OB ULTRASOUND: KEY ROLE IN SCREENING AND EVALUATION

Required Images for AIUM/ACOG

Presented by:
Stephanie Moore, RDMS
Minnesota Perinatal Physicians
Perinatal Sonographer

(ppt developed by Jane Burns, RDMS)

DISCLOSURE

I have no relevant financial relationships to disclose

OBJECTIVES

- List current AIUM/ACOG guidelines required for documentation of a complete (cpt code-76805) and limited (cpt code-76815) ultrasound scan
- Outline what images are required for maternal survey
- List biometry required for gestational age assessment
- Describe images required for fetal anatomy survey

Where to find information

- Best resource:
  - www.aium.org 800-638-5352
  - On right side of homepage
    - Practice parameters
    - Training guidelines
    - Official statements
    - Special communications
  - Methods for Estimating due date (May 2017)

www.aium.org

Practice Parameters
AIUM Guidelines (2018)

- Practice Guidelines for the Performance of Obstetric Ultrasound Examinations
  - Guidelines developed in conjunction with the American College of Radiology (ACR), the American College of Obstetricians and Gynecologists (ACOG) and the Society of Radiologists in Ultrasound (SRU)
  - Previous guidelines were updated and/or reapproved in 2013

(These represent the MINIMAL elements required for standard examination)

What are the New additions and/or changes

- Practice parameters for Performance of Limited Obstetric Ultrasound Examinations by Advanced Clinical Providers
  - Women’s health nurse practitioners (WHNPs)
  - Physician Assistants in OB/GYN (PAOGs)
  - Certified nurse-midwives (CNMs)
  - Certified midwives (CMs)
  - Performing and interpreting limited OB u/s within their Scope Of Practice (SOP)

More 2018 Updates

- Page 5: when assessing oligohydramnios
  - Deepest vertical pocket (DVP) is preferred
  - Less than 2 x 1 cm pocket (vertical x horizontal)
  - Multiples: additional views required (reapproved)
  - Chorionicity, amnionicity, size and am. Fluid comparison, genita
  - Placenta:
    - Cord insertion site documented (recommended – if technically possible)
More 2018 Updates

- Page 7: Fetal chest/heart
- Add three vessel view (3VV)
- Add three vessel trachea view (3VT)
- recommended – if technically feasible

AIUM Guidelines

- Must document
  - Maternal anatomy
  - Uterus
  - Cervix
  - Adnexa
  - Fetal anatomic survey – after 18w0d
  - Permanent record – images labeled
  - Patient ID, facility ID, date, anatomic right and left
  - Final report – official interpretation with ultrasound findings

AIUM Guidelines (www.aium.org)

- Must document
  - Fetal cardiac activity
  - Fetal number
  - Fetal presentation
  - Amniotic fluid assessment
  - Placenta
    - Location
    - Relationship to internal cervical os
    - Appearance
  - Gestational age assessment
  - Biometry

1st- Confirm Fetal Viability

- For cardiac activity documentation, use m-mode vs Doppler
- Lower ultrasonic exposure settings following the ALARA principle
  - As Low As Reasonably Achievable

M-MODE

- Time-motion mode
- Linear cursor
  - Positioned on 2-dimensional image
  - Produces a tracing of the information under the cursor
  - Displayed over time

Fetal Presentation

This is the second MOST important step
EVERYTHING ELSE relies on correct orientation/recognition

Label as:
- Cephalic
- Breech
- Frank – but is presenting part
- Flexing
- Transverse lie
- Oblique
- Variable
Fetal Biometry

**Gestational age assessment**
- BPD – Biparietal Diameter
- HC – Head Circumference
- FL – Femur Length (diaphysis)
- AC – Abdominal Circumference

Fetal Anatomic Survey

**Head/ Face/ Neck**
- Lateral cerebral ventricles
- Choroid plexus (CP)
- Midline Falc
- Cavum septi pellucidi (CSP)
- Cerebrum/cerebellum
- Cisterna magna (CM)
- Upper Lip
- Nuchal Fold (16w0d to 20w6d)

**Fetal Anatomic Survey**

**Abdomen**
- Stomach... on fetal left
- Kidneys... identify number and position
- Bladder... change in size during exam
- Umbilical cord insertion site into the fetal abdomen... umbilical arteries wrap around bladder
- Umbilical cord vessel number... two vs three

**Spine:**
- Cervical
- Thoracic
- Lumbar
- Sacral

*Evaluate in 3 planes*
- Sagittal/ transverse/coronal

**Chest:**
- Heart: m-mode or clip
  - 4-chamber view
  - Left ventricular outflow tract (LVOT)
  - Right ventricular outflow tract (RVOT)

**Extremities:**
- Both arms
- Both legs

**Fetal Gender:**
- multiple gestations
- anatomic defects

**Fetal Anatomic Survey**

- **Fetal Anatomic Survey**

- **Fetal Anatomic Survey**
Estimate of Amniotic Fluid Volume

- Qualitative (subjective)
- Semi-Quantitative (measure fluid)
  - Deepest Vertical Pocket (DVP) (best assessment for oligohydramnios)
  - Amniotic Fluid Index (AFI)

Semi-quantitative

- Measure deepest vertical pocket (DVP)
  - Also called maximum vertical pocket (MVP)
  - Or angle deepest pocket (ADP)
- Greatest vertical dimension of free fluid with transducer perpendicular to the floor
- Oligohydramnios < 2x1 cm pocket
- Polyhydramnios > 8 cm pocket

Semi-quantitative

- Developed in 1987...Phelan, Moore, Cayle
- AFI...amniotic fluid index
- Divide gravid uterus into four quadrants
- Measure DVP in each quadrant and add together
- Charts available for normal ranges
- Range varies with gestational age
- Oligohydramnios < 5 cm
- Polyhydramnios > 24 cm
- Numbers are an estimate: vary

Amniotic Fluid

- Fetal urination begins first trimester
- By 16 wk: 70-80% from fetal kidneys
- 18 weeks: 7-14 cc per day
- Term fetus voids 600-1200 cc per day
- Urine production slightly exceeds swallowed volume

Placenta

- Document the position of the placenta and its relationship to the internal cervical os
- Evaluate in both scan planes
- The appearance of the placenta should be appropriate for the gestational age
- Cord insertion into the placenta should be documented when technically feasible

Placental Location

Placenta attachment to uterine wall
- Anterior
- Posterior
- Fundal
- Left lateral
- Right lateral
- Previa

Variants – Succenturiate lobe
Placental thickness increases with gestational age to about 4 cm. Placentomegaly is a nonspecific diagnosis and can be seen with fetal and maternal disorders. Greater than 5 cm is abnormal.

Exclude myometrium from the placental measurement.

Evaluate Relationship of Placenta to Cervix

Assess for previa.

Measure distance of inferior placental margin from internal cervical os:
- in sagittal plane
- Assess umbilical cord insertion site
  - if technically feasible

About that cervical length...

DO NOT MEASURE CERVICAL LENGTH WITH A FULL BLADDER

- A full bladder compresses the cervix which elongates it.
- A full bladder hides funneling of the internal cervical os.
- A full bladder distorts the location of the placental margin.
- A full bladder may irritate the uterus causing focal myometrial contractions (FMC).

Most accurate cervical length is by transvaginal scan (TVS).

Cervix length:

Normal = ≥ 2.5 to 3.0 cm

Do not include the vaginal fornix in the cervical measurement.
Placental Cord Insertion

- Normal
- Or
- Central

Variants of Placental Cord Insertion

Placenta Previa

- Part of placenta covers internal os
- Greater chance of bleeding
- Said to "move" or "migrate"....actually trophotropism
- Where there is good blood supply, chorionic villi will continue to grow
- If poor blood supply/nutrition, chorionic villi will atrophy/regress

Previa - False Positives

- Overfilling of the bladder
- Uterine contraction (dx)
- Mimics previa
- Fibroid low in the uterus

Cervical Evaluation

- IF cervix appears shortened or cannot determine placental relationship to cervix by transabdominal scan
- Assess transvaginal or transperineal
- IF SUSPECTED premature rupture or membranes (PPROM)....do NOT do transvaginal scan
- Watch over time
- Fundal pressure to ck for dynamic cervix

Transperineal Scan
BIOMETRY

Fetal Head
- (a) Ventricular view
- (b) Thalamic view
- (c) Cerebellar view

BPD: biparietal diameter and head circumference
Transthalamic plane

Normal head shape is **oval**: Round shape may be marker for aneuploidy

BPD: Transthalamic Plane
- anterior
- posterior

Cavum septum pellucidum
Thalamus

Taken from outer edge of proximal skull to inner edge of the distal skull

Biparietal Diameter

BPD
- Measured at level of the thalami and cavum septi pellucidi (CSP)
- Cerebellar hemispheres should not be visible

Be Careful

http://files.aium.org/guidelines/obstetric/imageResources.pdf
**Head Circumference**

- Measured at the same level as the BPD calipers placed around the outer perimeter of the skull.

**Abdominal Circumference**

- AC: trace around skin line.
- True transverse abdominal view.
- Umbilical vein junction: portal sinus.
- Stomach.

**REMEMBER**

- There are 2 hypoechoic structures in the fetal abdomen: Stomach and Gallbladder.
- Check situs: correct right and left orientation.
- Stomach more dynamic.
- Should see it fill and empty at least once during time of scan.

**Femur Length**

- Femoral diaphysis length – reliable after 14 wk gestational age.
- Ultrasound beam perpendicular to femur shaft.
- Exclude femoral epiphyses.
- Should have posterior shadowing.

**What is the Diaphysis?**

- Shaft of long bone - between the epiphyses.
- Portion of long bone formed by primary center of ossification.

**Estimated Fetal Weight: EFW**

- Currently, even the best fetal weight prediction methods can yield errors as high as ±15%.
- This variability can be influenced by factors such as the nature of the patient population, the number and types of anatomic parameters being measured, technical factors that affect the resolution of ultrasound images, and the weight range being studied.
- If IUGR is demonstrated, Doppler evaluation is indicated.
Anatomy Survey

Lateral Cerebral Ventricles

- Normal PHLV (trigone/atrium) width = <10 mm

Cavum Septi Pellucidi (CSP)

- Transcerebellar plane
- Makes up the medial walls of the lateral ventricles
- Cavum is a rectangular space that interrupts the falx

Transcerebellar Plane

Correct angle: obtain plane where cavum septi pellucidi and cerebellum both visible.
Ensures correct angle for measuring posterior fossa (PF)

Cerebellar View

- Cerebellar hemispheres
- Rounded posteriorly
- Connected by vermis

Nuchal Fold

(recommended)

- Normal range
  - 14-18 wk: < 5mm
  - 18-21 wk: < 6mm
- Single most sensitive marker for Down Syndrome
Profile/Nasal Bone
(recommended)
Currently thought to be as sensitive as Nuchal Fold for detection of DS

Upper Lip and Nose
Identify Two Orbits/Lenses
Rule of Thumb: should be able to have space for third orbit

The “Basic” Cardiac Examination
(from 4-C View)
- Chamber number
- Ventricular wall contractility
- Cardiac thoracic ratio
- Chamber size
- Cardiac axis and position
- Chamber morphology
- Ventricular wall thickness
- Descending aorta location

Cardiac Axis/Position
- Axis - 45° (+ 20°) levorotation
- Position - anterior thorax

Normal 4-C Heart
If Suspect VSD---

Normal Heart Size is ~ 1/3 of Chest

To evaluate the Outflow Tracts and Great Arteries:

Locate the A-4 view and "SWEEP"
the beam towards the fetal head, passing through the ventricular outflow tracts continuing into the great arteries

Left Ventricular Outflow Tract (LVOT)

Right Ventricular Outflow Tract (RVOT)

Confirm Situs
Normal Stomach – varies in size and shape

Kidneys: number and location

Fetal Bladder

Umbilical cord insertion site into the fetal abdomen

Fetal Spine

Must see Skin Covering Over Posterior Elements
Best Plane - Transverse
Sweep transducer along entire length of the spine
Watch - vertebral transverse processes
Look - skin line overlaying processes
- splaying of posterior ossification centers

Coronal Plane
Only plane all 3 ossifications centers seen
Forms 3 regular lines that tether down into sacrum

Extremities
ARMS, HANDS, LEGS AND FEET
(presence/ absence/ movement/ posturing)

Upper Extremities

Lower Extremities

Fetal Anatomic Survey: Gender
Male
Female
Sonography Pitfalls

- Pseudo-omphalocele
- Too much compression in 3rd trimester
- Oligohydramnios
- FMC

Pseudo-omphalocele - FMC

May Require Specialized Exam

- Detailed exam if anomaly suspected (~75-85 images)
  - By history
  - Biochemical abnormalities - genetic screening
  - Anomalies or limited views on Standard scan (~30-36 images)
- Fetal Doppler – IUGR, Multiples, atypical antibodies
- Biophysical profile – IUGR, multiples, diabetes, CHTN, etc...
- Fetal echocardiogram – suspected heart anomaly
  - previous child with CHD

Umbilical Artery S/D Ratios

- Are GA dependent
- Decreases with increasing GA
- From 18-20 wk, 95th % at 7.0 to 7.9 s/d
- At 21 wk, 95th % at 6.7 and gradually decreases to 4.0 by 30 wk
- After 30 wk - usually below 3.5 to 3.0 s/d

Normal Umbilical Artery Doppler

Abnormal Umbilical Doppler

AEDF – absent end diastolic flow
Abnormal Umbilical Doppler

REDF – reverse end diastolic flow

Fetus with IUGR and Oligohydramnios

REFERENCES
For Lectures by Jane J.K. Burns; AS, RT, RDMS, Perinatal Sonographer

- AIUM: Practice Guidelines (American Institute of Ultrasound in Medicine)
  website: www.aium.org
- Ultrasonography in Obstetrics and Gynecology (5th edition)
  - Dr. Peter W. Callen, MD  Pub: W.B. Saunders Company
- Diagnostic Imaging Obstetrics (2nd edition)
  - Dr. Paula J. Woodward  Pub: Amirsys
  - www.perinatology.com

TO CONTACT ME
Minneapolis Perinatal Physician
Stephanie.Moore@allina.com

THANK YOU!!!