

OB ULTRASOUND: KEY ROLE IN SCREENING AND EVALUATION

Required Images for AIUM/ACOG

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(ppt developed by Jane Burns, RDMS)

DISCLOSURE

– for Stephanie Moore, RDMS

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**
(abnormal heart rate/bradycardia/keepsake imaging)
 - **Special communications**
 - Methods for Estimating due date (May 2017)

www.aium.org



Practice Parameters



[illegible][illegible][illegible]

- **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)

(These represent the MINIMAL elements required for standard examination)

- **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)**

- **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)
 - Chronicity, amnionity, size and am. Fluid comparison, genitalia
 - 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 (3VTV)
- recommended – if technically feasible

AIUM Guidelines

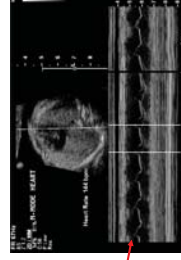
- Must document
 - Maternal anatomy
 - Uterus
 - Cervix
 - Adnexa
 - Fetal anatomic survey – after 18w0d
 - Permanent record – images labeled
 - Patient ID, facility ID, date, anatomic right and left
 - Final report – official interpretation with ultrasound findings
 - Real-time scanner
 - Transabdominal
 - Early (5-10MHz)
 - Mid trimester (3-5MHz)
 - Transvaginal (5-10MHz)

AIUM Guidelines (www.aium.org) for Standard Fetal Examination (Complete – 76805)

- Must document
 - Fetal cardiac activity
 - Fetal number
 - Fetal presentation
 - Amniotic fluid assessment
 - Placenta
 - Location
 - Relationship to internal cervix/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

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 – butt is presenting part
 - Footling
- 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 Falx
Cavum septi pellucidi (CSP)
Cerebrum/cerebellum
Cisterna magna (CM)
Upper Lip
Nuchal Fold (16w0d to 20w6d)

Fetal Anatomic Survey

Chest:

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

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**

Fetal Anatomic Survey

Spine: Cervical
Thoracic
Lumbar
Sacral

Evaluate in 3 planes

sagittal/ **transverse**/coronal

Fetal Anatomic Survey

Extremities:

Both arms
Both legs

Fetal Gender:

multiple gestations
anatomic defects

****Assess presence and movement**

Estimate of Amniotic Fluid Volume

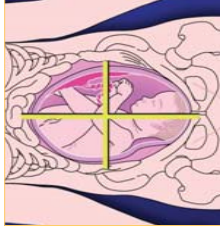
- ✓ Qualitative (**subjective**)
- ✓ Semi-Quantitative (measure fluid)
 - **Deepest Vertical Pocket (DVP)** (best assessment for oligohydramnios)
 - **Amniotic Fluid Index (AFI)**

Semi-quantitative

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

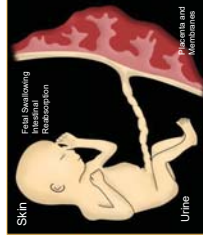
Semi-quantitative

- ✓ 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 < **5cm**
 - ✓ 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 it's **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 Appearance

Placenta thickness

- Increases with gestational age to about 4cm
- Placentalomegaly is nonspecific diagnosis
- Can be seen with fetal and maternal disorders
- Greater than 5cm is abnormal



Exclude myometrium from the placental measurement

Evaluate Relationship of Placenta to Cervix

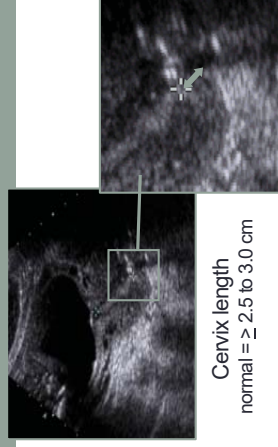
- Assess for previa
- Measure distance of inferior placental margin from internal cervical os
 - in sagittal plane
- Assess umbilical cord insertion site
 - if technically feasible



About that cervical length...

DO NOT MEASURE CERVICAL LENGTH WITH A FULL BLADDER

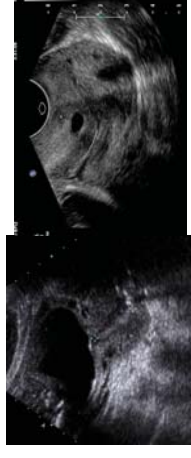
- ✓ A full bladder compresses the cervix which elongates it
- ✓ A full bladder hides funneling of the internal cervical os
- ✓ A full bladder distorts the location of the placental margin
- ✓ A full bladder may irritate the uterus causing Focal Myometrial Contractions (FMC)



Cervix length
normal = ≥ 2.5 to 3.0 cm

Do not include the vaginal fornix in the cervical measurement

Most accurate cervical length is by transvaginal scan (TVS)



Placental Cord Insertion



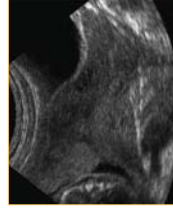
Variants of Placental Cord Insertion



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 (ctx)**
 - 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 of membranes (**PPROM**)do **NOT** do transvaginal scan
 - Watch over time
 - Fundal pressure to ck for **dynamic cervix**

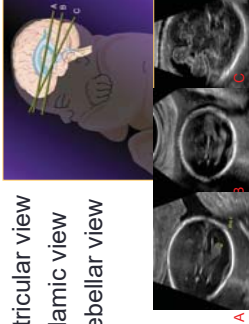
Transperineal Scan



BIOMETRY

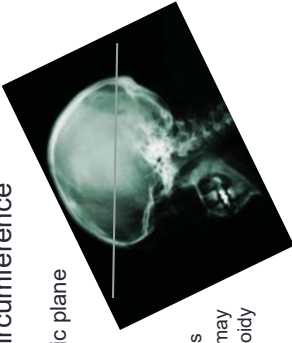
Fetal Head

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



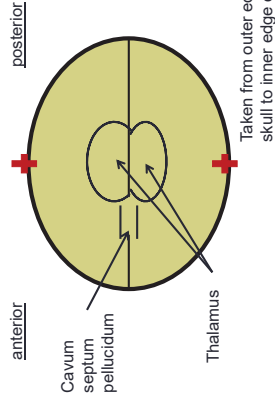
BPD: biparietal diameter
and head circumference

Transthalamic plane



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

BPD: Transthalamic Plane

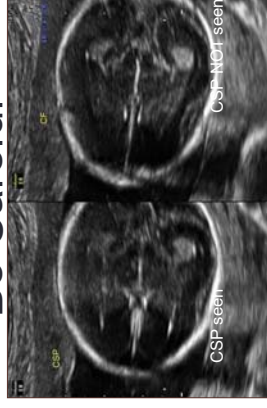


Biparietal Diameter

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

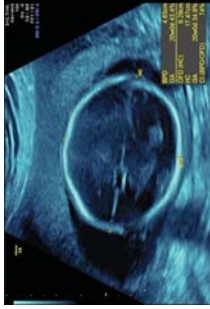


Be Careful

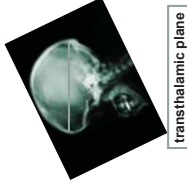


<http://files.aum.org/guidelines/obstetric/imageResources.pdf>

Head Circumference

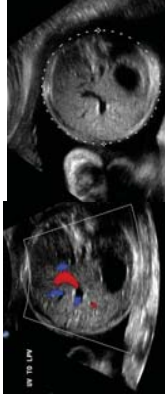


HC - measured at the **same level** as the BPD
callipers placed around outer perimeter of skull



transthalamic plane

Abdominal Circumference



AC: trace around skin line
true transverse abdominal view
junction: umbilical vein
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

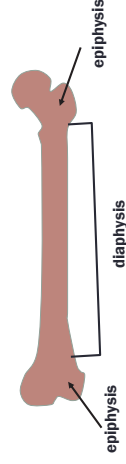


Femoral diaphysis length –

- reliable after 14 wk gestational age
- u/s 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
(Dorland's Medical Dictionary)



Estimated Fetal Weight : EFW

Currently, even the **best fetal weight prediction methods can yield errors as high as $\pm 15\%$** . 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.

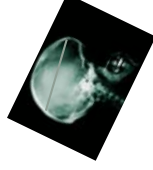
Anatomy Survey

Lateral Cerebral Ventricles



Lateral ventricle measurement:
 - taken at the atrium of the lateral ventricle
 - glomus of the choroid plexus
 - perpendicular to the ventricular cavity
 - inner to inner wall

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



transventricular plane

Cavum Septi Pellucidi (CSP)

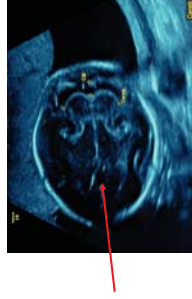


Makes up the medial walls of the lateral ventricles
 Cavum is rectangular space that interrupts the falx



transcerebellar plane

Transcerebellar Plane

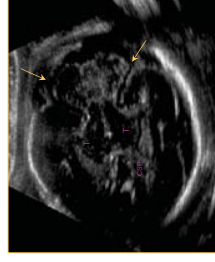


Correct angle: obtain plane where cavum septi pellucidi and cerebellum both visible.
 Ensures correct angle for measuring posterior fossa (PF)



transcerebellar plane

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



transcerebellar plane

Profile/Nasal Bone

(recommended)



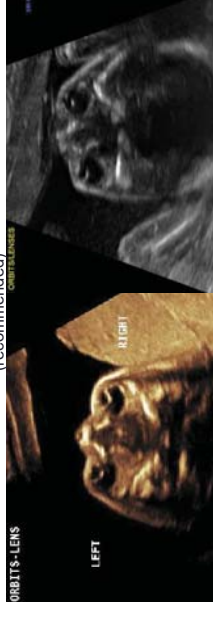
Currently thought to be as sensitive as Nuchal Fold for detection of "DS"

Upper Lip and Nose



Identify Two Orbits/Lenses

(recommended)



Rule of Thumb: should be able to have space for **third** orbit

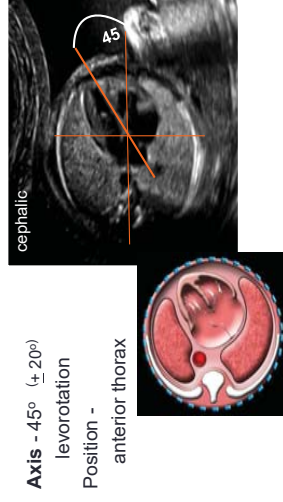
The "Basic" Cardiac Examination

(from 4-C View)

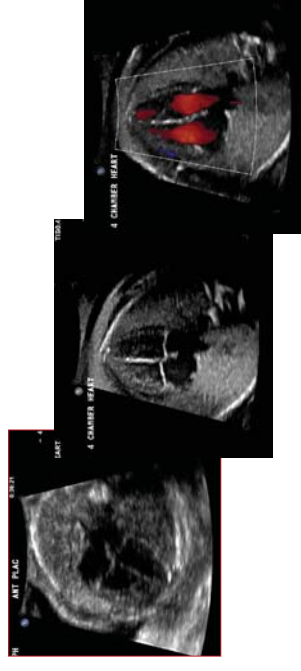


- Chamber number
- Ventricular wall contractility
- Cardiac thoracic ratio
- Chamber size
- Cardiac axis and position
- Chamber morphology
- Ventricular wall thickness
- Descending aorta location

Cardiac Axis/Position



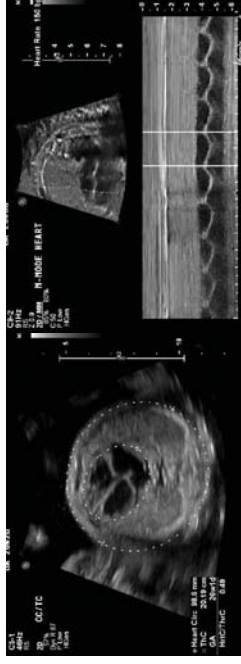
Normal 4-C Heart



If Suspect VSD---



Normal Heart Size is ~ 1/3 of Chest

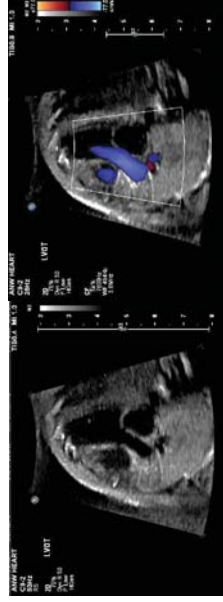


To evaluate the Outflow Tracts and Great Arteries:

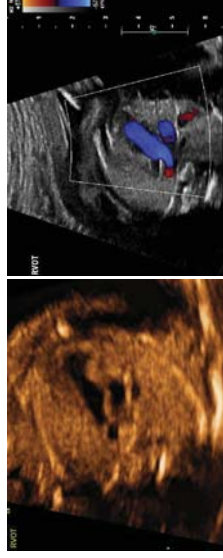
Locate the A-4 view and
“SWEEP”

the beam towards the fetal head, passing through the ventricular outflow tracts continuing into the great arteries

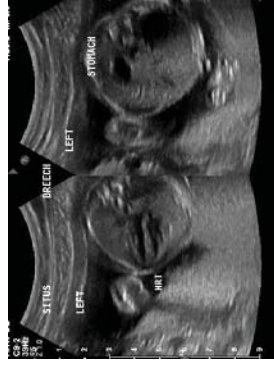
Left Ventricular Outflow Tract (LVOT)



Right Ventricular Outflow Tract (RVOT)



Confirm Situs



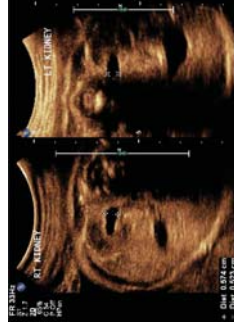
Normal Stomach – varies in size and shape



Kidneys: number and location



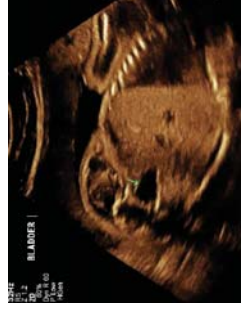
ck renal pelvis
ck AP diameter in transverse plane
Up to 20 wk... < 4 mm
20-30 wk... < 5 mm
After 30 wk < 7 mm



Fetal Bladder

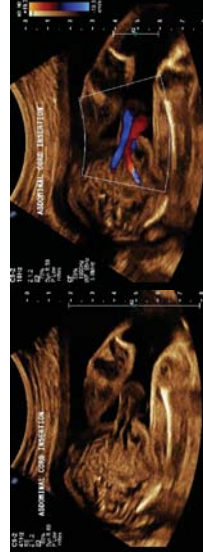
Anechoic structure

Fills and empties every 30-45 minutes



Ck location and size

Umbilical cord insertion site into the fetal abdomen



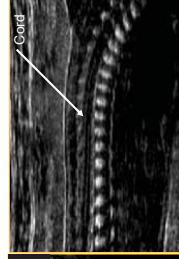
transverse

with color flow

Fetal Spine

Sagittal (longitudinal) Plane

One transverse process and vertebral body

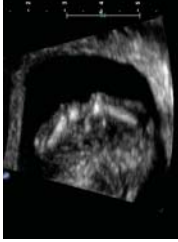


Must see Skin Covering Over Posterior Elements



Best Plane - Transverse

Sweep transducer along entire length of the spine
 Watch - vertebral transverse processes
 Look - skin line overlying processes
 - splaying of posterior ossification centers



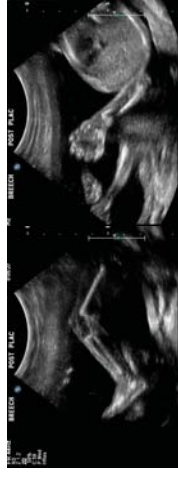
Coronal Plane

Only plane all 3 ossification centers seen
 Forms 3 regular lines that tether down into sacrum

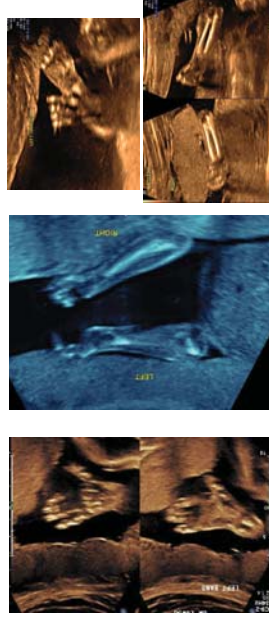


Extremities

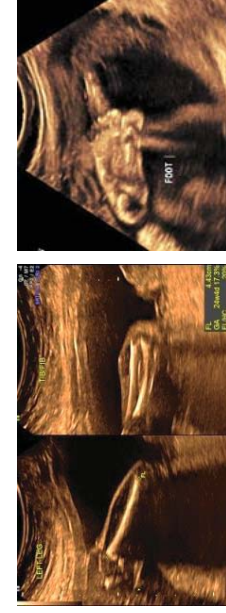
ARMS, HANDS, LEGS AND FEET
 (presence/ absence/ movement/ posturing)



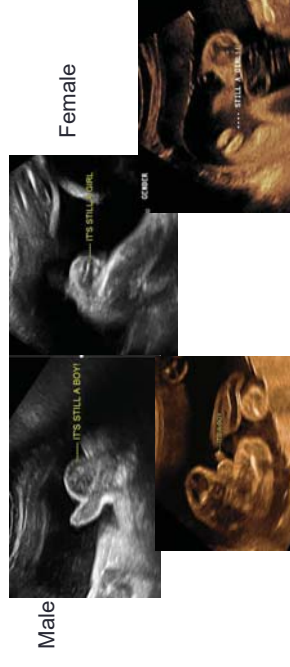
Upper Extremities



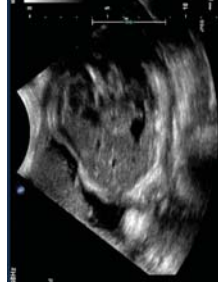
Lower Extremities



Fetal Anatomic Survey: Gender

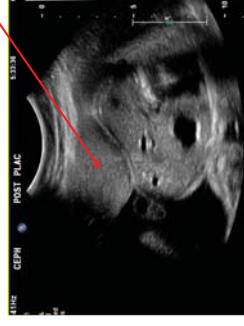


Sonography Pitfalls



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

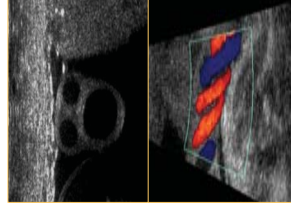
Pseudo-omphalocele - FMC



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** – IUQR, Multiples, atypical antibodies
- **Biophysical profile** – IUQR, multiples, diabetes, CHTN, etc.,
- **Fetal echocardiogram** – suspected heart anomaly
 - previous child with CHD

Umbilical Artery S/D Ratios

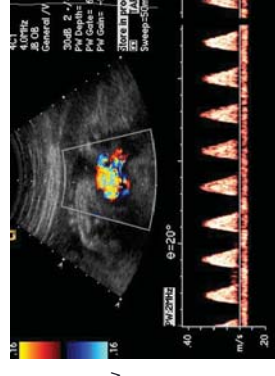


- **Are GA dependent**
- Decreases with increasing GA
- From 18-20 wk, 95th % at 7.0 to 7.9 s/d
- At 21 wk, 95th % at 6.7 and gradually decreases to 4.0 by 30 wk
- After 30 wk - usually below 3.5 to 3.0 s/d

Normal Umbilical Artery Doppler

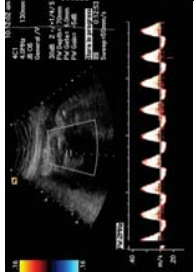


Abnormal Umbilical Doppler

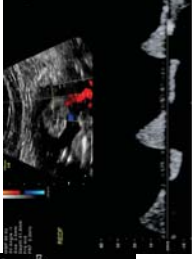


AEDF –
absent end
diastolic flow

Abnormal Umbilical Doppler



REDF –
reverse end
diastolic flow



Fetus with IUGD 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

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THANK YOU!!!