

## HIGH RISK OBSTETRIC ULTRASOUND GUIDELINES

Dolores H. Pretorius, M.D., Mary K. O'Boyle M.D. and Lori Romine M.D.

The obstetric ultrasound rotation is designed to emphasize an experience that relies on a close working relationship between radiologist, sonographer, perinatologist and genetic counselor. Close supervision of cases is essential for a successful, efficient and educational experience that emphasizes patient care with a great deal of interaction with our patients.

Cases begin at 8am at the Fetal Diagnosis and Treatment Center (FDTC). You are expected to be on the premises by that time. We understand that you have resident conferences some mornings; we expect you to arrive at the FDTC as soon as possible after the conferences. The sonographers will page you if you are not present and are needed.

You will be asked to check most US cases before patients are released. However, some cases are seen only by perinatology physicians; the sonographers will assist in differentiating these patients. You must check all the images and make sure all structures are adequately visualized. If you are unsure or not satisfied with certain images, you should scan the patient yourself. If needed, sonographers or staff can help you obtain the best image. Unfortunately, time does not permit scanning every patient, but you should have a full experience. The more motivated you are to go in the room and scan, the more the sonographers will ask you to do so and your learning experience will be greatly enhanced. ALL patient images must be reviewed by the attending prior to letting them leave the clinic.

An OB US protocol book is available in the reading room to help you learn what is needed for problem cases.

There is a log kept by Tiffany Tuanh where abnormal cases are listed in Fetal Center.

For abnormal sonograms an attempt should be made to do the following:

1. Make a **summary study** including the dating sheet as the first image and any other important images. This assists in preparing for Fetal Medicine Conference.
2. Choose **keywords** (Teaching File and the organ of interest) and write the diagnosis in the Study Comments

### MANDATORY CONFERENCES:

Fetal Medicine Conference

7:15 AM every 2nd and 4th Tuesday of the month,  
Auditorium at UCSD Hillcrest Medical Center

Imaging Conference

8:00 AM every Wednesday  
Lasser Conference Room at UCSD Hillcrest Medical Center

You will need to take the ppt presentations off the computer in Lasser Conference room and put in the appropriate folders on hard drive for teaching. Drive is with Brenda Guzman, secretary at Hillcrest.

On Fridays and Monday afternoons, perinatology covers the clinic so you may be assigned to Thornton or assist another Ultrasound location where OB/GYN ultrasound and general sonography is performed. If another Body service is short-staffed, this privilege will be forfeited.

### UCSD FETAL ECHOCARDIOGRAPHY INDICATIONS

#### FETAL FACTORS:

Aneuploidy  
Abnormal 4C/outflow tracts  
Pericardial effusion (>3mm)  
Arrhythmia

- Frequent premature beats (<10/minute)
- Sustained bradycardia <120 bpm (>5min)
- Sustained tachycardia
- Extracardiac structural anomalies
  - Omphalocele
  - Right sided stomach or heart
  - Esophageal atresia
  - Diaphragmatic hernia
  - Radical limb defects
  - VACTERL anomalies
- Conjoined twins
- Unexplained hydrops

#### MATERNAL FACTORS:

- Teratogens
  - Anticonvulsants
  - Lithium
  - Coumadin
  - Alcohol (severe exposure)
  - Indomethacin (more than 72 hours exposure)
  - Isotretinoin (systemic not cutaneous)
- Maternal CHD
- Rubella

#### FAMILIAL FACTORS:

- Paternal CHD
- Previous child with CHD
- Genetic syndrome in parent/sibling (e.g. Marfan, Tuberous Sclerosis, DiGeorge)
- Multiple secondary family members with CHD

#### GENERAL POLICY

ALL fetuses with anomalies must have documented 4CV and outflow tracts. If these are abnormal, these fetuses should then be referred in for a formal fetal echocardiogram. Outflow tracts are especially important in cases of: diabetes, monoamniotic twins, cleft lip/palate, clubfeet, any associated anomaly, secondary members with complex CHD, secondary members with left outflow lesions.

## HIGH RISK OBSTETRIC ULTRASOUND DICTATION GUIDELINES

### NEURO

#### CHOROIDAL SEPARATION

Choroidal separation in the region of the atrium greater than or equal to 4mm, recommend follow up in 6 weeks to re-evaluate, making sure to note which ventricle is abnormal and attempting to see both ventricles. Follow protocol for history of hydrocephalus. Follow-ups are usually around 22 weeks, then 28-32. If it persists at 32 weeks, recommend postnatal cranial ultrasound. Patients are also offered amniocentesis per data from the original Hertzberg study indicating a low incidence of karyotype abnormalities. Limbs should be checked to see flexion and extension.

#### DICTATE:

“Choroidal separation of \_\_\_ mm is noted in the \_\_\_ ventricle which is of unclear significance. Recommend follow up in \_\_\_ weeks.”

If <21 weeks, follow up in 2-4 weeks.

If >21 weeks, follow up in 6 weeks.

#### MILD VENTRICULOMEGALY

>10mm at atrium

We currently recommend amnio for the increased risk of abnormal karyotype and often MRI.

DICTATE:

"Recommend follow up to assess for progression and to see if there are any other abnormalities."

<21 weeks, F/U in 2-3 weeks.

>21 weeks, F/U in 6-7 weeks.

#### CHOROID PLEXUS CYSTS

Talk to the genetic counselor regarding whether the patient should be told and correlate with aneuploidy screening results. When amniocentesis is performed, the patient may not be told (especially if it is the only abnormality). We may wait for the amnio results instead. The patient should get a rule out Trisomy 18 scan (open hands, normal ankles, lip, palate and outflow tracts). Make sure that the finding is not normal corpus striatum masquerading as CPC.

DICTATE:

"Choroid plexus cysts have a low association with karyotype abnormality."

#### NUCHAL LUCENCY/NUCHAL THICKENING

First trimester (11 to 13 weeks)  $\geq 2.5$  mm with fetus occupying 75% of the image.

Second trimester  $\geq 6$  mm. Associated with trisomy 21.

DICTATE:

"Recommend referral to the Fetal Center for high-risk assessment and ultrasound."

### CARDIAC

#### INTRACARDIAC ECHOGENIC FOCUS

Data suggests a low association with karyotype abnormalities; we use a likelihood ratio of 1.1. You will need to discuss these on an individual basis with the attending staff. EFLV is seen in 10-15% of Asians so it is less important in this ethnic group.

#### SUBOPTIMAL OR NON-VIS 4CHAMBER HEART or OUTFLOW TRACTS

Recommend FU sonogram, prior to 24 weeks if possible.

### RENAL

Second trimester pyelectasis:

3-4 mm – get transverse and longitudinal renal images to assess for caliectasis

Follow up at 32-34 weeks if caliectasis present

$\geq 4$ mm

Get transverse and longitudinal renal images to assess for caliectasis.

DICTATE:

"Pyelectasis and/or caliectasis, recommended follow up ultrasound to be performed at 32-34 weeks to assess amniotic fluid and possible progression."

32 weeks and beyond pyelectasis:

$\geq 7$  mm but  $< 10$  mm

DICTATE:

"Follow up neonatal renal ultrasound should be performed after birth."

$\geq 10$ mm needs pediatric urology consult.

### OTHER FETAL

#### 2VC or SINGLE UMBILICAL ARTERY

Make sure that the 4 chamber view and the outflow tracts are visualized in order to avoid a fetal echocardiogram.

DICTATE:

“Recommend followup at 28-32 weeks to assess fetal growth.”

**UMBILICAL VEIN VARIX**

Follow up for growth at 28 weeks gestation.

**ECHOGENIC BOWEL**

The bowel should be as echogenic as bone to call echogenic bowel with tissue harmonics (THI) off. Discuss this with the genetic counselor in order to have the patient counseled. Amniocentesis may be offered. Follow up is performed at 6 week intervals: 28 weeks.

DICTATE:

“The bowel is echogenic which is associated with infection, prior hemorrhage, karyotype abnormality, cystic fibrosis and normal outcome. Recommend follow up at 28 and 34 weeks for growth.”

**PLACENTA**

**TRANSVAGINAL**

Make sure that a sentence documenting that transvaginal scanning was performed and why, e.g. placental location or cervical length assessment.

**LOW LYING PLACENTA**

If the placenta is within 2.5 cm of the cervical os, dictate the distance from the os to the placental edge. Do not dictate a specific recommendation for follow-up.

**PLACENTA PREVIA**

Recommend follow-up at 28 weeks.

**MARGINAL PCI**

No need for follow-up unless the cord is immediately adjacent to the placental edge.

DICTATE:

“The cord enters the placenta \_\_cm from the edge. No followup is necessary. “  
If the PCI is at the edge then dictate: “The PCI is at the placental edge consistent with marginal/velamentous cord insertion. Recommend followup at 28 weeks gestational age to assess for fetal growth.”

**VELAMENTOUS PCI**

Use color Doppler to determine whether the cord crosses the cervix to assess for vasa previa. If it does, discuss with the attending. Assess whether the PCI is near the lower uterine segment and make sure there are transverse and sagittal images labeled of the PCI. If no vasa previa is found,

DICTATE:

“The cord enters the membranes \_\_cm from the placental edge. Recommend followup at 28 weeks gestational age to assess for fetal growth.”

**OTHER**

**LUS IMAGING**

Cervical length must be measured and dictated on all patients, along with whether it was imaged transabdominally or transvaginally.

TV imaging of the cervix must be performed for:

All multiple gestations

Suspected short cervix prior to 32 weeks

H/O prior loss <28 weeks or midtrimester losses.

Any patient where satisfactory TA images cannot be obtained.

Polyhydramnios

Abnormal analytes at 24 weeks gestational age

**ELEVATED MSAFP AND NORMAL US**

If >5.0 MoMs then scan maternal liver.  
If staff is concerned (e.g. very high MSAFP),  
DICTATE:  
"Fetal growth should be carefully monitored with consideration for further US if needed."

#### RETURNING FOR AMNIO ONLY

<2 weeks after last exam, complete biometry not needed – just BPD for lab results.  
>2 weeks after last exam, need complete biometry to assess growth.

#### OTHER FOLLOW UPS

AFTER CVS: 18 weeks to check anatomy: palate, outflow tracts, limbs, feet, hands, facial profile.

VARICELLA/POSSIBLE VARICELLA: 16-18 weeks and 22 weeks (routine anatomy, orbits and limb lengths).

TWINS: Di:Di: Every 4 weeks until birth for growth– earlier if discordant.

Cervix at same time – TV from 14 wk to 32 wks

Di-Mo: Growth every 4wk if appropriate growth

Cervix at same time – TV from 14 wk to 32 wks

TTS check every 2 weeks til 28 wks

FAMILY HX HYDROCEPHALUS: 18, 22, 32 weeks.

HX SKELETAL DYSPLASIA: 16-18, 22, 32 weeks.

CONGENITAL DIAPHRAGMATIC HERNIA: 18, 22, 32 weeks.

#### RETURN VISITS

Low risk and high risk patients must have any suboptimally seen anatomy reevaluated as well as:

Biometry

Choroids/vents

4CV (and outflows)

Trans and long distal spine

Kidneys

Placental location

Palate and nose/lips if >20 weeks and not previously seen.

AFI if >28 weeks and maximum vertical pocket on all studies <28 weeks

LUS

ANY previously undocumented anatomy and ANY anatomy relevant to previously documented anomalies.

#### DICTATION DISCLAIMERS

MBH= Imaging was compromised by maternal body habitus.

EGAD= Imaging was compromised by early gestational age.

DSD= Lack of ossification of the distal spine is normal for this gestational age, but it precludes exclusion of neural tube defects.

#### HIGH RISK OBSTETRIC ULTRASOUND OBJECTIVES

All residents and fellows are expected to be able to perform an obstetric ultrasound study on their own by the end of the month. All positive QUAD screen patients require attending staff or fellows to scan **or** talk to the patient after the sonographer (California Quad Screening Program regulation) in order to participate in the program. Staff will make every effort to include residents and fellows in scanning, especially as skills progress.

Residents/fellows should be able to date a pregnancy on their own at the end of the month:

Obtain LMP and enter on date sheet.

Obtain BPD, HC, AC, FL and enter on date sheet

Examination components:

Know structures required on each exam (ACR, AIUM, ACOG guidelines).

Know the optional anatomic structures we include in our studies.

Amniotic fluid:

Causes of oligohydramnios and polyhydramnios.

Level of amniotic fluid index (AFI) that is worrisome.

When to call a referring MD for abnormal AFI.

Chromosome anomalies:

Typical findings with Trisomy 21 and 18.

Placenta:

3 types of placental cord insertion sites.

Placenta accreta – who is at risk and what are the 3 types?

When is a placenta previa called on US?

Differential diagnosis of placental lucencies.

US findings and clinical implications of circumvallate placenta.

Fetal Heart:

The criteria for a normal 4 chamber view of the heart, RVOT and LVOT.

Congenital heart diseases that have a normal 4C view.

Why the outflow tract views are important.

Serum Screening:

Causes of elevated maternal serum AFP (at least 5).

Define QUAD marker screening.

What is a positive NTD screen and what is examined on US?

What is a positive Tri 21 screen and what is examined on US?

What is a positive Tri 18 screen and what is examined on US?

Dating and Growth:

If a patient is 10 days to 3 weeks off dates, what questions do you ask?

If you suspect IUGR, what specific parameters need to be evaluated and what is the proper management?

When do we re-date. i.e. recommend using ultrasound dating, a first trimester pregnancy? A second trimester pregnancy?

Membranes and the Uterus:

Up to what week is AC separation physiologic?

Describe membranes of the uterus and differential diagnoses.

Doppler:

Know when spectral and color Doppler are utilized.

Cervix:

Know the normal range of cervical lengths and how to measure it.

What cervical length requires an immediate call to the OB?

Reports:

There are 2 portions to our reports:

**REQUIRED STRUCTURES:** must be N for “normal”, NV for “not visualized adequately” (although attempted to see), NE for “not evaluated” (only if seen well on prior study) or \* for “abnormal”. No blanks are to be left on required anatomy. All NV, NE and \* must be addressed in comments.

OPTIONAL STRUCTURES: dictated only if there are adequate images with which your staff agrees.

AMNIOCENTESIS: In general, we do not comment on whether an amniocentesis was performed in the ultrasound report. Occasionally, we do so if instructed by the attending perinatal staff.

REPORTS; All reports should include a comment regarding dating, anomalies and the clinical question. Example:

1. Size compatible with dates.
2. No congenital anomalies, specifically no sonographic evidence of Trisomy 21.

Technical:

What power/frequency transducer is usually used in OB US?

When is endovaginal scanning used?

Which patients may benefit from 3D US?

What is the mechanical index and thermal index?

Where are they on the imaging screen?

What increases the MI and TI?

Why are they important?

Billing:

Appropriate indications for obstetrical billing. It is also important to dictate that endovaginal scanning was used, if it was.

## OBSTETRICS ULTRASOUND PRETEST

1. List five causes of oligohydramnios.
  
2. List causes of polyhydramnios.
  - a. Maternal:
  
  - b. Fetal:
  
  - c. Idiopathic:
  
3. What are the sonographic findings of Trisomy 21?
  - a. Markers:
  
  - b. Congenital anomalies:
  
4. Why do we look for the placental cord insertion?
  
5. What are the sonographic findings of placenta accreta?
  
6. What patients are at risk for placenta accreta?
  
7. What are the 9 criteria for a normal 4 chamber view of the heart?



8. What congenital heart disease (list 3) will have a normal 4 chamber view?
  
9. What 2 imaging findings are important to assess on the right ventricular outflow tract image?
  
10. What 2 imaging findings are important to assess on the left ventricular outflow tract image?
  
11. What level of amniotic fluid index (AFI) is worrisome? What level requires the MD be called for patient evaluation today, i.e. very worrisome?
  
12. List the five most common causes of elevated AFP? Do you know any more???
  
13. What is the QUAD marker screen (what four blood markers are included) and when (what gestational ages) is it valid?
  
14. What is the nuchal translucency screen and when is it performed? What is important for the sonographers to do to get an adequate image for measurement?
  
15. If a patient is 10 days of 3 weeks off dates, what questions should you ask them regarding dating to determine if they should be re-dated or not?

16. Give the differential diagnosis for membranes in the pregnant uterus.
  
17. When should you consider performing color/power Doppler in obstetrics?
  
18. How short is short for the cervix? What should you do?
  
19. How do we dictate placenta previa in the 2nd trimester?
  
20. What four elements should be in every Report Impression?
  
21. What patients are candidates for 3D US?
  
22. When is endovaginal ultrasound indicated in obstetrics?
  
23. What indications are acceptable for obstetrical billing?

24. If you see placental lucencies, what should you think of?

25. What is a circumvallate placenta and what are the sonographic findings?

26. When are you confident of an ectopic pregnancy? When should you worry about the possibility of obstetricians treating an unexpected intrauterine pregnancy with methotrexate? BEWARE of the empty uterus.

27. What is the mechanical index and thermal index?

Where are they on the imaging screen?

What increases the MI and TI?

Why are they important?

28. Why is it important to assess caliper positions when measuring the abdominal circumference in the third trimester? Why do we do 3 measurements when abnormal or in diabetics?

29. What do normal and abnormal ductus venosus waveforms look like and when are they indicated?

30. What are the sonographic criteria of agenesis of the corpus callosum? (These are the same for fetuses and neonates.)

31. How do you decide amnionicity and chorionicity in twins?

## GENERAL ULTRASOUND PRETEST

1. What is an abnormal thickness of the endometrium in an asymptomatic postmenopausal patient on no hormone? In a premenopausal patient?
2. What is the differential for thickened endometrium?
3. What history is important in evaluation of premenopausal gynecology patients?
4. What history is important in evaluation of postmenopausal gynecology patients?
5. What do you do with an adnexal cyst in a postmenopausal patient?
6. What sonographic criteria are associated with vascular stenosis?
7. What are the sonographic findings of DVT, i.e. name 5 sonographic features that are assessed for DVT?
8. What is power Doppler and how is it different from color Doppler? How about high definition color Doppler (it is a form of power Doppler)?
9. Where should you think of using power Doppler?

10. Why do we use Doppler velocities in some patients, systolic/diastolic ratios, resistive index (RI) or pulsatility index (PI) in others? Where do we use each of these?

11. What four fluid collections are seen with renal transplants?

12. What are the sonographic criteria for renal artery stenosis?

13. What are the grades and sonographic findings of neonatal intracranial hemorrhage?

14. What are the simulators of hydronephrosis?

15. What are 5 false negatives and 5 false positives for gallstones?

16. What are the indications for prostate ultrasound?
17. How much does an abdominal, carotid, DVT and Obstetrical ultrasound cost?
18. Ultrasound specialists prefer to be called: Technologist? Technician? Sonographer?
19. What are the sonographic criteria for appendicitis?
20. What are the sonographic criteria for pyloric stenosis?
21. What are the sonographic findings of uterine polyp and what is the significance? What is the primary differential diagnosis?
22. How do we treat/care for pseudo aneurysm? What precautions are taken?
23. What are the indications for sonohysterography?
24. What are the possible complications of sonohysterography?
25. What are the characteristics of a benign thyroid nodule? A malignant thyroid nodule?
26. When is a carotid ultrasound a medical emergency?

27. When evaluating a liver transplant, what vessels are important to evaluate? What will send the surgeon back to the operating room in the immediate post op period, i.e. what is urgent when identified?

28. What are the sonographic criteria of testicular torsion? Ovarian torsion?

29. What is important to dictate regarding fibroids?

30. When a renal mass is identified on ultrasound, what 4 things should be evaluated on ultrasound before allowing the patient to leave the ultrasound area?