الله
BIOPHYSICAL PROFILE TEST FOR
ANTEPARTUM FETAL ASSESSMENT

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• Antepartum fetal surveillance with tests such as the biophysical profile for pregnancies is indicated in pregnancies at increased risk of antepartum fetal demise.
• the fetal **biophysical profile (BPP)** is a noninvasive, easily learned and performed antepartum test for evaluating **fetal well-being**.

• Ultrasound is used to assess **four discrete biophysical parameters**: fetal movement, fetal tone, fetal breathing, and amniotic fluid volume.
<table>
<thead>
<tr>
<th>Component</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Fetal movements</td>
<td>3 body or limb movements</td>
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<tr>
<td>Fetal tone</td>
<td>One episode of active extension and flexion of the limbs; opening and closing of hand</td>
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<tr>
<td>Fetal breathing movement</td>
<td>episode of $\geq 30$ seconds in $30$ minutes. Hiccups are considered breathing activity.</td>
</tr>
<tr>
<td>Amniotic fluid volume</td>
<td>single 2 cm x 2 cm pocket is considered adequate.</td>
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<tr>
<td>Non-stress test</td>
<td>2 accelerations $&gt; 15$ beats per minute of at least $15$ seconds duration.</td>
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</table>
Fetal movement and fetal tone develop between 7.5 and 9 weeks’ menstrual age.

Fetal breathing movements are detectable by, at least 17-18 weeks’ gestation.
Criteria for the biophysical profile test

| Nonstress test: | 2 points if reactive, defined as at least 2 episodes of FHR accelerations of at least 15 bpm and at least 15 seconds duration from onset to return associated with fetal movement. |
| Fetal breathing movements: | 2 points if one or more episodes of rhythmic breathing movements of ≥30 seconds within a 30-minute observation period. |
| Fetal tone: | 2 points if one or more episodes of extension of a fetal extremity or fetal spine with return to flexion. |
| Amniotic fluid volume: | 2 points if a single deepest vertical pocket ≥2 cm is present. The horizontal dimension should be at least 1 cm. |
| Fetal movement: | 2 points if three or more discrete body or limb movements within 30 minutes of observation. An episode of active continuous movement is counted as one movement. |

Zero points are assigned for any criteria not met. A score of 10/10, 8/8 (nonstress test not done), or 8/10 (including +2 points for amniotic fluid) is a normal test result. A score of 6/10 (including +2 points for amniotic fluid) is an equivocal test result, as a significant possibility of developing fetal asphyxia cannot be excluded. A score of 6/10 or 8/10 with oligohydramnios (0 points for amniotic fluid) is an abnormal test, and further assessment and correlation with the clinical setting are indicated. A score of 0 to 4/10 is abnormal; the risk of fetal asphyxia within one week is high if there is no intervention, and delivery is usually indicated. Refer to UpToDate topic on the fetal biophysical profile for additional information.

FHR: fetal heart rate; bpm: beats per minute.
The five biophysical parameters were chosen based upon their ease of measurement and the ability to evaluate them objectively using universally available equipment.

Other fetal biophysical activities (eg, sucking, eye movements, swallowing, micturition) might serve equally well as markers of fetal health but are not included in the BPP because measurement is more difficult and may be subjective.
The Biophysical Profile (BPP)

- The non-stress test and fetal breathing movements are suppressed when the pH falls below 7.2.

- If the fetal pH falls below 7.10 fetal tone and fetal movements become abolished.

- The presence of oligohydramnios with all of the other variables of the biophysical profile being normal may reflect chronic uteroplacental insufficiency.
The Biophysical Profile (BPP)

- Between 24 and 28 weeks' gestation, approximately 50 percent of NSTs are nonreactive.

- In contrast sonographically evaluated variables are valid early in gestation and account for three of the five components of the biophysical profile.

- The biophysical profile may be used to verify fetal well being when the nonstress test is not reactive.
• The more acute parameters that are absent (i.e., the lower the BPP score), the less likely the change is due to a sleep state.

• The longer the absence of acute parameters, the more likely the cause is pathologic. Extending the observation period to encompass the usual duration of sleep state cycles (20 to 40 minutes) minimizes the possibility of misdiagnosis of pathologic versus physiologic fetal conditions.
• The rate of stillbirth within one week of a normal modified BPP is the same as with the full BPP: 0.8 per 1000 women tested.

• Approximately 90 percent of pregnancies that undergo a modified BPP will have a normal result, the remainder will need to proceed to a full biophysical evaluation.
<table>
<thead>
<tr>
<th>Score</th>
<th>Interpretation</th>
<th>Perinatal Mortality/1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-10</td>
<td>Normal</td>
<td>1.86*</td>
</tr>
<tr>
<td>6</td>
<td>Equivocal</td>
<td>9.76</td>
</tr>
<tr>
<td>4</td>
<td>Abnormal</td>
<td>26.3</td>
</tr>
<tr>
<td>2</td>
<td>Abnormal</td>
<td>94.0</td>
</tr>
<tr>
<td>0</td>
<td>Abnormal</td>
<td>285.7</td>
</tr>
</tbody>
</table>

*The perinatal mortality is 0.8/1000 for structurally normal fetuses with a normal test within 7 days.*
INTERPRETATION

• **10/10, 8/8, or 8/10 with normal amniotic fluid** — 10/10, 8/8 (nonstress test omitted), or 8/10 (-2 points for either fetal movement, tone, or breathing but not amniotic fluid) is a normal test result: The risk of fetal death within one week if the fetus is not delivered is low (0.4 to 0.6/1000 births)
• These scores should be interpreted within the context of gestational age (eg, neonatal morbidity and mortality if the fetus is delivered) and maternal and obstetric factors (eg, risk of fetal death related to maternal, fetal, or obstetric disorder if the fetus is not delivered; whether cervix is favorable; maternal risks from continuing the pregnancy)
• Fetal death after a normal BPP is often due to an acute and unpredictable insult such as sudden cord prolapse, large fetomaternal hemorrhage, or abruption.
• **6/10 with normal amniotic fluid — 6/10**

• is an equivocal test result. The test is repeated within 24 hours to see if one of the absent acute variables returns to normal or, if the patient is at or near term, delivery is a reasonable option.
• **6/10 or 8/10 with oligohydramnios** — 6/10 or 8/10 with 0 points for amniotic fluid is an abnormal test, as the risk of fetal asphyxia within one week is 89/1000 with expectant management.
A NONSTRESS TEST SHOULD ALWAYS BE PERFORMED IF ANY ULTRASOUND-MONITORED PARAMETER IS 0 (IE, BPP ≤6/8).

• The nonstress test can be omitted when the BPP is 8/8 as it does not enhance test performance.

• The predictive value of the four ultrasound biophysical parameters (movement, tone, breathing, amniotic fluid volume) is equivalent to that of the four ultrasound parameters plus a nonstress test when the four ultrasound parameters are normal.
0 TO 4/10 — 0 TO 4/10 IS ABNORMAL; THE RISK OF FETAL ASPHYXIA WITHIN ONE WEEK IS 91 TO 600/1000 IF THERE IS NO INTERVENTION. DELIVERY IS USUALLY INDICATED.

• FACTORS POTENTIALLY AFFECTING THE SCORE
  • Antenatal corticosteroids –
    • a decrease in FHR variability on days 2 and 3 after administration.
    • Fetal breathing and body movements are also commonly reduced, which may result in a lower BPP score or nonreactive nonstress test.
Interpretation of an Equivocal or Abnormal BPP

The absence of a biophysical variable may reflect:

- Normal fetal activity and sleep cycles
- An inability of the central nervous system to perform that function
- Hypoxia
- External influences
- Fetal breathing movements may be
  - Stimulated by caffeine and hyperglycemia.
  - Inhibited by hypoglycemia, maternal supine hypotension, cigarette smoking, alcohol, diazepam and meperidine.
• **Subclinical infection** – The effect of subclinical infection on test results is controversial. Most studies have found that the BPP score is an insensitive method for detecting subclinical infection.
• **preterm labor** – Preterm labor may be associated with absence of fetal breathing movements, but absence of fetal breathing movements is not a good predictor of preterm delivery within 48 hours or seven days
• Any significant deterioration in the clinical status (eg, worsening preeclampsia, decreased fetal activity) requires reevaluation, regardless of the amount of time elapsed since the last test.

• The positive predictive value of a low BPP score for intrapartum fetal compromise (eg, a nonreassuring fetal heart tracing, neonatal acidemia, or other markers of neonatal morbidity at the time of delivery) is approximately 50 percent, with a negative predictive value greater than 99.9 percent.
Fetal Biophysical Profile in high risk pregnancy - PowerPoint
PPT Presentation

Action for Equivocal or Abnormal BPP

- The term fetus is generally delivered for a score of 6.
  - However, a score of 6 in a preterm fetus is usually repeated in 12 to 24 hours. In the interim, antenatal steroids may be given for pregnancies of less than 34 weeks of gestation.

- Delivery is usually indicated for BPP score of 4 or less.

- Oligohydramnios always requires further evaluation.

Patients with a biophysical profile score of 6 or less should be considered for transfer to Labor and Delivery for further observation or delivery and physician notified.
Fetal Biophysical Profile in high risk pregnancy - PowerPoint PPT Presentation

Special Considerations

- Rupture of the membranes does not alter the short-term sonographic variables of the biophysical profile in the healthy fetus.

- The negative predictive value of a normal biophysical profile score is not as high with an anomalous fetus, in contrast to a structurally normal fetus.

- Sudden fetal deaths have been reported following a normal biophysical profile score in fetuses with gastroschisis, omphalocele, and diaphragmatic hernia.
Special Considerations

- The observation of an abnormal biophysical profile in an anomalous fetus does not correlate very well with the presence of hypoxia.
- The biophysical profile score cannot be used in fetuses with congenital muscular diseases or central nervous system conditions that would affect muscular function.
- If an anomalous fetus had a previously normal biophysical profile score, a decreasing score should be considered an indication of compromise.