

# Diagnostic Imaging Pathways - Fetal Wellbeing (Assessment)

## Population Covered By The Guidance

This pathway provides guidance on the imaging assessment of pregnant patients for fetal well-being in the third trimester.

**Date reviewed: October 2013**

**Date of next review: 2017/2018**

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## Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

## Pathway Diagram

Date reviewed: October 2013  
Please note that this pathway  
is subject to review and  
revision

## ASSESSMENT OF FETAL WELL- BEING IN THE THIRD TRIMESTER

Conventional and  
Doppler Ultrasound

Any of the following?

- No growth in 2 weeks
- Fetal weight or abdominal circumference <10th percentile
- Oligohydramnios

Fetal weight > 90th percentile

Umbilical artery Doppler results  
(Consider with MCA and DV Doppler results)

Close monitoring

Normal diastolic  
flow

Reduced diastolic  
flow ( $\uparrow$  S:D ratio)

Absent or  
reversed diastolic  
flow

Close monitoring. If  
at term, deliver.

Management depends upon  
gestational age. Consider  
delivery.

## Image Gallery

*Note: These images open in a new page*



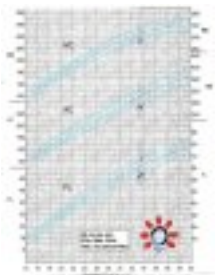
1a



### Intrauterine Growth Restriction

Image 1a,b,c (Ultrasound, 33 weeks gestation): The fetus is in a cephalic presentation. The placenta is situated on the posterior uterine wall, clear of the cervix.

Measurements: Biparietal diameter 78mm, Head circumference 283mm,

- 1b**  Abdominal circumference 266mm, Femur length 58mm. Estimated fetal weight 1625g +/- 237g. Amniotic fluid volume is normal (Amniotic Fluid Index = 12cm).
- 1c**  On Doppler imaging, there is reverse end diastolic flow in all sections of the umbilical artery evaluated.
- 1d**  Image 1d (Fetal Biometry Chart, 33 weeks gestation): The above measurements are all below the 3rd percentile.

## Teaching Points

- Routine ultrasound in the third trimester is not indicated. However, there are a number of maternal, fetal and pregnancy related indications for an ultrasound examination at this time. These include [4](#)
  - Pregnancy induced hypertension/pre-eclampsia
  - Chronic renal disease and hypertension
  - Maternal diabetes mellitus, pregnancy induced diabetes mellitus
  - Maternal vascular disorders
  - Suspected or previous history of IUGR
  - Previous history of intrauterine fetal death
  - Previous history of abruption
  - Multiple pregnancy
  - Clinical polyhydramnios or oligohydramnios
  - Review of fetal anomaly
  - Malpresentation
  - Planned vaginal delivery of breech presentation
  - Palpates small for dates
  - Advanced maternal age (>35 years)
- Umbilical artery Doppler studies in high risk populations can help reduce perinatal mortality. Consider results in conjunction with ultrasound and other Doppler studies of the MCA, uterine artery and ductus venosus

## Assessment of Fetal Wellbeing in the Third Trimester

- Routine conventional or Doppler ultrasound in the third trimester in low-risk or unselected populations has not been demonstrated to be beneficial to either mother or baby or cost-effective [5-7](#)
- Factors that may impact on fetal growth and wellbeing are indications for an ultrasound examination in the third trimester. These include [4](#)
  - Pregnancy induced hypertension/pre-eclampsia
  - Chronic renal disease and hypertension

- Maternal diabetes mellitus, pregnancy induced diabetes mellitus
  - Maternal vascular disorders
  - Suspected or previous history of IUGR
  - Previous history of intrauterine fetal death
  - Previous history of abruption
  - Multiple pregnancy
  - Clinical polyhydramnios or oligohydramnios
  - Review of fetal anomaly
  - Malpresentation
  - Planned vaginal delivery of breech presentation
  - Palpates small for dates
  - Advanced maternal age (>35 years)
- Macrosomia describes a large fetus, with an estimated fetal weight greater than the 90th percentile after correcting for sex and ethnicity, or greater than 4500gm. This condition is associated with increased fetal and neonatal morbidity and mortality. Most complications are related to delivery, including shoulder dystocia and birth trauma. Macrosomia associated with maternal diabetes carries a higher risk of intrauterine death. Close monitoring of fetal weight can be used to determine the optimal time for delivery [4](#)
  - Small for gestational age (SGA) refers to a fetus with an estimated fetal weight (EFW) or abdominal circumference below the 10th percentile [8](#)
  - Intrauterine growth restriction (IUGR) refers to a fetus with an estimated fetal weight below the 10th percentile corrected for sex and ethnicity and implies a pathological restriction of the genetic growth potential. [8](#) There may be features of chronic hypoxia and/or malnutrition, but a consensus does not exist for the definition of IUGR. It is associated with adverse fetal outcomes including acidosis, stillbirth, oligohydramnios and low-birth weight; and adverse events during labour including fetal distress in labour [4](#)

## Ultrasound

- Conventional and Doppler ultrasonography are used to assess fetal wellbeing through the following parameters [3,9](#)
  - Fetal biometry: including estimated fetal weight (EFW), abdominal circumference (AC), head circumference, femur length and assessment of the placenta and umbilical cord. AC is the most sensitive measurement for assessing fetal wellbeing
  - Biophysical profile (BPP): fetal heart rate, breathing, movements, tone and amniotic fluid volume
  - Umbilical artery Doppler ultrasound with calculation of the systolic to diastolic (S/D) ratio which can be related to gestational age on a nomogram
- Percentile charts are used to assess the estimated fetal weight for age. Normal values are arbitrarily chosen as between the 10th and 90th percentiles
- When there is placental insufficiency, progressive feto-placental circulation haemodynamic changes occur that can be detected on umbilical artery Doppler studies, aided by Doppler studies of the middle cerebral artery (MCA), uterine artery and ductus venosus and umbilical vein [3,11-13](#)
  - Doppler indices from the umbilical artery start to increase (with reduced end diastolic flow and increased S/D ratio) when functioning of the placental vascular tree is impaired [12](#)
  - There is preferential flow to the brain (“brain sparing effect”), heart and adrenal glands, with increased cerebral diastolic flow and cerebral vasodilation leading to decreased MCA Doppler indices,<sup>14</sup> while aortic blood flow resistance increases [12](#)
  - Late Doppler changes include absent or reversed end diastolic flow in the umbilical artery and increase in the resistance of venous blood flow in the ductus venosus and inferior vena



cava [12](#)

- Systematic reviews of conventional or Doppler ultrasound use have not yet demonstrated a benefit in the routine screening of low-risk or unselected patients [6,7](#)
- In high risk or selected populations, umbilical artery Doppler can predict mortality and risk of fetal compromise, and help guide management and timing of delivery [15](#). Use of fetal and umbilical artery Doppler ultrasound surveillance reduces the risk of perinatal death and obstetric intervention [12,16](#)
- Studies of MCA Doppler are conflicting. A recent meta-analysis found MCA Doppler to have a limited predictive accuracy for perinatal wellbeing [14](#)
- It may be useful after 32 weeks gestation where umbilical artery Doppler is normal. In one study MCA pulsatility index

## Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
<p><a href="#">Consent to Procedure or Treatment</a></p> <p><a href="#">Radiation Risks of X-rays and Scans</a></p> <p style="text-align: center;"><a href="#">Ultrasound</a></p> <p style="text-align: center;"><a href="#">Ultrasound (Doppler)</a></p>	<p><a href="#">Radiation Risk of Medical Imaging During Pregnancy</a></p> <p><a href="#">Radiation Risk of Medical Imaging for Adults and Children</a></p> <p style="text-align: center;"><a href="#">Ultrasound</a></p> <p style="text-align: center;"><a href="#">Transvaginal Ultrasound</a></p>

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