Assessing Fetal Lung Maturity

FLAME LECTURE: 60
BUTLER 2/10/15
Learning Objectives (CREOG)

- Describe approaches to assessing fetal lung maturity
- Understand the indications and contraindications for assessing fetal lung maturity
- Identify and interpret the commonly used fetal lung maturity tests
- Know which tests are affected by blood and meconium contamination

Prerequisites (suggested):
- FLAME LECTURE 23: fetal and placental physiology

See also – for closely related topics
- None
Indications for FLM Assessment

- To confirm fetal pulmonary maturity before elective scheduled deliveries when a gestational age of 39 weeks or greater can not be inferred

- Historic criteria used to infer 39 weeks gestation
  - Ultrasound measurement <20 weeks supporting a gestational age of 39 weeks or greater
  - Fetal heart tones have been documented as present for 30 weeks by Doppler
Indications for FLM Assessment

- Testing for fetal lung maturity **should not be performed** if delivery is indicated for immediate fetal or maternal reasons.

- On the flip side, a mature FLM test result before 39 weeks gestation, in the absence of clinical circumstances, is **not an indication** for delivery in itself.

- RDS, IVH and NEC have been reported in premature newborns with mature FLM tests.
Fetal Lung Maturity Tests

- Two types of FLM tests:
  - Biochemical tests measure the concentration of certain components of pulmonary surfactant.
  - Biophysical tests evaluate the surface-active effects of these phospholipids.

- Choice of tests should be based on:
  - Availability
  - Presence or absence of contaminants
  - Physician preference

- No test has been proven superior.
# Fetal Lung Maturity Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Technique/Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescence polarization</td>
<td>Competitive binding of a fluorescent probe to albumin (high polarization) and surfactant (low polarization)</td>
</tr>
<tr>
<td>TDx-FLM II (No longer available)</td>
<td></td>
</tr>
<tr>
<td>Lecithin/sphingomyelin ratio</td>
<td>Thin-layer chromatography; Lecithin increases and sphingomyelin remains constant as preg advances</td>
</tr>
<tr>
<td>(L/S ratio)</td>
<td></td>
</tr>
<tr>
<td>Phosphatidyl-glycerol (PG)</td>
<td>Thin-layer chromatography; Presence indicates more advanced state of fetal pulmonary maturity</td>
</tr>
<tr>
<td>Lamellar body counts</td>
<td>Hematology counter used; Surfactant stored within type II pneumocytes as lamellar bodies</td>
</tr>
<tr>
<td>Foam Stability Index (FSI)</td>
<td>Presence of stable bubbles noted; Surfactant generates stable foam in the presence of ethanol</td>
</tr>
</tbody>
</table>
# Fetal Lung Maturity Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Cut-Off Value</th>
<th>NPV (Mature)</th>
<th>PPV (Immature)</th>
<th>Blood Affects Results</th>
<th>Meconium Affects Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescence polarization</td>
<td>55 mg or &gt;</td>
<td>96-100%</td>
<td>47-61%</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>L/S Ratio</td>
<td>&gt; 2</td>
<td>95-100%</td>
<td>33-50%</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>PG</td>
<td>Present</td>
<td>95-100%</td>
<td>23-53%</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Lamellar body counts</td>
<td>50,000</td>
<td>97-98%</td>
<td>29-35%</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FSI</td>
<td>47-48 or &gt;</td>
<td>95%</td>
<td>51%</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Fetal Lung Maturity Tests

- The negative predictive value for mature neonatal lung function is high
  - Better at predicting the chance the infant will not develop RDS, than that the infant will
- TDx-FLM II and PG can be collected and interpreted from vaginal pool samples
Clinical Caveats

- Complication rate for 3rd trimester amniocenteses: 0.7% (in one study)

- Before 32 weeks gestation, FLM testing is not indicated because there is such a small % chance of the fetus showing maturity even with poor dating

- Corticosteroid administration reduces the incidence of RDS but may not have an impact on the results of FLM testing
Clinical Caveats

- Twin pregnancies:
  - May need to perform amniocentesis on both twins
  - Depends on gestational age, concordance of gender and growth

- Amniotic fluid volumes should not affect results

- Same cut-off values for FLM tests should be used in diabetics

- No consensus about when (and whether) to repeat testing if immature
References