At the end of this presentation the participants will be able:

- To classify IUGR fetuses
- To understand the cardiovascular changes that occur in IUGR fetuses
- To understand the issues in the management of IUGR fetuses
IUGR
Pubmed: IUGR

15,000 papers
IUGR-Definition

• Memphis
• Nashville
• Sidney
IUGR

Fetus who fails to reach its growth potential
IUGR

Definitions:

- EFW < 10th percentile (USA)
- EFW < 5th percentile (USA)
- EFW < 3rd percentile (USA)
- EFW < 15th percentile (USA)
- EFW > 2 SD below mean (Europe)
- AC 10th → 2.5th percentile (Europe)
Definitions:

• Each fetus is its own control (Deter-Rossavik)

• Ponderal index (Pediatricians)

• Population growth curves (Gardosi)
EFW < 10\textsuperscript{th} percentile

Normal

80\% ?

Pathologic

20\% ?

IUGR
Placental Insufficiency

“Umbrella that covers our ignorance in terms of etiology and pathogenesis of the utero-placental chronic dysfunction”

Placental Insufficiency

It is not the cause of IUGR but is rather the consequence of a disease process that often we do not understand.
Doppler in AGA and IUGR Fetuses
Doppler Indices

\[ \text{PL} = \frac{S - D}{M} \]
\[ \text{RI} = \frac{S - D}{S} \]
\[ \frac{S}{D} = \frac{S}{D} \]

\[ fd = \frac{2(fc \cdot \cos A \cdot V)}{c} \]
Fitzgerald was the first to obtain a Doppler signal in pregnancy in 1977.
Fetal middle cerebral artery velocimetry

MIDDLE CEREBRAL ARTERY
Cross-Sectional Study

Umbilical Artery: High placental vascular resistance
Umbilical Artery Doppler and Placental Vascular Histology


Placental arteries / High Power Field

Normal

Abnormal

Umbilical Doppler Waveform

7.5

1.5
Umbilical Artery Doppler and Outcome

- Reduce perinatal death and unnecessary induction of labor in the preterm growth restricted fetus

- A meta-analysis use of Doppler ultrasonography reduced the odds of perinatal death by 38 percent (95% CI 15-55)

MCA Waveforms at 24 Weeks

A = Normal

B = “Brain sparing effect”
Utero-Placental Vessels

Normal pregnancy

Preeclamptic and/or IUGR pregnancy

Uterine Artery

SGA fetuses with normal umbilical artery

- Uterine arteries
- Middle cerebral arteries

Venous System
Umbilical Vein

Quantitative assessment: Velocity

Qualitative assessment: Pulsation
Is Ductus venosus reversed flow an indication for delivery?
DV Transitional Phase

DV RF
1 hour later

DV RF 21 days before IUFD

DV RF 9 days before delivery
Ductus venosus at < 28 weeks and EFW < 1000 g

Is the biophysical profile normal or abnormal?

a. What is the SIA index and
b. What does it indicate?

- Peak systolic velocity
- Isovolumetric relaxation + a-wave

b. Myocardial function

Picconi et al J Ultrasound Med 2008;27:1283
Time Interval Between Occurrence of Pathologic Findings and Delivery

Idiopathic (Blue)
Preeclampsia (Yellow)

Percent Parameters Abnormal in the Two Groups

Staging and Classification of IUGR Fetuses
IUGR Staging

UA, MCA, DV

I

II

III

Modified by J Samson (2011)
IUGR Staging

Amniotic fluid index

≤ 5 → A

> 5 → B
IUGR Classification

- EFW < 10\textsuperscript{th} percentile
- Abnormal UA PI
- Amniotic fluid index >5 cm
- No maternal-fetal pathology
- 25 weeks

IUGR Stage IB idiopathic 25 weeks
IUGR Staging

IUGR Staging

When should IUGR fetuses be delivered?
IUGR Delivery?

- GRIT
- DIGITAT
- TRUFFLE
IUGR and Gestational Age at Delivery

Between 25 and 29 weeks ("vital weeks"), for each week the IUGR fetus remains in utero, the mortality decreases by 48%.

IUGR and Timing of delivery
Doppler/NST/BPP

Stage 0 IUGR
Stage I IUGR
Stage II IUGR
Stage III IUGR
Infant Mortality Rates
(per 1000 births)

Source: TN Dept. of Health, Office of Policy, Planning and Assessment, Division of Health Statistics