

Guidelines for Performance of Second & Third Trimester Ultrasound Examination

Jaideep Malhotra.
84, M. G. Road, Agra.

Introduction

The Obstetrician Gynecologist is entitled to perform ultrasound.

Second and third trimesters of pregnancy are the vital periods for growth. Where routine scanning is advocated it is usually done in the second trimester for an accurate analysis of growth, placenta, liquor, congenital anomalies and color flow of uterine artery for prediction of P.P.I.H. It is very vital for the sonographer/sonologist to systematically scan and document second & third trimester scans as per guidelines suggested. Abdominal ultrasound complemented by vaginal ultrasound is the ideal approach.

1. Fetal life, number, presentation, and activity should be documented.

Comment:

1. Abnormal heart rate and/or rhythm should be reported.
2. Multiple pregnancies require the documentation of additional information: number of gestation sacs, number of placentas, presence or absence of a dividing membrane, fetal genitalia (if visible), comparison of fetal sizes, and comparison of amniotic fluid volume on each side of the membrane.

- II. An estimate of amniotic fluid volume (increased, decreased, normal) should be reported.

Comment: Physiologic variation with stage of pregnancy should be considered in assessing the appropriateness of amniotic fluid volume.

- III. The placental location, appearance, and its relationship to the internal cervical os should be recorded. The umbilical cord should be imaged.

Comment:

1. It is recognized that apparent placental position early in pregnancy may not correlate well with its location at the time of delivery
 2. An overdistended maternal urinary bladder or a lower uterine contraction can give the examiner a false impression of placenta previa.
 3. Abdominal, transperineal, or vaginal views may be helpful in visualizing the internal cervical os and its relationship to the placenta.
- IV. Assessment of gestational age should be accomplished at the time of the initial scan using a combination of cranial measurement such as the biparietal diameter or head circumference, and limb measurement such as the femur length.

Comment :

1. Third trimester measurements may not accurately reflect gestational age. If one or more previous studies have been performed, the gestational age at the time of the current examination should be based on the earliest examination that permits accurate measurement of crownrump length, biparietal diameter, head circumference, and/or femur length by the equation: current fetal age = estimated age at time of initial study + number of weeks elapsed since first study.
2. Measurements of structurally abnormal fetal body parts (such as the head in a fetus with hydrocephalus or the limbs in a fetus with a skeletal dysplasia) should not be used in the calculation of estimated gestational age. The standard reference level for measurement of the biparietal diameter is an axial image that includes the thalamus.

Comment: If the fetal head is dolichocephalic or brachycephalic, the biparietal diameter measurement may be misleading. Occasionally, computation of the cephalic index, a ratio of the biparietal diameter to fronto-occipital diameter, will be needed to make this determination. In such situations, other measurements of head size, such as the head circumference, may be necessary.

Head circumference is measured at the same level as the biparietal diameter, around the outer perimeter of the calvarium.

Femur length should be routinely measured and recorded after the 14th week of gestation.

Comment: As with head measurements, there is considerable biological variation in normal femur lengths late in pregnancy.

- V. Fetal weight should be estimated in the late second and in the third trimesters and requires the measurements of abdominal diameter or circumference.

Abdominal circumference should be determined on a true transverse view, preferably at the level of the junction of the left and right portal veins.

Comment: Abdominal circumference measurement is necessary to estimate fetal weight and may allow detection of growth retardation and macrosomia.

If previous fetal biometric studies have been performed, an estimate of the appropriateness of interval growth should be given. (Graphically)

- VI. Evaluation of the uterus (including the cervix) and adnexal structures should be performed.

Comment: This will allow recognition of incidental findings of potential clinical significance. The presence, location, and size of myomas and adnexal masses should be recorded. It is frequently not possible to image the maternal ovaries during the second and third trimesters. Vaginal or transperineal

scanning may be helpful in evaluating the cervix when the fetal head prevents visualization of the cervix by transabdominal scanning.

- VII. The study should include, but not necessarily be limited to, assessment of the following fetal anatomy: cerebral ventricles, posterior fossa (including cerebellar hemispheres and cisterna magna), four-chamber view of the heart (including its position within the thorax), spine, stomach, kidneys, urinary bladder, fetal umbilical cord insertion site and intactness of the anterior abdominal wall. While not considered part of the minimum required examination, when fetal position permits, it is desirable to examine other areas of the anatomy.

Comment:

1. It is recognized that not all malformations of the above-mentioned organ systems can be detected using ultrasonography.
2. These recommendations should be considered minimum guidelines for the fetal anatomic survey. Occasionally some of these structures will not be well visualized, as occurs when fetal position, low amniotic fluid volume, or maternal body habitus limit the sonographic examinations. When this occurs, the report of the ultrasound examination should include a notation delineating structures that were not well seen.
3. Suspected abnormalities may require a targeted evaluation of the area(s) of concern.

Fetal Complete, Routine Study (Second and Third Trimesters)

Head

1. Transaxial fetal head at level of thalamus and midbrain. Measure BPD.
2. Repeat scan in same plane as Image #1. Measure biparietal and fronto-occipital diameters.
3. Transaxial fetal head at level of lateral ventricles, demonstrating atria.

4. Same as Image #3, with measurement of width of one of the atria.
5. Transaxial fetal head demonstrating posterior fossa, including cerebellum and cisterna magna.
6. Same as Image #5, with measurement of the diameter of the cisterna magna and the width of the cerebellum.
2. Document largest pocket of fluid in right upper quadrant of the uterus.
3. Document largest pocket of fluid in right lower quadrant of the uterus.
4. Document largest pocket of fluid in left lower quadrant of the uterus.

Body

1. Transaxial abdomen, at the level just below the heart, demonstrating the umbilical portion of the left portal vein to confirm a true transaxial plane.
2. Same as Image #1: Measure two abdominal diameters perpendicular to each other, from skin surface to skin surface.
3. Transaxial view of the lower thorax, demonstrating a 4-chamber view of the fetal heart. Label on the image the right or left side of the fetus so that situs can be determined.
4. Repeat Image #3, demonstrating the fetal stomach.
5. Transaxial mid abdomen to demonstrate both kidneys.
6. Repeat Image #5 at a slightly different level.
5. Body of placenta close to or at the umbilical cord insertion.
6. Long axis of lower uterine segment through internal os and endocervical canal to rule out placenta previa.

Fetal Complete, High Risk Pregnancy (Second and Third Trimesters)

Head

1. Transaxial fetal head at level of thalamus and midbrain, Measure BPD.
2. Repeat scan in same plane as Image #1. Measure biparietal and fronto-occipital diameters. Determine head circumference (see note below).
3. Transaxial fetal head at level of lateral ventricles, demonstrating atria. Measure width of atria.
4. Transaxial fetal head demonstrating posterior fossa, including cerebellum, cisterna magna. When possible, also measure nuchal skin thickness (for gestational age <22 weeks).
5. Same as Image #5, with measurement of the diameter of the cisterna magna, width of the cerebellum, and measurement of nuchal skin thickness (only in second trimester).
6. Sagittal view of occipital region of skull.

Body and Femur

1. Transaxial midabdomen demonstrating cord insertion.
2. Transverse of umbilical cord to demonstrate number of vessels.
3. Transaxial or sagittal fetal pelvis to demonstrate urinary bladder.
4. Long axis of femur.
5. Long axis of femur with measurement of femur length.
6. The other femur (When possible)

Spine

1. Transverse cervical spine.
2. Transverse thoracic spine.
3. Transverse lumbosacral spine.
4. Sagittal cervical spine
5. Sagittal thoracic spine.
6. Sagittal lumbosacral spine.

Placenta and Amniotic Fluid

1. Document largest pocket of fluid in left upper quadrant of the uterus.
3. Transaxial view of the lower thorax, demonstrating a 4-chamber view of the fetal heart. Label on the image

the right or left side of the fetus so that situs can be determined.

4. Transaxial view of the abdomen, demonstrating the fetal stomach.
5. Transaxial midabdomen to demonstrate both kidneys, at level of renal pelvis.
6. If only one kidney could be demonstrated on Image #5, use this image to demonstrate the other kidney, at the level of the renal pelvis.

Body and Femur

1. Transaxial midabdomen demonstrating cord insertion
2. Transverse of umbilical cord to demonstrate number of vessels.
3. Transaxial or sagittal fetal pelvis to demonstrate urinary bladder.
4. Long axis of femur.
5. Long axis of femur with measurement of femur length.
6. The other femur (when possible) with measurement of femur length

Spine

1. Transverse cervical spine.
2. Transverse thoracic spine.
3. Transverse lumbosacral spine.
4. Sagittal or coronal cervical spine
5. Sagittal or coronal thoracic spine
6. Sagittal or coronal lumbosacral spine.

Placenta and Amniotic Fluid

1. Document largest pocket of fluid in left upper quadrant of the uterus.
2. Document largest pocket of fluid in right upper quadrant of the uterus.
3. Document largest pocket of fluid in right lower quadrant of the uterus.
4. Document largest pocket of fluid in left lower quadrant of the uterus.
5. Central placenta with the scan plane perpendicular to the fetal/chorionic surface of the placenta, close to or at the umbilical cord insertion.
6. Long axis of lower uterine segment through internal os and endocervical canal to rule out placenta previa.

Cardiac Evaluation

In addition to the four chamber view of the fetal heart already specified under the Body section, the following images should be obtained, if possible, in mid-second-trimester fetuses.

1. Left ventricular outflow tract, demonstrating left ventricle, aortic root and ascending aorta.
2. Right ventricular outflow tract demonstrating right ventricle, pulmonic infundibulum and main pulmonary artery.
3. M-mode documentation of fetal heart motion and heart rate. The M-mode tracing should be obtained through a ventricle.

Facial Structures

1. Coronal or transaxial view of the orbits.
2. Coronal view of the face to include the lips.
3. Transaxial view of the upper lip and hard palate.
4. Transaxial view of the mandible.
5. Sagittal midline view of the face from the forehead through the maxilla.

Upper Extremity, Hands, Feet and Fetal

1. Long axis of a radius, with measurement (when indicated)
2. Long axis of the contralateral radius, with measurement (when indicated).
3. Long axis of the humerus, with measurement (when indicated)
4. Long axis of the contralateral humerus, with measurement (when indicated)
5. Sagittal of a foot, including ankle.
6. Sagittal of the other foot, when possible.
(continuation of "upper extremity/hands/feet/fetal gender")
 1. Image of an open hand
 2. Image of the other hand, when possible
 3. Perineum to demonstrate the external genitalia.

Intrauterine Fetal Heart

Includes a survey of cardiac situs, chamber and valve relationship and great vessel relationships. Doppler is

not routinely used unless an abnormality is suspected or detected during the study. Color doppler may be useful for assessing abnormalities more completely or where further evaluation is warranted. This study is not routinely performed before 18 weeks, gestational age.

1. Apical or long-axis four-chamber view demonstrating both atria and ventricles.
2. Transverse oblique view of great vessels (aorta and pulmonary artery) and their relationship to each other.
3. Transverse view of main pulmonary artery, right pulmonary artery and ductus arteriosus entering the aorta.
4. Transverse view of the aortic arch.
5. Sagittal view of the inferior vena cava and superior vena cava entering the right atrium.
6. Sagittal oblique view of the aortic arch leaving the left ventricle with neck vessel branches.
7. Sagittal oblique view of the pulmonary artery with the ductus arteriosus entering the descending aorta including descending thoracic aorta.
8. Sagittal view of the left ventricle, left atrium, mitral valve and left ventricular outflow tract demonstrating continuity of the interventricular septum with the anterior aortic root wall.
9. Transverse view of the atria showing the foramen ovale with the foramen ovale flap in the left atrium.
10. Transverse view of the left atrium showing the entrance of at least two pulmonary veins into the left atrium
11. M-mode documentation of fetal heart motion and heart rate. The M-mode tracing should be obtained through a ventricle.

Conclusion

Each protocol is a set of minimum specification for a scan and each is based on a normal patient with no findings. It is the responsibility of the person performing the ultrasound scan to extend the basic protocol as needed to document all pathology detected. The protocols and guidelines are not rigid in sequencing of images. These are arbitrarily written for 6 images on a 8/10 film-other forms of archiving like printer, video & formats may be used by individuals. If followed in sequence it will prevent omission and contribute to efficiency during reading but it is not essential that images appear in the exact sequence specially in fetal studies, where we take what we get at a given moment. These protocols and guidelines aim as providing a checklist and standardised approach to documenting & study and may not be a consensus of all physicians as the final responsibility of a scan report lies with the sonographer or sonologist doing & reporting the scan.

Acknowledgements

Thanks to American College of Radiology, American Institute of ultrasound in Medicine, International Society of ultrasound in obstetrics & Gynaecology and Thomas Jefferson Institute for letting us use and follow their protocols. Thanks to FOGSI for coming out with a book on guidelines and protocols. Thanks to Dr. Amit Gupta for all his help in scanning and documenting.