New SOGC and TOP Guidelines for Obstetrical Ultrasound

ROBERT DAVIES, MD, FRCPC
Speaker Background

President, Alberta Society of Radiologists
  • Professional organization representing radiologists, their practices, and diagnostic imaging in Alberta.

Towards Optimized Practice
  • Co-chair, Obstetrical Ultrasound Clinical Practice Guidelines

Medical Director, Canada Diagnostic Centres
  • 16 clinics, Edmonton & Calgary
zzzzzzzzzzzzz.....
Why this topic?

1. Integral part of both hospital and community ultrasound practice in Alberta;

2. Wide variation in education, understanding, protocols, and execution;

3. Patient care failures occurring;

4. Opportunity for improvement.
What is being done?

- Relationships formed with OB-GYN’s and Perinatologists North and South
- 2015 Alberta Society of Radiologists CME dedicated to Obstetrical Ultrasound quality

- TOP CPG’s underway for:
  - Pregnancy Dating*
  - Detailed Anatomic Study
  - Fetal Wellbeing
  - Twins / Multiples*

- Next step: adopt as CPSA DI standards.
Objectives
Objectives

• Discuss highlights of each guideline relevant to sonographers

• Questions (& answers hopefully)

• Obtain feedback about challenges you face, and hear your advice
1. Pregnancy Dating

- Determination of Gestational Age by Ultrasound (No. 303, Feb 2014) – SOGC

- Determination of Gestational Age by Ultrasound (Sept 2014), TOP
Pregnancy Dating: Key points

• Ultrasound is consistently more accurate than relying on patient recall for menstrual dating

• Routine ultrasound in the first or second trimester reduces inductions for post term pregnancies

• A woman’s self-knowledge and awareness of her internal functions, including ovulation, can be very accurate. However, given the physiologic changes that can occur in any one menstrual cycle, the exact time of ovulation, fertilization and implantation cannot be precisely known.
Pregnancy Dating

- Offer every pregnant woman a first trimester dating ultrasound (can combine with NT visit)

- Use a second trimester ultrasound to assess gestational age if the availability of obstetrical ultrasound is limited
1st trimester

- Use CRL from either transabdominal or transvaginal ultrasound to determine gestation age
  - Although transvaginal ultrasound may better visualize early embryonic structures than a transabdominal approach, it is not more accurate to determine gestational age
- Use the earliest ultrasound with a CRL of at least 10mm or 7 weeks (or 10 mm) to determine the gestational age where there is more than one first trimester ultrasound.
- Use crown-rump length up to 84 mm, and the biparietal diameter for measurements > 84 mm
  - Between the 12th and 14th weeks, crown-rump length and biparietal diameter are similar in accuracy
2nd and 3rd trimester

- Use a combination of multiple biometric parameters: biparietal diameter, head circumference, abdominal circumference and femur length) to determine gestational age, rather than a single parameter
  - Ie your calcs package (Hadlock 3, Hadlock 4, etc)

- Follow-up for interval growth two to three weeks if a third trimester ultrasound is used to base gestational age

- It is difficult to confirm an accurate due date in the third trimester
Dating Changes

- Once gestational age is determined by an ultrasound performed at seven weeks or beyond, the estimated delivery date should NOT be adjusted by measurements on any subsequent ultrasound.

- BUT: exam done before 7 weeks could have a due date updated at the next visit.
  - Don’t report a calculated EDC <7w, or state a caveat.
How do we date pregnancy’s at CDC?

1. By date of IVF implantation

2. By first best ultrasound (in order of most relevant):
   - 1\textsuperscript{st} US exam with a measureable CRL of 10 mm or more
   - 1\textsuperscript{st} US exam with a measureable CRL at all
   - 2\textsuperscript{nd} trimester fetal biometry up to 23 weeks
   - If no exam with a measurable CRL done, then the last pre-embryonic 1\textsuperscript{st} trimester exam (mean sac diameter)

3. By Last Menstrual Period (LMP)
Questions?
2. Detailed Anatomic Study

- Content of a Complete Routine Second Trimester Obstetrical Ultrasound Examination and Report (No. 223, Mar 2009) - SOGC

- Fetal Soft Markers in Obstetric Ultrasound (No 162, June 2005) – SOGC

- TOP Guideline is in V1
Biometry

- Should be reported all in millimetres or in centimetres along with equivalent estimated gestational age for:
  - Biparietal diameter
  - Head circumference
  - Abdominal circumference
  - Femur length
  - Humeral length

- Should be reported in millimetres if abnormal:
  - Nuchal fold
  - Cisterna magna
  - Cerebellar diameter
  - Lateral ventricle width
Anatomy

- Should be reported as:
  normal, OR abnormal (with details), OR not seen (with explanation)

- Should be reported for:
  - Cranium
  - Cerebral ventricles, cavum septi pellucidi, the midline falx, the choroid plexus
  - Posterior fossa: cisterna magna, cerebellum
  - Face: orbits, lips
  - Spine
  - Chest
  - Cardiac four-chamber view
  - Cardiac outflow tracts
  - Heart axis
  - Cardiac situs
  - Stomach
  - Bowel
  - Kidneys
  - Bladder
  - Abdominal cord insertion
  - Number of cord vessels
  - Upper extremities and presence of hands
  - Lower extremities and presence of feet
Anatomy

- Gender
  - May be relevant to any abnormalities seen
  - Required for accurate Estimated Fetal Weight determination in later 2\textsuperscript{nd}, and 3\textsuperscript{rd} trimester
    - Provincial growth chart standard is age specific
    - Use female if gender unknown
    - Starts at 21 weeks
      - Use Hadlock before then?
Anatomy

AHS POLICY

Fetal Gender Determination and Disclosure

Ultrasound and Echocardiography

DIUE1.2

Diagnostic Imaging Provincial Executive Team

May 24, 2011

Diagnostic Imaging Services

NA

May 2012

PURPOSE
To ensure standardized practices throughout AHS DI regarding the determination and disclosure of fetal gender.

POLICY STATEMENT
The Society of Obstetricians and Gynecologists of Canada (SOGC) recommends that “...fetal genitalia be examined as part of the routine second trimester obstetric ultrasound and that this examination not be prolonged or repeated if no abnormalities are seen but sex determination is inconclusive. If fetal sex has been determined, a patient’s request for disclosure should be respected, either directly or in a report to the referring health professional.”

APPLICABILITY
This policy is applicable to all AHS facilities providing obstetrical ultrasound services.

POLICY ELEMENTS
1. Fetal Gender Determination
   1.1. In keeping with the SOGC recommendations, during the routine second or third trimester ultrasound determination of the fetal gender will be attempted however the exam will not be prolonged or be repeated solely to determine fetal sex.

2. Patients requesting disclosure of Fetal Gender
   2.1. Disclosure of fetal gender upon request respects a patient’s autonomy over personal health information, and therefore if the patient (not the husband or accompanying friend) requests to know the gender of their fetus, the sonographer/ perinatologist/ radiologist may tell the patient provided the fetus is in an adequate position to allow for fetal gender determination.

   2.2. Alternatively, diagnostic imaging units that prefer to maintain a policy of non-disclosure should include gender information in the ultrasound report allowing the referring physician to disclose the fetal gender at their patient’s request.

3. Risk of Error in Determining Gender
   3.1. The risk for error in determining fetal gender with ultrasound is estimated to be less than 3%, but the patient should be made aware of this possibility at the time of disclosure.

DEFINITIONS
NA

CROSS REFERENCES
Appendix A – SOGC Policy Statement “Fetal Sex Determination and Disclosure”
Common Findings

- Echogenic Intracardiac Focus (EIF)
  - 0.5 – 12% of scans
  - 2x increase risk of Tri 21
    - Significant @ maternal age ~31
  - Probe < 5 MHZ?
  - Bone bright?
  - There in two planes?
  - Valve leaflet artifact?
  - Check for other Tri 21 markers
Common Findings

- Choroid plexus cyst
  - 1% of scans
  - 7x increase in Tri 18 risk
    - Significant @ maternal age ~35
  - >= 3mm in two planes
  - Size / number / laterality not important
  - Check for other Tri 18 markers
Common Findings

- Renal pelviectasis
  - 0.7% of scans
  - Only weakly associated with Downs
  - >=5mm
  - Significant in association with other findings, women >35, measurement >10mm
Common Findings

- Nuchal Fold
  - $\geq 5\text{mm from } 16\text{w0d-17w6d}$
  - $\geq 6\text{mm from } 18\text{w0d-23w6d}$

- 17x increase risk for Trisomy 21
  - Automatic referral to MFM
Also

- Amniotic fluid volume
  - Four quadrant AFI
  - Deepest Vertical Pocket (DVP) of 2-8cm

- Placenta
  - Position, proximity to os
  - Placenta accreta? (anterior with prior C-section)
  - Accessory lobes, velamentous cord insertion, vasa previa
    - Check over internal os with doppler

- Cervix
To EV or Not to EV, that is the question...

- Low lying placenta (<2cm)
  - Do EV if there is time

- Shortened cervix (<3cm)
  - Do EV
What’s important?

- Growth: <10\textsuperscript{th} percentile AC or EFW
- Fluid: <2cm DVP, <5cm AFI
- Cervix: <3cm on EV
- Anatomy: Completion by 20 weeks
  - Rapid referral for soft markers in older women, multiple markers, and discrete abnormalities
  - Complicated management > 24w
Questions?
STAY STRONG!

WEEKEND IS COMING SOON
3. Fetal Wellbeing

- No single SOGC guideline
  - Antepartum health surveillance, IUGR, Cervical Length in Preterm Birth, etc from the SOGC.
  - Some discussion re: routine 3\textsuperscript{rd} trimester exam

- Alberta has high rates of pre-term delivery, low birth weights, and associated complications
Fetal Wellbeing

• Goal is to prevent still birth and neonatal losses by:
  • successfully identifying abnormalities
  • rapid transfer or escalation of care
  • appropriate interventions
### Current pregnancy

**Maternal**
- Post-term pregnancy (> 294 days, > 42 weeks)\(^9,10\)
- Hypertensive disorders of pregnancy\(^11\)
- Pre-pregnancy diabetes\(^12\)
- Insulin requiring gestational diabetes\(^13\)
- Preterm premature rupture of membranes\(^14\)
- Chronic (stable) abruption\(^15\)
- Iso-immunization\(^8\)
- Abnormal maternal serum screening (hCG or AFP > 2.0 MOM) in absence of confirmed fetal anomaly\(^16\)
- Motor vehicle accident during pregnancy\(^17\)
- Vaginal bleeding
- Morbid obesity\(^18,19\)
- Advanced maternal age
- Assisted reproductive technologies

**Fetal**
- Decreased fetal movement\(^20,21\)
- Intrauterine growth restriction\(^22\)
- Suspected oligohydramnios/polyhydramnios
- Multiple pregnancy
- Preterm labour

### Previous obstetrical history

<table>
<thead>
<tr>
<th>Maternal</th>
<th>Fetal</th>
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<tr>
<td>Hypertensive disorder of pregnancy</td>
<td>Intrauterine growth restriction</td>
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<tr>
<td>Placental abruption</td>
<td>Stillbirth</td>
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</table>
Wellbeing Assessment

- Standard in Alberta is a “modified” BPP exam
  - Ultrasound components with score _/8

- No real scientific support for ignoring 6/8 result once >28 weeks (local preference)

- Abnormal cases should then receive a non-stress test or NST
  - Scored total _/10

- Management decisions made by Antepartum team:
  - Follow-up NST and/or BPP
  - Medical interventions
  - Delivery
### BIOPHYSICAL PROFILE SCORING

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<tr>
<th>VARIABLE</th>
<th>SCORE 2</th>
<th>SCORE 0</th>
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<tbody>
<tr>
<td><strong>Fetal Breathing movements</strong></td>
<td>Presence of at least one episode of sustained fetal breathing of a least 30 second duration</td>
<td>Absence of fetal breathing or the absence of an episode of breathing lasting 30 seconds</td>
</tr>
<tr>
<td><strong>Fetal Movements</strong></td>
<td>Three or more gross discrete body motions or limb movement/swallowing</td>
<td>Two or less gross body movements</td>
</tr>
<tr>
<td><strong>Fetal Tone</strong></td>
<td>One or more episodes of extension of a fetal extremity or spine with return to flexion</td>
<td>Extremities in position of extension or partial flexion. Spine in extension. Fetal movement not followed by return to flexion. No fetal movement</td>
</tr>
<tr>
<td><strong>Qualitative Amniotic Fluid Volume</strong></td>
<td>Largest pocket of amniotic fluid &gt; 2x2 cm</td>
<td>Largest vertical pocket of amniotic fluid &lt; 2x2cm</td>
</tr>
</tbody>
</table>
### Table 7. Perinatal mortality within one week of biophysical profile by BPP score*

<table>
<thead>
<tr>
<th>Test Score Result</th>
<th>Interpretation</th>
<th>PNM within 1 week without intervention</th>
<th>Management</th>
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<tbody>
<tr>
<td>10/10</td>
<td>Risk of fetal asphyxia extremely rare</td>
<td>1/1000</td>
<td>Intervention for obstetric and maternal factors.</td>
</tr>
<tr>
<td>8/10 (normal fluid)</td>
<td>Probable chronic fetal compromise</td>
<td>89/1000</td>
<td>Determine that there is evidence of renal tract function and intact membranes. If so, delivery of the term fetus is indicated. In the preterm fetus &lt; 34 weeks, intensive surveillance may be preferred to maximize fetal maturity.</td>
</tr>
<tr>
<td>6/10 (normal fluid)</td>
<td>Equivocal test, possible fetal asphyxia</td>
<td>Variable</td>
<td>Repeat test within 24 hr</td>
</tr>
<tr>
<td>6/10 (abnormal fluid)</td>
<td>Probable fetal asphyxia</td>
<td>89/1000</td>
<td>Delivery of the term fetus. In the preterm fetus &lt; 34 weeks, intensive surveillance may be preferred to maximize fetal maturity.</td>
</tr>
<tr>
<td>4/10</td>
<td>High probability of fetal asphyxia</td>
<td>91/1000</td>
<td>Deliver for fetal indications.</td>
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<tr>
<td>2/10</td>
<td>Fetal asphyxia almost certain</td>
<td>125/1000</td>
<td>Deliver for fetal indications.</td>
</tr>
<tr>
<td>0/10</td>
<td>Fetal asphyxia certain</td>
<td>600/1000</td>
<td>Deliver for fetal indications.</td>
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</table>

*Modified from Manning FA, Dynamic ultrasound-based fetal assessment: The fetal biophysical score*30
Wellbeing Assessment

- Ultrasound also informs:
  - Fetal Anatomy
  - Cardiac
  - Growth
  - Position
  - Fluid
  - Placenta
  - Cord
  - Cervix (up to 34 weeks)
Do Not Miss

- BPP 6/8

- Oligohydramnious
  - BPP component 0/2 (no 2x2cm pocket)
  - AFI < 5cm
  - ? AFI < 5<sup>th</sup> percentile

- Intrauterine Growth Restriction (IUGR)
  - Date accurately and consistently (see previous)
  - EFW or AC < 10<sup>th</sup> %
  - Use Alberta-derived, gender specific AHS growth charts for EFW percentiles
Table 5 Percentiles for Birth Weight (in grams) by Gestational Age, Singleton Female Live Births with Outliers Removed, Alberta, 2000 to 2009

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<th>Gestational age (weeks)</th>
<th>Number of live births</th>
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<th>5</th>
<th>10</th>
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Figure 3 Birth Weight Percentiles, Female Singleton Live Births with Outliers Removed, Alberta, 2000 to 2009 Combined
### Table 6  Percentiles for Birth Weight (in grams) by Gestational Age, Singleton Male Live Births with Outliers Removed, Alberta, 2000 to 2009

<table>
<thead>
<tr>
<th>Gestational age (weeks)</th>
<th>Number of live births</th>
<th>Percentile</th>
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Figure 4 Birth Weight Percentiles, Male Singleton Live Births with Outliers Removed, Alberta, 2000 to 2009 Combined
Do Not Miss

Abnormal Umbilical Artery Doppler

- Perform when there is known or suspected IUGR, and?
  - Previous pregnancy with fetal death in utero
  - Decreased fetal movement
  - Oligohydramnios / Polyhydramnios
  - Multiple pregnancy
  - Maternal diabetes
  - Maternal hypertension

- Reduced, absent, or reversed umbilical artery end-diastolic flow significant

- Careful attention to technique
  - Doppler gate size
  - Doppler angle
Figure 4. Umbilical artery pulsatility Index: 20 to 42 weeks

Umbilical artery pulsatility index (5th, 50th, and 95th percentiles) from a cross-sectional study of 1556 healthy pregnancies at 20 to 42 weeks' gestation. All fetuses were singletons, and gestational age was confirmed by early ultrasound measurements of crown-rump length. Recordings from umbilical artery were made in the absence of fetal body breathing movements. The pulsatility index was calculated as (systolic velocity - diastolic velocity)/mean velocity. This figure was published in High Risk Pregnancy: Management Options, 3rd edition. James et al. Copyright Elsevier (2006).
Do Not Miss

Other:
- abnormal FHR
- large/active bleed
- placental abnormalities (accreta)
- shortened cervix <3cm at <34 weeks
- sudden drop in growth otherwise
- fetal abnormalities
Bottom Line

• Abnormal Case:
  • Keep the patient
  • Alert the Rad
  • Prevent Disaster
Questions?
4. Twins / Multiples

- TOP Clinical Practice Guideline: Perinatal ultrasound and follow up care in twin and multiple pregnancies
- Ultrasound in Twin Pregnancies (No. 260, June 2011) - SOGC
Key Message

- Accurate and early determination of chorionicity and amnionicity by ultrasound is essential, ideally in the first trimester, and it should be clearly reported.

- Management varies whether:
  - Dichorionic (DCDA)
  - Monochorionic, diamniotic (MCDA)
  - Monochorionic, monoamniotic (MCMA)
DCDA / MCDA / MCMA

• Proves Dichorionic vs. Mono:
  • Separate gestational sacs
  • Separate placentas
  • Membrane >2mm thick, 4 layers, +lambda sign
  • Different genders

• Proves Diamniotic vs. Mono:
  • Inter-twin membrane present
  • Two yolk sacs

• Proves Monoamniotic:
  • Cord or limb entanglement
Dichorionic vs. Mono: TTTS

- Twin-Twin Transfusion Syndrome
  - Frequent complication of monoamniotic twins, 10-15%: placental circulations mix
  - Does not always have growth discrepancy

Stage 1 oligo-polyhydramnios sequence
Stage 2 absent bladder in the donor
Stage 3 abnormal fetal vascular Doppler studies
Stage 4 hydrops of one fetus
Stage 5 death of one fetus
Date the Pregnancy

- See Dating guidelines

- Suggest dating the pregnancy using the larger fetus (when discordant for size) in a twin pregnancy, to avoid missing an early-onset intrauterine growth restriction in one twin.
Track the Twins

• By convention, the presenting twin (sac abuts the cervix) is fetus A / 1

• This does not change

• Further describe by:
  • Left / Right
  • Anterior / Posterior
  • Fundal / Lower
  • Gender
Fluid

- Level of amniotic fluid in multiples at each ultrasound visit using deepest vertical pocket (DVP) measured in both gestational sacs and compare:
  - Oligohydramnios is defined as < 2 cm
  - Polyhydramnios is defined as > 8 cm
  - At each assessment, a free-floating dividing membrane should be visualized, and ideally the DVP should be imaged in view of the dividing membrane.
Growth

• **Routinely report estimated fetal weights (EFW) and gender-appropriate percentiles for each fetus.**

• Use singleton growth curves for evaluating growth abnormalities.

• Alberta gender specific live birth weights

• **If gender unknown use female growth chart**

• Define significant growth discordance as the presence of either a >20% difference in ultrasound-derived estimated fetal weight or a (20 mm) absolute measurement difference in abdominal circumference
Fetus

- All
  - BPP at each visit 28 weeks +

- Monoamniotic
  - Verify bladder filling
  - Umbilical artery doppler at 16 weeks +
  - MCA doppler at 26 weeks +
Consider performing endovaginal ultrasound measurement of closed cervical length when:

- screening for risk of preterm birth
- assessment of spontaneous preterm labour.

Cervical length by transabdominal scanning not adequate for these concerns.
• IUGR of one or both twins
• Growth discrepancy (20% EFW / 20mm AC)

• Oligohydramnious of one or more (<2cm DVP)
• Other TTTS signs

• BPP 6/8 or less

• And other concerns as for singletons
  • see previous section re: fetal wellbeing
Questions?
Thank you!

Success.