Fetal Testing: What Do I Order and When?

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Objectives

• What are the indications for testing?
• What tests are out there?
• When to test?
• Which test is predictive of outcome?
Why Test?

Prevent perinatal morbidity and mortality
Who Needs Testing?
Background Risks

Low-risk pregnancies
4.0 – 5.5/1000

ACOG Practice Bulletin, Number 102, March 2009: Management of Stillbirth
Background Risks
Maternal Illness

Hypertension:

• Chronic hypertension: ↑ 1.5 – 2.7 X

• Pregnancy-induced hypertension
  – Mild: ↑ 1.2 – 4 X
  – Severe: ↑ 1.8 – 4.4 X

ACOG Practice Bulletin, Number 102, March 2009: Management of Stillbirth
Background Risks
Maternal Illness

Diabetes:

• Gestational: $\uparrow 1.2 - 2.0 \times$

• Pre-gestational: $\uparrow 1.7 - 7.0 \times$

Obesity (pregnancy weight): $\uparrow 1.8 - 2.9 \times$

ACOG Practice Bulletin, Number 102, March 2009: Management of Stillbirth
Background Risks
Maternal Illness

- SLE: $\uparrow 6 - 20 \times$
- Renal disease: $\uparrow 2.2 - 30 \times$
- Thyroid disorders: $\uparrow 2.2 - 3.0 \times$
- Thrombophilia: $\uparrow 2.8 - 5.0 \times$
- Cholestasis of pregnancy: $\uparrow 1.8 - 4.4 \times$

ACOG Practice Bulletin, Number 102, March 2009: Management of Stillbirth
Background Risks
Pregnancy Related Conditions

• IUGR: ↑ 1.7 X
• Previous stillbirth: ↑ 1.4 – 3.2 X
• Fluid abnormalities
  - Oligohydramnios: ↑ 2.4 X
  - Polyhydramnios: ↑ 2.1 X

ACOG Practice Bulletin, Number 102, March 2009: Management of Stillbirth
# Indications - ACOG

## Maternal
- *Type I Diabetes*
- *Hypertensive Disorders*
- Chronic Renal Disease
- Systemic lupus erythematosus
- Antiphospholipid syndrome
- Hyperthyroidism (poorly controlled)
- Hemoglobinopathies
- Cyanotic heart disease

## Pregnancy Related
- Decreased fetal movement
- *Fluid abnormalities*
- *IUGR*
- Post-term Pregnancy
- Isoimmunization (moderate to severe)
- Previous fetal demise (unexplained or recurrent risk)
- Multiple gestation (with significant growth discrepancy)

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance
Severity of Disease is Important
Severity of Disease

Hypertension:

“The most significant perinatal outcomes were observed in patients with severe gestational hypertension and preeclampsia with a stillbirth rate of 52/1000.”

Severity of Disease

Diabetes:

- 3% of all stillbirths
- poor glycemic control
- complications of:
  - Macrosomia
  - Polyhydramnios
  - IUGR
  - Preeclampsia

Severity of Disease

Lupus

• 10 studies of 500 patients
• Fetal prognosis = maternal disease activity
  – Fetal demise more common with **antiphospholipid antibodies**
  – 38 – 59% VS 16 – 20%

Severity of Disease

Renal:

- **Severe** = perinatal mortality $4X >$ mild or moderate
  
- **Dialysis** = live birth rate of only $52\%$

Severity of Disease

**IUGR:**

“Fifty-two percent of sudden intrauterine unexplained death (SIUD) cases were affected by IUGR (birth weight below their 10th percentile) ….”

Tools of the Trade

BPP

Modified BPP

Fluid Assessment

NST

Doppler
NST

Reactive (normal):

- two or more fetal heart rate accelerations
  - 15 beats acceleration above the base line
  - 15 sec duration
  - 20 minute period

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
NST

Nonreactive:

< 2 heart rate accelerations within 20-minutes over a 40-minute testing period
BPP

- Tone – extension or flexion of limbs or trunk (1 episode)
- Gross Body Movements - (3 episodes)
- Breathing - 30 seconds
- Fluid - Maximum vertical pocket of at least 2cm
- NST - Excluded if all other parameters are met

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
BPP - Scoring

- 10/10 (with NST) or 8/8 (without NST) = perfect score
- 6/8 is equivocal
  - NST should be performed
  - if NST reactive, a passing score of 8/10 may be given
- 4/8 is a failing score and further action should be considered

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Modified BPP

NST + AFI

- Reactive NST + AFI > 5cm = a normal test result

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
Amniotic Fluid Assessment
Fluid Assessment

- 90° to the surface
- AFI = all four quadrants • MVP = largest quadrant
Fluid Assessment
Fluid Assessment
Oligohydramnios

- Oligohydramnios - < 2 cm pocket or AFI < 5cm
- Study of perinatal mortality by Chamberlin (1984)
  - > 2 and < 8 cm: 1.97/1000
  - < 2 cm: 37.7/1000
  - < 1 cm: corrected perinatal mortality: 109.4/1000

ACOG, 1999; reaffirmed 2012
Fluid Assessment
Polyhydramnios

• Corrected perinatal mortality: 4.12/1000
• AFI > 24cm
• MVP of > 8cm

✓ “was arbitrary and based upon clinical impression gained while performing the biophysical profile scoring”

Umbilical Cord Doppler
Umbilical Artery Doppler

- Measures the resistance to flow in the umbilical cord
- Measurement should be taken in a free loop of the cord
- Risk increases as resistance increases
- Measured as S/D, RI or pulsatility index
- Findings are significant when the diastolic flow is absent or reversed
Umbilical Artery Doppler

Good

Bad

Ugly
Are the Tools Effective?
“There is a **dearth** of evidence from randomized controlled trails that antepartum fetal surveillance decreases the risk of fetal death”

“In the absence of a definitive, relevant randomized clinical trial, evidence for the value of antepartum fetal surveillance will remain **circumstantial**”

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
Are the Tools Effective?

NST – Uncompromised Fetus

• 24 – 28 wks is frequently non-reactive
• 28 - 32 wks may be non-reactive 50% of the time
• 15% of all NSTs are non-reactive
• Variable decelerations may be observed in up to 50% of NST (only concerning if > 1 min)

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
# NST vs. No NST

## Cochrane Review #1

4 studies with 1636 high risk pregnancies (did not specify singleton or multiple)

<table>
<thead>
<tr>
<th></th>
<th>NST vs. No NST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perinatal Mortality</td>
<td>No significant difference</td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>No significant difference</td>
</tr>
<tr>
<td>Apgar &lt; 7 in 5 min</td>
<td>No significant difference</td>
</tr>
<tr>
<td>NICU</td>
<td>No significant difference</td>
</tr>
<tr>
<td>Gestational Age at Birth</td>
<td>No significant difference</td>
</tr>
<tr>
<td>Neonatal Seizures</td>
<td>No significant difference</td>
</tr>
</tbody>
</table>

So are we really going to stop doing antenatal testing????

NOT LIKELY!!!
NST vs. BPP or Modified BPP
Cochrane Review #2

• 4 studies with 2829 high risk pregnancies >24 wks EGA
• No difference:
  ➢ Perinatal deaths
  ➢ Cesarean Section
  ➢ Apgar scores < 7 in 5min
  ➢ Admission to the NICU
  ➢ Birth weight < 10th percentile
  ➢ Presence of meconium at birth
• *Induction more likely for an abnormal BPP*

Lalor, Fawole, Alfievic, Devane. 2012: Issue 4
NST vs. BPP

• Both
  – Negative predictive value: > 90%
  – False positive rate ~ 60%
  – Better at ruling out than predicting fetal compromise

NST = BPP
So how often should I test?
**Frequency of Testing**

**Cochrane Review #3**

167 SGA and IUGR fetuses (normal fluid and normal Dopplers)

<table>
<thead>
<tr>
<th>Twice Weekly Testing</th>
<th>Every Two Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>No fetal deaths</td>
<td>No fetal deaths</td>
</tr>
<tr>
<td>25% more likely to have induced labor</td>
<td>More likely to go into spontaneous labor (near term)</td>
</tr>
<tr>
<td>Mean GA at birth was 4 days earlier</td>
<td>Mean GA at birth was 4 days later</td>
</tr>
<tr>
<td>Two infants required ventilation (at 30 and 32 weeks)</td>
<td>No infants required ventilation</td>
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Umbilical Artery Doppler

A light in the dark?
UA Doppler vs. No Doppler Cochrane Review #4

18 studies which evaluated 10,000+ high-risk pregnancies

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<thead>
<tr>
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<th>Perinatal Death</th>
<th>Perinatal Morbidity</th>
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<tbody>
<tr>
<td>SGA/IUGR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HTN</td>
<td>No change</td>
<td>No change</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td>Not estimable</td>
</tr>
<tr>
<td>Previous Loss</td>
<td></td>
<td>Not estimable</td>
</tr>
<tr>
<td>Post Dates</td>
<td></td>
<td>Not estimable</td>
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</tbody>
</table>

UA Doppler vs. No Doppler Cochran Review #4

18 studies which evaluated 10,000 high-risk pregnancies.

<table>
<thead>
<tr>
<th>Pregnancy Intervention</th>
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<tbody>
<tr>
<td>Emergent C-Section Singleton</td>
</tr>
<tr>
<td>Emergent C-Section Multiples</td>
</tr>
<tr>
<td>Emergent Induction Singleton</td>
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18 studies which evaluated 10,000+ high-risk pregnancies

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<td>Pervious Loss</td>
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Key Points

◆ There are many conditions that raise the risk of perinatal mortality and morbidity
  ➢ Hypertension, diabetes, IUGR, fluid abnormalities

◆ Methods of fetal surveillance:
  ➢ NST, BPP, Modified BPP, Fluid Assessment, & Doppler
Key Points

- NST, BPP, and Modified BPP are all equally predictive of outcome
  - High false positive rates

- Umbilical Artery Doppler has been shown to improve outcomes in SGA and IUGR pregnancies only
Recommendations
BPP (32 weeks)

- 8/8
  - Repeat in one week
  - Reactive

- 6/8
  - NST

- 4/8
  - To hospital
  - Non-reactive
Umbilical Artery Doppler

- Effective in reducing the risk of perinatal death and mortality in SGA and IUGR fetuses
- No benefit for evaluating pregnancies complicated by maternal disease
- Repeat weekly at time of BPP

ACOG Practice Bulletin, Number 9, 1999 – Antepartum Fetal Surveillance.
Thank You

😊