



Government of the Republic of Trinidad and Tobago

Ministry of Health



*Women's Health*

# *ULTRASOUND EXAMINATION IN PREGNANCY*

*Clinical Guideline*

*Directorate of Women's Health  
Ministry of Health*

*Trinidad and Tobago*

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# LIST of ABBREVIATIONS

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ALARA	as low as reasonably achievable
AC	Abdominal Circumference
ACOG	American College of Obstetrics and Gynecology
ACR	American College of Radiology
AIUM	American Institute of Ultrasound in Medicine
BJOG	British Journal of Obstetrics and Gynaecology
BPD	Biparietal Diameter
CRL	Crown Rump Length
EDD	Estimated Due Date (Delivery Date)
FL	Femur Length
HC	Head Circumference
ISUOG	International Society of Ultrasound in Obstetrics and Gynecology
LMP	Last Menstrual Period
MBTT	Medical Board of Trinidad and Tobago
MOH	Ministry of Health
MSD	Mean Sac Diameter
NICE	National Institute of Health and Care Excellence
NWRHA	North West Regional Health Authority
OFD	Occipito-Frontal Diameter
RCOG	Royal College of Obstetrics and Gynaecology
RHA	Regional Health Authority
SOGC	The Society of Obstetricians and Gynaecologists of Canada
SRU	Society of Radiologists in Ultrasound
TAS	Transabdominal Scan
TVS	Transvaginal Scan
USS	Ultrasound Scan

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## 1.0 INTRODUCTION

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The aim of this document is to provide a clinical guide for healthcare practitioners performing or requesting ultrasound scans (USS) in pregnancy.

Ultrasound in pregnancy is accepted as being of considerable diagnostic value. The acoustic output of modern equipment is generally much greater than that of the early equipment however, and in view of the continuing progress in equipment design and applications, outputs continue to be subject to change.

**Sonographers** are qualified/certified healthcare professionals who perform and report (in certain circumstances) diagnostic, screening and assists with interventional ultrasound examinations. Their individual scope of practice can be wide and varied. The reader is directed to relevant regulatory bodies for updated requirements for registration and certification which are not within the scope of this document.

**Radiologists** have postgraduate training in radiology which also involves the performing and reporting of ultrasound scans as well as interventional procedures.

There are also medically qualified doctors who have received additional certification in part or all aspects of medical ultrasound. Some obstetricians may also have specialized training in fetal ultrasound. All doctors reporting and practicing in T&T are required to have valid annual registration with the Council of the Medical Board of Trinidad and Tobago (MBTT). This includes doctors reporting from other jurisdictions (overseas and tele-radiology services) for facilities in Trinidad and Tobago.

The Maternal and Child Health Manual (2015), a publication of the Ministry of Health, outlines some reasons for performing ultrasound scans. USS may also be requested at other times based on clinical indications.

The recommended timeline for USS in obstetric patients is as follows:

- **1st Trimester – 11-13+6 weeks of gestation.**
- **2nd Trimester – 18-22 weeks of gestation**

## 2.0 USS REQUESTS

It is the duty of the healthcare practitioner, recommending an USS examination in pregnancy, to complete all relevant patient data fields on the request form, including specifying the urgency of the request. All relevant clinical information must accompany the request including the reasons for the request and the LMP.

The request should be specific e.g. routine screening first trimester scan, routine screening anomaly scan. For specific indications, these must be clearly elaborated e.g. suspected intrauterine growth restriction and fetal Doppler assessment.

### 3.0 MINIMUM REQUIREMENTS

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It is recommended that healthcare providers (and RHAs responsible for the personnel) performing regular departmental based-USS examination in pregnancy, meet the following basic requirements:

- Receive training or certification by having undertaken a recognized course of study in obstetrics- and gynaecological USS
- Are up to date with their annual registration with their regulatory body
- Participate in continuous medical education (CME) activities
- Have the appropriate minimal equipment specifications and standards (Appendix I)
- Produce a documented report as well as a permanent record of the images produced. A sample template is noted in Appendix II
- Are aware of counselling techniques and referral pathways in case of potential adverse findings detected on the USS e.g. fetal anomaly, intrauterine demise
- Practise the principles of as low as reasonably achievable (ALARA) settings to reduce ultrasonic exposure
- Are engaged in quality control measures including education, infection control and maintenance of equipment
- Release of reports, internal quality assurance, peer-review, and audits under the direction of the consultant/Specialist Medical Officer (Radiologist)

For operators whose imaging practice does not play a major role in the course of their clinical activity, it is accepted that they may have focused training in particular areas e.g. a clinician performing an emergency USS for fetal presentation. It is recognized that these operators will only have basic training in the use of the ultrasound and will not be able to explore the full functions of sophisticated modern USS units. This should be explained to the patient during the consent process and the reasons for performing the urgent or emergency USS to allow life-changing urgent interventions. **These users must be clearly instructed not to overstep their operating boundaries.**

Recommendations for the frequency of the number of USS examinations to occur are outside the scope of this document. These will be determined by local clinical guidelines and clinical scenarios.

### 4.0 DISCLOSURE OF RESULTS

Unless the scan is being performed as an emergency, the patient/couple should be aware that in most cases, results are only available at a later date. At many RHAs and satellite RHA-services, images are initially collected but then reviewed and routine reports are issued at a later date by a radiologist. An RHA-specific patient information leaflet on this topic is recommended for development if not already in place.

Staff performing the USS examination should avoid disclosure as far as possible without causing additional concerns for the client(s). In case of an urgent matter, the staff should make all efforts for urgent review and disclosure by the relevant personnel rather than having the patient return at a later date. The operator should communicate at all times in a professional manner and reassure the client(s).

## 5.0 DEVIATION FROM GUIDELINES

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Deviations from the recommendations stated in this guideline should be documented in the case notes as well as the reasons for doing so.

## 6.0 USS FOR SOCIAL REASONS

The Ministry of Health does not recommend the performing of USS in order to produce “keepsake” videos and images. This industry is now becoming commonplace with the introduction of “3D/4D” technology. **The advertising and promotion of these services are considered an unapproved use of a medical device according to the US Food and Drug Administration (FDA) regulations.**

## 7.0 FIRST TRIMESTER USS

In this document, we refer to the first trimester as a stage of pregnancy starting from the time at which viability can be confirmed (i.e. presence of a gestational sac in the uterine cavity with an embryo demonstrating cardiac activity) up to 13 + 6 weeks of gestation.

In this document, the term ‘embryo’ is used before 10 weeks and ‘fetus’ thereafter, to reflect the fact that after 10 weeks of gestation organogenesis is essentially complete and further development involves predominantly fetal growth and organ maturation.

In general, the main goal of a fetal USS is to provide accurate information on the following, which will facilitate the delivery of optimized antenatal care:

- Confirm cardiac activity,
- Establish a more accurate gestational age and due date (corroborate the last period calculated due date)
- Assess for ectopic pregnancy
- Assess for other pelvic issues e.g. fibroids, ovarian cysts
- Determine the number of fetuses and,
- In the presence of a multiple pregnancy, assess chorionicity and amnionicity.

Currently, we do not offer routine ultrasound screening for fetal aneuploidy.

### 7.1 Timing of 1st Trimester Scan

Routine serial scans simply to confirm an on-going early pregnancy in the absence of any clinical concerns, pathological symptoms or specific indications, are not recommended.

It is advisable to offer the first USS scan when gestational age is thought to be between 11 and 13+6 weeks’ gestation.

### 7.2 Assessment of “viability” in early pregnancy

Fetal viability, from an ultrasound perspective, is the term used to confirm the presence of an embryo with cardiac activity at the time of examination. Embryonic cardiac activity has been documented in normal pregnancies as early as 37 days of gestation, which is when the embryonic heart tube starts to beat. Cardiac activity is often evident when the embryo measures 2 mm or more.

### 7.3 Early pregnancy measurements/assessment of gestational age

Accurate dating is essential for appropriate follow-up of pregnancies and is the primary indication for USS in the first trimester.

The **mean gestational sac diameter (MSD)** has been described in the first trimester from 35 days from the last menstrual period onwards. The MSD is the average of the three (3) orthogonal measurements of the fluid-filled space within the gestational sac.

In the presence of the embryo, the **CRL** provides a more accurate estimation of gestational age because MSD values show greater variability of age prediction at this stage.

CRL measurements can be carried out transabdominally (TAS) or transvaginally (TVS). A midline sagittal section of the whole embryo or fetus should be obtained, ideally with the embryo or fetus oriented horizontally on the screen. An image should be magnified sufficiently to fill most of the width of the ultrasound screen, so that the measurement line between crown and rump is at about 90° to the ultrasound beam. (Appendix III)

The biparietal diameter (BPD) and fetal head circumference (FHC) are measured on the largest true symmetrical axial view of the fetal head, which should not be distorted by adjacent structures or transducer pressure. (Appendix III).

## **7.4 Other intra- and extra uterine structures**

### **7.4.1 Placenta**

The echostructure of the placenta should be evaluated. Clearly abnormal findings, such as masses, single or multiple cystic spaces or sub chorionic fluid collection, should be noted and followed up.

Position of the placenta in relation to the cervix is of less importance at this stage of pregnancy since most 'migrate' away from the internal cervical os. ***Placenta praevia should not be reported at this stage.***

Special attention should be given to patients with a prior Cesarean section, who may be predisposed to 'scar pregnancy' or placental-uterine invasion.

### **7.4.2 Cervix**

The length of the cervix can be assessed as well as if there is associated funneling of the internal os.

### **7.4.3 Uterus**

The presence of any uterine fibroids or other anomaly should be reported.

### **7.4.4 Ovaries/ Adnexa**

The presence of abnormal ovarian cysts, adnexal masses or suspected ectopic pregnancy should be reported.

## **7.5 Multi-Fetal Pregnancy**

The presence of multi-fetal pregnancy is reported. Determination of chorionicity and amnionicity is determined and reported as pregnancy management surveillance varies depending on these. The presence of the lambda or T-sign should be documented at this scan.

## 8.0 SECOND TRIMESTER USS

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The main objective of a second trimester fetal ultrasound scan is to provide accurate diagnostic information on the presence or absence of fetal anomalies.

It is recommended that a second-trimester ultrasound scan be performed between 18 and 22 weeks of gestation. Storage of motion video-clips are recommended for the fetal heart assessment.

Sample reporting template forms are noted in Appendix II.

### 8.1 Fetal biometry and wellbeing

- 8.1.1 The following sonographic parameters can be used to estimate gestational age and for fetal size assessment:
- biparietal diameter (BPD)
  - head circumference (HC)
  - OFD and Cephalic Index
  - abdominal circumference (AC)
  - femur length (FL)
- 8.1.2 Measurements should be performed in a standardized manner. Appendix III has reference images of the measurements, anatomical structures and planes.
- 8.1.3 If the gestational age has not already been established at a dating or first-trimester scan, it should be assessed at the mid-trimester scan. Subsequent scans should not be used to calculate a new estimated date of delivery if the age has already been established by a high quality scan earlier in the pregnancy.

### 8.2 Biparietal diameter (BPD) Anatomy and Head Circumference (HC)

- 8.2.1 The following are recommended in order to measure the BPD:
- Cross-sectional view of the fetal head at the level of the thalami
  - Ideal angle of insonation is 90° to the midline echoes
  - Symmetrical appearance of both hemispheres
  - Continuous midline echo (falx cerebri) broken in middle by the cavum septi pellucidi and thalamus
  - No cerebellum visualized
  - The plane for measurement of BPD and HC must include the cavum septum pellucidum, thalamus, choroid plexus in the atrium of the lateral ventricles
- 8.2.2 Caliper placement
- This should be standardized and maintained in every study. Both calipers should be placed from the outer edge of the proximal skull to the inner edge of the distal skull.

The HC can be measured directly by placing the ellipse around the outside of the skull bone echoes.

### 8.3 Abdominal circumference (AC)

- 8.3.1 The plane of view should fulfil the following:
- Transverse section of the fetal abdomen (as circular as possible)
  - Umbilical vein at the level of the portal sinus
  - Stomach bubble visualized
  - Kidneys should not be visible
- 8.3.2 Caliper placement

The AC is measured at the outer surface of the skin line, either directly with ellipse calipers or by manual tracing.

## 8.4 Femur length (FL)

8.4.1 The FL is imaged optimally with both ends of the ossified metaphysis clearly visible. The longest axis of the ossified diaphysis is measured

8.4.2 Caliper placement

Each caliper is placed at the ends of the ossified diaphysis without including the distal femoral epiphysis if it is visible. This measurement should exclude triangular spur artifacts that can falsely extend the diaphysis length.

## 8.5 Estimated fetal weight (EFW)

Mid-trimester sonographic measurements can be used to identify abnormalities of fetal size. This measurement is based on a computerized model which varies based on the algorithm that is used. **There is no data from local or national based models.** Caution should be employed when utilizing the information obtained.

## 8.6 Amniotic fluid assessment

Amniotic fluid volume can be estimated subjectively or using sonographic measurements. Subjective estimation is not inferior to the quantitative measurement techniques (e.g. deepest pocket, amniotic fluid index) when performed by experienced examiners. Patients with deviations from normal should have more detailed anatomical evaluation and clinical follow-up.

## 8.7 Doppler ultrasonography

Routine use of Doppler techniques is not currently recommended as part of the second-trimester ultrasound examination. There is insufficient evidence to support universal use of uterine or umbilical artery Doppler evaluation for the screening of low-risk pregnancies.

Doppler investigation should be limited to High-risk pregnancies under certain criteria (examples are listed in Appendix IV).

## 8.8 Multi-fetal gestation

The full scope of the management of multi-fetal gestation is not within the scope of this document. Evaluation of multiple pregnancies should include the following additional elements:

- Visualization of the placental cord insertion
- Distinguishing features (gender, unique markers, position in uterus)
- Determination of chorionicity is sometimes feasible in the second trimester if there are clearly two separate placental masses and discordant genders
- Chorionicity is better evaluated before 14–15 weeks (lambda sign or T-sign)
- Follow-up of multiple pregnancies should be arranged in accordance with local guidelines and clinical practices.

## 8.9 Recommended Components of Anatomical survey and Obstetric Scan

In addition to uterine, cervical and adnexal structures, the following is a list of structures that should be documented:

## Recommended minimum requirements for basic 2nd trimester fetal anatomical survey

### HEAD ▶

Intact cranium  
Cavum septi pellucidi  
Midline falx  
Thalami  
Cerebral ventricles  
Choroid plexus  
Cerebellum- transcerebellar diameter  
Cisterna magna- diameter

### FACE ▶

Both orbits present  
Median facial profile\*  
Mouth present  
Upper lip intact

### NECK ▶

Absence of masses (e.g. cystic hygroma)

### CHEST/ HEART ▶

Normal appearing shape/size of chest and lungs  
Heart activity present  
Four-chamber view of heart in normal position  
Left and Right Ventricular outflow tracts\*  
No evidence of diaphragmatic hernia

### ABDOMEN ▶

Stomach in normal position  
Bowel not dilated

Both kidneys present and normal echopattern,  
no pelvicalyceal dilatation  
Urinary bladder noted

### CORD ▶

Insertion site to fetal abdomen and into placenta  
Presence of 3 blood vessels

### SKELETON ▶

No spinal defects or masses  
(transverse and sagittal views)  
Arms and hands present -normal relationships  
Legs and feet present -normal relationships

### PLACENTA ▶

Placenta Position- if low lying measure distance  
of inferior edge to internal os  
No masses present  
Accessory lobe

### GENITALIA ▶

Male or Female\* (May be important in multifetal  
gestation and sex-inherited disorders)

**\*Optional components. Perform if technically feasible.**

## 9.0 THIRD TRIMESTER USS

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Routine third trimester USS examinations are not recommended. These should be requested if clinically indicated. Possible reasons include:

- Investigation of placental abruption or praevia
- High risk patients e.g. Zika virus exposure, and those who need serial growth scans for growth restriction or macrosomia
- Continued evaluation of anomalies detected on the 2nd Trimester scan
- Other uterine or adnexal masses
- Multiple gestation
- As clinically indicated based on direction from the Specialist Medical Officer or Registrar
- Patients presenting for the first time in pregnancy

## 10.0 SUSPECTED FETAL ANOMALIES

### 10.1 Release of reports

As far as possible, images are to be reviewed and the report approved by the Radiologist before communicating any suspected abnormal results as noted above.

### 10.2 Additional Investigations

The need for another opinion or higher level scan in the Department will be determined by the Radiologist.

The Radiologists and Obstetrician will determine on the need for any additional diagnostic imaging e.g. 3D/4D scan and Fetal MRI, based on the clinical scenario.

### 10.3 Communication

The results of an abnormal scan should be communicated in accordance with professional standards with clear communication at a level based on the patient's capability to comprehend and with only relevant persons present in a quiet environment with minimal possibility of being interrupted e.g. closed room, phone ringers and alerts off.

### 10.4 Persons involved

It is recommended that this be done at a senior level by the Obstetric team. If necessary, multidisciplinary team members may be present if allowed by the patient. These may include the neonatologists, neonatal surgeon, midwifery, counsellors and other relevant personnel. However it is best to have fewer people involved at the first meeting but the other members can be on standby by to attend.

### 10.5 Operationalization of Processes and Referral Pathways

Each RHA will develop a flow plan with the mechanism for this process to be operationalized based on their resources. The process should ensure that lines of communication are easy and that the case is managed in an expeditious manner. This may include an in utero consultation or transfer to another RHA with the appropriate resources in accordance with the MoH's Referral and Transfer Protocol. This is to be conducted at the level of the Specialist Medical Officer.

## 11.0 LENGTH OF EXAMINATION TIMES

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The time allowed for an ultrasound examination should take into account the fact that the actual transducer time is only a small component of the overall examination.

Time needs to be allowed for patient information management, room preparation, infection control measures, assessing the ultrasound request, introductions and explanations, obtaining consent and assisting the patient when necessary on to and off the examination couch.

Postprocedure time is required to discuss the findings with the patient, write the report, archive the images and attend to the after-care of the patient, including making arrangements for further appointments and/or further investigations.

Equipment will also need cleaning and disinfecting as required post examination. An ultrasound practitioner has a professional responsibility to ensure that the time allocated for an examination is sufficient to enable it to be carried out competently. It is critical to patient management that no ultrasound examination is compromised by arbitrarily set departmental and or government targets.

The allocated appointment time will vary depending on their type and complexity. It may also be influenced by the expertise of the ultrasound practitioner and training commitments within the department. In addition, the duration of the examination will be further influenced by the scan findings and/or the physical condition of the patient e.g. obesity.

In 2015, the British Medical Ultrasound Society repeated the previous UK recommendations of an allocation of 30 minutes for the procedure of an obstetric ultrasound anomaly scan for a singleton pregnancy, and 45 minutes for a multiple pregnancy. Decisions on appointment times for patients are to be locally determined based on the available resources.

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## 13.0 APPENDICES

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### *APPENDIX I*

#### **Summary of standards for USS equipment**

(More details can be obtained from the references in the bibliography)

Scanners can be supplied with a number of transducers which differ in their mode of action, their "footprint" and the shape of their field of view e.g. linear arrays, curvilinear arrays and phased arrays. Each scanner can be subdivided in terms of frequency range.

Scanners also have been specially developed for endoscopic use, transvaginal, transoesophageal and transrectal use.

The choice of scanner should match the type and nature of the workload e.g. a larger mainframe unit is required for hospital-setting for heavy use, and a smaller portable unit for mobile use in the field or home. However with advancing technology smaller units do not necessarily compromise quality.

#### **Essential general recommended functions include:**

- Brightness mode (B-mode)
- Adjustment for frequency range
- Two transducer-connections
- Multiple and adjustable focal zones
- Scanning pre-sets
- Clinical software applications
- Local digital image archiving and picture printing
- PACS/DICOM compatibility
- MHRA/FDA compliant machine
- Magnification both using read and write zoom
- Patient ID and data entry
- Gain and Time compensation (TGC)
- Colour and Power Doppler
- Linear, curved, areas and volume measurements
- Cine-loop
- Adjustable power output with lowest as default preferably
- Safety indices displayed
- CE marking compliance

#### **Obstetrics and Gynaecology essential**

- Resolution- axial <0.5 mm at all depths, <2 mm in focal zones, slice thickness <8mm at all depths
- Multiple image display
- Colour Doppler
- Multimode display
- 3D/4D optional
- Random image review
- Spectral Doppler
- Calculation of waveform indices
- Adequate penetration of at least 15 cm of normal tissue
- Good image quality photographs

#### **Risk reduction and Quality Assurance**

- Acoustic standards e.g. FDA , IEC standards
- Infection Control e.g. cleaning according to manufactures instructions, use of approved probe covers

- Electrical conformation to standards
- Mechanical safety e.g. CE mark
- User safety e.g. avoid physical strain, ergonomics
- Support including CME, Training updates, Repair and Maintenance, Machine specific functions
- Replacement of equipment e.g. life-span service expectations of machine, policies for replacement, deterioration in performance
- Scanning environment e.g. couch and operator seating, display monitor quality, room temperature and lighting, electrical and IT
- Registration e.g. Evidence of annual registration
- Justification of USS examination
- A range of images should be digitally saved
- Contrast e.g. the use of contrast is used in certain ultrasound scans and the small risk of anaphylactoid reaction is noted

### **Ultrasound report style**

- Concise
- Easy to understand
- Non-ambiguous
- Omitting irrelevant statements and measurements
- Avoid technical terms e.g. echogenicity, acoustic shadowing
- Explain significance of terms and measurements
- Avoid unknown abbreviations
- Use of appropriate templates for completely normal reports

### **Audit and Quality Improvement**

It is recommended that the operator/department participate in the local, regional and international applicable improvement programs and standards. A program of audit should be in place for the department e.g. weekly, monthly reviews and formal audit by a team.

### ***APPENDIX III***

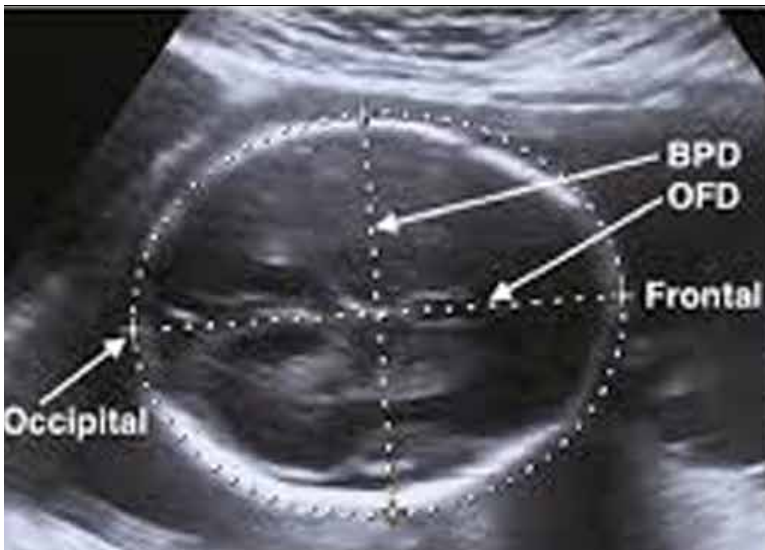




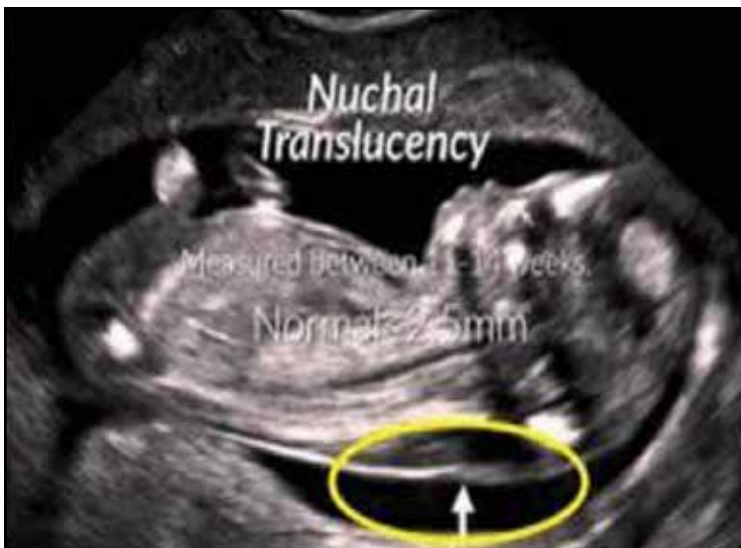




*BPD Biparietal Diameter*



*Standard fetal biometry at 22-24 weeks*



*USS measurement of the nuchal translucency thickness (NT)*

## *APPENDIX IV*

### **Doppler ultrasound in the Small-for- Gestational –Age Fetus**

The full clinical use of Doppler USS is not within the scope of this guideline. Local guidelines and policies should be referred to.

The Royal College of Obstetricians and Gynaecologists Green Top Guideline No. 31 (The Investigation and Management of the Small-For-Gestational-Age Fetus February 2013, updated January 2014) has the following summarized recommendations on Doppler ultrasound:

- All women should be assessed at booking for risk factors for a SGA fetus/neonate to identify those who require increased surveillance
- Women who have a major risk factor (Odds Ratio [OR] > 2.0) should be referred for serial ultrasound measurement of fetal size and assessment of wellbeing with umbilical artery Doppler from 26–28 weeks of pregnancy
- Women who have three or more minor risk factors should be referred for uterine artery Doppler at 20–24 weeks of gestation
- In high risk populations uterine artery Doppler at 20–24 weeks of pregnancy has a moderate predictive value for a severely SGA neonate
- In women with an abnormal uterine artery Doppler at 20–24 weeks of pregnancy, subsequent normalization of flow velocity indices is still associated with an increased risk of a SGA neonate. Repeating uterine artery Doppler is therefore of limited value.
- Women with an abnormal uterine artery Doppler at 20–24 weeks (defined as a pulsatility index [PI] > 95th centile) and/or notching should be referred for serial ultrasound measurement of fetal size and assessment of wellbeing with umbilical artery Doppler commencing at 26–28 weeks of pregnancy.
- Uterine artery Doppler has limited accuracy to predict adverse outcome in SGA fetuses diagnosed during the third trimester.
- In a high-risk population, the use of umbilical artery Doppler has been shown to reduce perinatal morbidity and mortality. Umbilical artery Doppler should be the primary surveillance tool in the SGA fetus. When umbilical artery Doppler flow indices are normal it is reasonable to repeat surveillance every 14 days. More frequent Doppler surveillance may be appropriate in a severely SGA fetus.
- When umbilical artery Doppler flow indices are abnormal (pulsatility or resistance index > +2 SDs above mean for gestational age) and delivery is not indicated repeat surveillance twice weekly in fetuses with end diastolic velocities present and daily in fetuses with absent/reversed end–diastolic frequencies
- In the preterm SGA fetus, middle cerebral artery (MCA) Doppler has limited accuracy to predict acidaemia and adverse outcome and should not be used to time delivery.
- In the term SGA fetus with normal umbilical artery Doppler, an abnormal middle cerebral artery Doppler (PI < 5th centile) has moderate predictive value for acidosis at birth and should be used to time delivery
- Ductus venosus Doppler has moderate predictive value for acidaemia and adverse outcome. Ductus venosus Doppler should be used for surveillance in the preterm SGA fetus with abnormal umbilical artery Doppler and used to time delivery



