



# IUGR fetuses



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# IUGR

Fetus who fails to reach  
its  
growth potential

# Fetal Growth

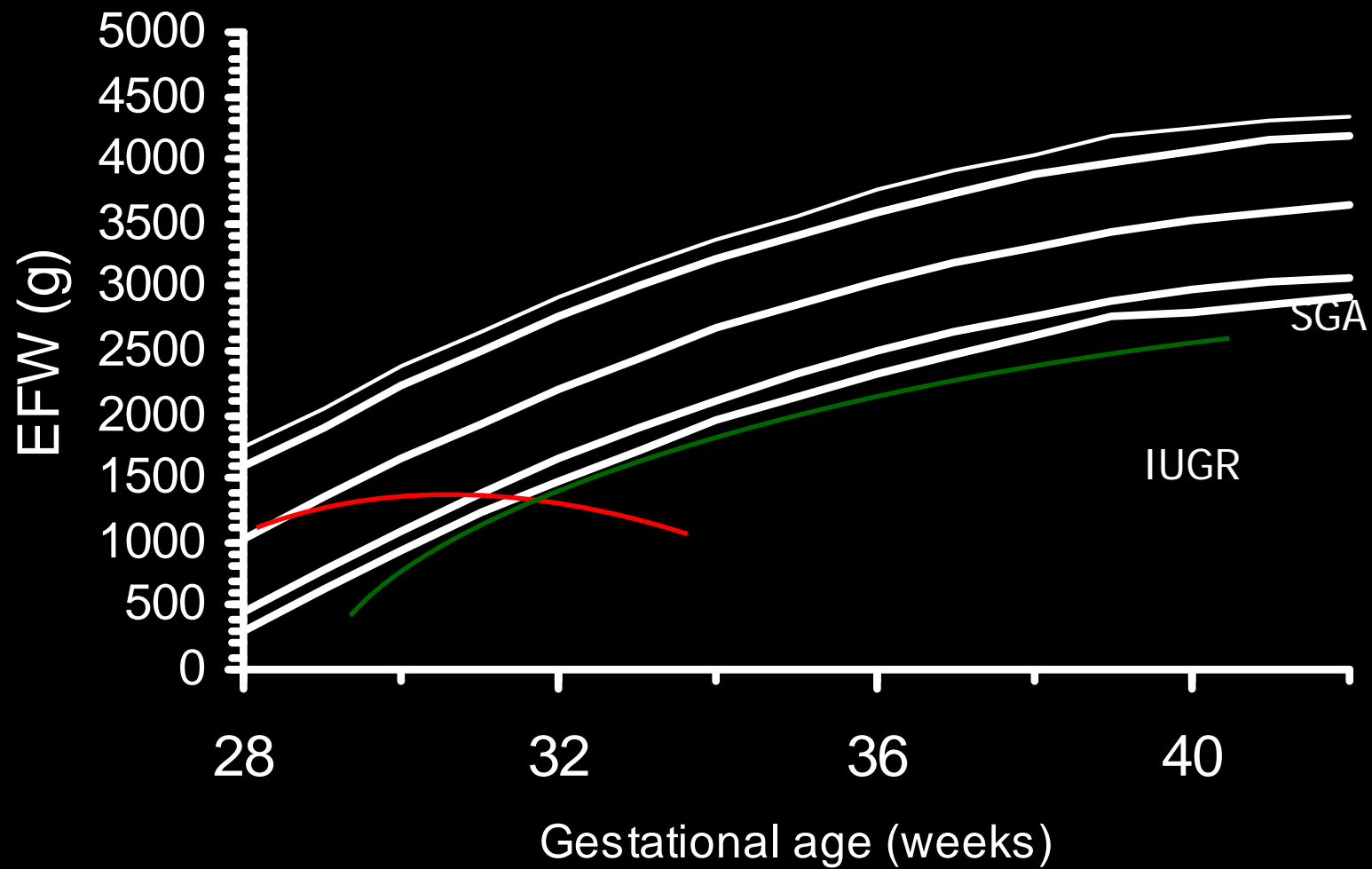
**Intrinsic Factor: Genetic**

**Extrinsic Factor: Environment**

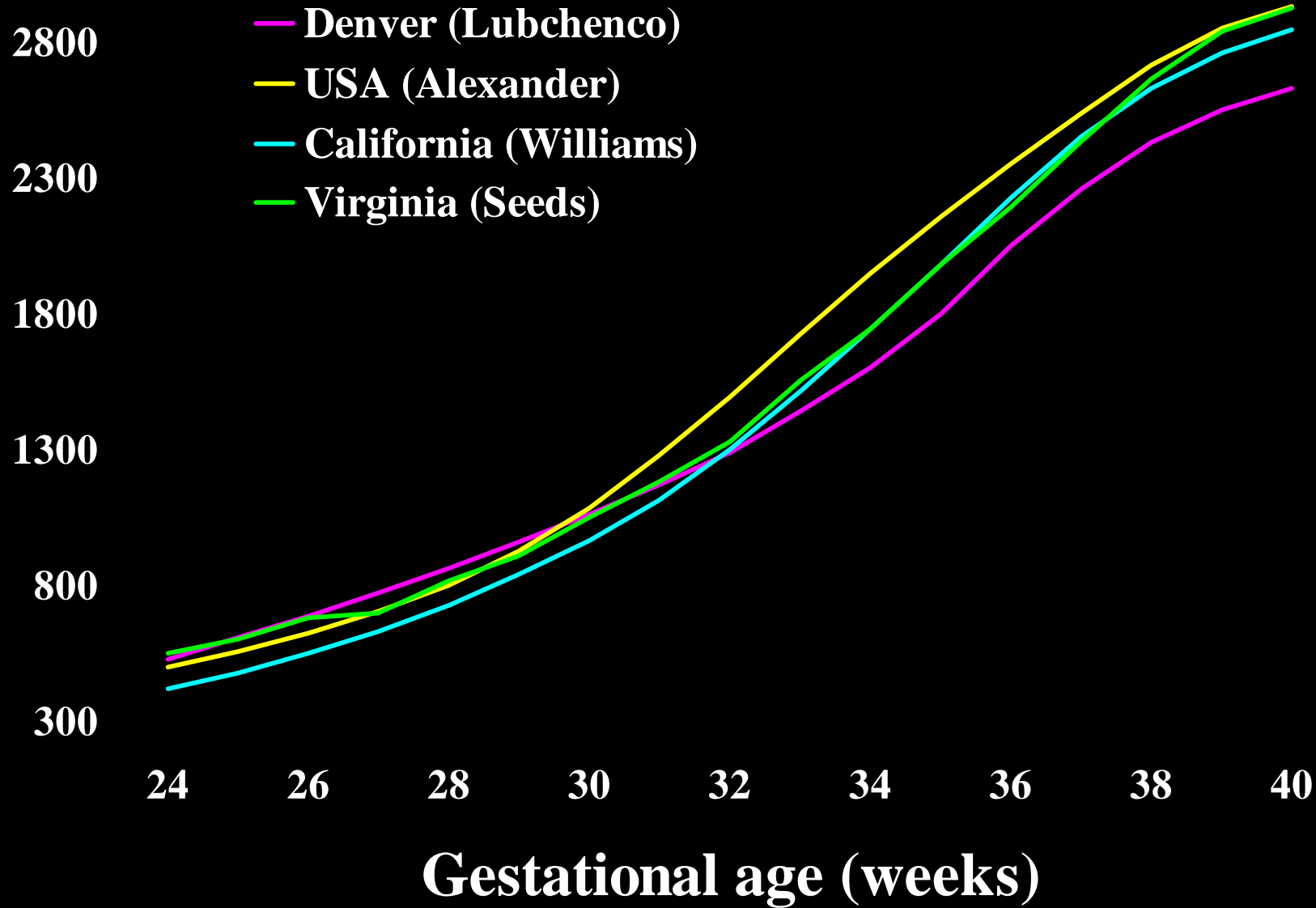
# IUGR

## *Definitions:*

- EFW < 10<sup>th</sup> percentile (USA)
- EFW < 5<sup>th</sup> percentile (USA)
- EFW > 2 SD below mean  
(2.5th percentile: Europe)
- EFW < 15<sup>th</sup> percentile (Others)



# FW 10th percentile



# QUESTION

**Why do we want to  
detect IUGR  
fetuses?**

# **ANSWER**

**To reduce associated  
morbidity and  
mortality  
(IUFD/stillbirths)**



# IUGR

**Second leading cause of perinatal morbidity & mortality**

**10-fold greater risk for fetal death than an AGA fetus**

**Fretts RC, et al. Obstet Gynecol 1992;953**

**EFW < 10<sup>th</sup> percentile**

**Normal**

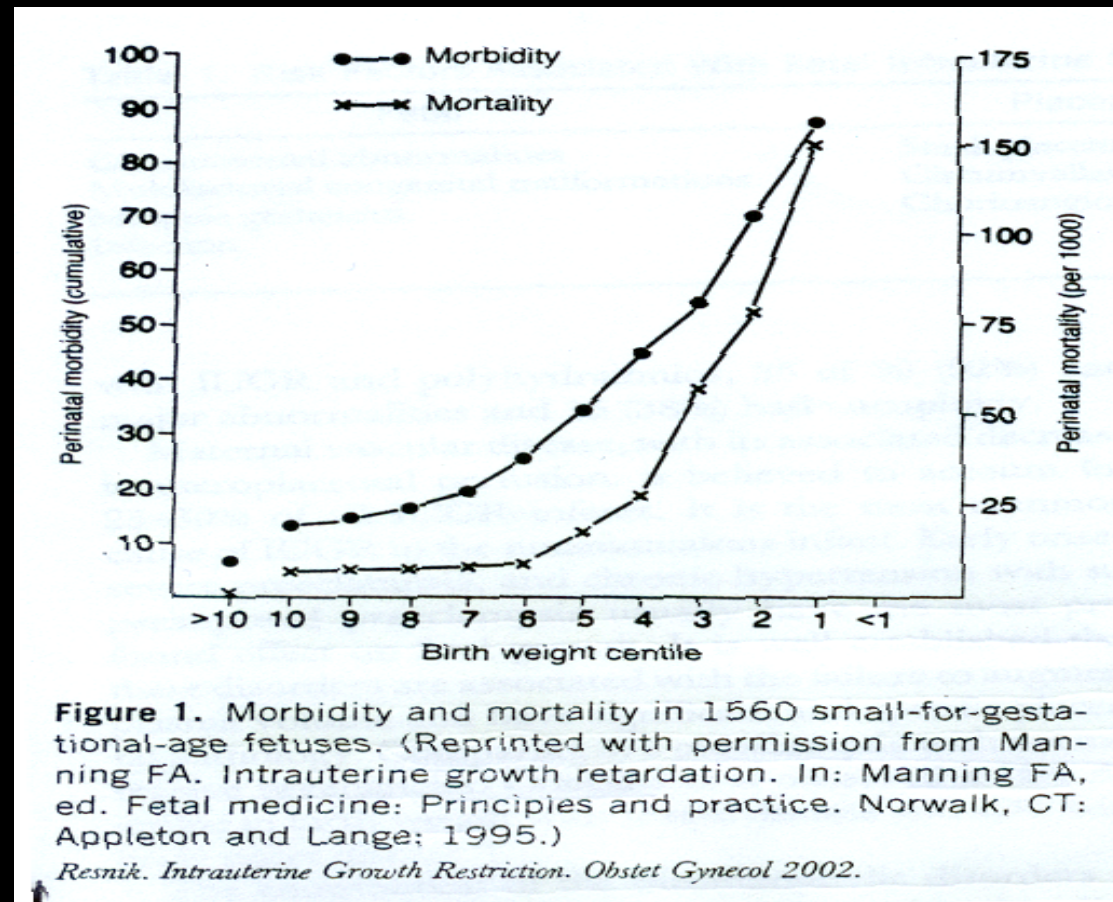
**80 % ?**

**Pathologic**

**20 % ?**

**IUGR**

# IUGR



- Second leading cause of perinatal morbidity & mortality
- 10-fold greater risk for fetal death than an AGA fetus

# IUGR - Morbidity

- Short-term problems**
- Hypoglycemia
  - Hypocalcemia
  - Hypothermia
  - Polycythemia
  - Necrotizing enterocolitis
  - Pulmonary hypertension

- Long-term sequelae**
- Ischemic Heart Disease
  - Stroke
  - Hypertension
  - NIDDM

## IUGR - Morbidity

- **Physical handicap - 10 %**
- **Neurodevelopmental delay - 5 %**

**(10 years follow-up)**

# IUGR - Diagnosis

- **History**
- **Physical Examination**
- **Ultrasound**
- **Doppler Ultrasonography**

# DOPPLER

**Doppler meta-analysis has shown the use of the umbilical artery in high risk pregnancies reduces the number of antenatal admissions (44%), inductions of labor (29%), cesarean sections for fetal distress (52%), and perinatal mortality (38%)**

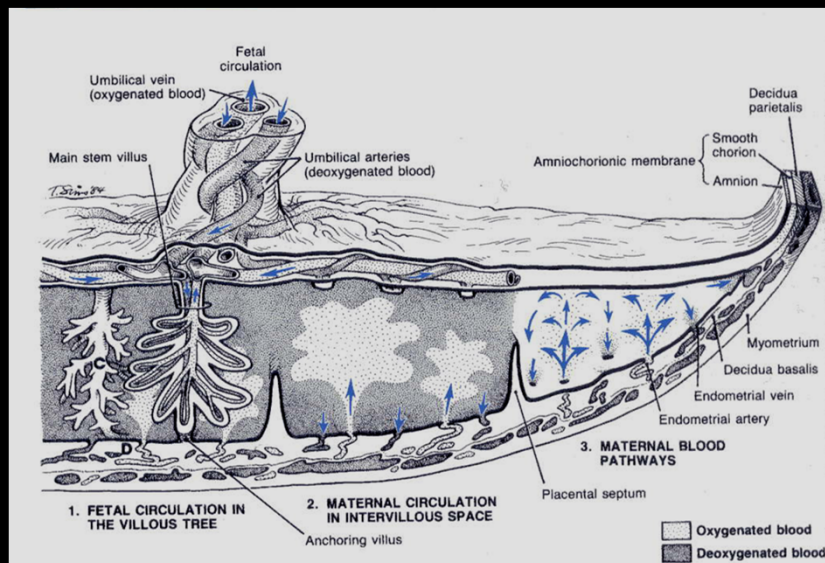
# Causes

Idiopathic

Maternal

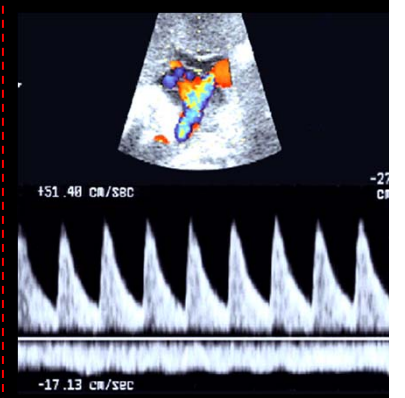
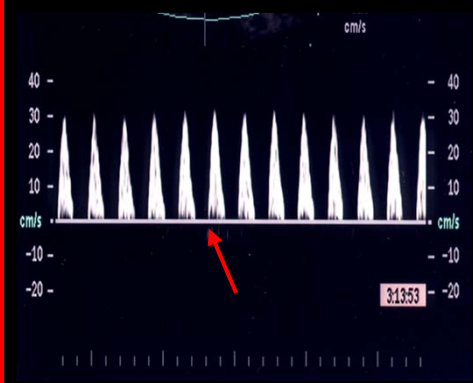
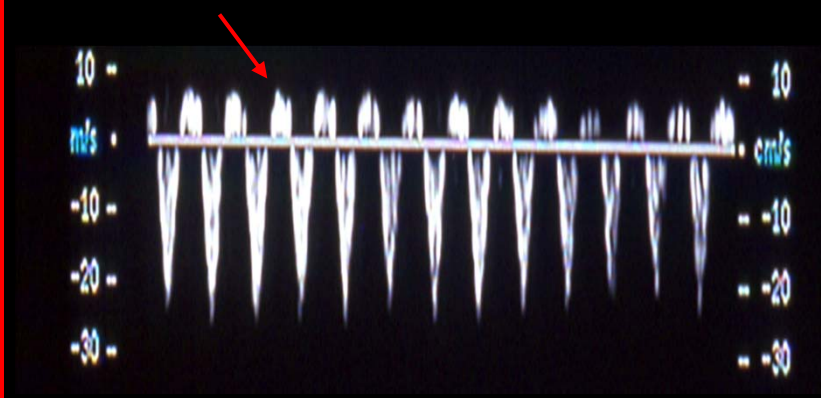
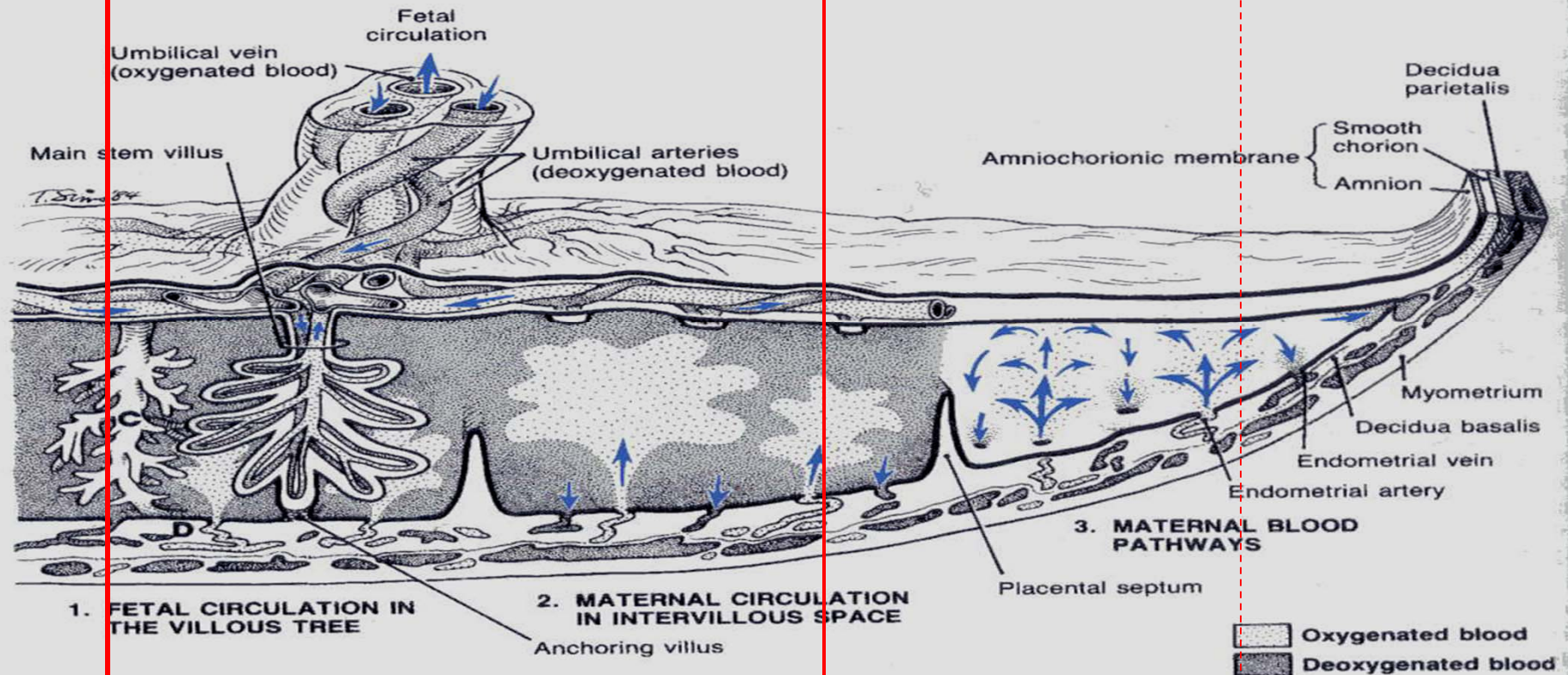
Fetal

Placental



Cosmi E, Obstet Gynecol 2005

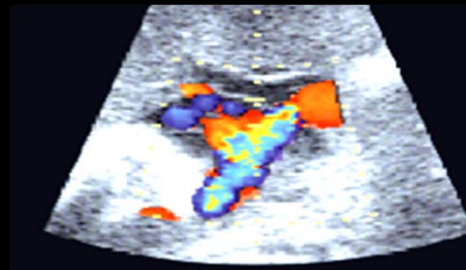
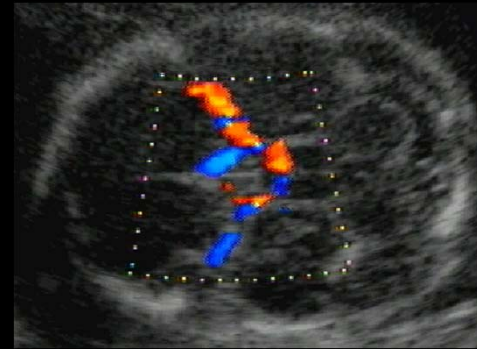
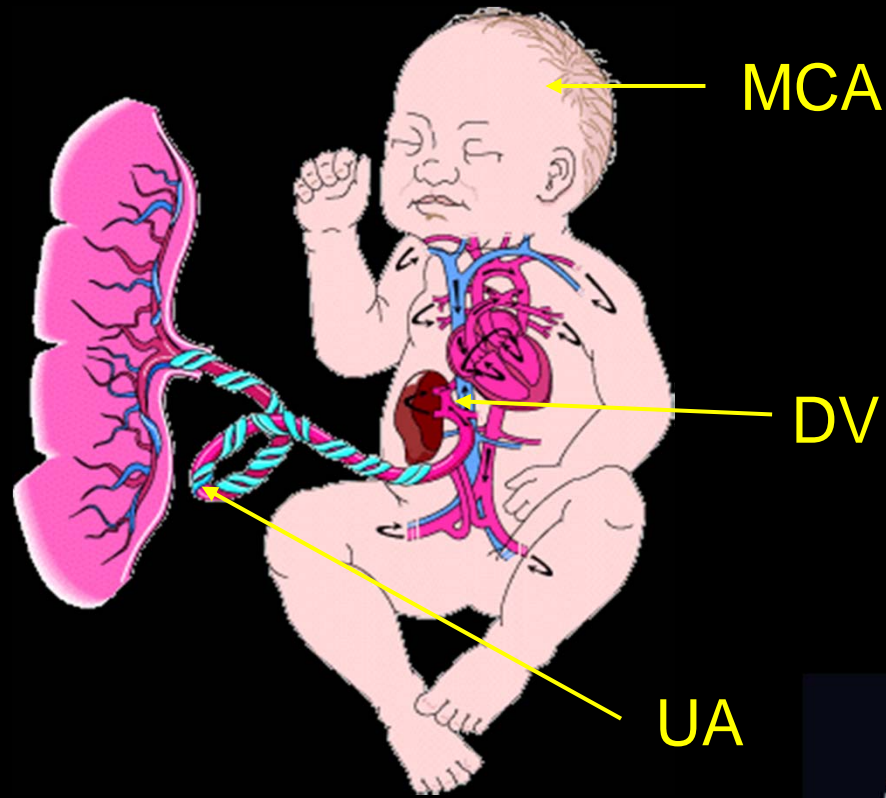




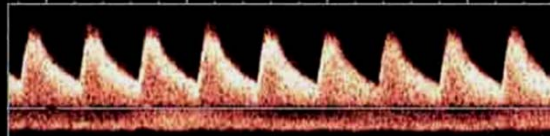
## Antenatal testing performed in all fetuses from preeclamptic women

- Doppler velocimetry twice weekly
- fetal growth every 2 weeks
- daily NST
- Biophysical profile twice weekly

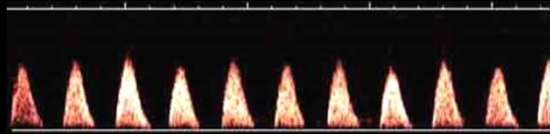
# Doppler studies in the fetus



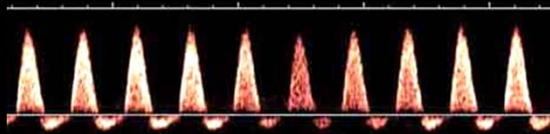
## Umbilical artery:



Normal flow

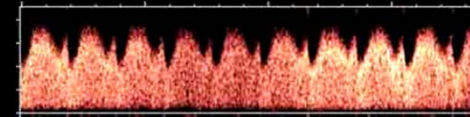


Absent end diastolic flow (AEDF)

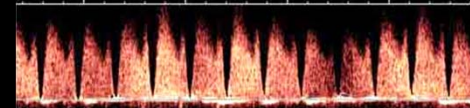


Reversed flow (RF)

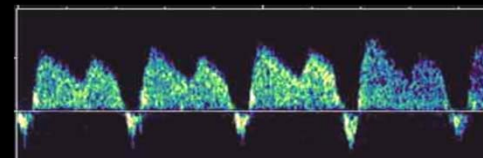
## Ductus venosus:



Normal flow

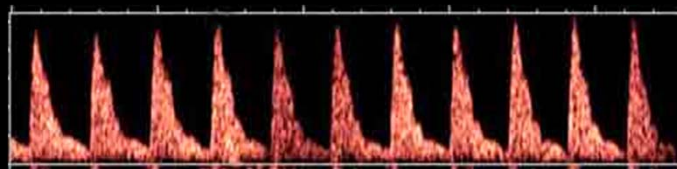


Absent end diastolic flow (AEDF)

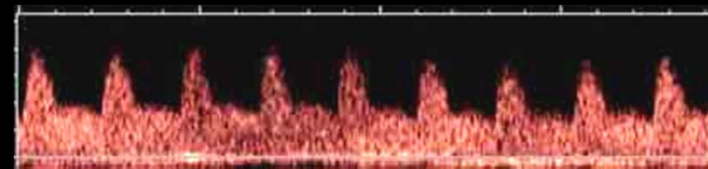


Reversed flow (RF)

## Middle cerebral artery:



Normal flow



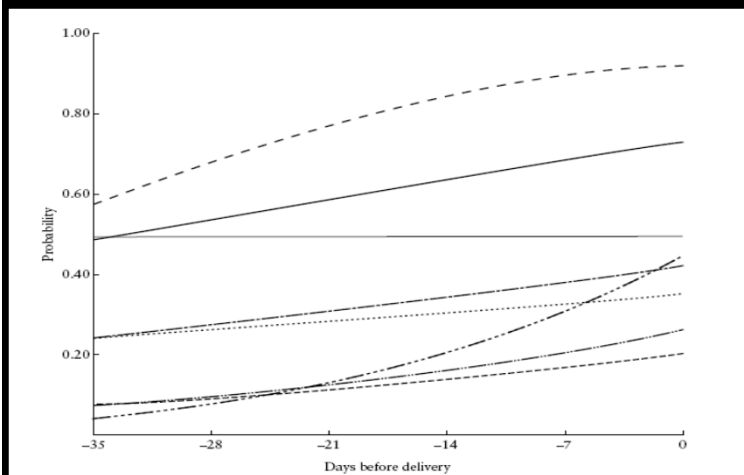
Decrease of PI, "brain sparing effect"

Balance preterm delivery and fetal compromise

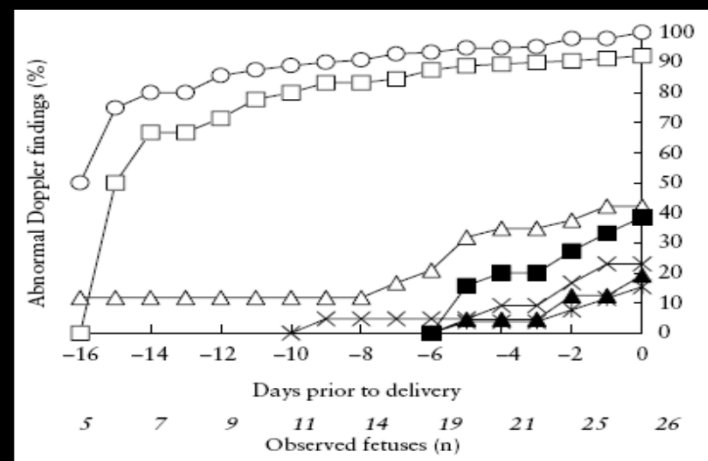
GRIT study Group;  
Truffle Trial

Need more Observational studies before RCT

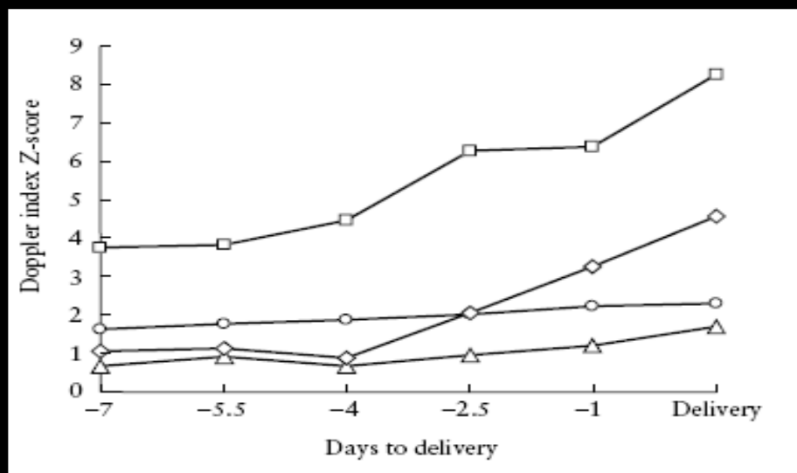
# Temporal Sequence of Doppler Abnormalities



Hecher et al, Ultrasound Obstet Gynecol, 2001

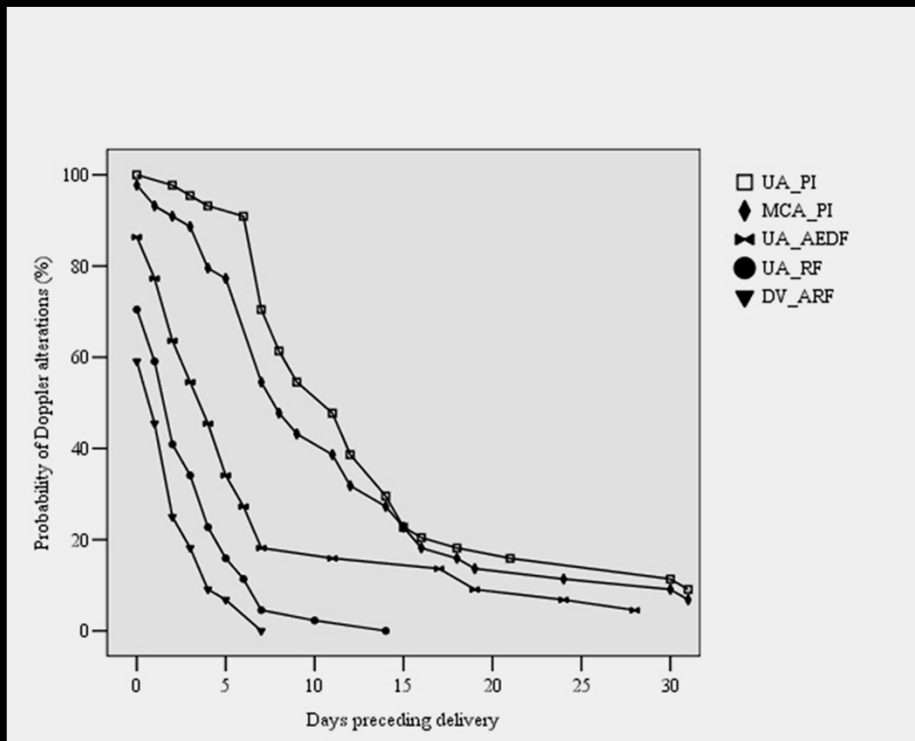


Ferrazzi et al, Ultrasound in Obstet Gynecol, 2002



Baschat et al, Ultrasound Obstet Gynecol, 2001

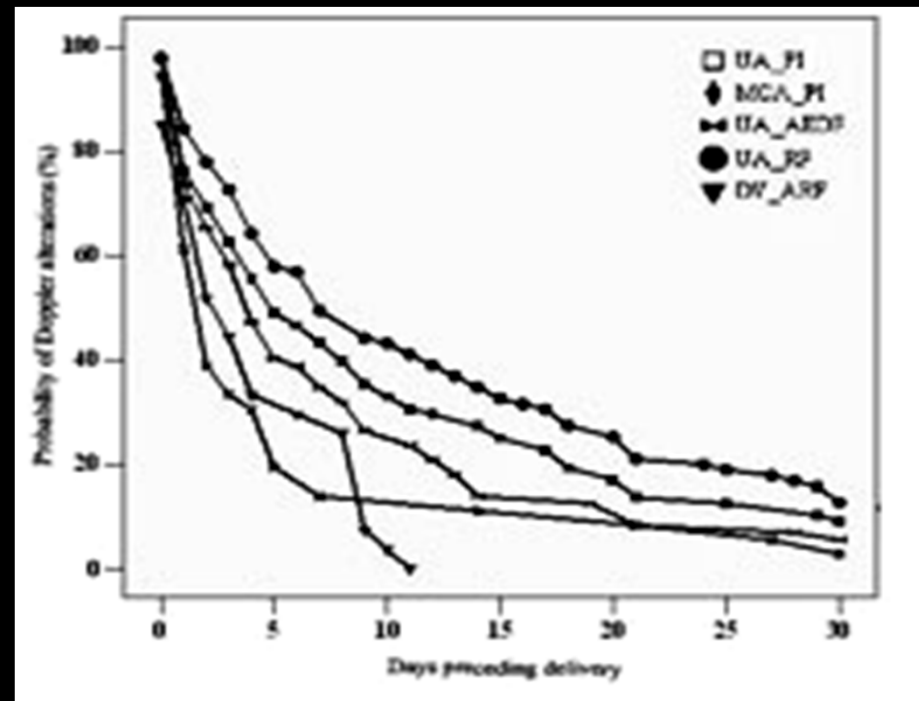
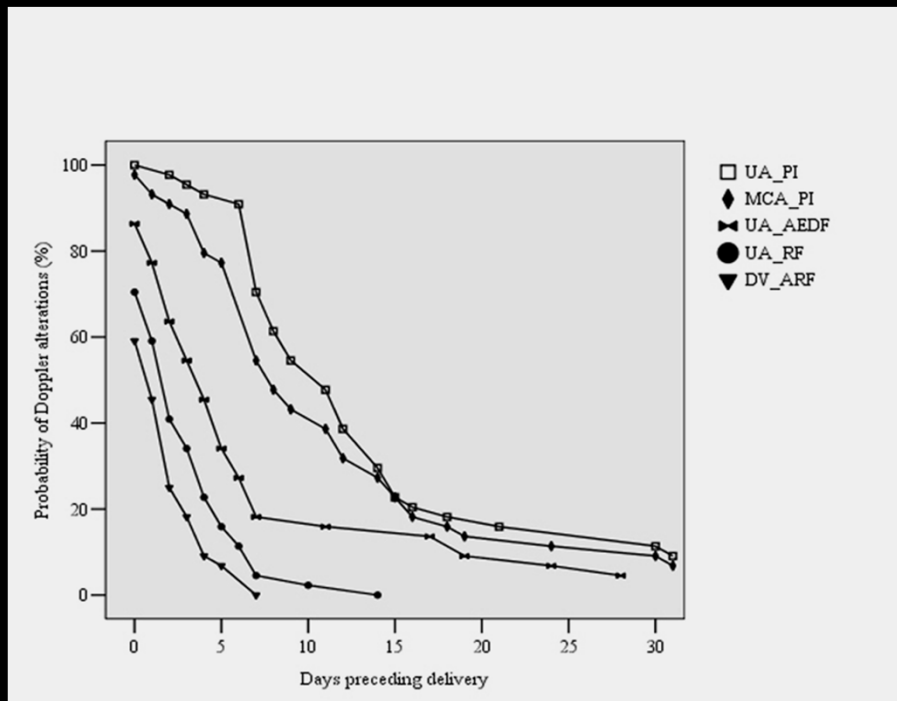
In fetuses with all Doppler alterations by increasing the probability for each parameter to be abnormal, the time from time 0 (CS) became shorter



DOPPLER ALTERATIONS ESTIMATED DELIVERY TIME

	MEAN	C.I. 95%
UMBILICAL ARTERY_IR	14	11 – 17
UMBILICAL ARTERY_EDF	7	4 – 10
UMBILICAL ARTERY_RF	3	2 – 3
MIDDLE CEREBRAL ARTERY	9	7 – 12
DUCTUS VENOSUS	3	2 – 4

Kaplan Meier approach testing with Breslow test:  $p < 0.0001$

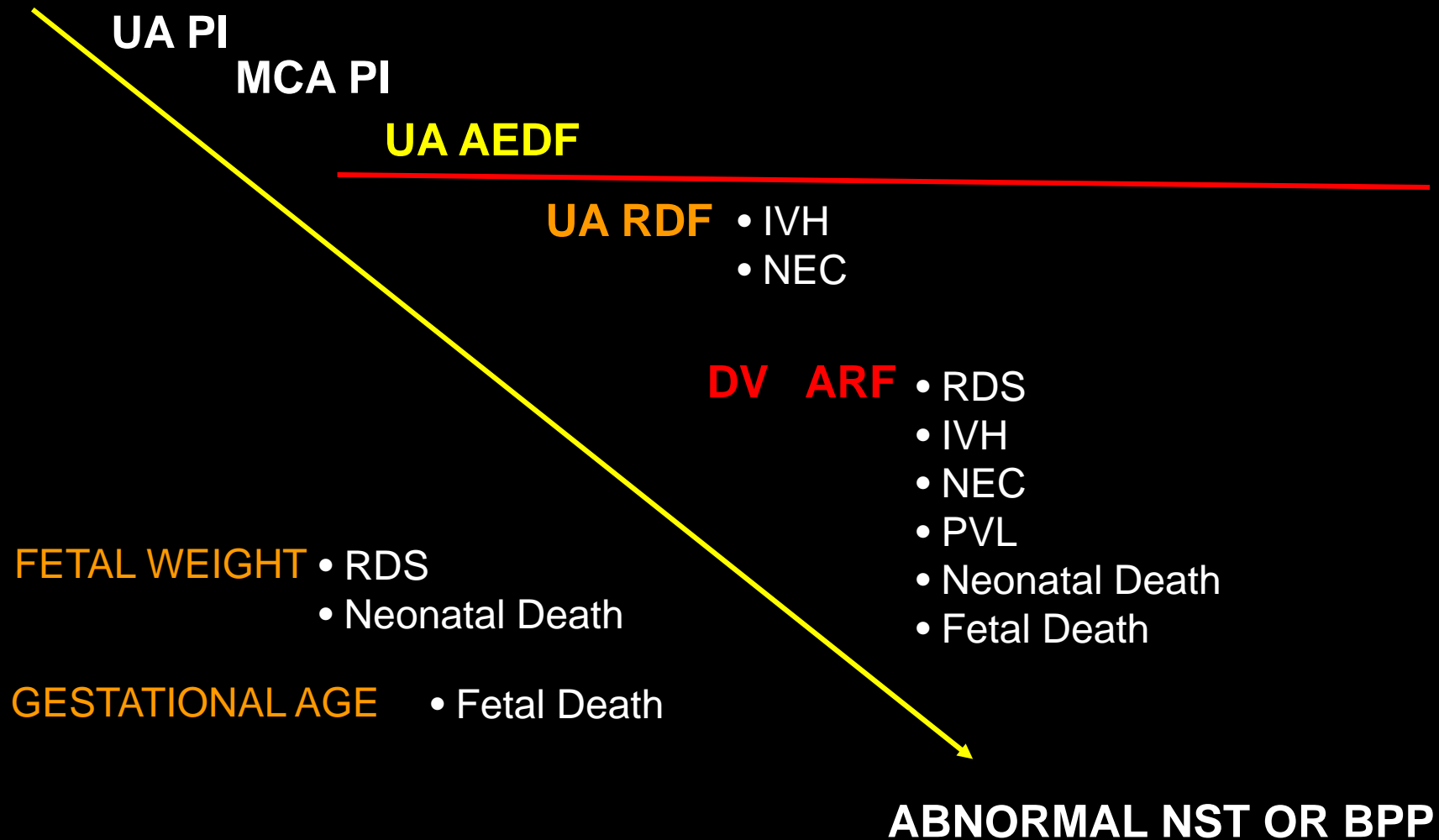


Cosmi et al, Obstet Gynecol 2005, Cosmi et al, Ultrasound Obstet Gynecol, 2008



# 241 Idiopathic IUGR Fetuses

Stepwise multiple logistic regression analysis



## Multivessel and Combined test

- MCA PSV is predictive for poor outcome
- Integrated Doppler and BPP are the best predictor for neonatal Outcome

In fetuses with umbilical artery reversed flow, BPS < 6 was a risk factor for neonatal morbidity ( $p < 0.008$ ) and mortality ( $p < 0.0001$ ) and BPS > 6 was a protective factor for neonatal morbidity ( $p < 0.002$ ), mortality ( $p < 0.002$ ) and fetal death ( $p < 0.0001$ ). In fetuses with absence or reverse a-wave in ductus venosus, BPS < 6 was statistically correlated with an increased morbidity ( $p < 0.004$ ) and mortality ( $p < 0.004$ ), while BPS > 6 was correlated with a decrease in morbidity ( $p < 0.001$ ), mortality ( $p < 0.0001$ ) and fetal death ( $p < 0.0001$ ).

**Mari G and Cosmi E, Ultrasound Obstet Gynecol, 2007;**

**Cosmi et al. Ultrasound Obstet Gynecol 2008**

# Intervention thresholds in early onset placental dysfunction

Observational multi-center study  
604 severe IUGR fetuses

A.A. Baschat , E. Cosmi, K. Bilardo, C. Berg MD, S. Rigano, U. Germer, D. Moyano, S. Turan, J. Hartung, A. Bhide MD, T. Müller, H. Galan, S. Bower, K. Nicolaides, B. Thilaganathan, E. Ferrazzi, K. Hecher, U. Gembruch, C. R. Harman, Obstet Gynecol 2007

- UA-AEDF
- Abnormal venous Doppler
- Low cord pH

**Neonatal morbidity and death**

- DV-ARF
- Low Apgar score
- GA delivery
- Birthweight

**Impact of intact survival rate and neonatal mortality**

