GUNDERSEN HEALTH SYSTEM ULTRASOUND DEPARTMENT POLICY AND PROCEDURE MANUAL

SUBJECT: Obstetric Ultrasound Exams
SECTION: OB Ultrasound
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Scheduling: One every 80 minutes for singleton pregnancies for the second trimester screening (OB Complete) anatomy survey. Patients pregnant with multiples are allowed extra time for each fetus.

Prep: Full urinary bladder for second trimester screening ultrasound exams on patients that are 20 weeks gestation or less. If a vaginal ultrasound is performed the patient is asked to empty her bladder.

Equipment: Real-time ultrasound unit with 3.5 to 5.0 MHz abdominal ultrasound transducers. It may be necessary to have a unit with a 2.5 MHz transducer. If a vaginal sonogram is performed a 5 to 7.5 MHz vaginal ultrasound transducer is used.

Exam Protocol: Fetal ultrasound should only be performed when ordered by medical staff (physician, midwife, physician's assistant, or nurse practitioner). The lowest possible exposure settings and Doppler settings (when necessary) should be used to obtain the diagnostic information needed. To confirm fetal life with real-time ultrasound, fetal cardiac activity and/or fetal movement need to be observed.

First Trimester: First trimester OB sonograms are performed transvaginally in most cases due to better visualization and can be performed up to 13w6d when the CRL is the method used to determine fetal age. Later in the first trimester (12+ weeks) a full bladder transabdominal approach may be used, for example, when performing first trimester screening or late first trimester dating. Evaluate the uterus and adnexa for a gestational sac and its location if seen. If an embryo is seen the crown-rump length (CRL) is measured. Report whether or not cardiac activity is seen. Cardiac activity can be documented via cineclip or M-mode. Pulsed Doppler is **NOT** recommended in the first trimester. Evaluate the uterus, adnexa, and cul-de-sac. CRL is measured in fetuses up to 13w6d. Beginning at 14 weeks fetal biometry measurements should be performed (BPD, HC, AC, FL, and HL).

Second and Third Trimester: Evaluate fetal life, presentation, activity, and fetal number. Evaluate the amniotic fluid volume as decreased, normal, or increased (an amniotic fluid

index is performed whenever there is a question of decreased or increased amniotic fluid volume). Evaluate the placenta for location and relationship to the cervix, as well as the placental cord insertion and any structural abnormalities. To assess gestational age the following measurements are performed: BPD (biparietal diameter) – measured at the level of the thalamus; HC (head circumference) – measured at the same level as the BPD, around the outer edge of the calvarium; FL (femur length); HL (humerus length); AC (abdominal circumference) – measured transversely at the level of the stomach and of the junction of the right and left portal veins; EFW (estimated fetal weight) and interval fetal growth parameters can be calculated using the previously mentioned fetal biometric measurements. The uterus, adnexae, and cervical length are evaluated. The second trimester screening ultrasound exam evaluates, but is not limited to, the following fetal anatomy: intracranial anatomy to include the cerebral ventricles, choroid plexus, midline falx, and cavum septi pellucidi; the posterior fossa (cerebellum and cisterna magna); upper lip; 4-chamber view of the heart and the position of the heart within the chest, images of the outflow tracts of the heart; spine; stomach; diaphragm, gallbladder, kidneys; urinary bladder; umbilical cord vessel number and fetal cord insertion site; the anterior fetal abdominal wall (umbilicus); fetal limbs (images of all long bones of the extremities and both hands and feet); and nuchal fold. Other areas of fetal anatomy may be evaluated as necessary and/or as fetal position permits.

Imaging Protocol: A second trimester screening ultrasound exam is ideally performed at approximately 20 weeks gestation and should not be scheduled before 18 weeks. The following images represent the second trimester screening ultrasound exam. Fetal position and situs should be the first two images of the exam. The rest of the images do not need to be performed in any specific order. Additional images may be necessary for proper documentation.

1. Fetal position
2. Fetal situs: transverse dual image of fetal heart and fetal stomach
3. Fetal heart rate using M-mode, **NOT** pulsed Doppler
4. Longitudinal cervix with the length measured
5. Lower edge of the placenta and its relationship to the internal cervical os
6. Longitudinal placenta
7. Transverse placenta
8. Placental cord insertion site
9. Bilateral adnexae – if seen measure each ovary
10. BPD
11. HC
12. AC
13. FL
14. HL
15. Nuchal fold (15w 0d – 21w 6d)
16. Width of cerebral lateral ventricular atrium
17. Choroid plexus
18. Transverse cerebellar diameter
19. Cisterna magna

20. Midline falx
21. Cavum septum pellucidum
22. Upper lip
23. Nasal bone length
24. Presence of arms and legs
25. Presence of hands and feet
26. Stomach
27. Gallbladder
28. Urinary bladder
29. Diaphragm
30. Four chamber heart **(Enlarged image: Zoom up the image *before* freezing it to better demonstrate the cardiac anatomy).**
31. RT and LT cardiac outflow tracts, with and without Color Doppler (cineclips are helpful if they can be obtained. **Enlarged image: Zoom up the images *before* freezing them to better demonstrate the cardiac anatomy).**
32. 3VV (3-vessel view)
33. 3VTV (3-vessel trachea view) **IF FEASIBLE**
34. Color Doppler image and/or cineclip of the heart with demonstration of the interventricular septum. **Enlarged image: Zoom up the images *before* freezing them to better demonstrate the cardiac anatomy).**
35. Umbilical cord vessel number
    a. transverse color or power Doppler image of umbilical arteries adjacent to bladder
    b. image of a section of the umbilical cord within the amniotic demonstrating coiling or non-coiling of the umbilical cord vessels
36. Transverse image of fetal cord insertion (umbilicus)
37. Kidneys **(Enlarged image: Zoom up the image of the kidneys *before* freezing it to better demonstrate the renal anatomy).**
38. Fetal renal arteries: preferably longitudinal image along the fetus' that demonstrates the renal arteries branching from the aorta; if not possible then transverse image of renal arteries branching from aorta is acceptable
39. Spine: cervical, thoracic, lumbar, and sacral – longitudinal image(s) that also demonstrate the skin overlying the fetal spine
40. Transverse cineclip of fetal spine; if cine not possible then transverse images of C through L spine
41. Vertical measurement of largest pocket of amniotic fluid

<u>Images Needed When Performing a Growth Sonogram (if possible)</u>

Measurements of the BPD, HC, AC, FL **and HL** should be performed

1. Kidneys
2. Bladder
3. Stomach
4. Diaphragm
5. Four chamber heart: LVOT, RVOT, FHR using M-mode
6. Diameter of lateral ventricle
7. Cerebellum/cerebellar lobes

8. Cisterna magna
9. Spine: sagittal proximal/distal **OR** transverse C, T, L, S
10. Number of limbs
11. Placental location in relation to internal cervical os
12. **All** third trimester scans should include an AFI
13. Please include the previous biometry measurements on the graphs
14. If EFW < 10th% or AC < 5th% please obtain umbilical artery Dopplers

Guidelines for the Performance of MCA Doppler

The proximal middle cerebral artery is enlarged to occupy more than 50% of the image and is sampled 2 mm after its origin from the internal carotid artery. The angle of the ultrasound beam and the direction of blood flow should be zero degrees (per Dr. Berdahl an angle of insonation up to 15 degrees is ok). The risk of anemia is highest in fetuses with a pre-transfusion peak systolic velocity of 1.5 times the median or higher: http://perinatology.com/calculators/MCA.htm

Guidelines for Performing Umbilical Artery Doppler (if not specifically ordered)

•Perform US Fetal Biophysical Profile without stress (BPP) and US OB Fetal Umbilical Artery Doppler if a singleton or multiple fetuses at 24 0/7 weeks gestation and beyond is found to have:

1. Intrauterine Growth Restriction (IUGR) as defined by an estimated fetal weight (EFW) less than 10th percentile for gestational age by Hadlock's criteria listed in reference, whether symmetric or asymmetric IUGR
2. Abnormal abdominal circumference (AC) less than or equal to the 5th percentile"

Doppler Guidelines from Drs. Berdahl and Merkitch

IUGR: Umbilical artery Doppler – use S/D ratio and PI
MCA – use PSV and PI (calculate MoM from Perinatology.com (website above)

Alloimmunization/Anemia/Twins: MCA – use PSV and PI (calculate the MoM from Perinatology.com (see above)

References:

1) Alfirevic Z, Neilson JP. Doppler Ultrasonography in High-Risk Pregnancies: Systematic Review with Meta-Analysis, Am. J Obstet Gynecol 1995; 172:1379-87
2) Galan HL, Pandipati S, Filly RA. Chapter 7 - Ultrasound Evaluation of Fetal Biometry and Normal and Abnormal Fetal Growth; In Ultrasonography in Obstetrics and Gynecology, 5th Edition, editor Callen PW, Saunders Elsevier, Philadelphia PA, 2008