



## **Analisi della Capacità Accelerativa e Decelerativa Cardiaca di feti con Restrizione di Crescita Intrauterina basata su ECG trans-addominale**

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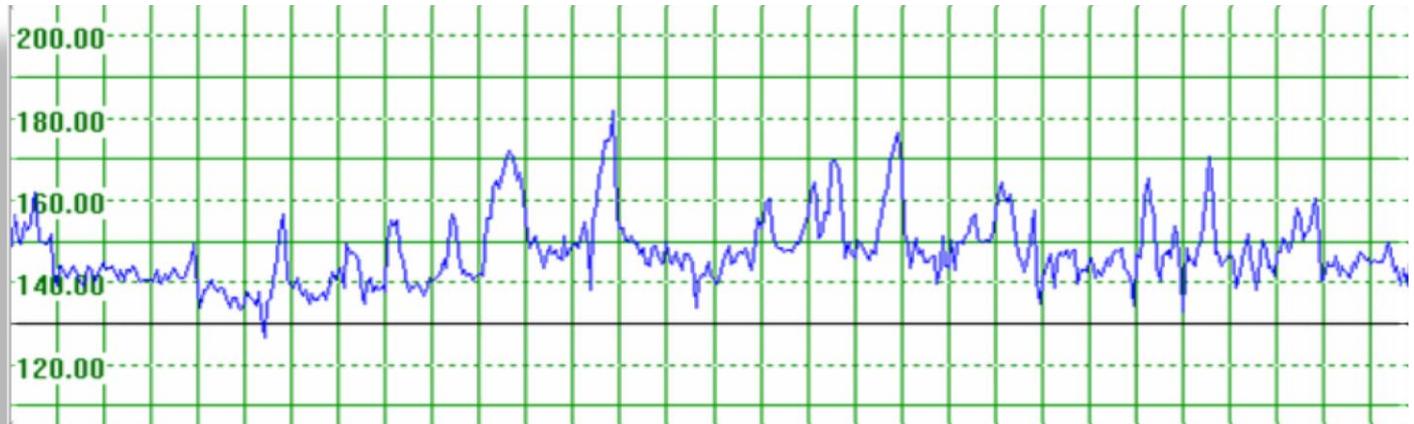
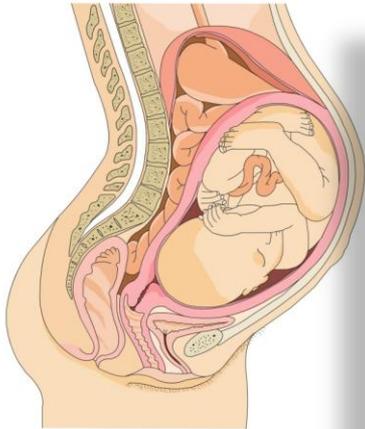
**UNIVERSITÀ DEGLI STUDI  
DI MILANO**



*Dept Woman Mother and Neonate –  
ICP –BUZZI CHILTERN'S HOSPITAL,  
University of Milan, School of Medicine,*



## BACKGROUND



STV

## PHASE RECTIFIED SIGNAL AVERAGING - PRSA

- ✓ CAPACTA' ACCELERATIVA (AC) E DECELERATIVA (DC)

marker di regolazione autonoma della FC

# Obiettivi

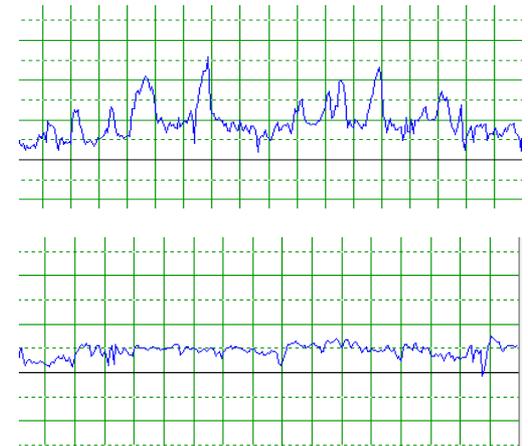
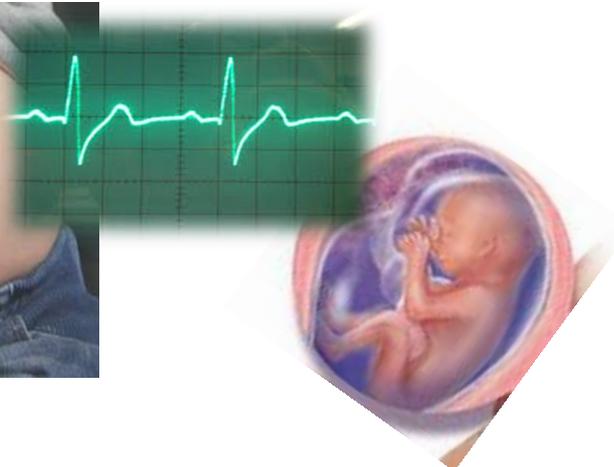


ANALISI PRSA dell'**elettrocardiogramma fetale**

acquisito per via trans-addominale

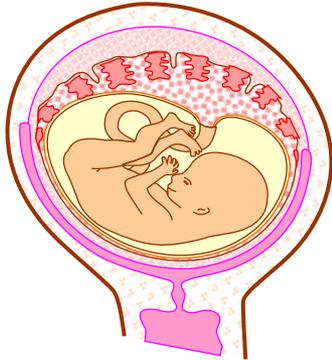
calcolo di **AC** e **DC** in feti con restrizione di crescita intrauterina e controlli sani

- 1) *diverse epoche gestazionali;*
- 2) *stati di attività e quiete fetale.*



# METHODS

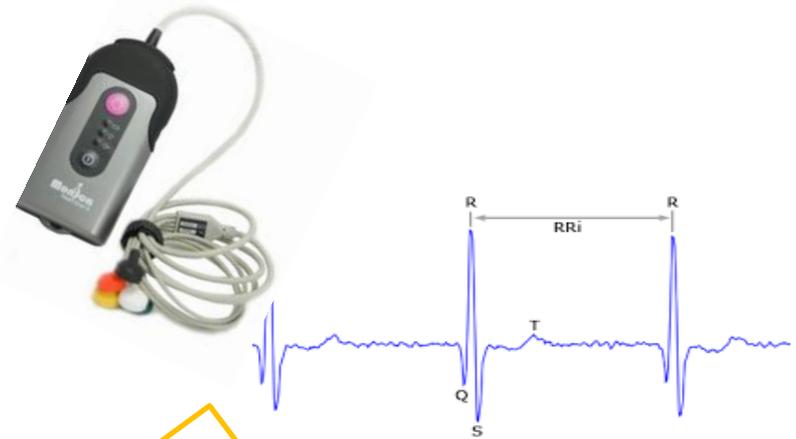
**AGA**



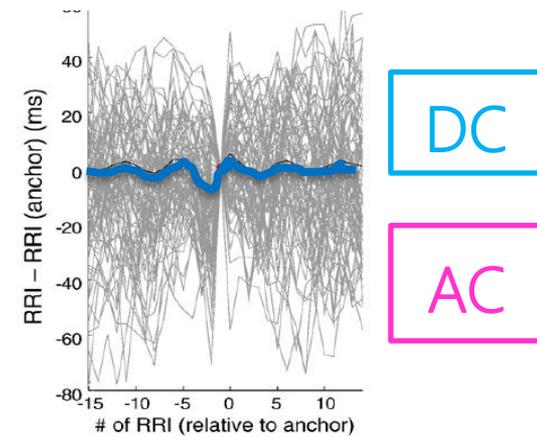
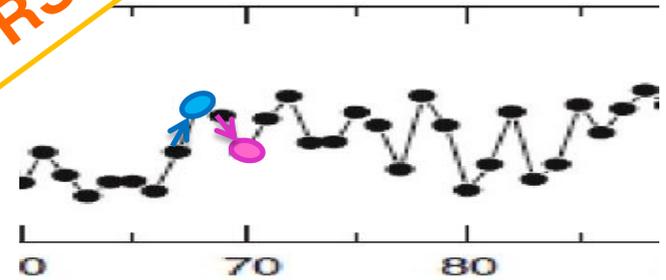
**IUGR**



1. **AC e DC** casi vs controlli a diverse epoche gestazionali
2. **AC e DC** su segmenti di **10 min** ad **ALTA e BASSA** variabilità (AV e BV)
  - Confronto *INTRA*-individuale tra AV e BV
  - Confronto *INTER*-individuale di AV e BV



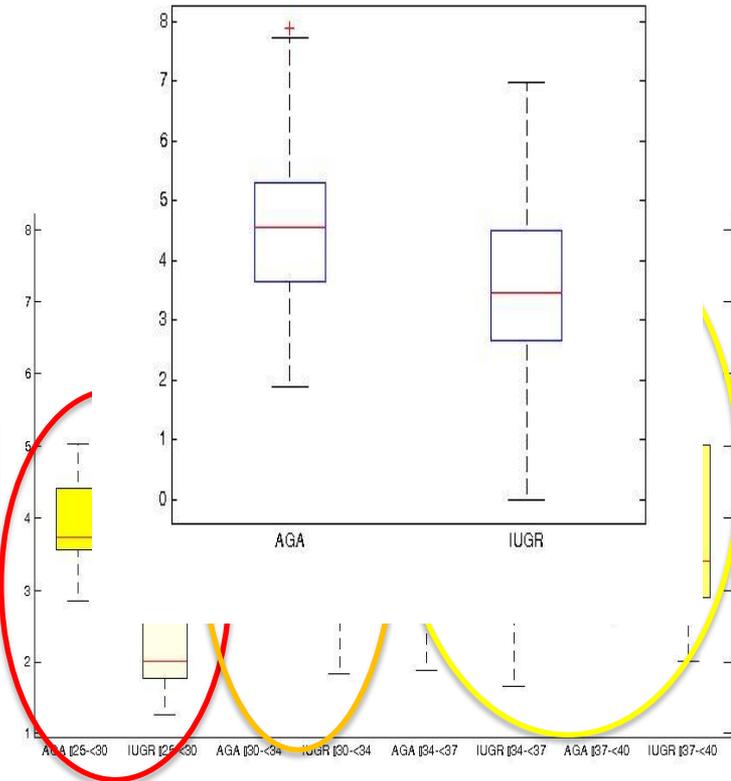
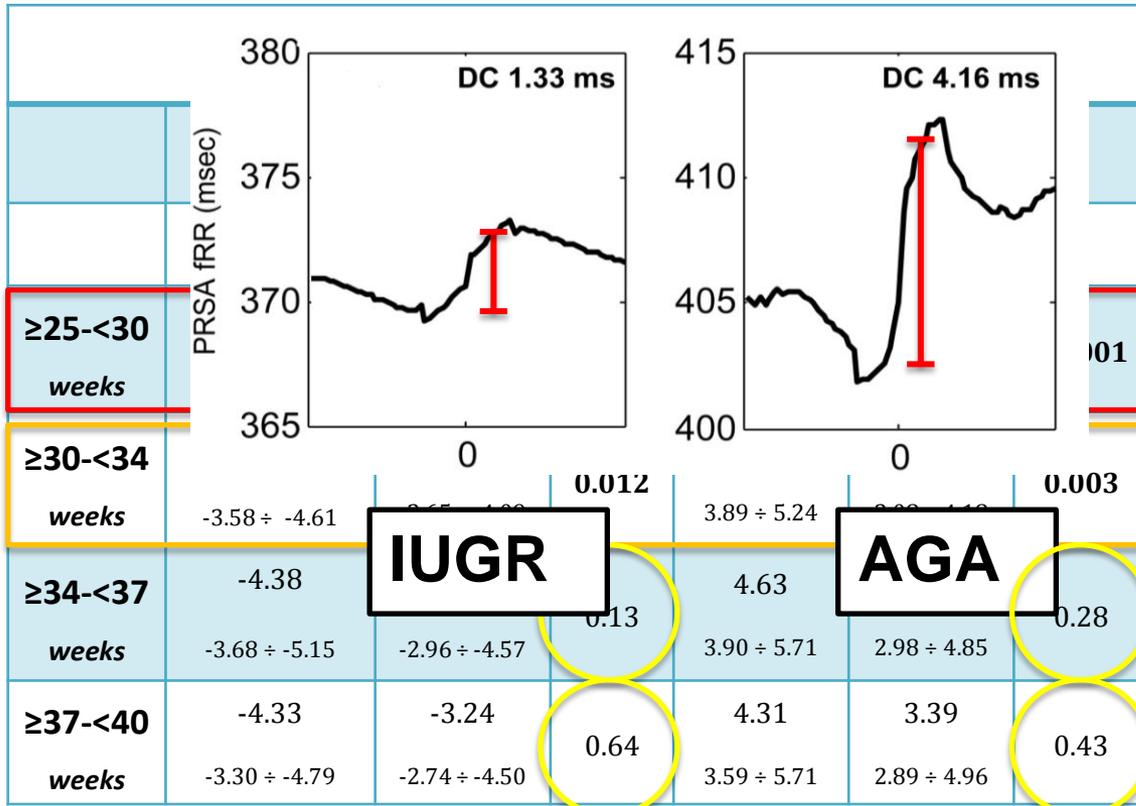
**PRSA**



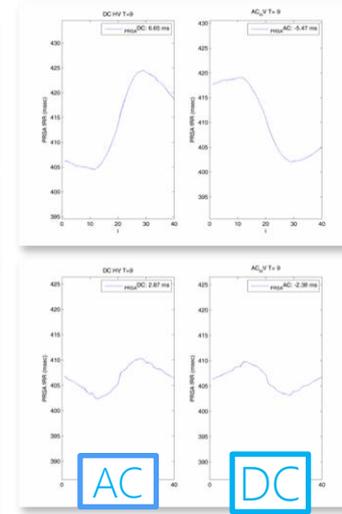
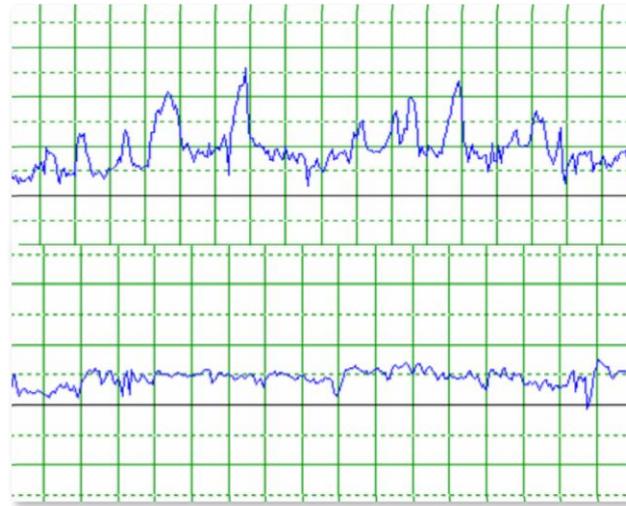
# RESULTS

1) AC e DC casi vs controlli a diverse epoche gestazionali

$p < 0.0001$



2) AC e DC  
su segmenti di  
ALTA e BASSA  
variabilità (AV e BV)



p < 0.0001

PRSA analysis on **HIGH VARIABILITY** segments

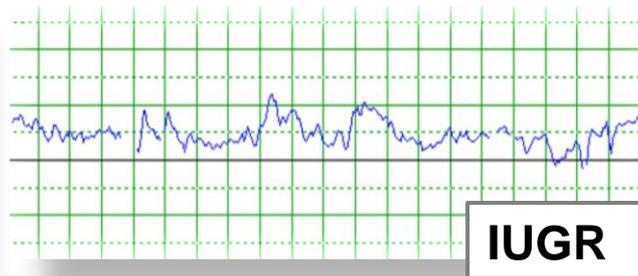
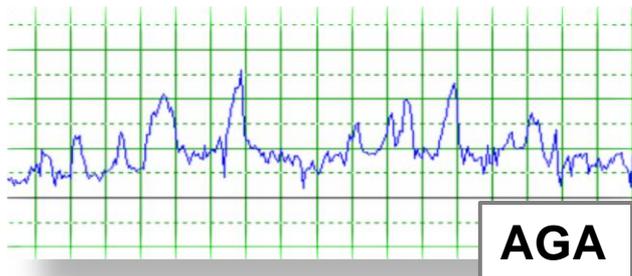
|                         | AC (msec)              |                        |              | DC (msec)           |                     |                  |
|-------------------------|------------------------|------------------------|--------------|---------------------|---------------------|------------------|
|                         | AGA                    | IUGR                   | p            | AGA                 | IUGR                | p                |
| <b>≥25-&lt;30 weeks</b> | -4.18<br>-4.02 ÷ -4.79 | -3.15<br>-2.78 ÷ -3.57 | <b>0.04</b>  | 4.49<br>4.27 ÷ 5.32 | 2.98<br>2.70 ÷ 3.39 | <b>0.002</b>     |
| <b>≥30-&lt;34 weeks</b> | -4.29<br>-3.81 ÷ -4.92 | -2.92<br>-2.58 ÷ -4.02 | <b>0.004</b> | 4.90<br>4.47 ÷ 5.57 | 3.32<br>2.80 ÷ 4.20 | <b>&lt;0.001</b> |
| <b>≥34-&lt;37 weeks</b> | -4.55<br>-3.79 ÷ -5.08 | -4.24<br>-3.25 ÷ -4.76 | 0.94         | 4.82<br>4.15 ÷ 5.69 | 4.32<br>3.45 ÷ 5.22 | 0.56             |
| <b>≥37-&lt;40 weeks</b> | -4.61<br>-3.49 ÷ -5.74 | -3.71<br>-3.25 ÷ -4.67 | 0.21         | 4.49<br>3.78 ÷ 6.23 | 4.26<br>3.42 ÷ 4.99 | 0.31             |

1) FETI IUGR hanno **AC-DC** ↓ rispetto a FETI AGA

<34°  
*early*

2) **AC-DC** cambiano a seconda delle fasi di quiete o di attività fetale

3) Anche nei periodi ad **AV** i feti IUGR hanno **AC-DC** ↓



- 1) Due meccanismi fisiopatologici distinti del deficit autonomico
- 2) **AC&DC** riflettono lo stato neurologico fetale
- 3) Nuovo metodo di monitoraggio fetale antepartum: analisi di **AC** e **DC** del battito cardiaco fetale estratto da **fECG**

➤ IPOSSIA CRONICA

➤ PREMATURITA'



- ✓ *Non-invasive*
- ✓ *Bed-side*
- ✓ *Computerized*
- ✓ *Reliable*

- ✓ *Performance della CAPACITA' ACCELERATIVA E DECELERATIVA*  
*come test diagnostico*
- ✓ *Correlazione con PARAMETRI BIOFISICI*
- ✓ *Correlazione OUTCOME POST-NATALI*

# GRAZIE PER L'ATTENZIONE



in collaborazione con:



Società Italiana di Medicina Perinatale

Presidentessa: Prof. Irene Cetin

27-29 novembre

**2014**  
**Milano**

ORGANIZING SECRETARIAT

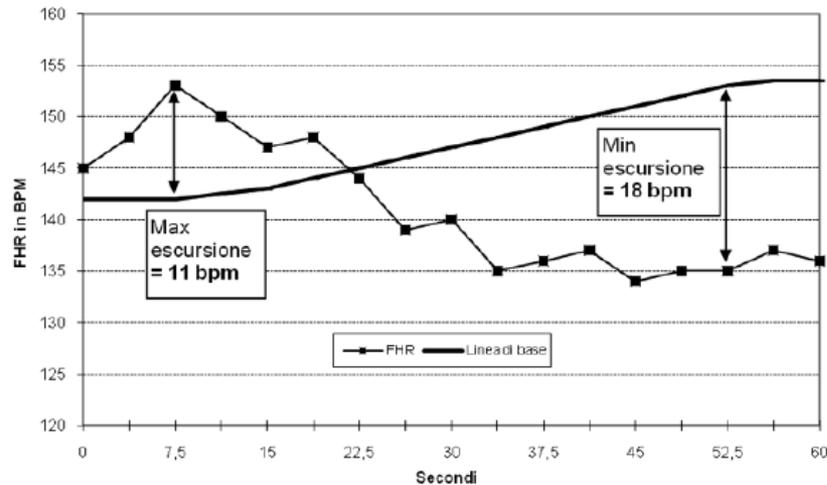


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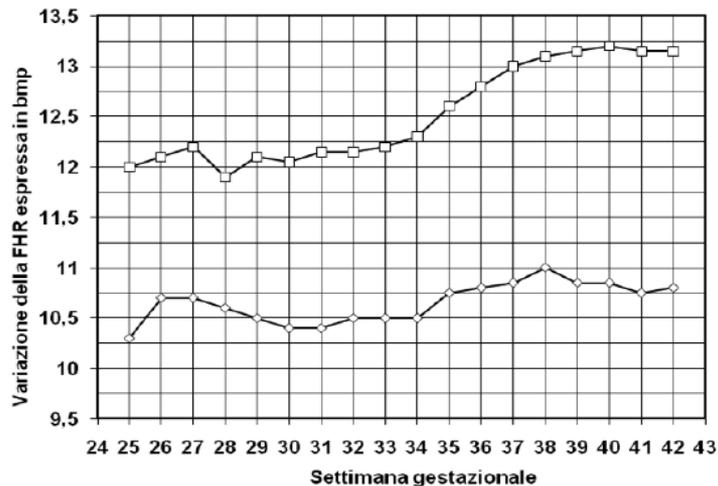


# i criteri Dawes-Redman

Calcolo della variazione "picco di massima frequenza - picco di minima frequenza" in un segmento della durata di un minuto di tracciato corretta per la linea di base.



◇ 1° centile □ 5° centile

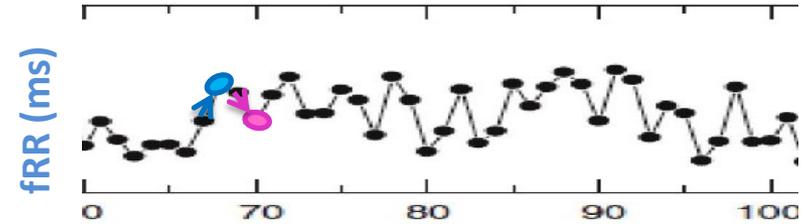
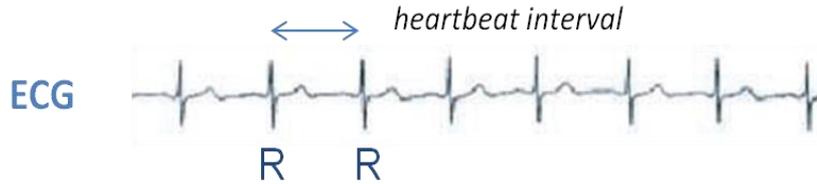


Il tracciato viene diviso in intervalli di un minuto;  
per ogni segmento di un minuto vengono determinati gli *intervalli* tra il **picco di minima frequenza** e quello di **massima frequenza**.

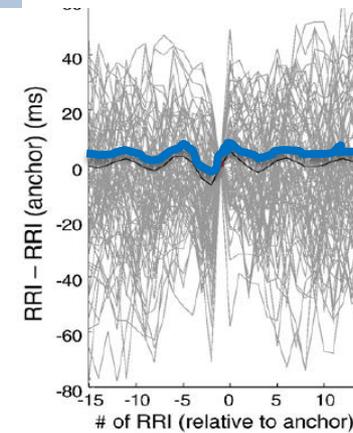
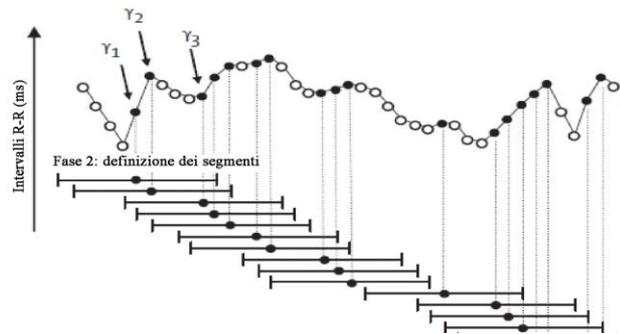
Un segmento è considerato a bassa o alta variabilità se il valore della **variabilità "peak to peak"** è  $< (BV)$  o  $> (AV)$  al **1° centile** per l'età gestazionale e se si mantiene  $</>$  a questo limite per almeno **5-6 minuti** consecutivi.

# Analysis of fetal heart rate: PRSA

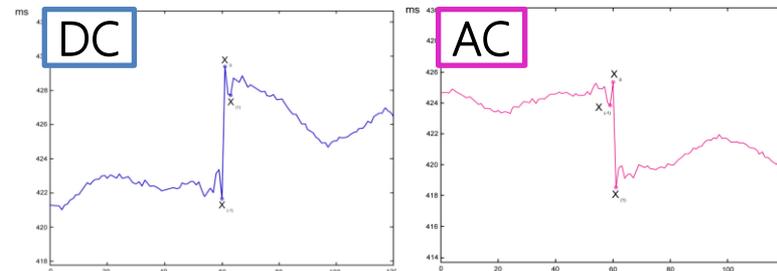
## 1. DEFINIZIONE DEI PUNTI DI ANCORAGGIO



## 2. RETIFICAZIONE DI FASE e SIGNAL AVERAGING



## 3. CALCOLO DI AC-DC

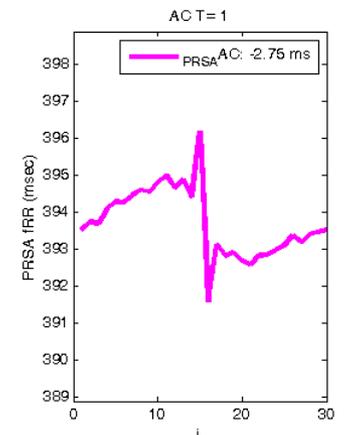
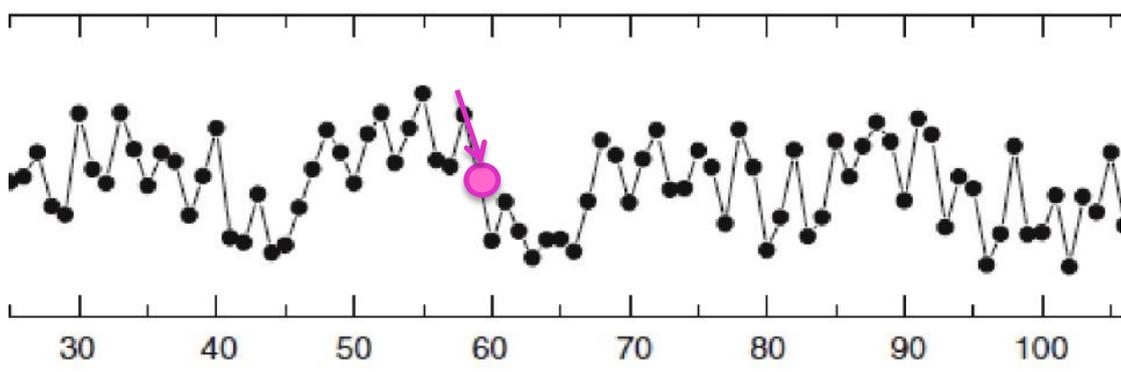




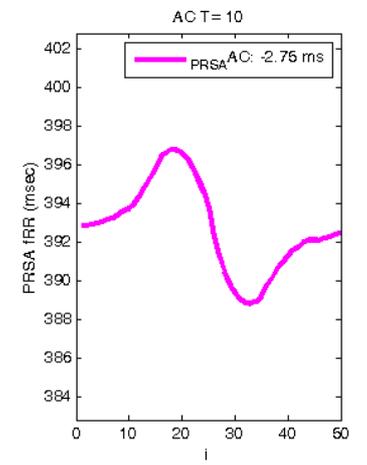
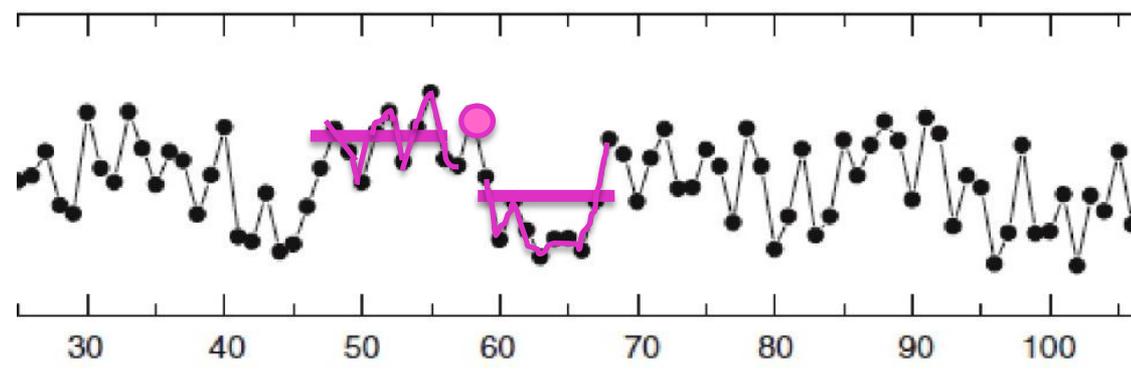
# BACKGROUND

# T value

$T_1 = 1$  heart beat interval



$T_{10} =$  average of 10 heart beat intervals



# STUDY POPULATION

## 71 IUGR

- 1)  $\geq 25 \div < 30$  weeks  $\rightarrow$  **7** cases;
- 2)  $\geq 30 \div < 34$  weeks  $\rightarrow$  **16** cases;
- 3)  $\geq 34 - < 37$  weeks  $\rightarrow$  **29** cases;

65/71 recordings with 10 min of HV periods, and 25/71 recordings with LV segments.

## 72 AGA

- 1)  $\geq 25 \div < 30$  weeks  $\rightarrow$  **8** cases;
- 2)  $\geq 30 \div < 34$  weeks  $\rightarrow$  **20** cases;
- 3)  $\geq 34 - < 37$  weeks  $\rightarrow$  **19** cases;
- 4)  $\geq 37 - < 40$  weeks  $\rightarrow$  **25** cases.

70/72 recordings with HV periods, 23/72 with LV segments **of whom only 3 cases were <37 weeks of gestation.**