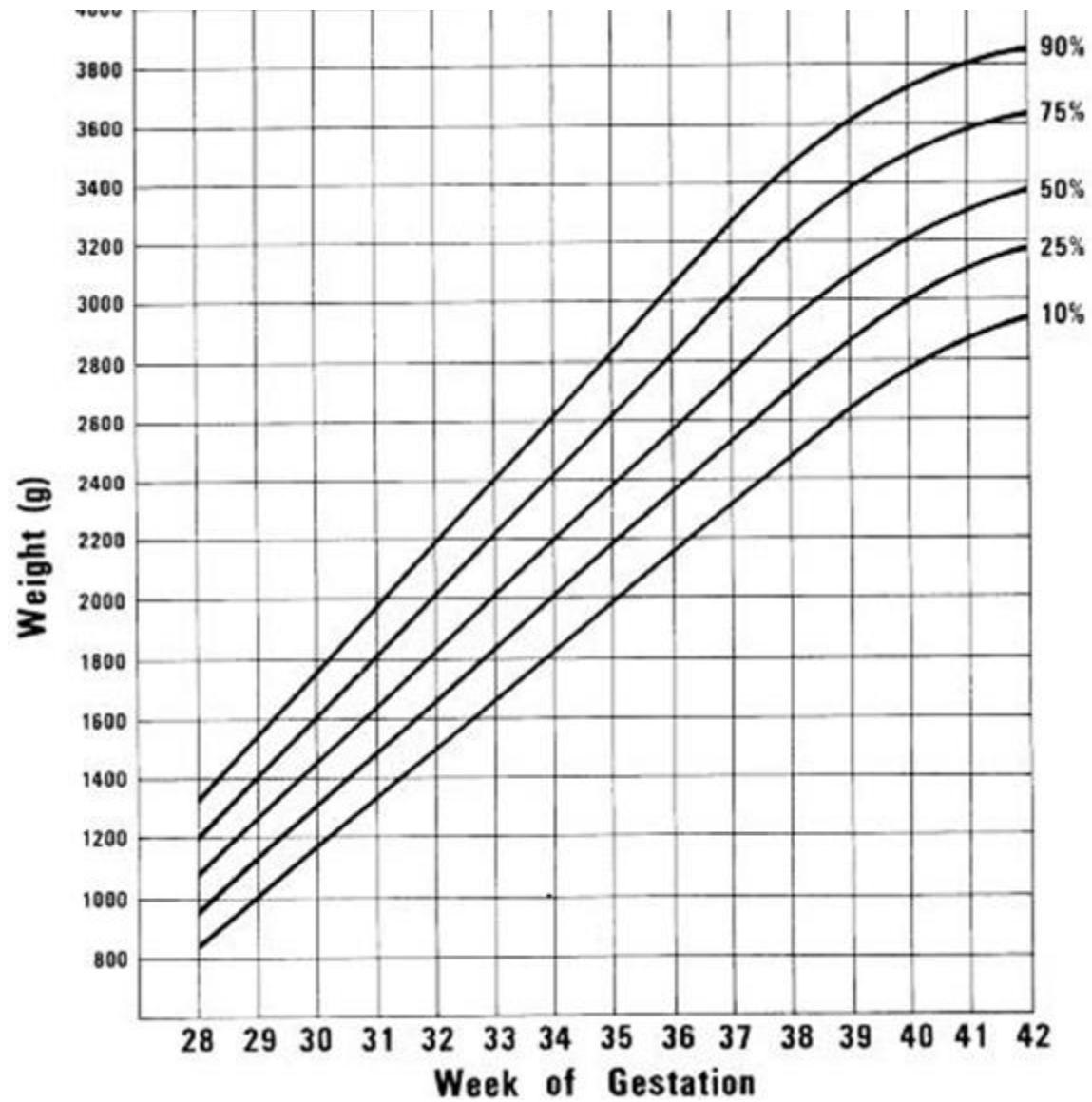


# Fetal compromise and surveillance

Dr Fida Thekrallah

# Fetal compromise

- Growth of the fetus is poor
- Increase rates of perinatal morbidity and mortality
- 40 % unexplained fetal death in utero
- 30% of SIDS
- perinatal hypoxia and acidaemia, operative delivery and neonatal encephalopathy
- Hypoglycaemia, hypothermia, hypocalcaemia and polycythaemia
- Reduced risk of RDS
- early cognitive and neurological impairment and cerebral palsy
- Barker hypothesis



# Small for gestational age fetus

- SGA fetus when the growth is around the 10<sup>th</sup> centile
- Majority of these fetuses are healthy but small
- Incidence is usually depend on which cut off is used

# Fetal growth restriction

- Failed to reach their growth potential
- Growth velocity slows down or stops completely because of inadequate oxygen and nutritional supply
- At risk of the sequelae of poor growth

# SGA and FGR

- **Normal SGA:** no structural anomalies, with normal liquor, normal umbilical artery Doppler waveforms
- **Abnormal SGA:** with genetic or structural abnormalities
- **FGR:** those with impaired placental function identified by abnormal UADWS and reduced growth velocity

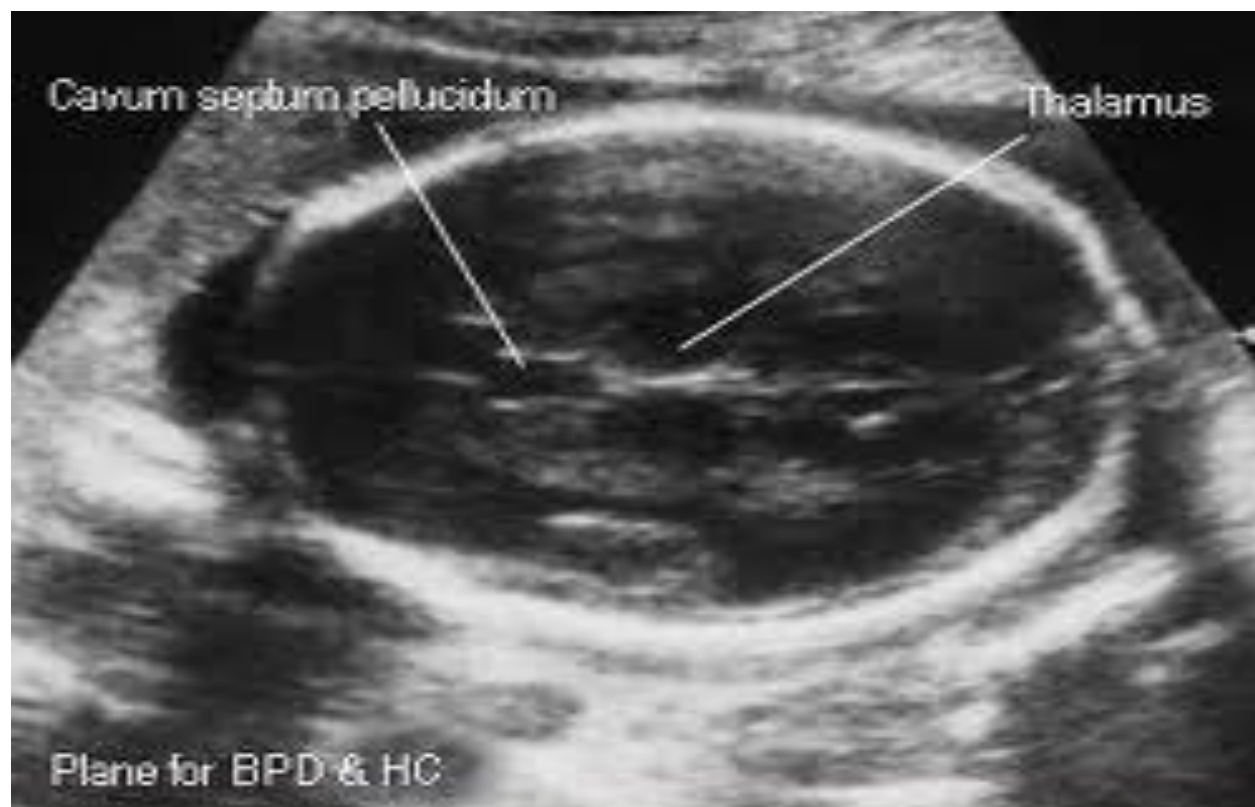
# Fetal weight

BPD

HC

AC

FL









# Pathologic growth

- Symmetrical (early onset IUGR)

Symmetrically small, both head and AC are equally affected

Insult occurs early in pregnancy (fetal infection)

- Asymmetrical (late onset IUGR)

AC is small and the Head is spared

Late insult( placental dysfunction)

Early onset placental dysfunction could lead to symmetrical SGA

# Etiology

## **Multifactorial**

- Maternal size is of greater importance than paternal size
- Ethnic and socioeconomic factors
- Male fetuses are 200 gm heavier than female fetuses

# Etiology

Maternal factors

Fetal factors

Placental factors

# Maternal factors

↑ Maternal age

Nutrition: Starvation (first and second trimester protection)

Anorexic mothers (twice the risk of SGA)

BMI less than 19

- Smoking: 400 gm

Increase level of caroxyhaemoglobin

- Alcohol

- drug abuse

- Beta blocker, anticonvulsants (phenytoin)

# Maternal factors

- Maternal diseases: severe cardiorespiratory disease
- Sickle cell disease, collagen vascular disease
- Antiphospholipid antibody syndrome
- Prothrombin gene mutation
- Protein S deficiency
- Maternal diabetes
- Chronic hypertension

# Fetal factors

Chromosomal abnormalities

Triploidy, trisomy 18

Trisomy 21

Cardiac defects

Gastroschisis

Infection: varicella, CMV, syphilis,  
toxoplasmosis, Malaria



# Placental factors

- Placental mosaicism
- Placental dysfunction

## BEFORE

Placental dysfunction is due to failure of the second wave invasion of the trophoblast during the second trimester

## NOW

Abnormal vascular development of the placenta , continuous , started immediately after conception

# Etiology

FGR

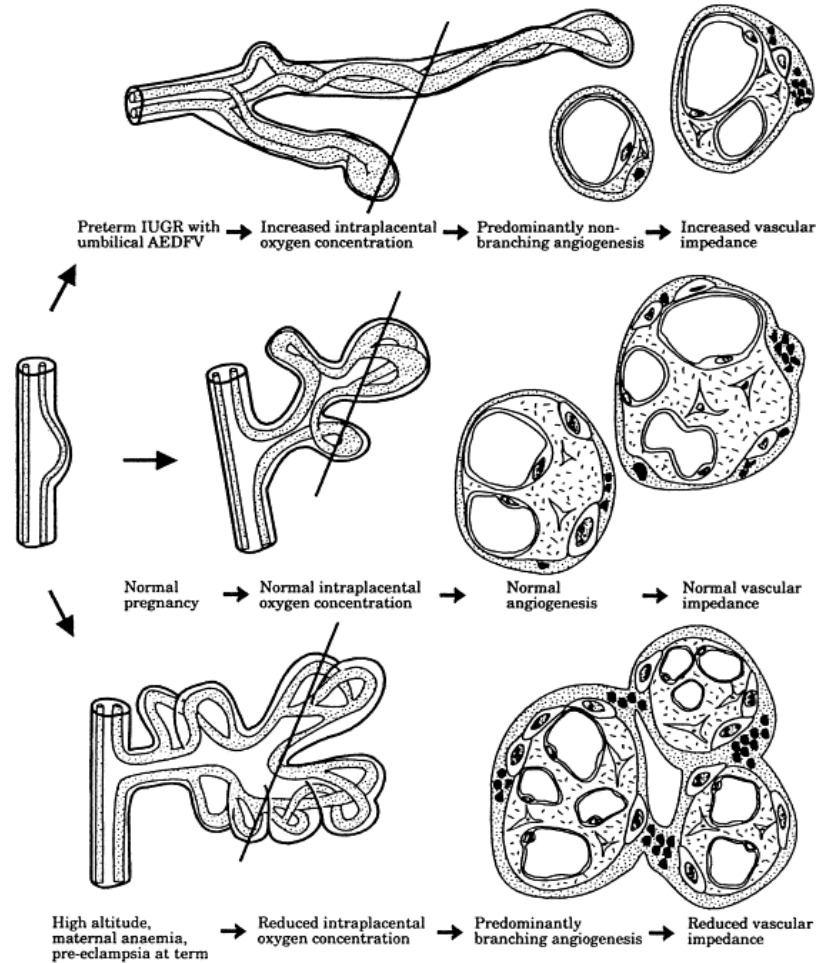
Non-branching

Angiogenesis

Reduction in vascularity

↓ in gas exchange

villi → chronic hypoxia



# prediction

Increase fetal monitoring

Improve outcome

**Risk factors**

**Biochemical markers**

**Uterine artery Doppler**

# prediction

History and examination:

Identify the risk factor(BMI,smoking, previous history of SGA,congenital uterine anomalies, uterine fibroid, older women,preeclampsia)

**most patients affected with FGR have no risk factors**

# Maternal serum screening

**hCG, alpha-fetoprotein ,inhibin A and  
PAPP-A**

- ***Low level of PAPP-A is associated with low birthweight.***
- **other markers don't show the same strong correlation**

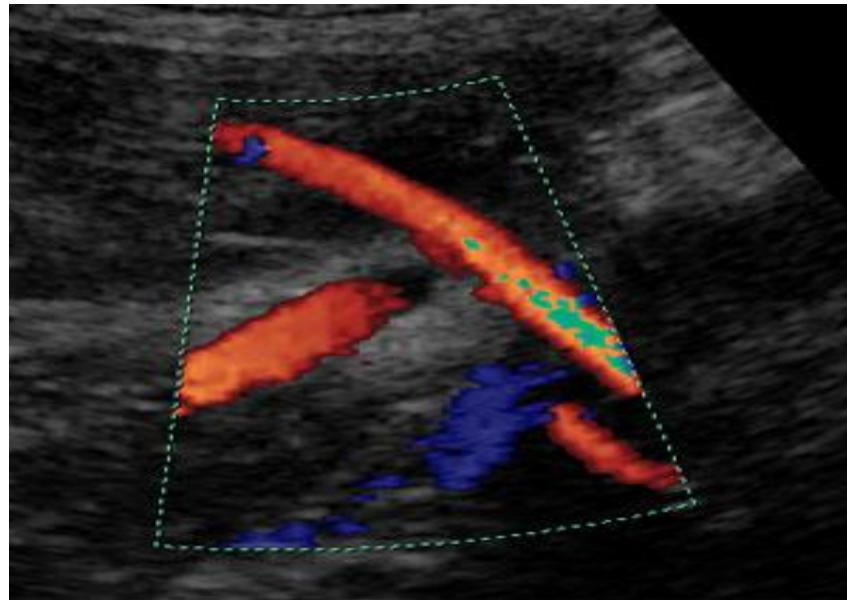
# Ultrasound markers

Best predictor is abnormal uterine artery  
Doppler velocitmetry

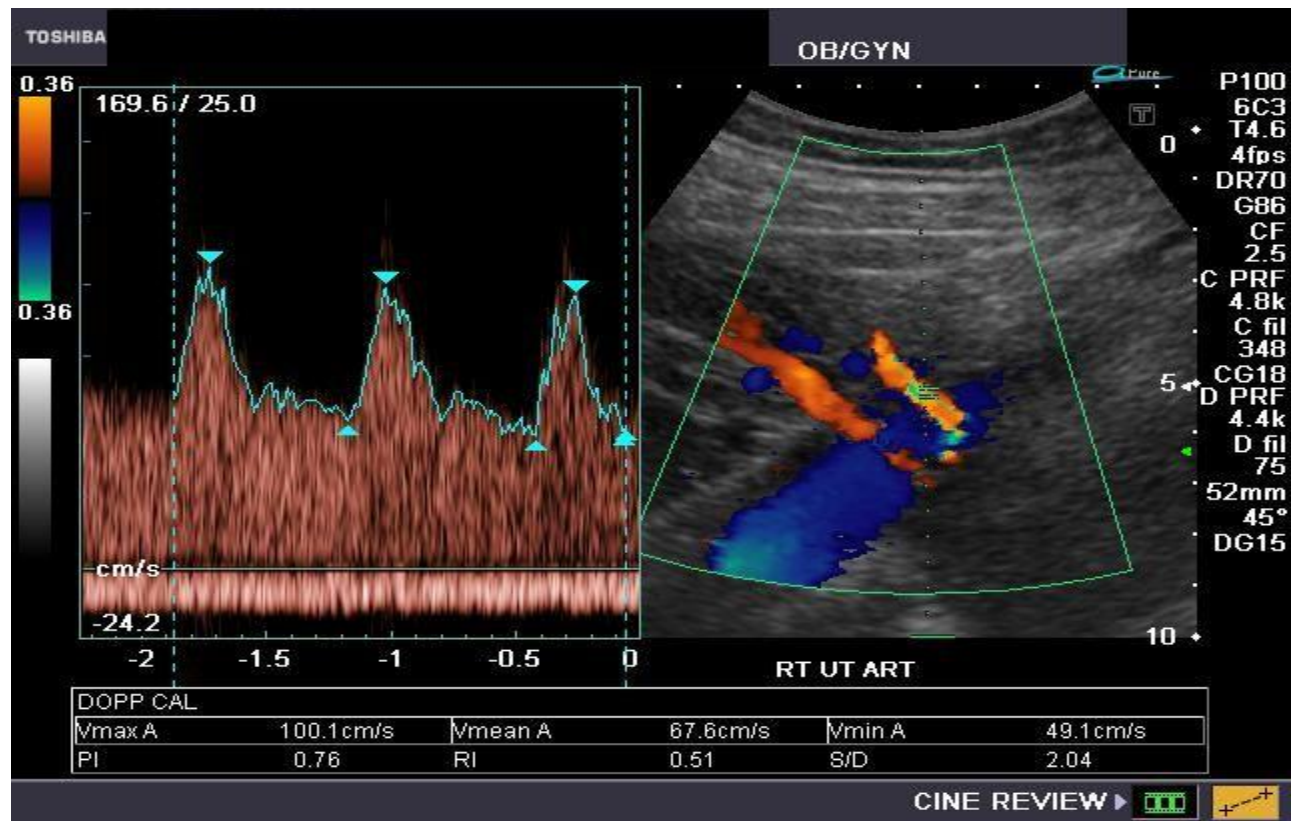
Reflects maternal arterial blood supply to the  
placental unit

# Prediction

- **Uterine artery** is a reflection of the downstream resistance of the maternal side of the placenta



# Uterine artery Doppler





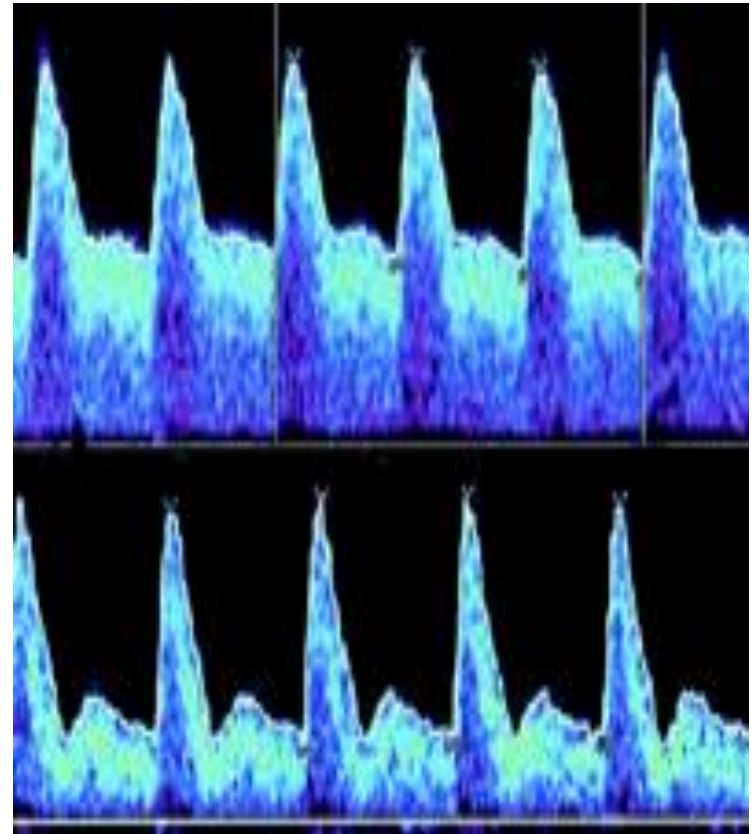
# Uterine artery Doppler

Low resistance waveforms  
indicates good  
placentation

High resistance wf indicates  
poor placentation

End Diastolic notching

Three fold increase in the risk  
of FGR



# Clinical assessment

- Maternal weight gain
- SFH
- Ultrasound biometry
- Liquor volume
- CTG
- Biophysical profile
- Umbilical artery Doppler
- Other Dopplers

# Clinical assessment

- Maternal weight gain
- Fundal height : maternal shape , fetal lie and liquor

Symphysis fundal height (SFH)

Sensitivity of SFH is poor, 29%

Customised SFH chart (maternal height, weight, parity and ethnic group) ,49%

Requires computer software

[www.gestation.net](http://www.gestation.net)



# Gestation Network

Contact Us

Home

Gestation Calculator

**Growth Charts**

Estimating Fetal Weight

Centile Calculator

Literature

- Growth charts
- Literature
- Clinical Application

## Growth charts

### Introduction

**GROW** (Gestation Related Optimal Weight) is the method used to generate a customised antenatal growth chart. The chart is based on the calculation of an individualised weight standard for the duration of the pregnancy, adjusted for the physiological variables of maternal height, weight in early pregnancy, parity and ethnic group. After the mother's and pregnancy details (including expected date of delivery) are entered into the software, the chart can be printed and attached to the maternity record. The Perinatal Institute has developed hand held Pregnancy Notes ([www.preg.info](http://www.preg.info)) with an adhesive strip for the charts and explanation of their use for fetal growth assessment. The charts can be used for plotting fundal height and estimated fetal weight, and assessed against the individually predicted or 'customised' standard. See [Clinical Application](#). For details of the evidence for customised growth charts see [Literature](#).

### Trial Version

This page enables access to trial versions of the GROW chart Windows Application (WinApp) and Web Application (WebApp). The WinApp is a downloadable, stand-alone version of the software that runs under Microsoft Windows. The WebApp is a Web-only browser-based version of the software, and thus needs an internet connection.

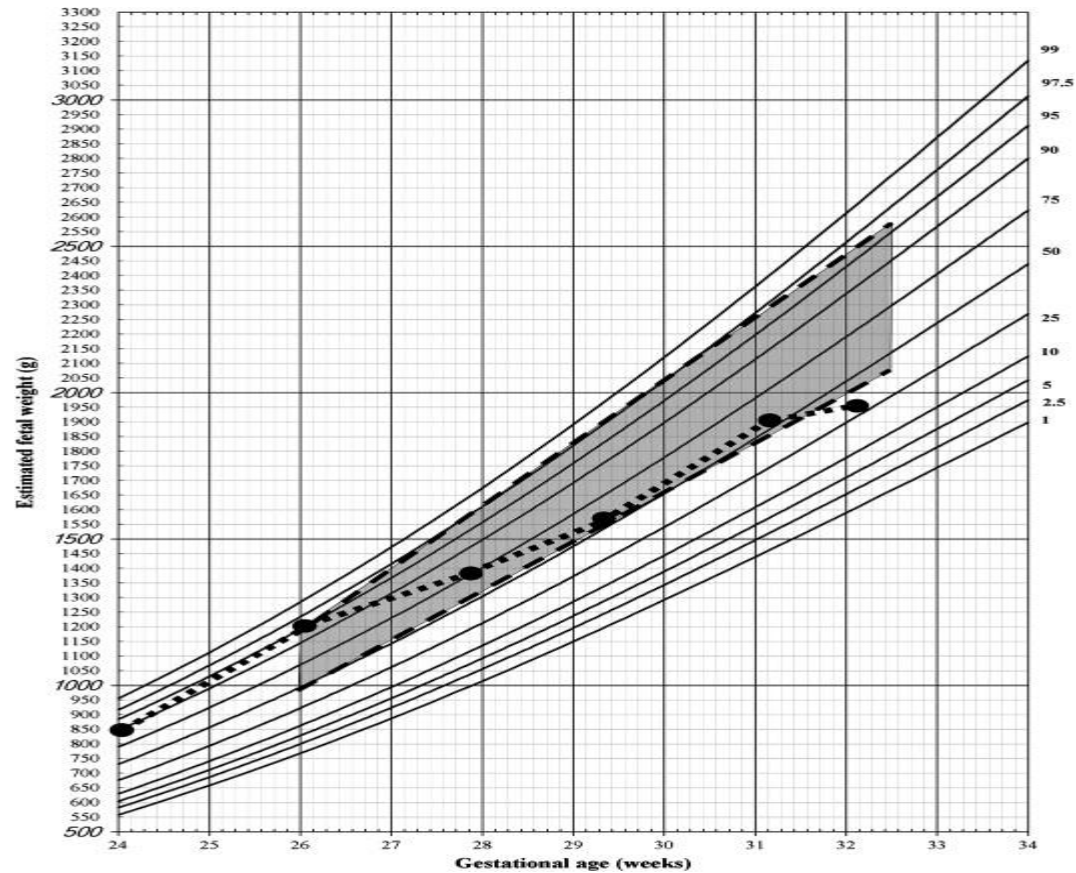
### Version for trained users

The effectiveness of any method used in fetal growth surveillance can be compromised if protocols for standardised fundal height measurement and referral for further investigation are not followed. The Perinatal Institute offers training prior to implementation of customised charts into clinical practice.

# Ultrasound biometry

- Most sensitive
- EFW and AC are the most accurate diagnostic measurements to predict FGR
- **10<sup>th</sup> centile** had better sensitivity than other centiles
- Single or serial measurements?
- Single measurement may give indication if the fetal weight or AC is above or below the predefined centile
- Serial measurements (AC) are the best to check for growth velocity

# Ultrasound biometry



# Ultrasound biometry

## **Ultrasound assessment:**

Fetal biometry: AC is the most accurate predictor of the fetal weight

Comparison between Head size and abdominal size

The most effective way of detecting FGR is by serial ultrasound measurements over time.

# Tests for fetal well being

Cardiotocography

NST , quick and simple to perform.

Two accelerations within 30 mins trace

With normal short term and long term variability

Predictive ability could be improved by introduction of fetal stress testing(uterine contractions)

Natural oxytocin (nipple stimulation),oxytocin administration

Vibroacoustic stimulation



# Clinical assessment

- Maternal weight gain
- SFH
- Ultrasound biometry
- Liquor volume
- CTG
- Biophysical profile
- Umbilical artery Doppler
- Other Dopplers

# Biophysical activity

Ultrasound assessment over 30 minutes

Liquor, fetal tone, body and breathing movements and NST

Maximum score is 10 , scores under 8 abnormal

Time consuming testing, movement could be ceased up to 40-60 min (unnecessary intervention)

Liquor and NST (modified BPP)

# Clinical assessment

Liquor volume:

Common finding associated with FGR

Redistribution of the fetal blood flow to the brain

Decrease renal perfusion and decrease renal output

Degree of reduction in liquor is reflected by the degree of hypoxemia

# Clinical assessment

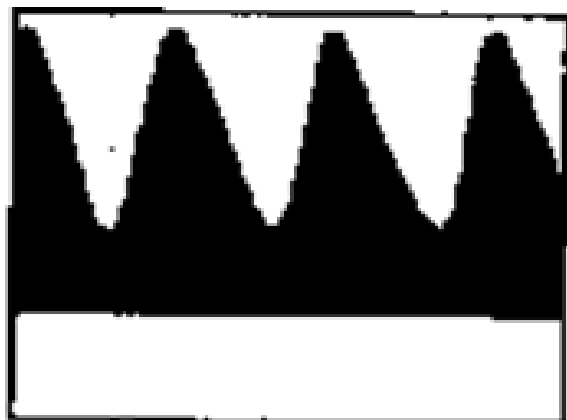
## Umbilical artery Doppler blood flow

Normal flow is the forward flow from the fetus to the placenta

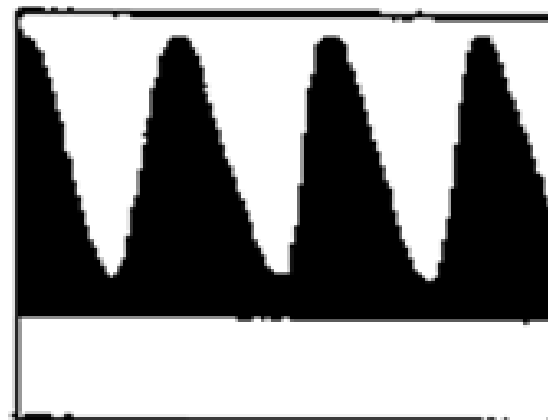
Increase vascular resistance absent end diastolic flow or reversed end-diastolic flow

Correlates well with degree of hypoxia

And allows separation between SGA fetuses and FGR



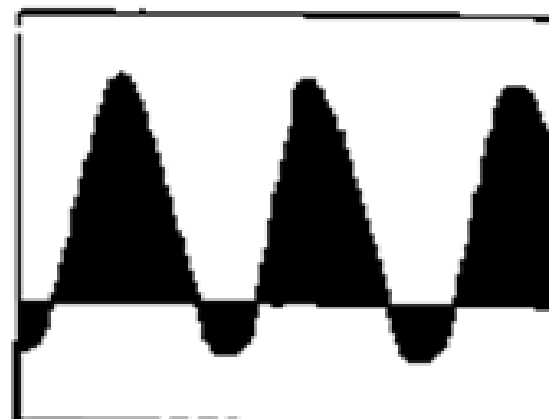
Normal pregnancy



Reduced end diastolic velocity



Absent end diastolic velocity



Reversed end diastolic velocity

# prophylaxis

Cessation of smoking

Anti malarial treatment

Protein energy supplementation of the poorly nutrition women.

# Monitoring of SGA

Umbilical artery Doppler is superior to the biophysical profile and CTG

Close monitoring of the liquor

Fortnightly assessment of the fetal size especially the abdominal circumference

Delivery is indicated if there is evidence of fetal compromise

# Monitoring of FGR fetuses

Balance the risk of continuing pregnancy  
against

the risk of prematurity

REDF indication for delivery

If reduced growth velocity, reduced liquor or  
abnormal umbilical artery waveform after 34  
weeks , delivery is indicated

Prior to 34 weeks, steroids should be given



# Monitoring of FGR fetus

Absent end diastolic flow before 34 weeks, fetal demise vary between few days to weeks

Changes in CTG is very late and might indicate irreversible damage

MCA and ductus venosus Doppler (brain sparing and fetal decompensation)

Follow up should be done in maternal fetal units

OB

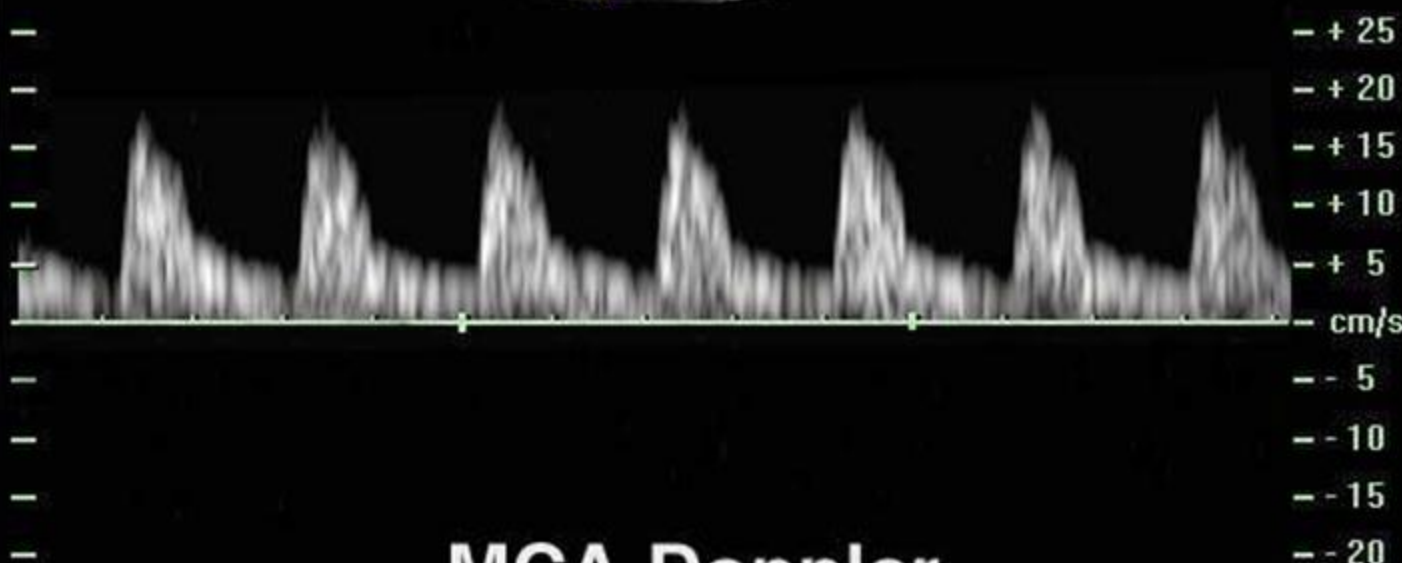
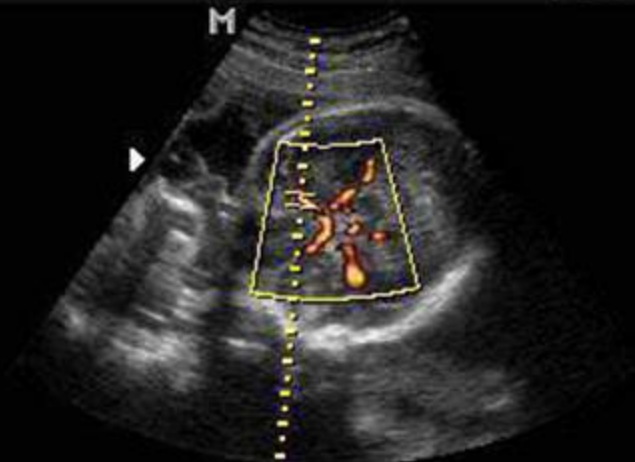
VA4-7 /

Gen Tib3.9

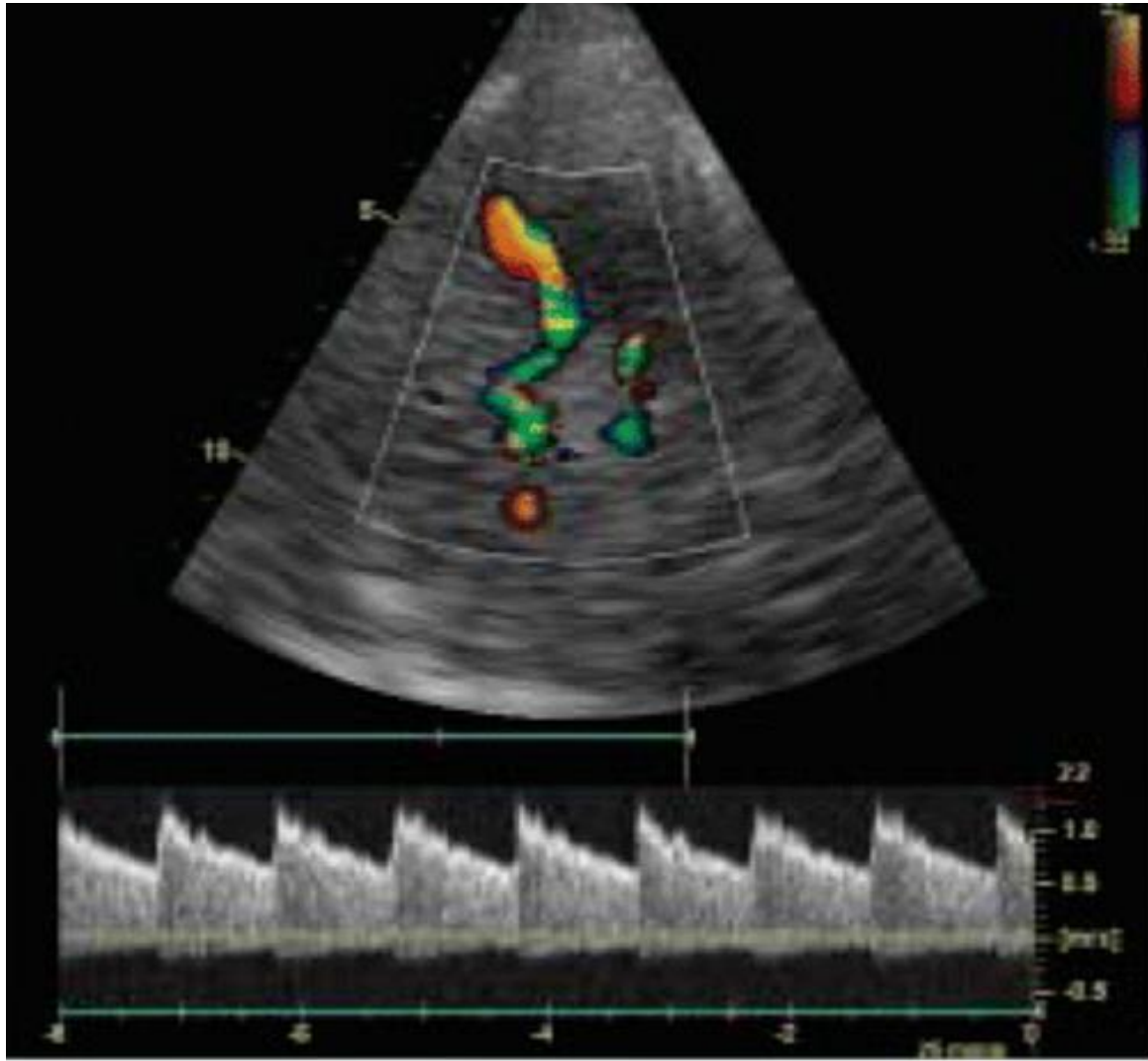
03:19:23 pm

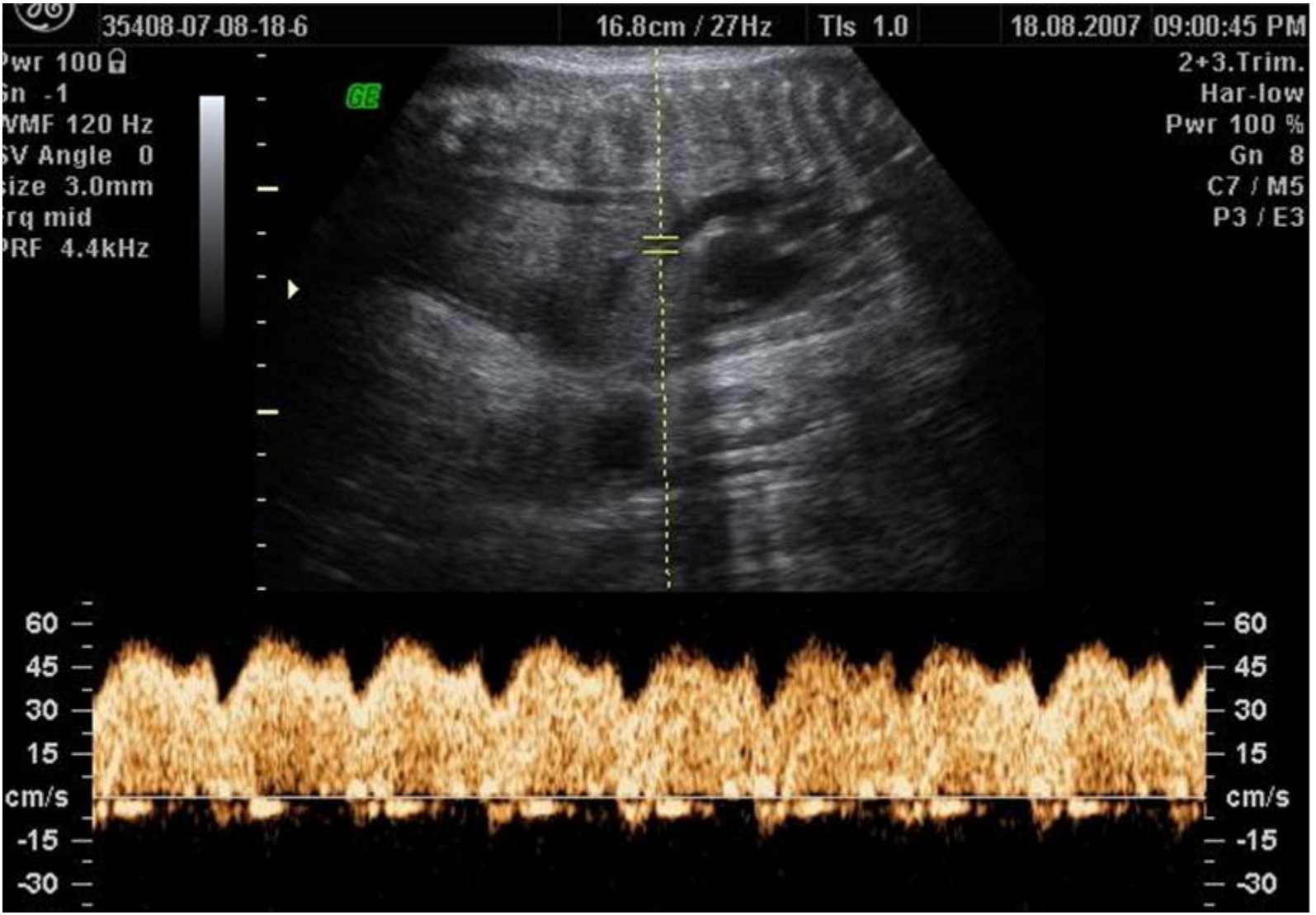
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F1 / 2.00 kHz  
Depth 56  
Size 4  
Angle 0

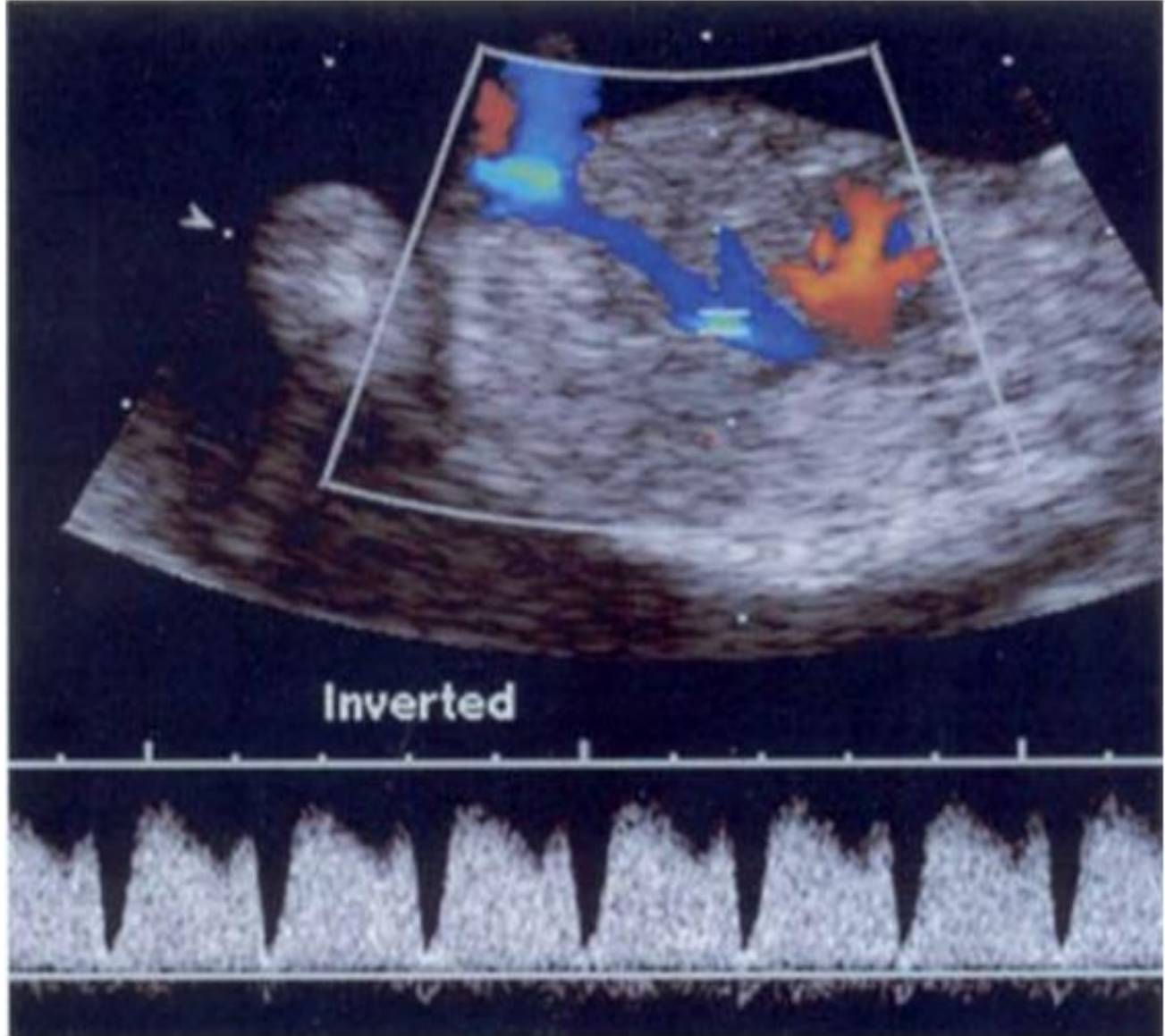
[2D] G50 / 90dB  
FA0 / P90  
**HAR**  
[PD] G47 / 0.94 kHz  
FA2 / F1 / 14



**MCA Doppler**







# Labour and delivery

At risk of intrapartum hypoxia and acidaemia.

Under 37 weeks, c/s is indicated

In UADW is normal , induction of labour

Continuous electronic fetal monitoring

Oxytocin and prostaglandin should be used with great care