Fetal compromise and surveillance

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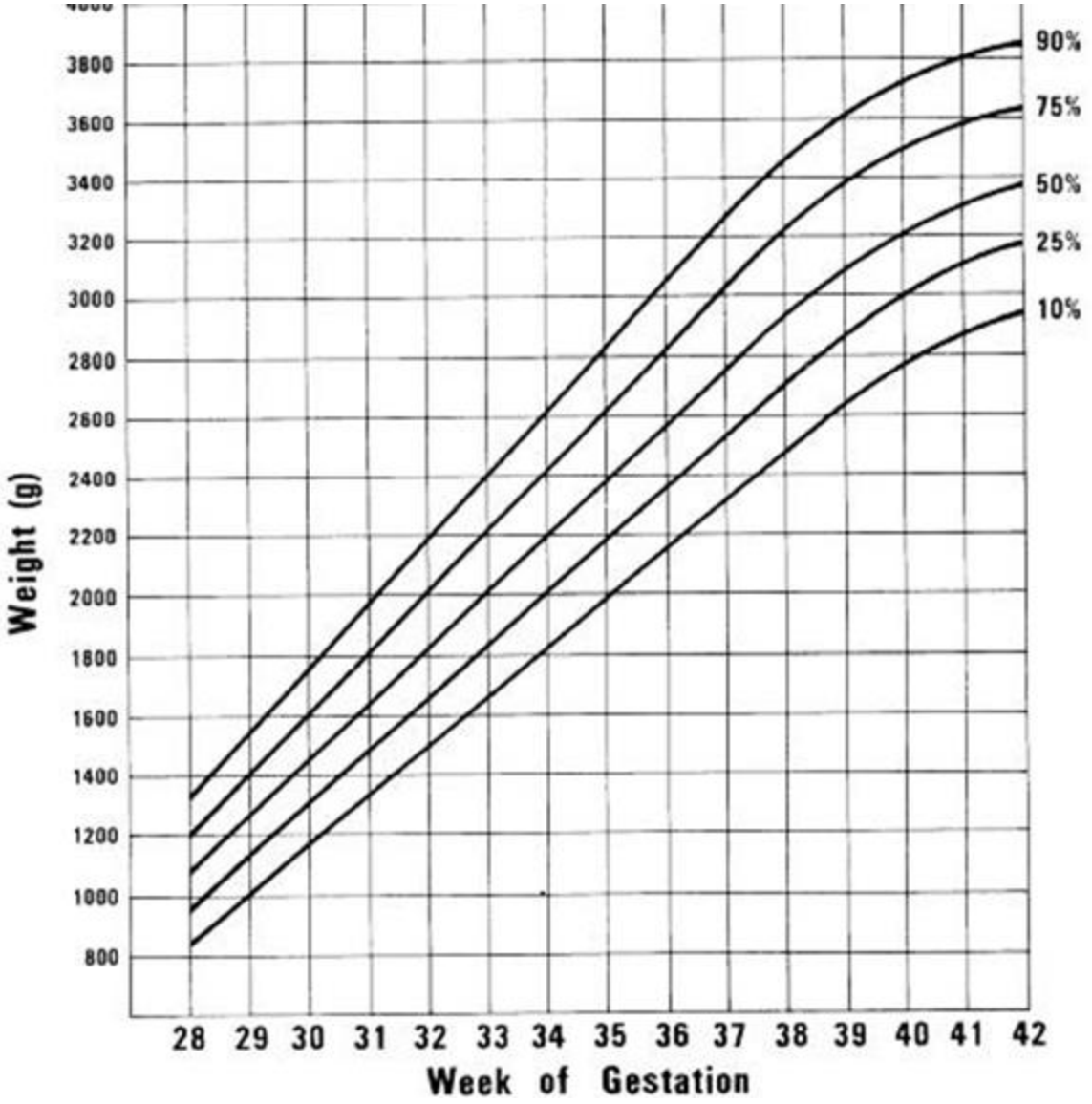
Fetal compromise

- 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


Weight (g)
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
28 29 30 31 32 33 34 35 36 37 38 39 40 41 42
Week of Gestation
90%
75%
50%
25%
10%

Small for gestational age fetus

- SGA fetus when the growth is around the 10^{th} 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

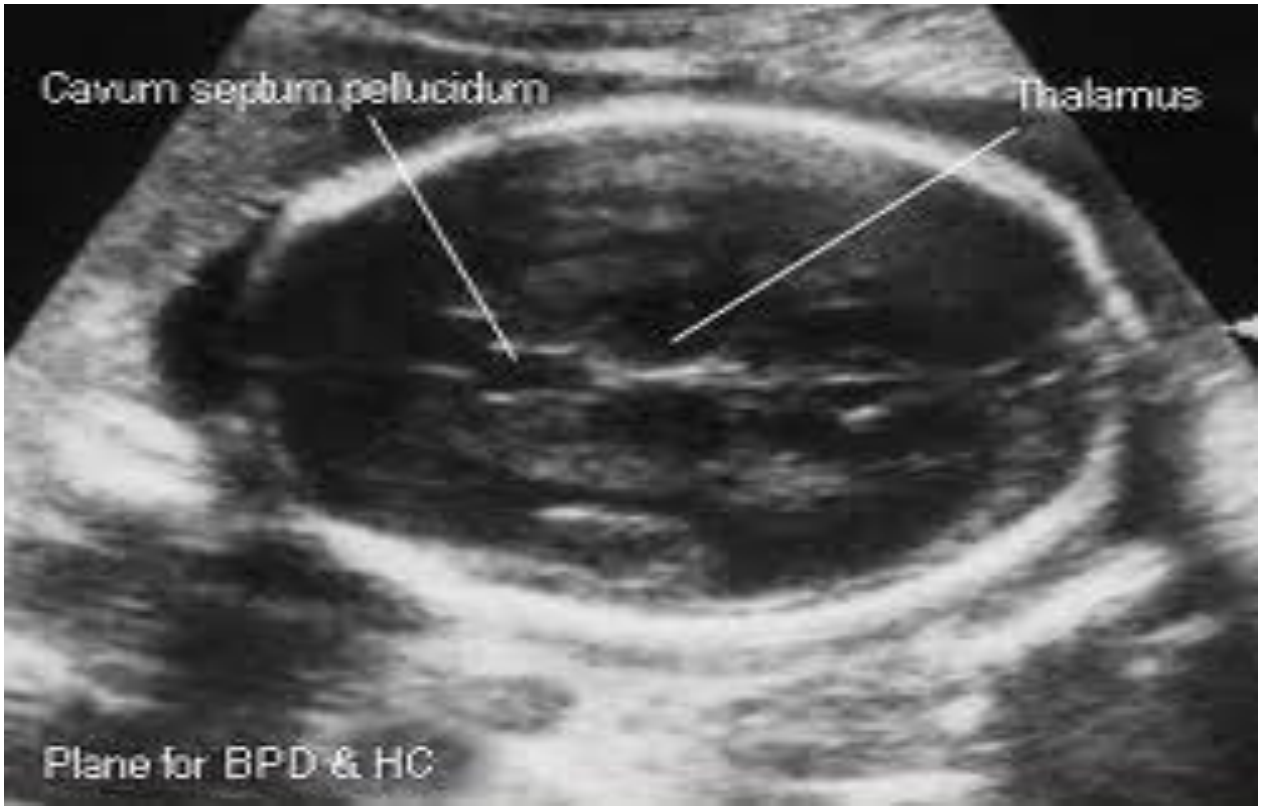
Fetal weight

BPD

HC

AC

FL


Cavum septum pellucidum
Thalamus
Plane for BPD & HC


J
SPINE
STOMACH
ABDOMINAL CIRCUMFERANCE


01/12/95
01:05 PM
Convex
3.5 MHz
dnf
F
FL
4.8 cm
26 W 0 D
0
5
10
Image by Tim Ramer, MD; Used with permission

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 socioechonomic 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 caroxyhaemogobin

- Alcohol
- drug abuse
- Beta blocker, anticonvulsants(phenytoin)

Maternal factors

- Maternal diseases: severe cardiorespiratory disease
- Sickel 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

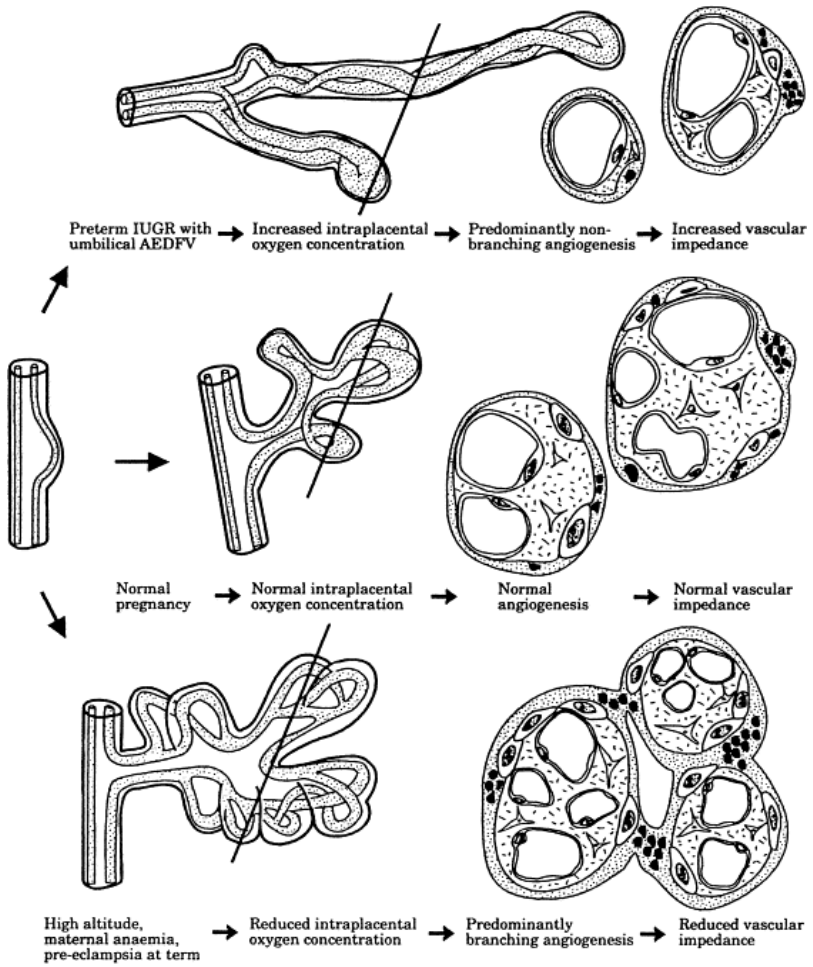
Non-branching

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**

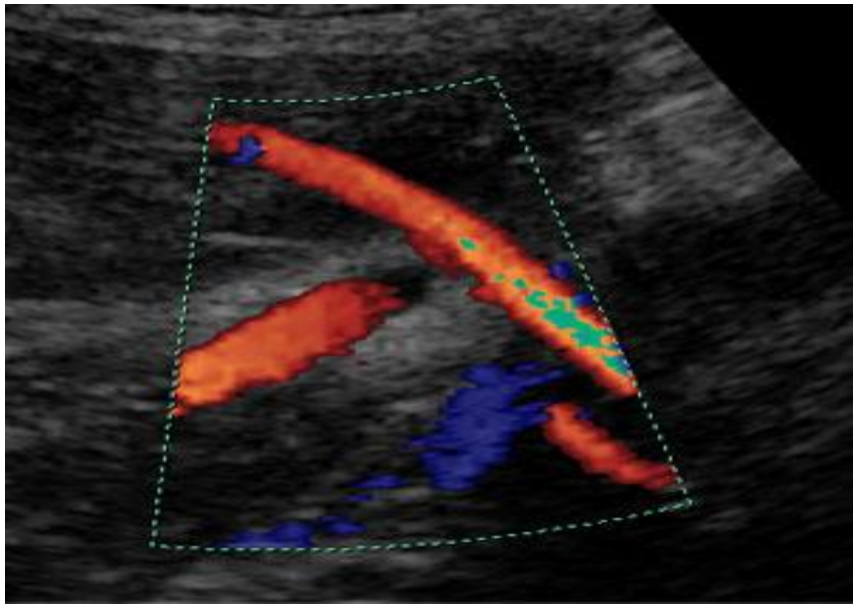
Ultrasound markers

Best predictor is abnormal uterine artery Doppler velocitmetry

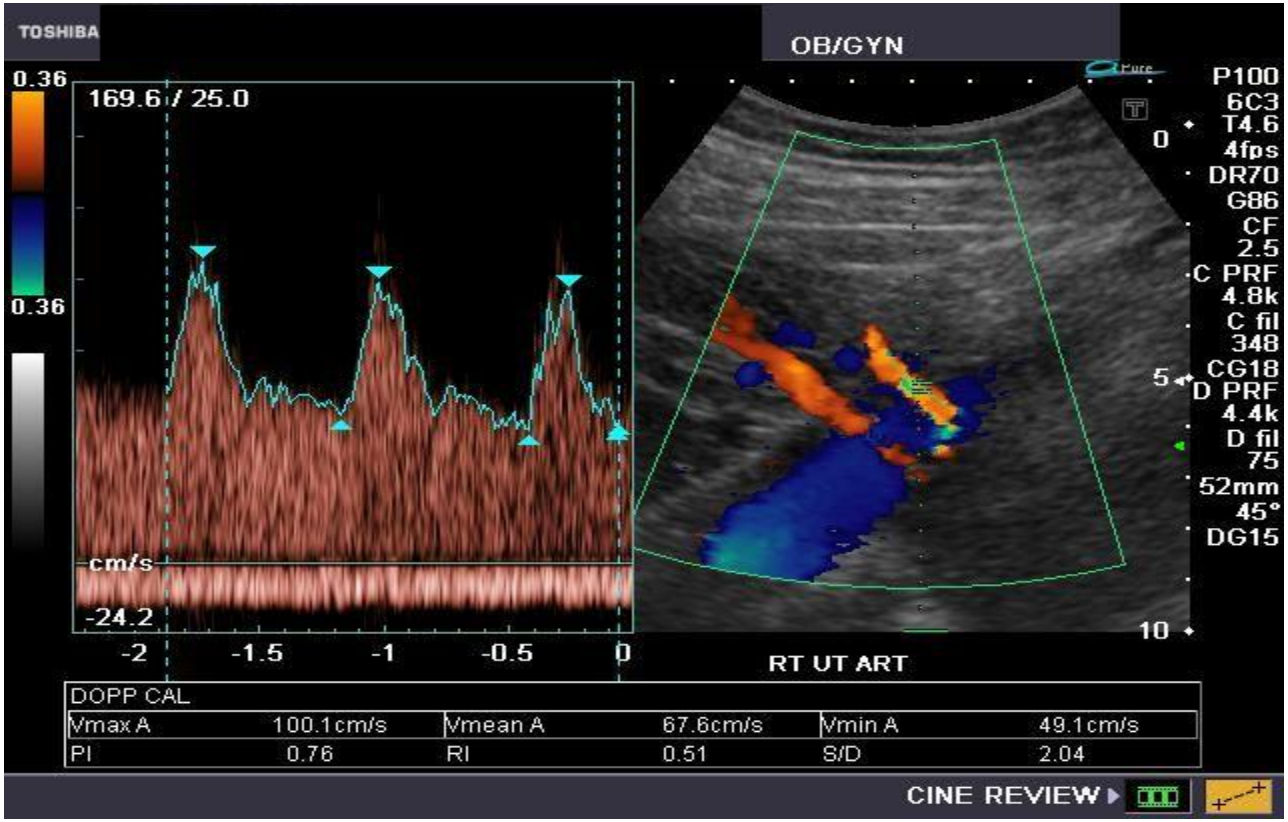
Reflects maternal arterial blood supply to the placental unit

Prediction

- Uterine artery is a reflection of the down stream resistance of the maternal side of the placenta



Uterine artery Doppler



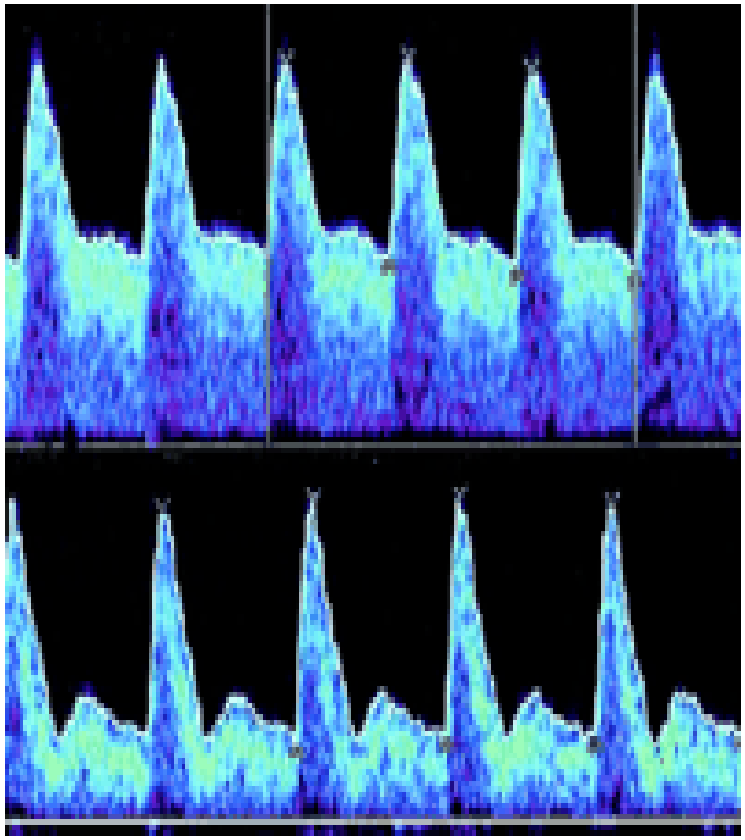
Uterine artery Doppler

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

Gestation Network

Growth charts

Introduction

GROW (Gestation Related Optimal Weight) is the method used to generate a customised antenatal growth char chart is based on the calculation of an individualised weight standard for the duration of the pregnancy, adjus the physiological variables of maternal height, weight in early pregnancy, parity and ethnic group. After the m and pregnancy details (including expected date of delivery) are entered into the software, the chart can be pr and attached to the maternity record. The Perinatal Institute has developed hand held Pregnancy Notes (www.preg.info) with an adhesive strip for the charts and explanation of their use for fetal growth assessment 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 see Literature.

Trial Version

This page enables access to trial versions of the GROW chart Windows Application (WinApp) and Web Applicati (WebApp). The WinApp is a downloadable, stand-alone version of the software that runs under Microsoft Windo 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 standar fundal height measurement and referral for further investigation are not followed. The Perinatal Institute offer training prior to implementation of customised charts into clinical practice.

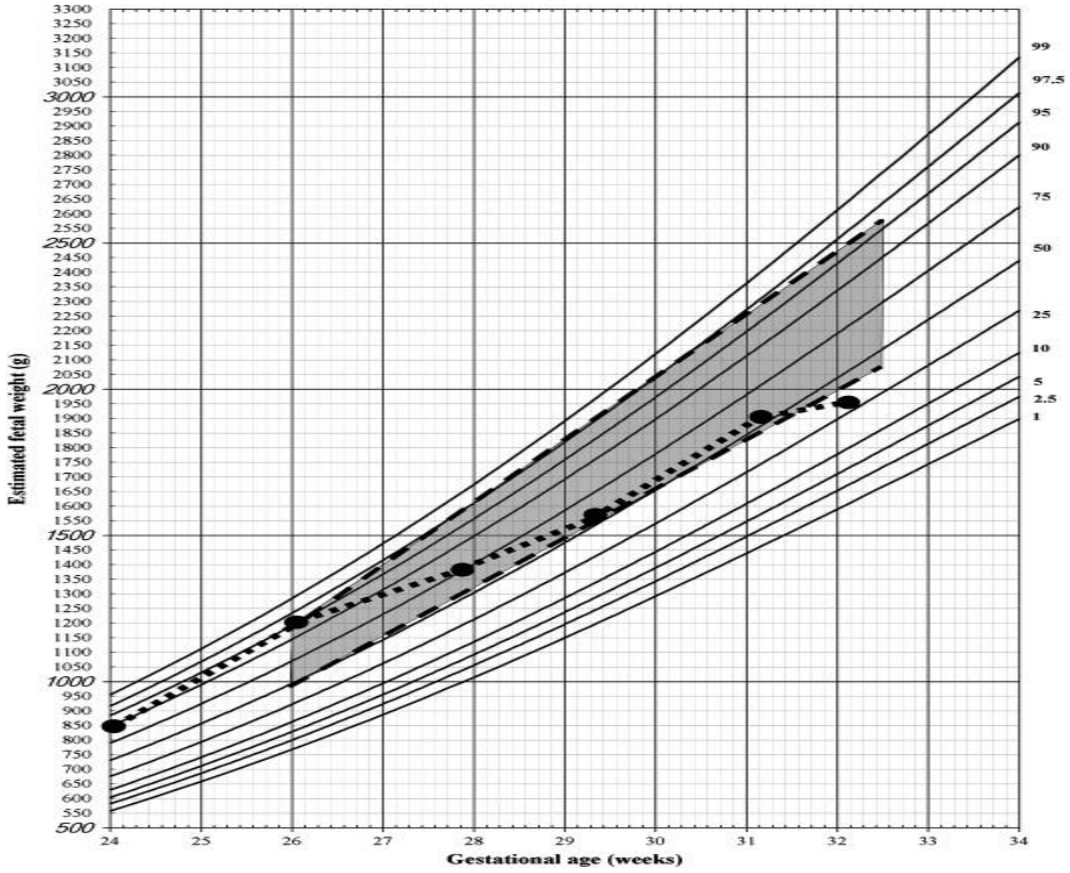
Ultrasound biometry

- **Most sensitive**
- **EFW and AC are the most accurate diagnostic**

measurements to predict FGR

- **10^{th} 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

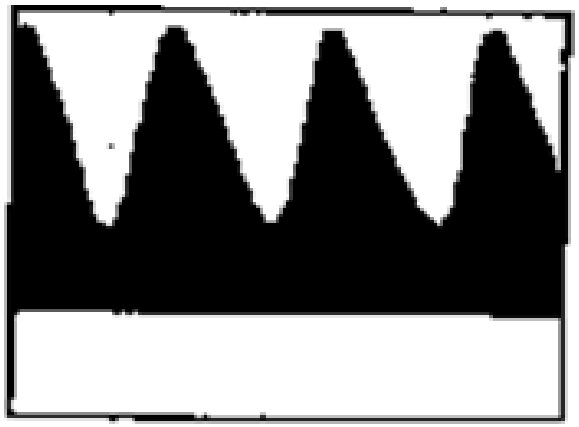
Umbilical artery Doppler blood flow

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

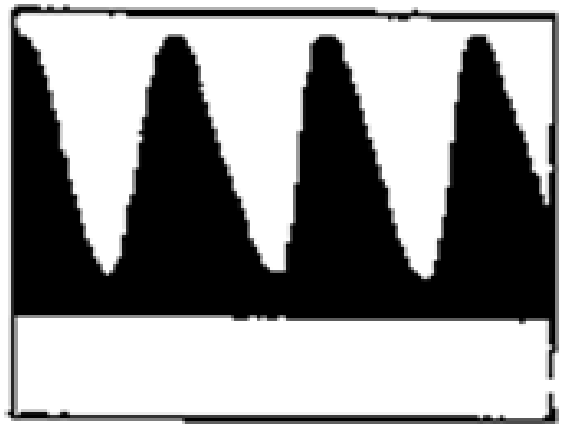
Increase vascular resistance absent end diastolic flow or reversed end-diastolic flow

Correlates well with degree of hypoxia

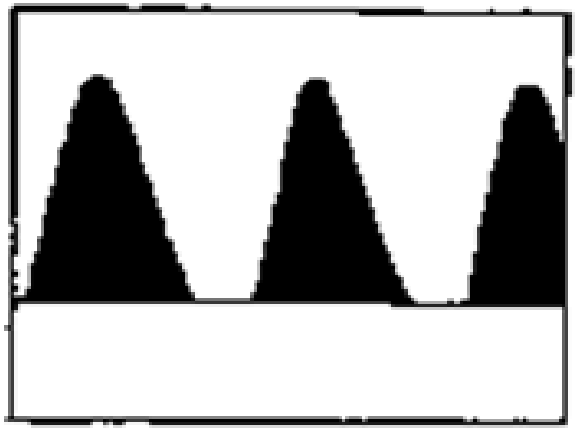
And allows separation between SGA fetuses and FGR



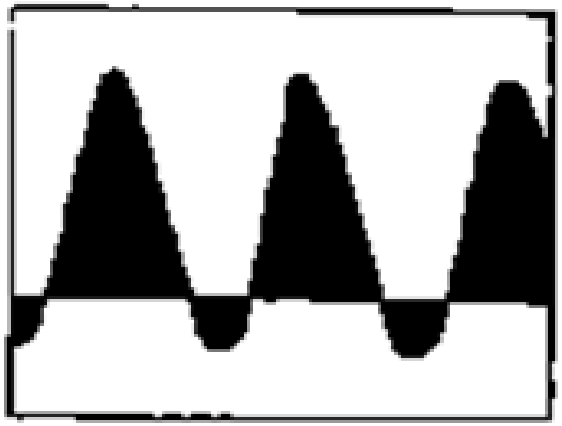
Normal pregnancy



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

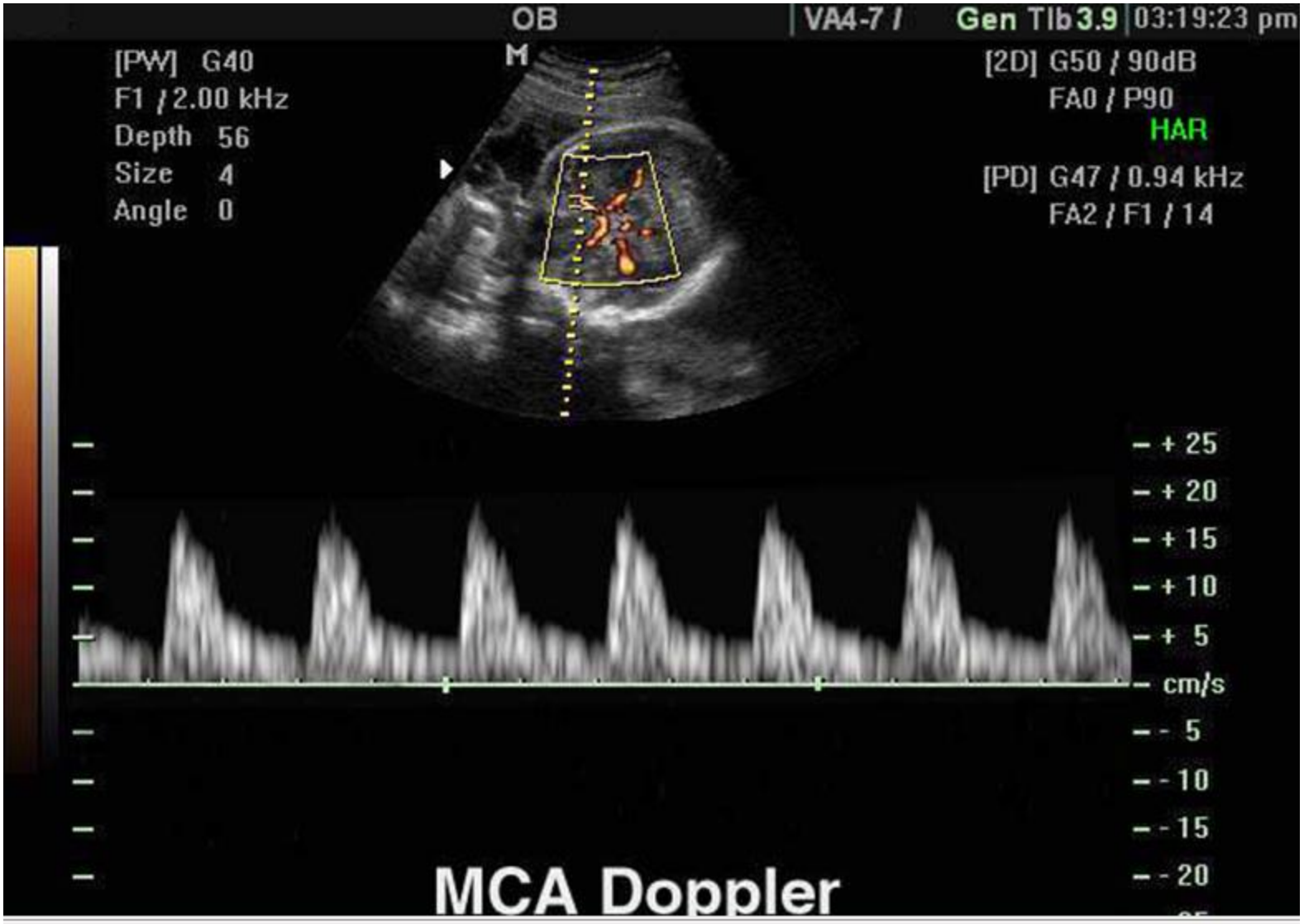
Monitoring of FGR fetus

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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FA0 / P90
HAR
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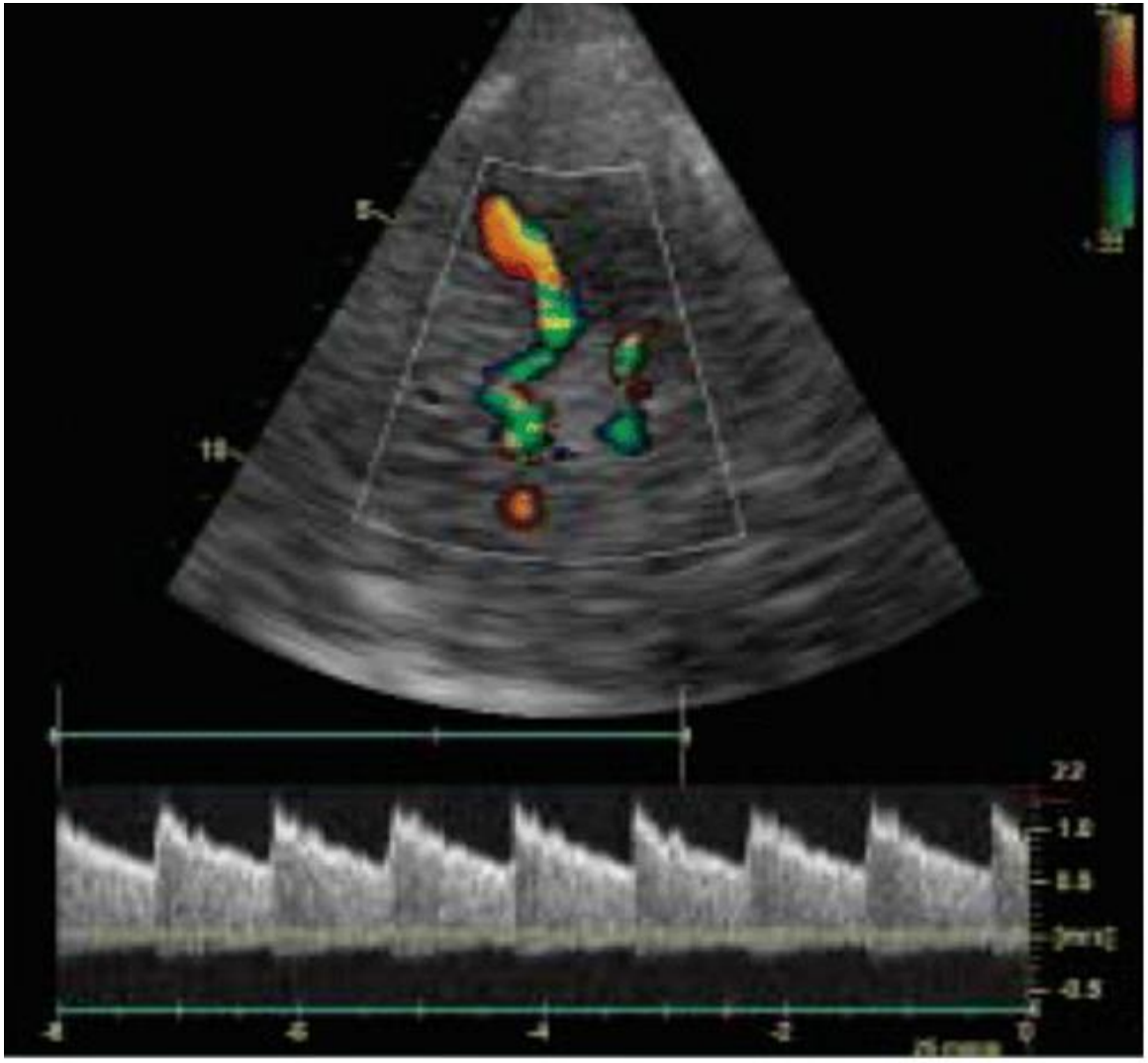
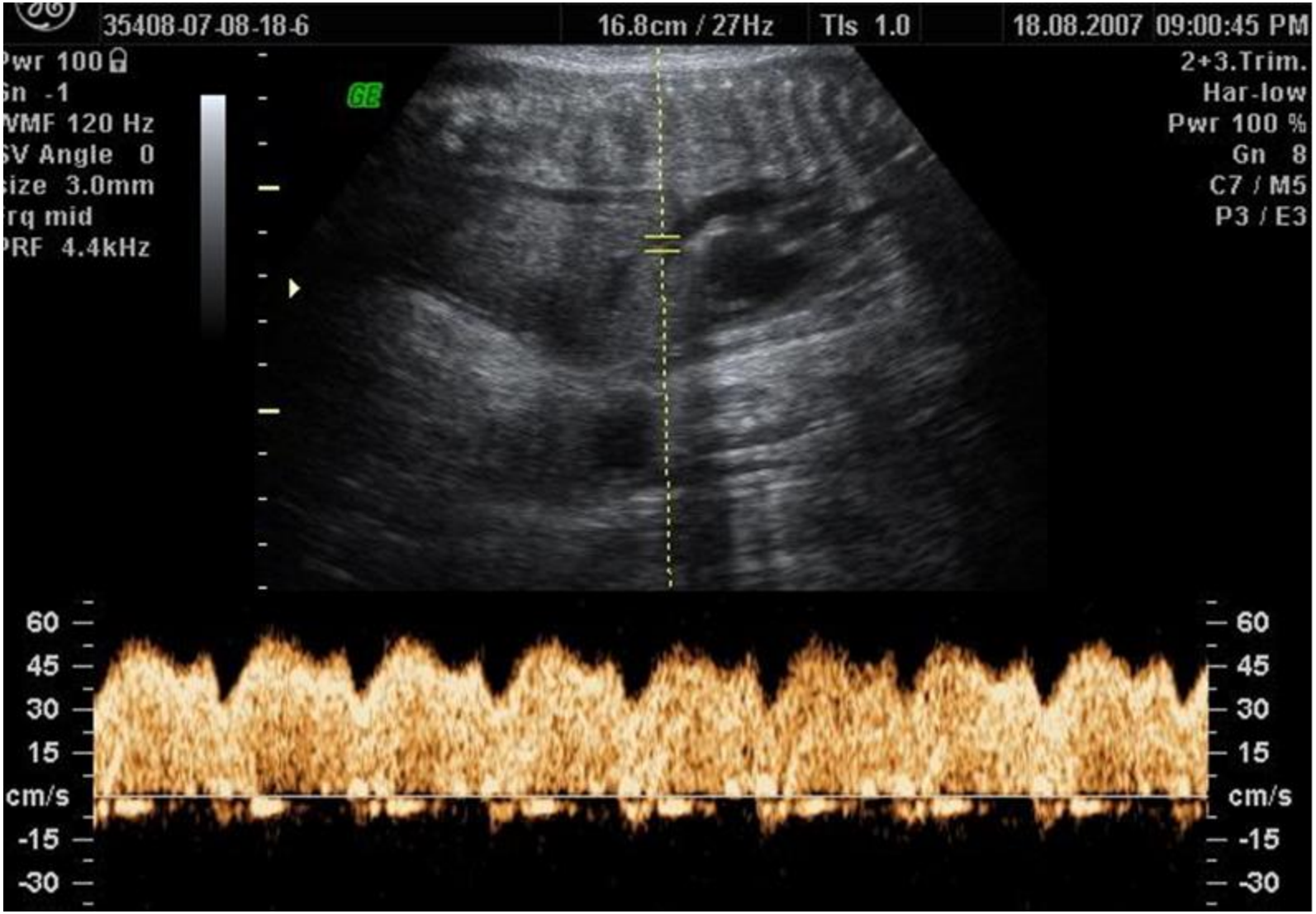
cm/s
- 5
- 10
- 15
- 20
MCA Doppler

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Gn -1
VMF 120 Hz
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Size 3.0mm
Frq mid
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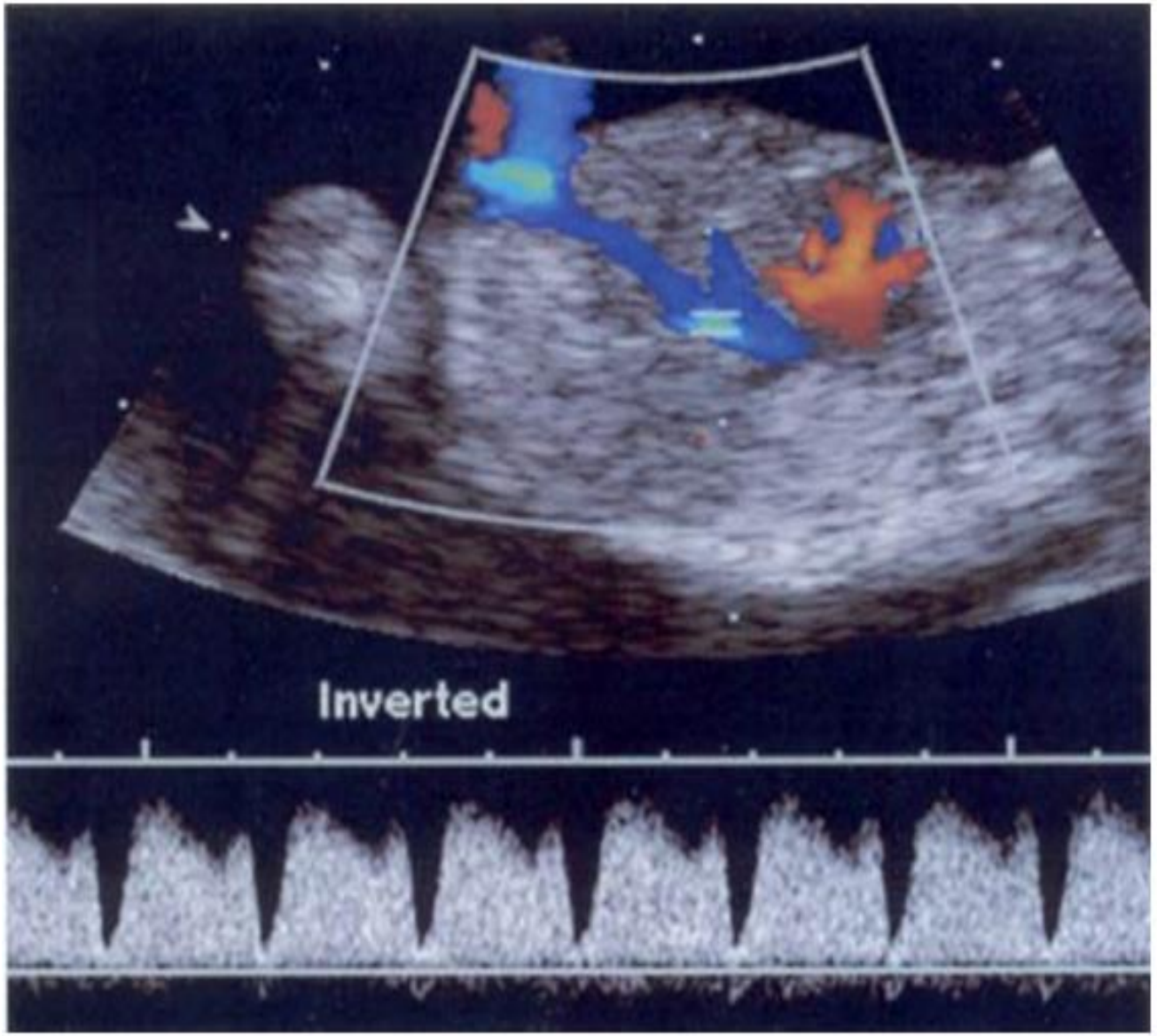
Inverted

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 electonic fetal monitoring

Oxytocin and prostaglandin should be used with great care