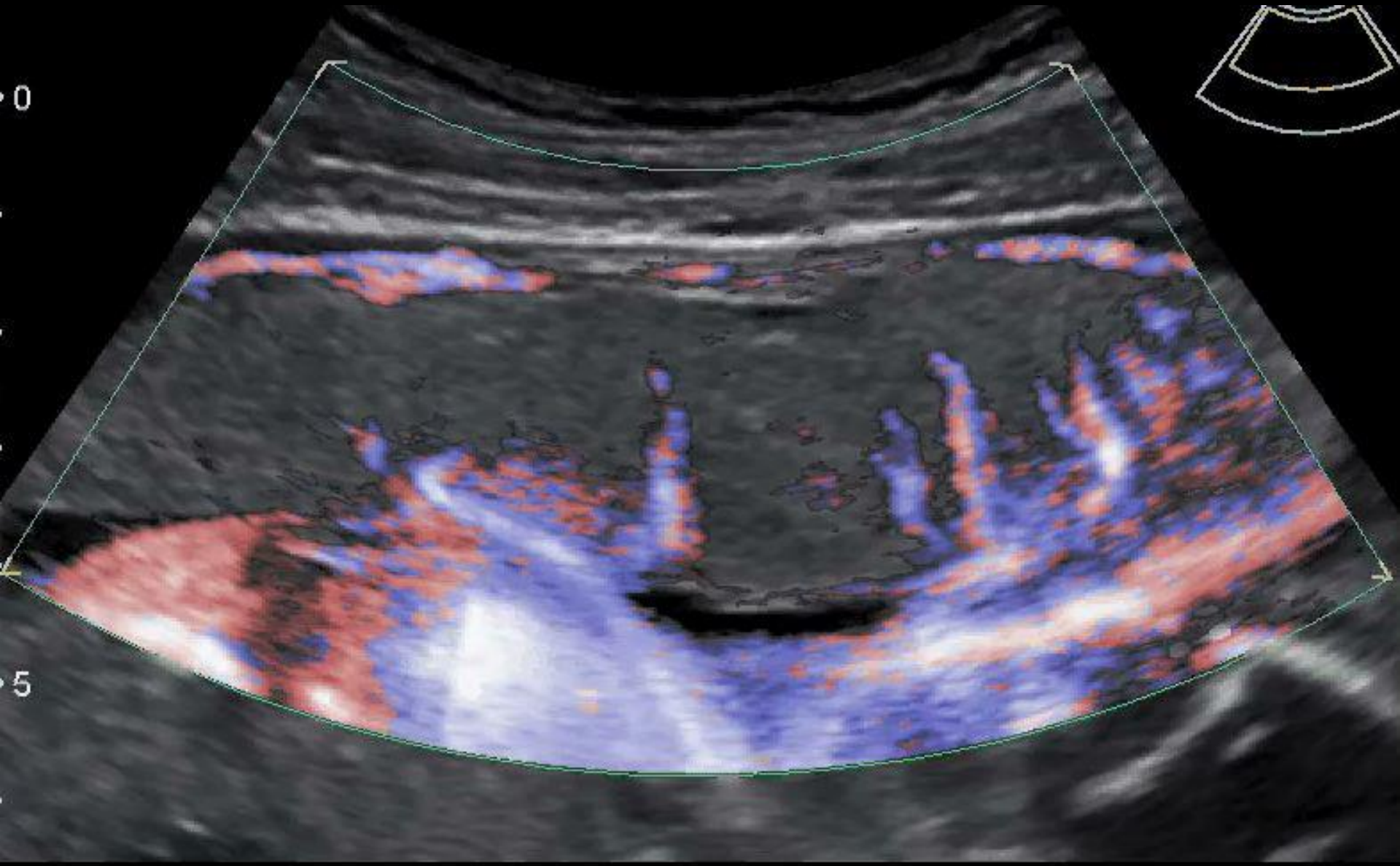
# Fetal Vessels

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# Doppler and Placental Perfusion

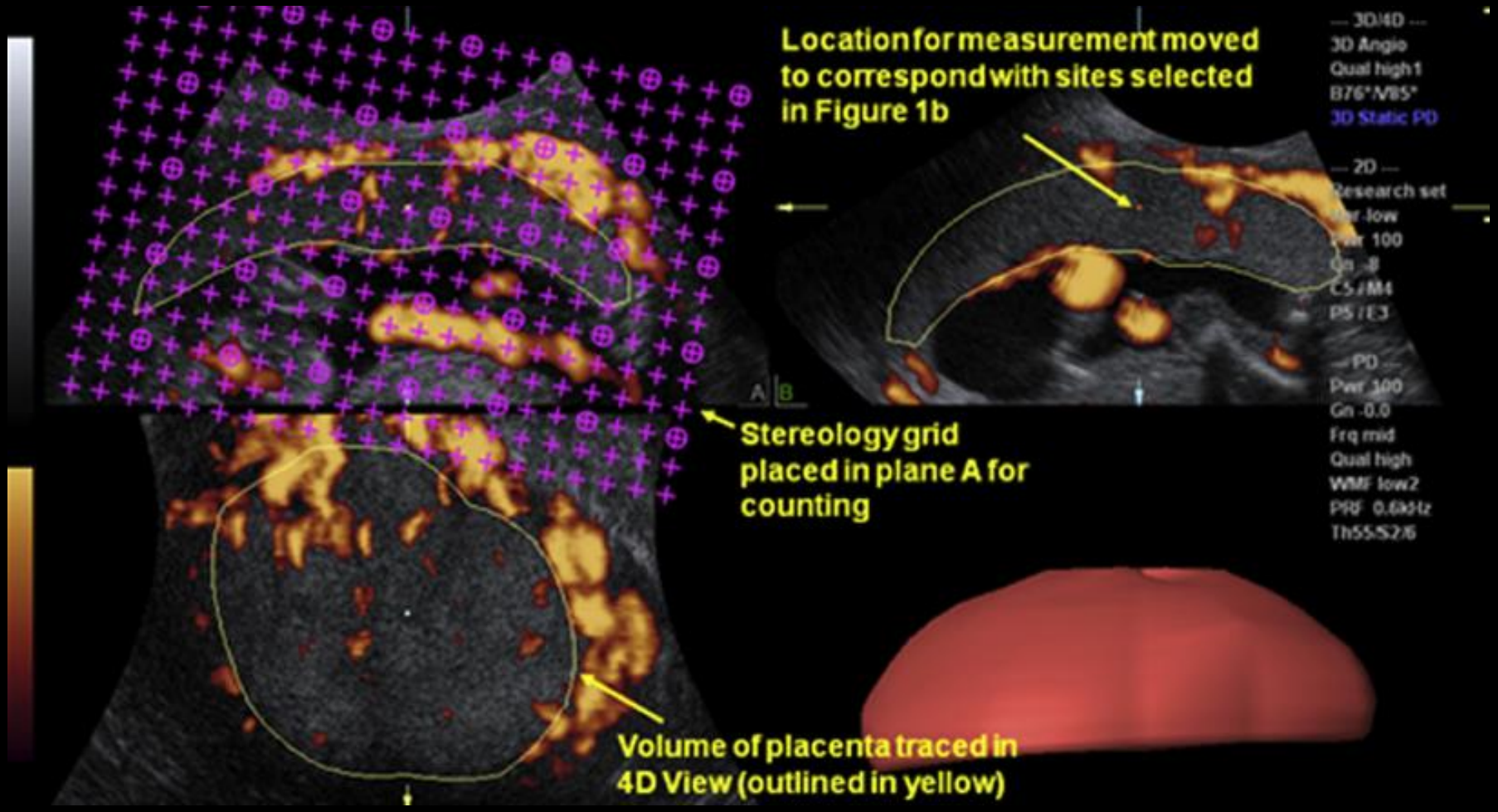
- In late onset SGA pregnancies:
  - Uterine Doppler and umbilical vein flow are surrogates for placental under-perfusion

Ultrasound Obstet Gynecol 2014;10.1002 (Epub) – Parra-Saavedra

# 3D Ultrasound

- Vascularization Index / variations
- Placental volume

# 3D Fractional Volume




Placenta 34 (2013) 1002e1008

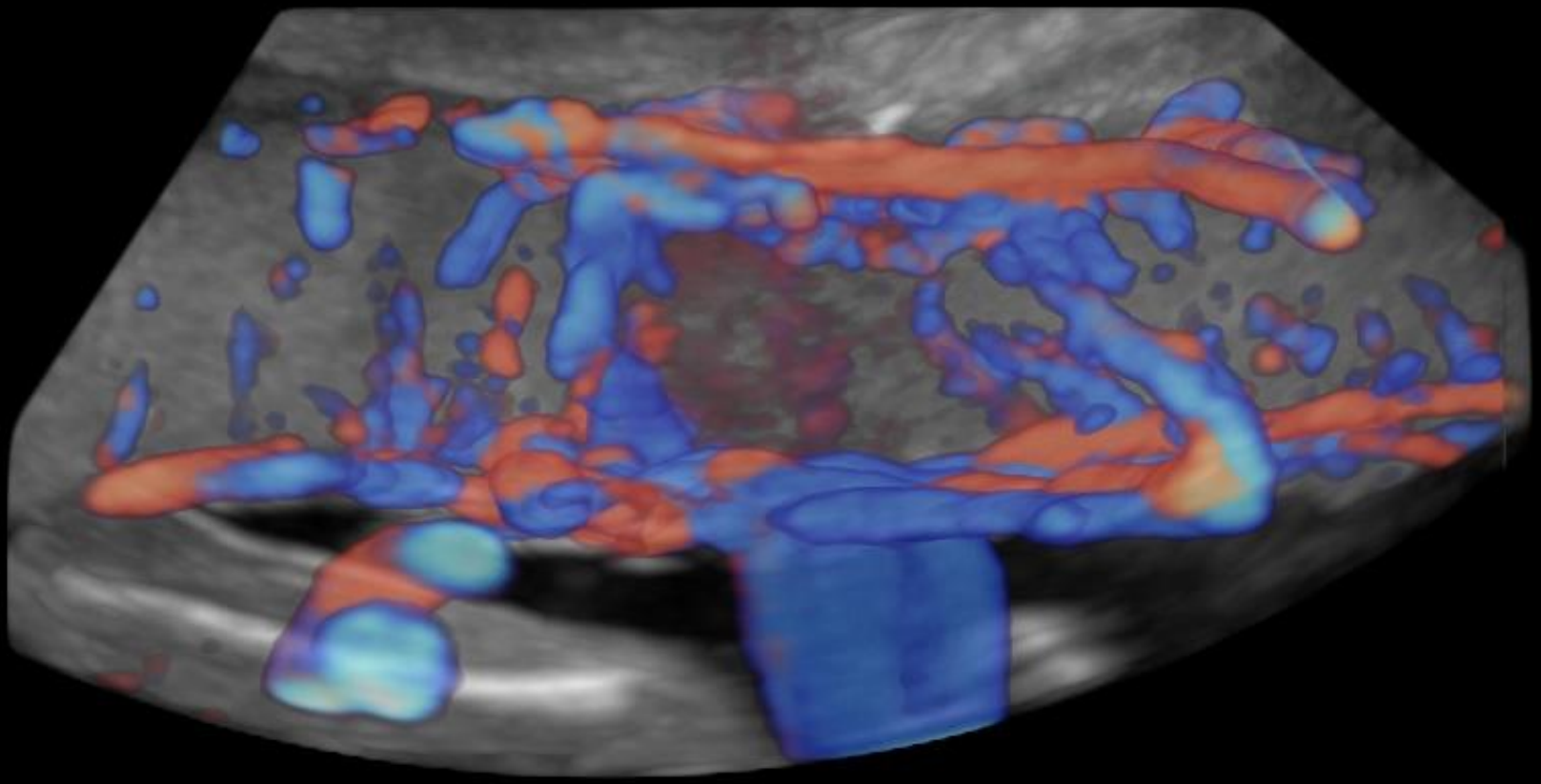
# Literature Review

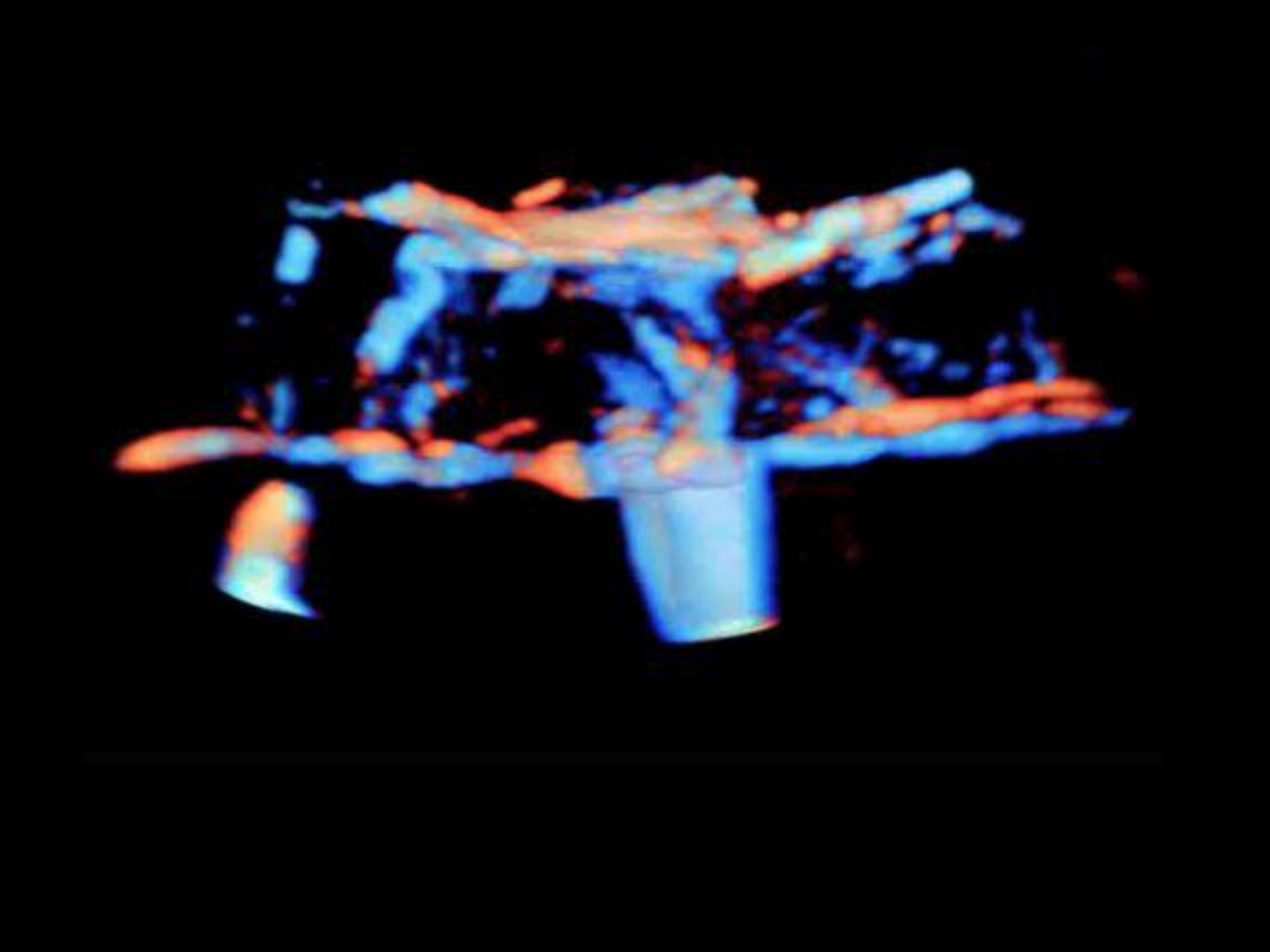
**Table 2:** Studies regarding the value of different parameters from 3D assessment for the prediction of adverse pregnancy outcome.

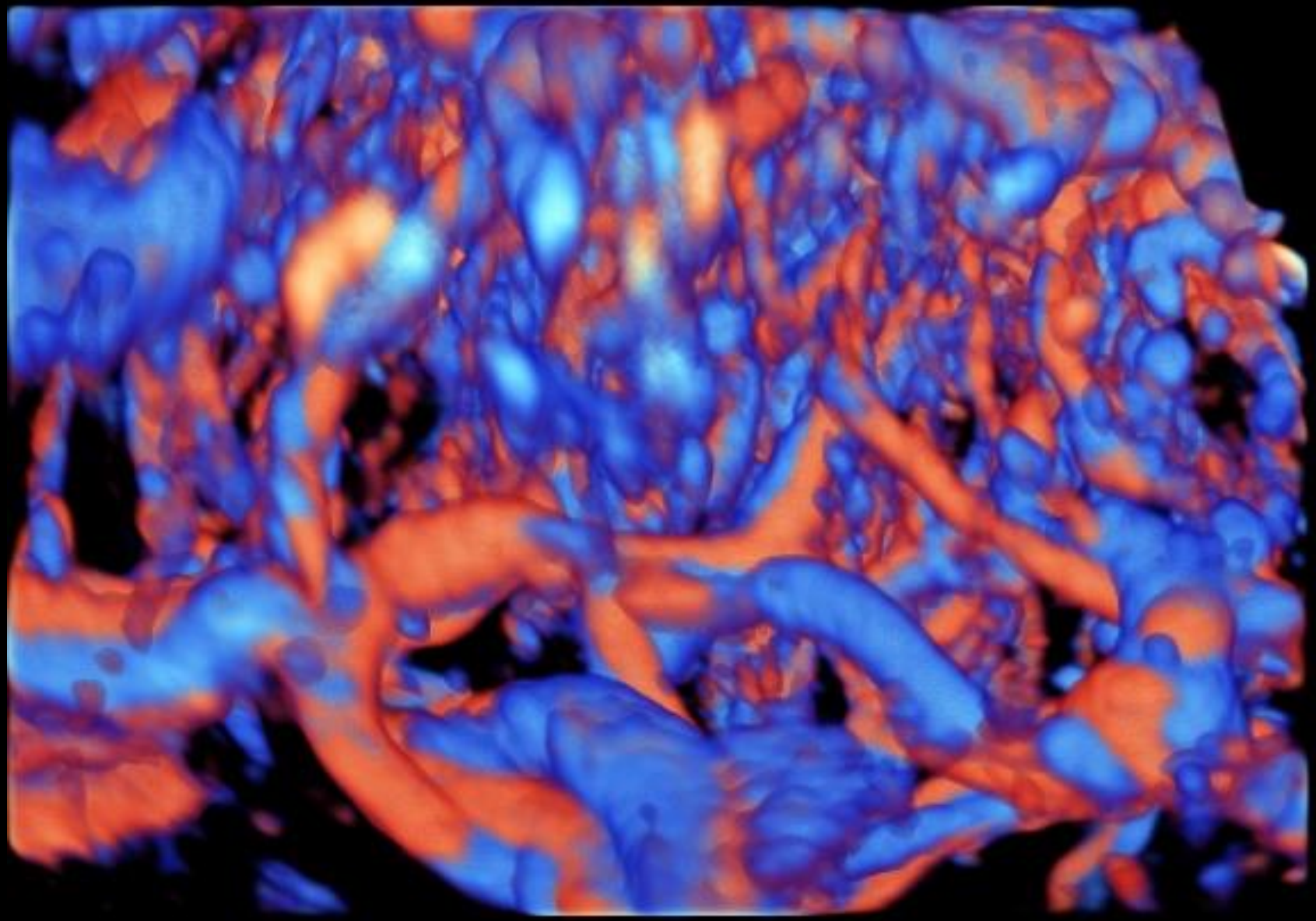
| *Study* | *Year* | *N* | *Week* | *Population* | *Parameter* | *Prediction* | *Screening* |
|---|---|---|---|---|---|---|---|
| Merce[33] | 2005 | 99 | 14-40 | Normal | PB, VI, Fl, VFI | Correlation with GA | Useful |
| Zalud[40] | 2007 | 199 | 14-25 | Normal | VI, Fl, VFI | Definition of indices in 2nd trimester | Useful |
| GJiot[27] | 2008 | 45 | 23-37 | Normal & FGR | VI, Fl, VFI | FVW in Normal and IUGR | Useful |
| Zalud[41] | 2008 | 199 | 14-25 | Normal | VI, Fl, VFI | Correlation with maternal age and parity | Parity influences indices |
| De Paula[31] | 2009 | 295 | 12-40 | Normal | VI, Fl, VFI | Quantitative analysis of PV | Placental indices have constant distribution |
| Rizo[38] | 2009 | 84 | 11-14 | Low PAPP-A | PV, VI, Fl, VFI | Pregnancy outcome | Altered 3D placental indices, useful |
| Noguchi[30] | 2009 | 208 | 12-40 | Normal | PB, VI, Fl, VFI | FGR | Useful |
| Tuuli[43] | 2010 | 120 | 11-14 | Normal | VI, Fl, VFI | Correlation of indices± PB | VI & VFI more reliable than Fl in PB |
| Hafner[21] | 2010 | 383 | 11-14 | Normal | PV, PQ, VI, Fl, Uterine art. Doppler | Pregnancy outcome | Useful for IUGR and PE |
| Yigiter[44] | 2011 | 310 | 11-14 | Normal | PV, VI, Fl, VFI, uterine art. Doppler | PAPP-A, IGF-1, free β-hCG | Significant correlation |
| Obido[18] | 2011 | 388 | 11-14 | Normal | PV, VI, Fl, VFI | Adverse pregnancy | Useful |

PB: Placental sonobiopsy; VI: Vascularization index; Fl: Flow index; VFI: Vascularization flow index; PV: Placental volume; PQ: Placental quotient; PE: Pre-eclampsia; FGR: Fetus growth restriction; FVW: Flow velocity waveforms

J Ultrasound Obstet Gynecol 2013:7(1):73



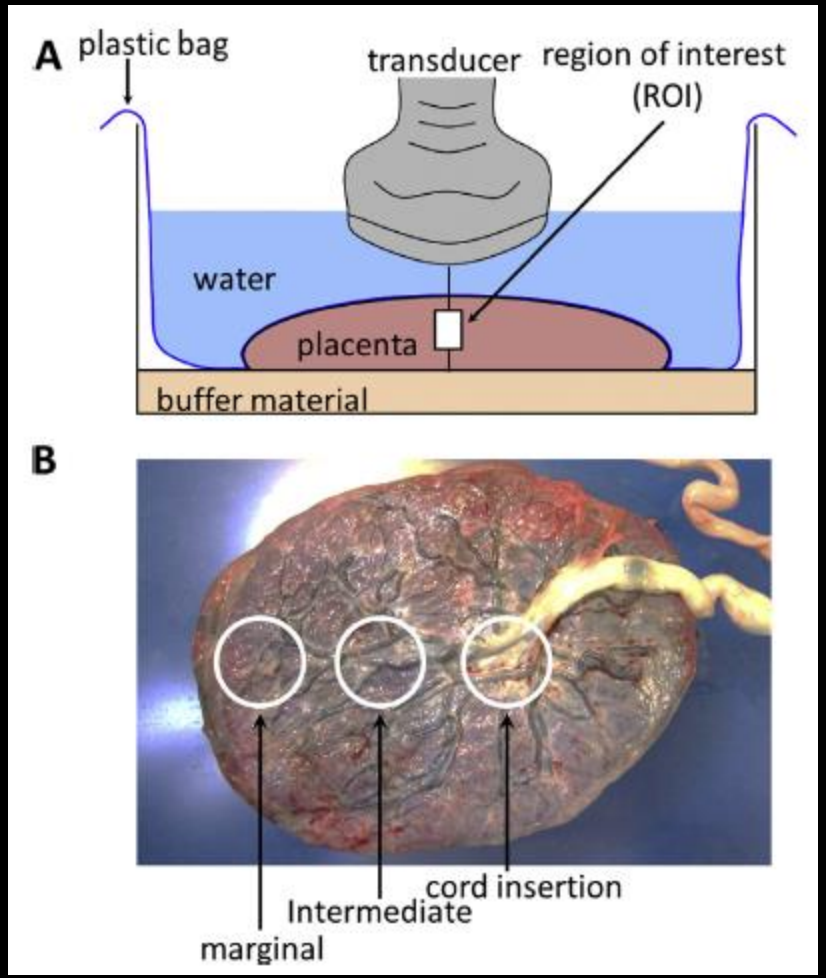




# Placental Elasticity by Ultrasound

- Tissue stiffness and compliance
- Measuring the shear wave that propagates through tissue in recoil

# Placental Elasticity: Acoustic Radiation Force Impulse Imaging

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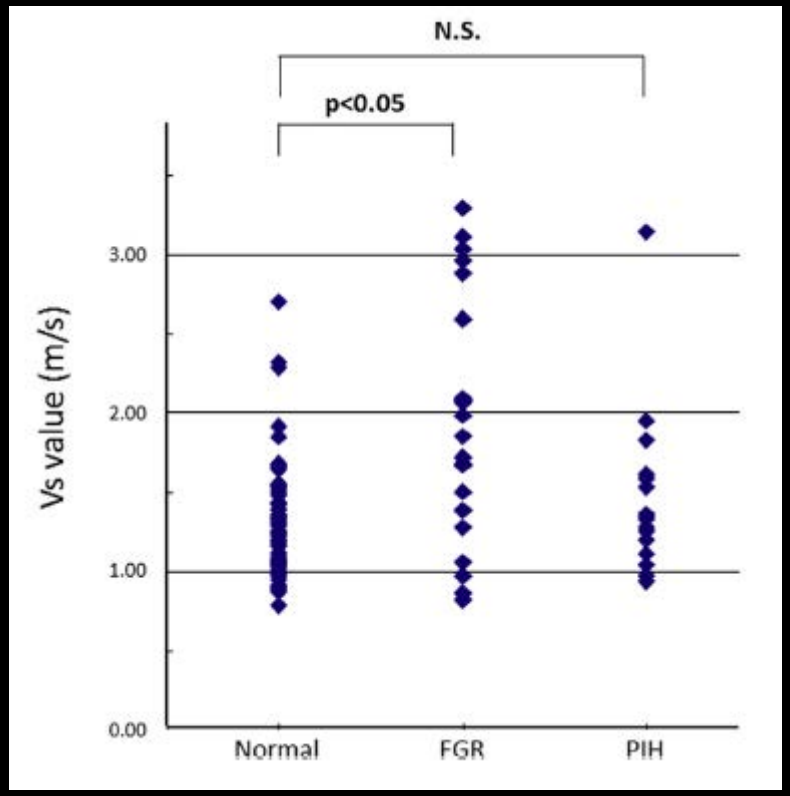
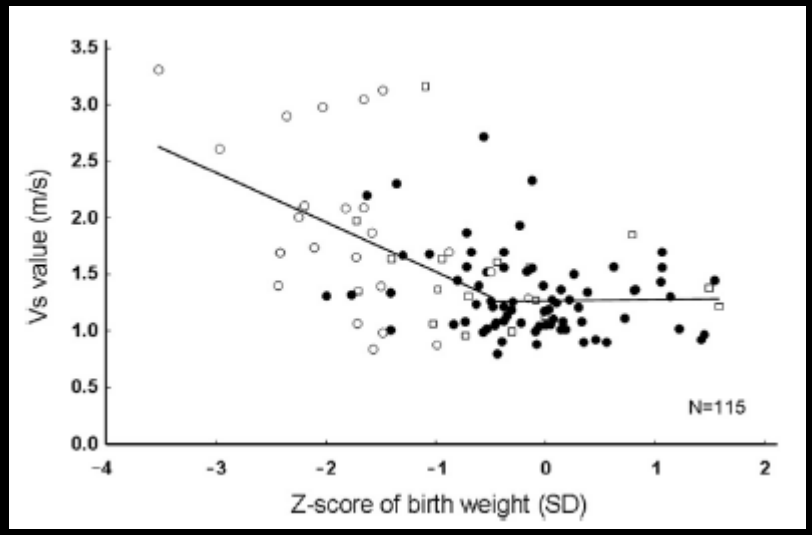
# Placental Elasticity: AR Force Impulse Imaging




Vs: Velocity of lateral shear wave
Faster wave correlates with stiffer tissue

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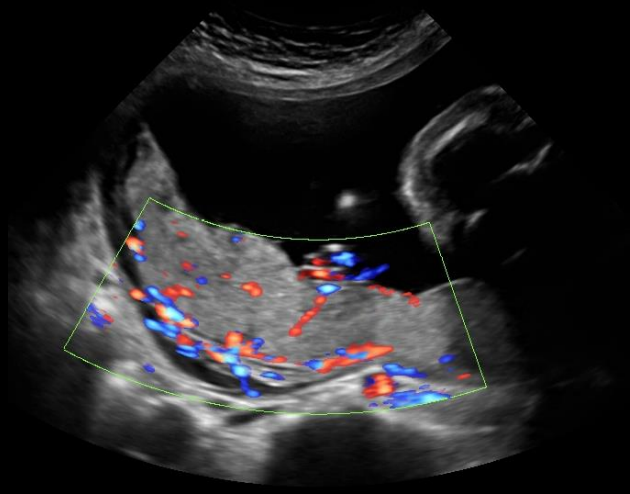
# Limitations



- Technical error in measurement
- Placenta cannot be seen in its entirety after 24 weeks
- Anterior placenta is more amenable to ultrasound imaging
- Movement and pulsation of maternal vessels introduce error
- Wide scope validation studies not done