OB/GYN

MEDICINE
KING SAUD UNIVERSITY

Antenatal Fetal Assessment

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References: 437 Lectures And Notes , 436 teamwork

Color code: 437 Notes , 436 Notes | Important | Extra | Kaplan

Editing file: https://docs.google.com/presentation/d/1C-lJHwIqf6tV5j8V9UIMv8PKAH4i4zLbfK6GOFB2PA4/edit?usp=sharing

Objectives:

Describe how to test for each of the following:

1. Fetal well-being.
2. Fetal growth.
3. Fetal movements.
4. Amniotic fluid volume.
5. Fetal lung maturity

Fetal Assessment (Fetal Well-Being)

Definition

- Fetal assessment is to identify fetuses at risk of neurologic injury or death in order to prevent prenatal mortality & morbidity.
- The most common reasons for fetal testing are decreased fetal movements, diabetes, postdates, chronic hypertension, and IUGR.
- **It can be It can be divided into:** early pregnancy fetal assessment, late pregnancy fetal assessment
- **OR can be divided into:** assessment of low risk pregnancy, assessment of high risk pregnancy

Fetal and neonatal complications of antepartum asphyxia:

- Stillbirth (Mortality)
- Metabolic acidosis at birth
- Hypoxia renal damage
- Intracranial hemorrhage
- Seizure
- Cerebral palsy

Rationale:

If fetal oxygenation challenged:

- Blood flow directed to brain, heart & adrenal & blood flow away from the kidney ⟶ decrease fetal urine production ⟶ Decrease amniotic fluid (AF) volume (so AF volume is our 1st marker in fetus chronic low oxygenation)
- CNS hypoxia ⟶ Decreased Fetal movement.
- Chemoreceptors ⟶ vagally-mediated reflex ⟶ Fetal heart rate abnormality (present as late deceleration).

Conditions associated with increased perinatal morbidity and mortality: These are examples of conditions that you need to label the patient as a high risk and do a fetal assessment

- Small for gestational age fetus small fetus
- Decreased fetal movement
- Postdate pregnancy (>294 days) after 40 weeks
- Pre-eclampsia and chronic hypertension

- Pre-pregnancy diabetes
- Insulin requiring gestational diabetes
- Preterm premature rupture of membranes
- Chronic (stable) abruption

Indication for antepartum fetal surveillance

Maternal	Pregnancy complication
• Antiphospholipid syndrome • Poorly controlled HTN • Hemoglobinopathies (e.g. skill cell) • Cyanotic heart diseases • Systemic lupus erythematosis • Chronic renal disease • Type 1 diabetes mellitus • Hypertensive disorders	• Preeclampsia • Decreased fetal movement • Oligohydramnios • Polyhydramnios • Intrauterine growth restriction (IUGR) • Postterm pregnancy • Isoimmunization • Previous unexplained fetal demise • Multiple gestation

When to start fetal assessment antenatally:

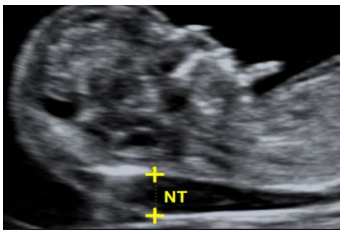
- Risk assessment individually
- For diabetes assessment should start from 32 weeks onward if **uncomplicated**
- If **complicated** (uncontrolled diabetes or have HTN or any other complications of diabetes) diabetes starts at 24 weeks onward.
- For post date pregnancy start at 40 weeks
- For any patient with decreased fetal movement start **immediately**
- Fetal assessment is done once or twice a week (depend on antenatal assessment score if high we can do it once every two weeks, if low score we have to do it every 3 days which is twice a week)

Pregnancy Assessment

Early Pregnancy Assessment:

1) Fetal heart activity: (fetal heart rate)

- Fetal auscultation (special stethoscope or Doppler) - after12 weeks[1].
- Fetal heart activity seen by USS - from 6 weeks.
- Nuchal translucency measurement (NT) We measure the area behind the neck of the fetus if it is increased dilated this means most likely the fetus is chromosomally abnormal and you need to further assess the fetus measurement for early screening for chromosomal abnormality between **11-13 weeks** timing is very important .

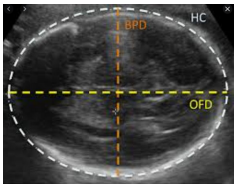


2) Fetal movement

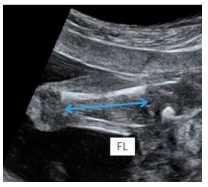
- Fetal movements are usually first perceptible to mother ~17w-20w if the mother is multipara she can feel it as early as 17w and if she is primigravida she can feel it late at 20w . (Quickening is the first fetal movement the mother feels) it takes time to feel the movement bc the uterus is small compared to the abdominal wall at 1st trimester
- 50% of isolated limb movements are perceived
- 80% of trunk and limb movements.

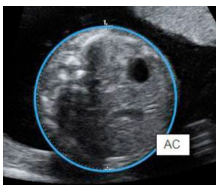
3) Fetal growth:

- Symphysis Fundal Height (SFH)
- UltraSound Scan (USS)
- Biometry: you will find all of these measurements in the ultrasound



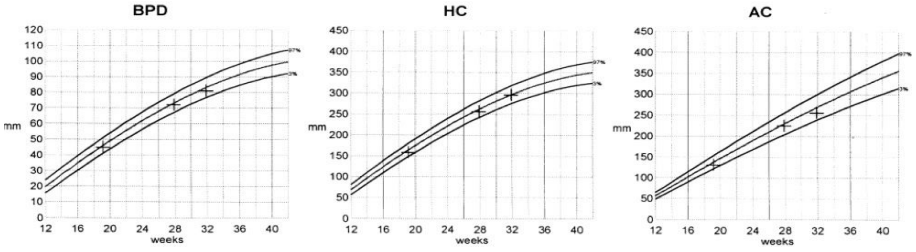
1. Biparietal diameter (BPD) widest diameter in the fetus head
2. Abdominal circumference (AC)
3. Femur length (FL)
4. Head circumference (HC)
   - Amniotic fluid





Fetal growth chart:

For every measurement we have to compare it with the fetal growth chart if it was above the 3 lines this means we have a big fetus and if it is below the 3 lines this means a small fetus, normal fetus should be between the 3 lines



[1] You need 12 weeks to listen bc there is the symphysis pubis of the mother, so when the uterus goes above the symphysis pubis then you can listen to the heart

Late Pregnancy Assessment: late pregnancy means the second half of the pregnancy

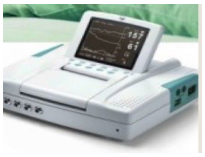
1) Fetal movement counting (kick chart):

- It should be started ~28w in normal pregnancy & ~24w in high risk pregnancy.
- It can reduce avoidable stillbirth. Sometimes patients are alert and complain of decrease fetal movements

Fetal movement counting technique	
CARDIFF TECHNIQUE	**SADOVSKY TECHNIQUE**
• 10 movements in 12 hours at least (so if the mother felt more than 10 movements in 12 hours this is normal, the abnormal is less than 10 in 12 h). • If abnormal patient should count again then get further assessment (the CTG).	4 movements /hour ⟶ if not felt ⟶ another hour ⟶ still not felt ⟶ patient need more assessment. This technique is helpful bc some patients get busy so they cannot feel the movements.

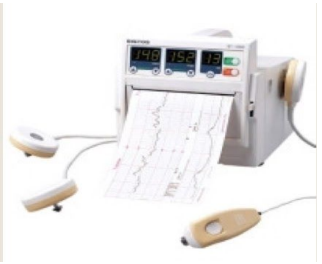
2) Contraction stress test (CST):[2]

- We cause (induce by medication) at least 2 uterine contractions over 20 minutes you have to monitor the fetus heart during contractions because during contractions the O2 delivery to the fetus is disturbed, if the fetus is well oxygenate he will tolerate and there will be acceleration increase in fetal heart rate but if the fetus is already in hypoxia he will not tolerate the contractions and his heart rate will drop late deceleration.
- Uterine contraction restricts O_2 delivery to the fetus.
  - Normal fetus will tolerate contraction. Negative CST requires absence of any late decelerations with contractions or sometimes acceleration
  - Hypoxic fetus will have late deceleration bc the blood vessels will be closed. Positive CST is worrisome. This requires the presence of late decelerations associated with at least 50% of contractions.
- High false positive rate ~50%.
- 100% true negative rate. That's why we don't use it these days unless you don't have US
- Contraindications: include previous classical uterine incision, previous myomectomy, placenta previa, incompetent cervix, preterm membrane rupture, and preterm labor.



[2] sometimes called oxytocin challenge test bc we give oxytocin to contract the uterus.

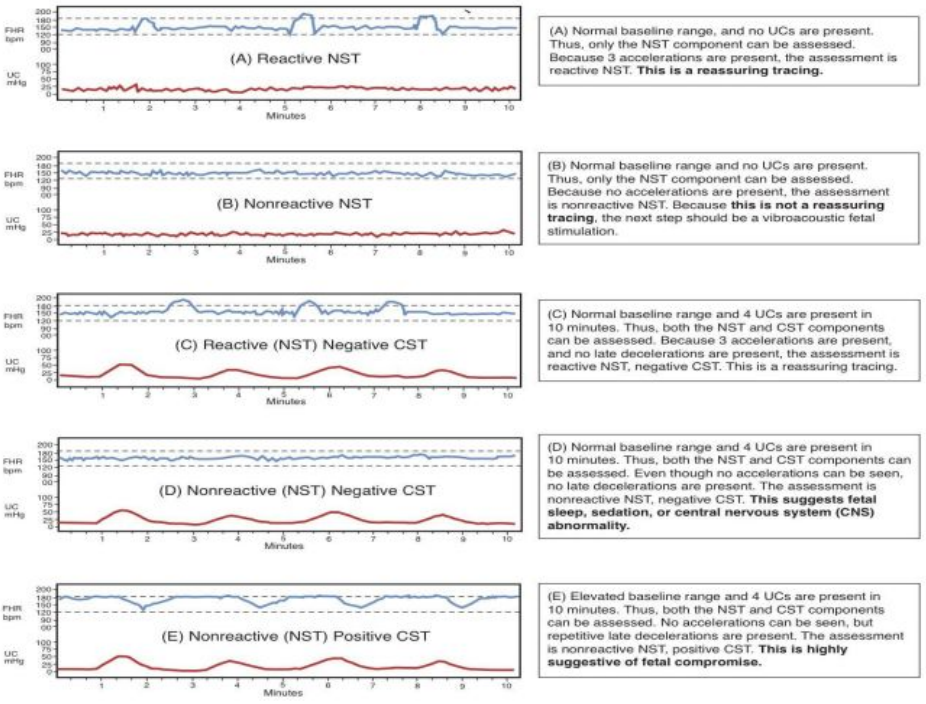
3) Non stress test (NST) you only connect the CST to the mother without inducing contractions and only monitor fetal heart rate



- The first step in the assessment of fetal well-being is the NST.
- Main advantage over CST is no need for contraction.
- False +ve & false –ve higher than CST.
- The baseline 120-160 beats/minute. You have to know the baseline very important!
- Different criteria in fetuses <32w.

  The criteria vary by gestational age:
  - <32 weeks, the increase should be ≥10 beats/min lasting ≥10 s
  - >32 weeks, the increase should be ≥15 beats/min lasting ≥15 s
  -

Reactive	Non-reactive
• At least two accelerations from baseline of 15 bpm for at least 15 sec within 20 minutes you have to memorize this! • Assessment: reassuring of fetal well-being. • Follow-up: repeat weekly.	• No acceleration after 20 minutes → proceed for another 20 minutes. • If non reactive in 40 minutes proceed for contraction stress test or biophysical profile (US). • The positive predictive value of NST to predict fetal acidosis at birth is 55%. • Assessment: sleeping, immature, or sedated fetus; acidotic, compromised fetus? • Follow-up: VAS "Vibratory Acoustic Stimulation". • If still NR do CST or BPP.



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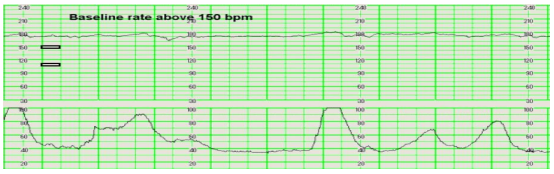
Interpretation of cardiotocography (CTG):

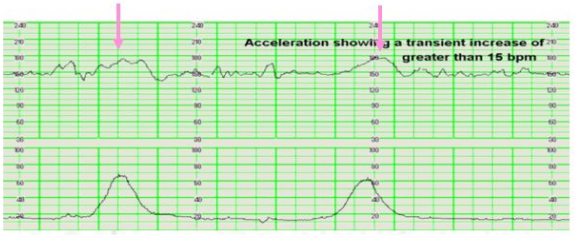
- Normal baseline FHR 110-160 bpm
- Moderate bradycardia 100-109 bpm
- Moderate tachycardia 161-180 bpm
- Abnormal bradycardia <100 bpm
- Abnormal tachycardia >180 bpm



Causes of fetal tachycardia include: hypoxia, chorioamnionitis, maternal fever, fetal anemia sepsis heart failure and arrhythmia, mimetic drugs

Acceleration (CTG) reactive CTG

A normal temporal increase in the FHR from the baseline by **>15 bpm** for greater than **15 seconds** .

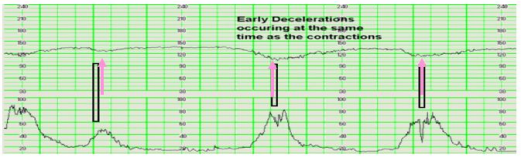


Multiple accelerations (arrows)

Decelerations (CTG)

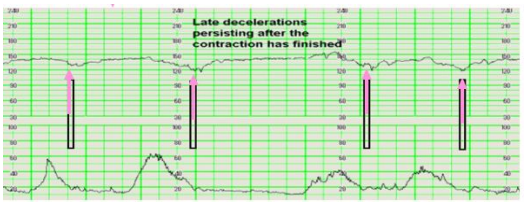
Early deceleration

The deceleration correspond with the uterine contraction. caused by: Head compression



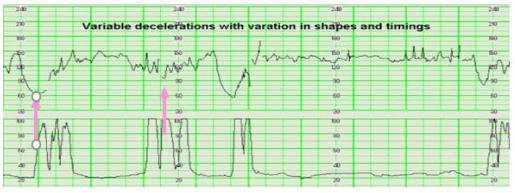
Late deceleration

The peak of the deceleration will be **after** the peak of uterine contractions. Uteroplacental insufficiency

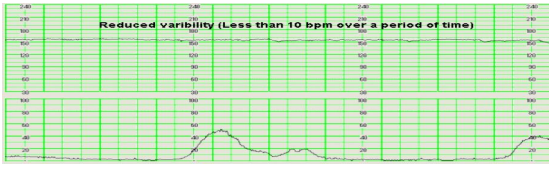


Variable deceleration

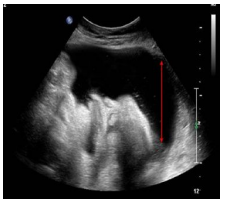
Decelerations that differ in the shape, size and relation to the contractions : Cord compression, Primary CNS dysfunction



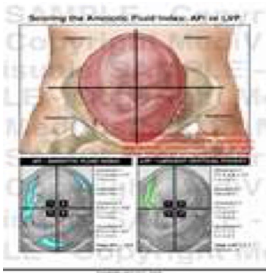
Reduced variability straight line no reaction even with contractions :



4) Amniotic fluid index (AFI) very important measures by cm by adding



- The sum of the maximum vertical fluid pocket diameter in four quarters. You will put the probe in the 4 abdominal quarts and measure the vertical line in each quarter and sum them up
  - The normal value: 5-25 cm
  - oligohydraminous: AFI < 5 cm. Consideration must be given to problems with urinary tract anomalies or renal perfusion.
  - polyhydraminous: AFI > 24 cm Consideration must be given to problems with decreased fetal swallowing or GI tract anomalies.



5) Biophysical profile (BPP) very important

Combines NST with USS estimation AFV, fetal breathing, body movement & reflex/tone/extension-flexion movement. 5 component

- It is a scoring system. Score is out of 10 every component is scored 2
- It is done over 30 minutes.
- It measures acute hypoxia through (NST, body mov. and breathing) & chronic hypoxia (AFI decrease).
- The risk of fetal death within 1 week if BPP is normal~ 1/1300.
- Modified BPP (mBPP): includes only the NST and AFI.
- Low false negative 0.8/1000, High false positives ~60%.

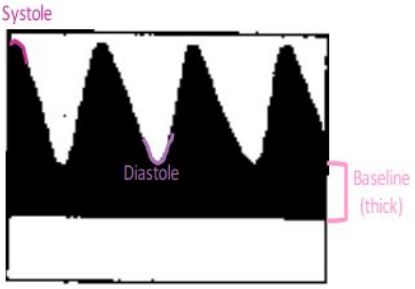
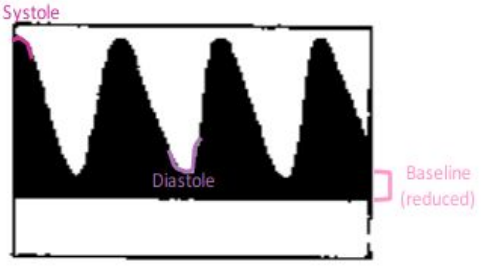
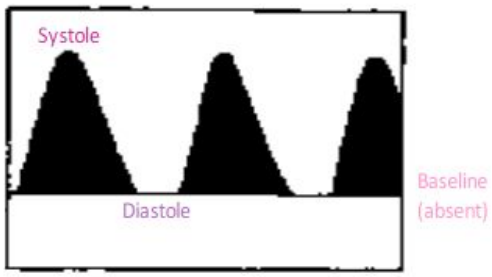
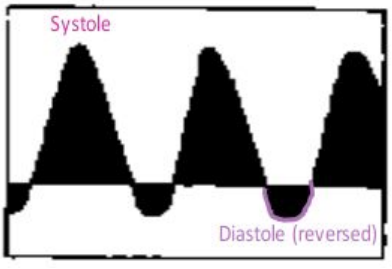
Fetal Biophysical profile/NST + AFI (extremely important)**:**

Biophysical Variable (all seen by US)	Normal (score=2)	Abnormal (score= 0)
Fetal breathing Movements (FBM)	1 episode FBM of at least 30s duration in 30 min	Absent FBM or no episode >30s in 30 min
Fetal movements	3 discrete body/limb movements in 30 min	2 or fewer body/limb movements in 30 min
Fetal tone	1 episode of active extension with return to flexion of fetal limb(s) or trunk. Opening and closing of the hand considered normal tone.	- Either slow extension with return to partial flexion or movement of limb in full extension. - Absent fetal movement.
Amniotic fluid volume	1 pocket of AF that measures at least 2 cm in 2 perpendicular planes.	Either no AF pockets or a pocket <2 cm in 2 perpendicular planes.

- Score of 8 or 10 —highly reassuring of fetal well-being. Management is to repeat the test weekly or as indicated.
- Score of 4 or 6 —worrisome. Management is delivery if the fetus is ≥36 weeks or repeat the BPP in 12–24 h if <36 weeks. An alternative is to perform a CST.
- Score of 0 or 2 —highly predictive of fetal hypoxia. Management is prompt delivery regardless of gestational age.

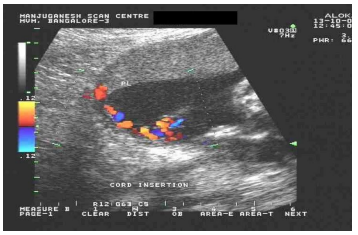
6) Doppler Velocimetry (UAV)

- Measurement of blood flow velocities in maternal & fetal vessels.
- Reflect fetoplacental circulation.
- Doppler indices from UA (Umbilical a.), Uterine a. & MCA (middle cerebral a. Of fetus).
- Doppler studies are mostly valuable for IUGR, as well as fetal anemia in alloimmunized pregnancies.
- In IUGR absent or reversed EDG (end diastolic flow) associated with fetal hypoxia.

Doppler Velocimetry (UAV) very important	
Normal pregnancy	**Reduce end diastolic velocity**
	 if you see this you have to repeat it every 3-4 days to make sure if the baby going to the normal side or deteriorating reduced oxygenation
Absent diastolic velocity	**Reversed end diastolic velocity**
 during diastole there is no flow between the mother and the fetus. E.g. IUGR associated with fetal hypoxia.	 which means the blood go from fetus to the mother. this happen bc the fetus is hypoxic → asphyxia → more resistance → the blood can't go to the fetal circulation → return to the mother. This is very dangerous (it is the stage before fetal death) E.g. IUGR associated with fetal hypoxia.

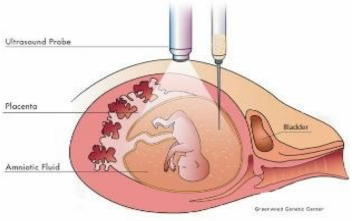
UMBILICAL ARTERY DOPPLER:

- This test measures the ratio of systolic and diastolic blood flow in the umbilical artery.
- The umbilical circulation normally has low resistance, so significant diastolic blood flow is expected.
- The systolic/diastolic (S/D) ratio normally decreases throughout pregnancy.
- This test is predictive of poor perinatal outcome only in IUGR fetuses.
- Nonreassuring findings, which may indicate need for delivery, are absent diastolic flow and reversed diastolic flow



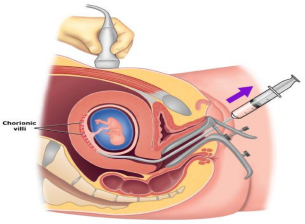
Invasive Fetal Assessment

1. AMNIOCENTESIS



- **Definition:** Obtaining a sample of amniotic fluid during pregnancy.
- **When it's done?** Usually done after 15w under ultrasound guidance without anesthesia (can be done after 11w)
- **Indications:**
  - Genetic (karyotype). NTD (neural tube defect) screening is performed on amniotic fluid with biochemical analysis (AFP and acetylcholinesterase).
  - Bilirubin level (in RH-isoimmunisation)
  - Fetal lung maturity (L/S)
  - Therapeutic in polyhydramnios to decrease the pressure tension on the mother
- **Risks:** Rupture of membranes (ROM) ~1%, abortion 0.5%, infection 1/1000.

2. CHORIONIC VILLUS SAMPLING (CVS)[3]

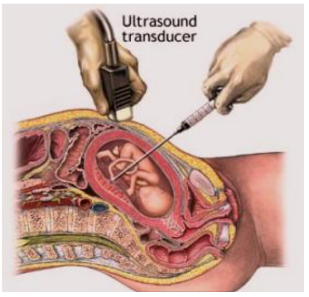


- **Definition:** It is the procedure of choice for first trimester prenatal diagnosis of genetic disorders. The procedure can be performed transcervically or transabdominally.
- **When it's done?** Usually done after 10w. (between 10 and 12w of gestation), why? bc if there is genetic disease the mother can terminate the pregnancy early which has less complication than if done later

[3] The catheter is placed directly into placental tissue without entering the amniotic cavity.

- It is the procedure of choice for first trimester prenatal diagnosis of genetic disorders we do it for high risk mothers: previous history or family history of genetic diseases
- Second trimester amniocentesis is associated with the lowest risk of pregnancy loss; chorionic villus samplings safer than early (i.e, before 15 weeks) amniocentesis. so before 11 weeks we do CVS but after 11 weeks we do amniocentesis
- **Complication:**
  - Procedure-induced limb defects.
  - Fetal loss (0.7 % within 14 days of a TA CVS procedure and 1.3 % within 30 days).

3. CORDOCENTESIS



- usually done after the 1st trimester (after 13 weeks) but can be done at any time
- **Indication:**
  - Rapid karyotyping.
  - Diagnosis of inherited disorders.
  - Fetal HB assessment.
  - Fetal plt level. If mother have autoimmune thrombocytopenia
  - Fetal blood transfusion
- **Complication:** Bleeding**,** Bradycardia, Infection

Fetal Lung Maturity

- A test for fetal lung maturity is performed before semi-elective but medically indicated birth <39 weeks rarely done now a days
- Tests for fetal lung maturity are generally not performed before 32 weeks of gestation if the fetus immature he is at risk for respiratory distress syndrome ARD, intracranial hemorrhage and necrotizing enterocolitis
- RDS develops as a consequence of surfactant deficiency and immature lung development the main killer is lung immaturity now a days with the discovery of surfactant and use of antenatal steroid this risk is much lower.
- L/S ratio (Lecithin–sphingomyelin ratio) is most commonly used (ratio should be 2:1) we do this test mainly to diagnose if the fetus going to have severe ARD as a consequence of surfactant deficiency and immature lungs

The value of fetal lung maturity in clinical situations:

- Premature rupture of membranes (≥32 weeks)
- If FLM test is mature, delivery is likely safer than "wait and see" approach but if the fetus lungs are immature and the mother is okay you postpone the delivery until more fetal maturation achieved
- Assessment of need for NICU - possible only if early delivery has medical mandate and time allows for FLM testing
- Other selected late preterm and early preterm pregnancy issues where FLM may guide management of at-risk pregnancy

Comparison of FLM laboratory testing options:

All tests require amniocentesis for obtaining amniotic fluid

Lamellar body count (LBC)	Phosphatidylglycerol (PG)	Lecithin-sphingomyelin ratio (L/S)
• initial FLM choice • Rapid, sensitive • New data indicates that one can estimate risk of respiratory distress syndrome as a function of gestation age and LBC	• Not useful unless gestation age 35 weeks • Limited availability • Sensitive	• Main role is adjudication of immature LBC or PG • Labor intensive, imprecise • Limited availability • Results take >24 hours unless performed at a local laboratory

MCQs

1) A 32-year old pregnant at 33-weeks came to the clinic with reduced fetal movements. Which one of the following is the best initial management for this patient?

A- Caesarean section. B- Induction of labor. C- Non-stress test D. Ultrasound

2) During monitoring fetal heart rate on labor, you noticed repetitive deceleration after uterine contraction. What is the most likely diagnose?

A- Congenital fetal cardiac block

B- Cord compression

C- Head compression

D- Fetal hypoxia

3) 10 weeks of gestation presented to antenatal clinics for the first time. you did US which is useful for what in this stage:

A- Gestational age.

B- Congenital anomalies

C- Locate placenta

D- Amniotic fluid index

4) A 42-year old presented in early pregnancy. She is worried that her baby might have down syndrome. Which one of the following should be performed as screening method?

A- Amniocentesis

B- Chorionic villus sampling

C- Ultrasound scan

D- Umbilical blood sampling

5) Which one of the following will be obtained by doing a first trimester ultrasound scan for twin pregnancy?

A- Determination of fetal presentation.

B- Localization of cord insertion.

C- Placental Localization.

D- Determine chorionicity.

Answers: 1- C. 2- D. 3- A. 4-C. 5- D.