# IUGR, IUFD & Fetal surveillance

# Session objectives

- Define IUGR
- Describe causes of IUGR
- Propose management Options
- Describe causes of IUFD
- Evaluation of IUFD
- Describe antepartum fetal assessment

# IUGR( Intrauterine growth restriction)

Definition: IUGR is said to be present if babies birth weight is less than tenth percentile for the average gestational age.

- Could be preterm, term or post term
- SGA is often used synonymously with IUGR, but SGA fetuses are not necessarily growth retarded, could be constitutional.

# IUGR-cont'd

Incidence: Dysmaturity comprises 1/3$^{rd}$ of LBW.

- Developed countries: 2- 8%
- Term babies: 5%
- Post term: 15%
- Normal fetal growth: Cellular hyperplasia followed by cellular hyperplasia & hypertrophy and at last hypertrophy alone.
- 2/3$^{rd}$ of fetal weight gain occurs beyond 24$^{th}$ week

# IUGR-Types

- Based on clinical evaluation & ultrasound, classified in to two:

1. Fetuses which are small & healthy: normal Ponderal Index, normal subcutaneous tissue and uneventful neonatal course.
2. Pathological (true): based on relative size of their head, abdomen & femur further classified in to two:

i. Symmetrical/ type I/ intrinsic
ii. Asymmetrical/ Type II/ extrinsic

# Symmetrical IUGR

- 20%
- Insult occurs early at stage of cellular hyperplasia.
- Intrinsic to fetus
- Total cell number is less
- Ponderal Index is normal
- Often caused by structural or chromosomal abnormalities or congenital infection
- All organs are involved including head

# Asymmetric IUGR

- 80%
- Insult at late phase i.e. at phase of cellular hypertrophy
- Total cell number is normal but size is small
- Due to maternal diseases extrinsic to fetus
- Low ponderal index
- Head is larger
- FL/AC & HC/AC ratios are elevated

| Symmetrical | Asymmetrical |
| --- | --- |
| Uniformly small | Head larger than abdomen |
| PI- normal | Low |
| HC:AC & FL: AC-normal | elevated |
| Etiology- genetic/infection | Chronic placental deficiency |
| Total cell No-less<br>Cell size- Normal | Normal<br>Smaller |
| Course- Poor prognosis | Good prognosis |

# Etiology

- Maternal
- Fetal
- Placental
- Unknown
- Etiology is not known in 40% of cases

# Etiology-cont'd

Maternal:

- Constitutional: smaller women, maternal genetic & racial background
- Maternal nutrition before & during pregnancy
- Maternal diseases: anemia, hypertension, heart diseases, renal diseases etc.
- Toxins: alcohol, smoking, cocaine, heroin, drugs

# Etiology-cont'd

Fetal: failure of utilization

- Structural anomalies- cardiovascular, renal
- Chromosomal abnormality- 8-12 5 growth retarded
- Infection: TORCH agents
- Multiple pregnancy

# Etiology-cont'd

Placental: due to poor uterine blood flow &/or chronic placental insufficiency

- Placenta previa
- Abruption
- Circumvallete placenta
- Placental infarction
- Mosaicism

# Patho-physiology

Basic pathology:

- Reduced availability of nutrients in mother or
- Reduced transfer by placenta or
- Reduced utilization by fetus
- Brain cell size in asymmetric SGA as well as cell number in symmetric SGA are reduced
- Oligohydraminos is common as contribution from renal & pulmonary system reduced
- Liver glycogen content is reduced.

# Diagnosis

- Improvement in detecting IUGR was made both clinically and by biophysical methods

A. **Clinical:**

- SFH, fetal mass
- Maternal weight gain- stationary or decreasing
- Abdominal girth- stationary or decreasing

B. **Biophysical**: Confirm the clinical GA

- Ultrasound is useful not only diagnosing IUGR but also identify symmetrical vs asymmetrical

# Diagnosis-cont'd

Ultrasound parameters to diagnose IUGR include:

i. **HC/AC ratio**: Normally before 32 weeks is greater than one, at 32-34 weeks is equal to one and after 34 weeks is less than one.

- In asymmetric IUGR, head remains larger and the ratio is elevated
- In symmetric IUGR, the ratio is normal
- Using the HC/AC ratio, 85 % of IUGR are diagnosed
- AC is single most parameter

# Diagnosis- US

ii. **FL/AC**: is 22 at all gestational ages from 21weeks to term.

- Femur length is unaffected in asymmetric IUGR.
- FL/AC ratio greater than 23.5 is suggestive of IUGR

iii. **Amniotic fluid** volume: reduced amniotic fluid is associated with asymmetric IUGR

iv. **Doppler velocimetry**: S/D ratio > 2.6, diastolic notch

# Ultrasound-cont'd

v. Exclude structural abnormalities

vi. Ponderal Index (PI)

**C. Biochemical markers**

- Elevated erythropoietin level in cord blood is suggestive

**D. Physical features at birth**

- Weight at birth
- Length
- Head circumference

# Physical features-cont'd

- Dry & wrinkled skin
- Thin umbilical cord
- Old man's look
- Pinna- cartilaginous ridges
- Normal reflexes including Moro
- Well formed plantar creases

# Complications

1. **Fetal:**

- Antenatal: chronic fetal distress, fetal death
- Intrapartum: hypoxia & acidosis
- After birth:

i. immediate:

- Hypoglycemia
- MAS
- Hypothermia
- pulmonary hemorrhage
- Polycythemia
- NEC
- IVH
- Hyperviscosity
- asphyxia

# Fetal complications-cont'd

ii. Late:

- Symmetric- slow growth rate
- Catch up growth in early infancy in asymmetric IUGR
- Link between IUGR and development of cardiovascular diseases, type 2 DM & hyperlipidemia

Maternal complications: IUGR per se doesn't cause harm but underlying diseases.

- Chance of recurrence is twice

NB: fetal mortality is six times higher & morbidity is to level of 50%.

# Management

- When SGA is suspected, careful ultrasound for diagnosis of IUGR
- If IUGR present, differentiate between symmetric vs asymmetric
- If symmetric IUGR, meticulous workup for fetal anomalies including karyotyping
- Screening for TORCH not recommended

# Management-cont'd

- Majority of deaths occur after 36 weeks, so correct diagnosis & intervention
- General management: No proven therapy to reverse growth restriction
- Adequate rest in LLP
- Correct malnutrition with balanced diet
- Appropriate therapy for associated factors
- Avoid smoking, alcohol, etc
- Low dose aspirin for recurrent ones
- Maternal hyperoxygenation

# Management

Antepartum evaluation:

- Serial evaluation of fetal growth every 3-4 weeks for BPD, HC/AC, AFI, EFW
- Fetal well being: NST, BPP, Doppler

# Management

Factors that affect termination of pregnancy include:

- Presence of fetal abnormality
- Gestational age
- Degree of growth restriction
- Associated complicating factors
- Fetal compromise
- Past obstetric history
- Facilities available at place of management

# Management-cont'd

- If GA > 37 weeks, TERMINATE
- If GA< 37 weeks

i. uncomplicated: conservative

ii. Complicated: if fetal lung maturation confirmed, terminate; if not steroids and terminate

# IUFD( intrauterine fetal death)

Definition:

- Only deaths occurring in utero in which the fetus or neonate weighs 500 gm or more (WHO)
- Only deaths occurring in utero in which the fetus or neonate weighs 500 gm or more and/or deaths occurring at 22 weeks of gestation or greater (ACOG)
- Only deaths occurring in utero in which the fetus or neonate weighs 1000 gm or more and/ or deaths occurring at 28 weeks of gestation or greater (Ethiopia)

# Introduction

- Not all conceptions result in a live born infant
- Of the clinically recognized pregnancies, 10-15 % are lost.
- Almost 1% of women entering the 2nd half of pregnancy will suffer the loss of their baby
- Almost 80% of still births occur before term and
- More than half occur before 28 weeks.
- Still births are much more common with decreasing gestational age

# Introduction

- It is a common cause of serious psychological morbidity
- Words like fetal demise, still birth, stillborn & fetal death are used interchangeably.
- Gradual decrement in incidence of IUFD:

- Preconceptual care
- Care during pregnancy & labor
- Provision for prenatal diagnosis
- Selective termination in congenital anomalies

# Magnitude

- World wide 3 million still births occur yearly
- In USA, 6.8/1000 live births

**Etiology**:

- Fetal- 25-40%
- Placental- 25-35%
- Maternal- 5-10%
- Unexplained-25-35%

# Fetal causes

- Chromosomal anomalies
- Non chromosomal birth defects
- Non- immune hydrops
- Infections-viruses, bacteria, protozoa

# Placental causes

- Abruption
- Feto-maternal hemorrhage
- Cord accident.
- Placental insufficiency
- Intrapartum asphyxia
- Placenta previa
- Twin-to –twin transfusion
- Chorioamnionitis
- PROM

# Maternal causes

- **Anti phospholipd antibodies**
- **Diabetes**
- **Hypertension disorders**
- **Trauma**
- **Abnormal labor**
- **Sepsis**
- **Acidosis**
- **Hypoxia**
- **Uterine rupture**
- **Post term pregnancy**
- **Drugs**
- **Rh disease**

# Pathology

- Maceration- blistering & peeling of skin occurs between 12-24 hours after death.
- Initial pathology after death is fetus swells and appear dusky red.
- Maceration is a result of aseptic autolysis affecting different structures

# Diagnosis

- Repeated examination is needed to confirm the diagnosis usually in the absence of ultrasound

**Signs & symptoms**

- Absent fetal movement
- Pregnancy symptoms absent or diminishing
- White milk expression during pregnancy
- Fundal height-same or decreased.
- Smaller uterus than expected

# Diagnosis-cont'd

- Abdominal girth same or decreased.
- Gradual retrogression of the fundal height.
- Egg- shell cracking feel of the fetal head (late feature)
- Fetal movements not felt during palpation.
- Absent FHB-pinardes stethoscope

# Diagnosis-cont'd

**Laboratory:**

- An abnormal blood level of HCG.
- Urine pregnancy test could be positive or negative.

**X-Ray**

- Spalding's sign- the irregular overlapping of the cranial bones on one another and the rolled up appearance of the fetal trunk. Occurs 7 days after fetal death

# X-ray- cont'd

- Robert's sign- the appearance of gas bubbles in the thoracic cavity of the fetus within the heart chambers or great vessels. Occurs 12 hours after death
- Kehrer's sign- hyper flexion of the spine.

**Ultrasound:**

- Absent cardiac activity.
- Absent fetal movement.
- Oligohydraminos and collapsed cranial bones

# Complications

1. Psychological upset or stress.
2. Infection.
3. Blood coagulation disorders.
4. During labor-uterine inertia, retained placenta, PPH
5. Maternal death

# Work up

- ABO and Rh grouping
- VDRL
- Post prandial blood sugar (FBS) level
- Thyroid profile
- TORCH screening
- Lupus anticoagulant and anticardiolipin Abs
- Complete blood count
- Urine toxicology screen
- Indirect coomb's (anti body screen)
- Prothrombin time (PT)
- Partial thromboplastin time (PTT)

# Work up-cont'd

- U/A
- Platelet count
- Fibrinogen level.
- Cord or cardiac blood for
- Culture and sensitivity
- Estimation of Ig level
- Coomb's if cord blood is available
- Cytogenetic studies
- Post mortem examination
- Naked examination of placenta, cord & fetus

# Management

Principles:

- Confirm diagnosis by ultrasound
- Search for cause
- Determine fibrinogen level & PTT

Management could be expectant or interference

- **Expectant**: in 80% of cases spontaneous expulsion occurs in 2 weeks time.

- Follow with coagulation profile like PT, PTT, Fibrinogen & platelet count weekly

# Interference/ active intervention

Indications for termination:

- Psychological upset
- Infection
- Coagulation abnormalities manifested by falling fibrinogen
- IUFD after 4 weeks
- ROM/ labor

# Methods of termination

- Oxytocin infusion
- Prostaglandins
- Catheter methods
- C/S or hysteretomy
- Destructive deliveries

NB: bereavement management by managing staff is important.

# Prevention

- Total prevention is not possible but include:

- Preconceptual care
- Regular antenatal care
- Screen at risk mothers

# Fetal surveillance

- Also called as antenatal testing
- Primary objective is prevention of perinatal mortality
- Progressive decline in maternal death all over the world has shifted focus on fetal health
- Aims:

1. Ensure satisfactory fetal growth & well being
2. Screen high risk factors that affect fetal environment

# Indications for testing

1. Pregnancy with obstetric complications: IUGR, multiple pregnancy, Rh iso-immunization, etc
2. Pregnancy with medical complications: DM, HTN, etc
3. Others: maternal age > 35 years, previous still birth, previous delivery to abnormal fetus, etc
4. Routine antenatal testing

# Tests

**Early pregnancy**:

1. **Biochemical:**

a. **Maternal serum alpha-fetoprotein (MSAFP):**

- Oncofetal protein produced by yolk sac & fetal liver
- Fetal & amniotic fluid level is highest at 13 weeks & then after decreases while maternal serum level peaks at 32 weeks
- Level of 2.5 MoMs when adjusted for maternal weight is taken as cut off point

# Cont'd

- **Elevated in a number of conditions like:**
- **Wrong gestational age**
- **Open neural tube defects**
- **Multiple pregnancy**
- **IUFD**
- **Anterior abdominal defects**
- **Renal anomalies**
- **Lower levels are found in trisomies and GTD**
- **Elevated level detects 85% of neural tube defects followed with ultrasound &/or amniocentesis**

# Cont'd

b. Triple screen test: MSAFP, hcG & unconjugated estriol at 15-18 weeks

- Used for detection of Down's syndrome with low MSAFP & unconjugated estriol but the hcG level is elevated.

c. Acetylcholinesterase (AchE): Elevated in most neural tube defects

d. Nuchal translucency: by ultrasound

# Cont'd

e. Prenatal genetic diagnosis: amniocentesis, chorionic villous sampling & cordocentesis

- For cytogenetic analysis
- DNA analysis for single gene disorders

# Tests in Late pregnancy

- Could be

1. Clinical
2. Biochemical &
3. Biophysical

- Clinical: includes SFH, weight gain & abdominal girth. It is used as a screening test for further investigation

# Tests- cont'd

2. Biochemical: due to poor predictive value, these tests have been abandoned. Tests include determination of serum estriol & human placental lactogen

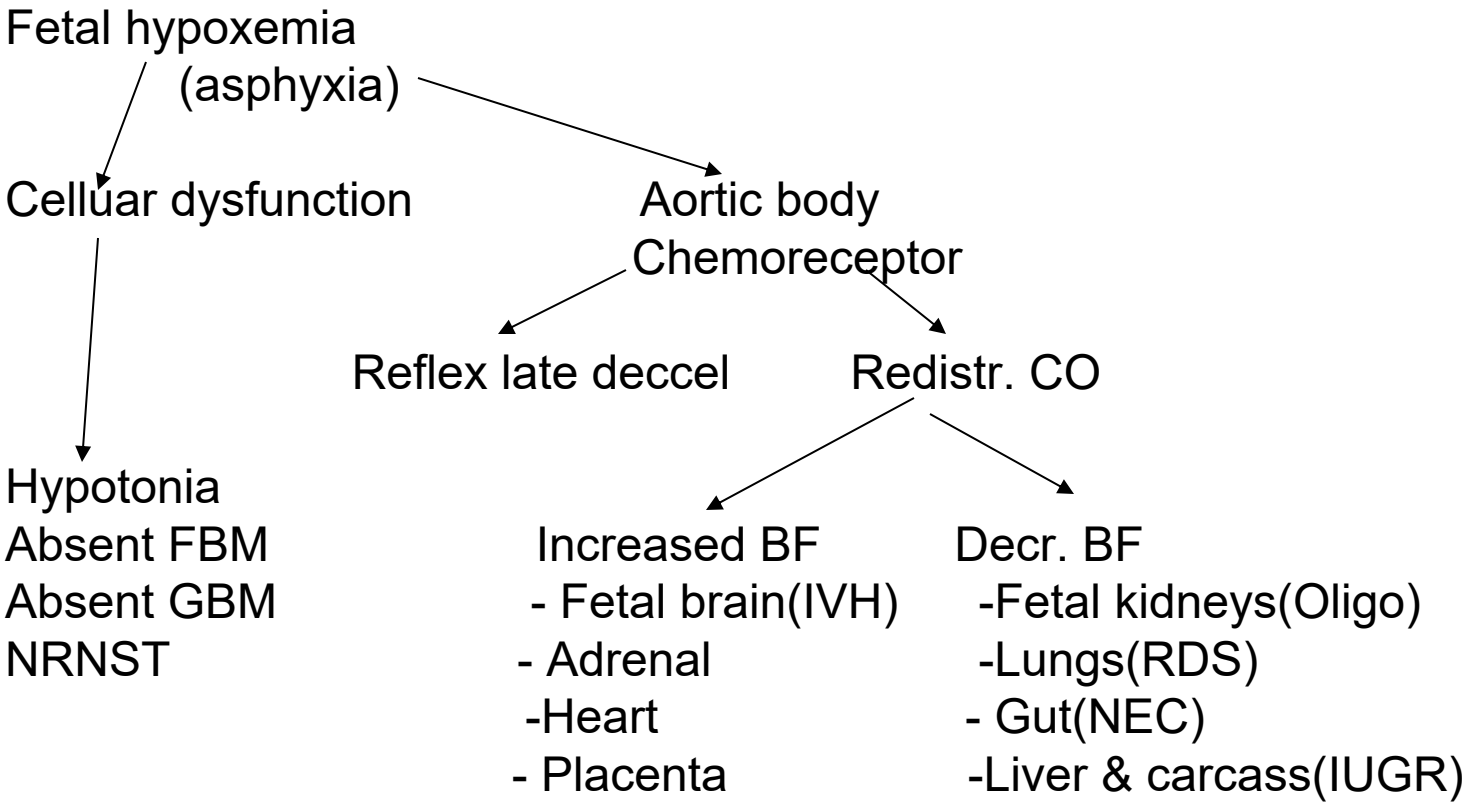
# Biophysical methods

- Fetal biophysical activities are initiated, modulated & regulated through fetal nervous system.
- Fetal CNS is sensitive to diminished oxygen
- Fetus has different states like 1F, 2F, 3F & 4F
- Fetal state-quiet sleep(1F)-25% of time
  active sleep(2F)-60-70%
- ❖ Near term - active sleep(40 min),
  - quiet sleep(20 minutes)

# Biophysical variables

- Acute variables: CNS regulated activities
- Chronic variables: oligohydraminos, IUGR
- Gradual hypoxia theory: states the first to appear embryo logically is the last to disappear.
- FT-7.5 wks, GBM-9wks, FBM-20wks, NST-28 wks
- NST is the first and fetal tone is the last to be affected

# Effect of hypoxia




**Adapted from medicine of mother & fetus,1999

# Fetal movement count

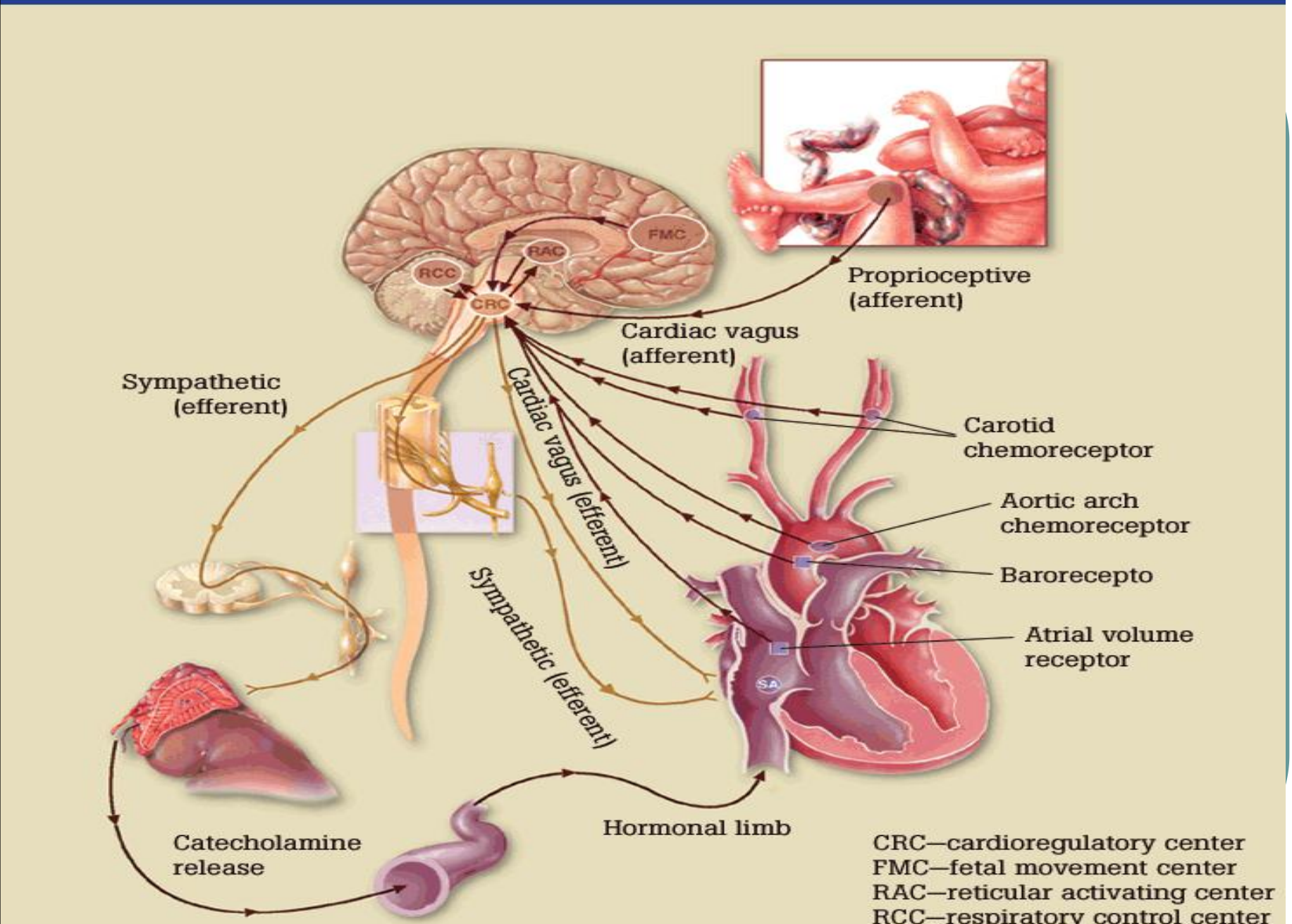
- Cardiff count to ten
- Three times /day/ for an hour- count of 3 or more per hour
- Mothers perceive 85% of fetal movements
- Reduced perception:

- Fetal sleep state
- Fetal anomalies
- Anterior placenta
- Hypoxia
- Hydraminos
- Obesity
- Drugs
- Chronic smoking

# Non stress test

- Test is valuable in assessing fetal well being than fetal illness
- Acceleration of FHR with fetal movement
- Test is said to be reactive if two accelerations of 15bpm of 15 seconds duration occurring in 20 minutes, associated with fetal movement.

**FIGURE 1. Schematic of modifiers of FHR**



# Contraction stress test

- **Principle :** The response of the fetus at risk for uteroplacental insufficiency to uterine contraction
- **Types** -oxytocin(90 min)
  - nipple stimulation(30 min)

# Interpretation of CST

1. ***Negative*** - no late deceleration and adequate FHR recording
2. ***Positive*** - late deceleration that are consistent / persistent in >50% of contractions
3. ***Suspicious*** - late deceleration are present with less than half of the contractions
4. ***Hyperstimulation*** - >5 contractions in 10 min or lasting for 90 seconds
5. ***Unsatisfactory*** - quality of tracing inadequate for interpretation or no adequate contraction

# Biophysical profile

- Four acute variables and one chronic variable.
- Done first by F. Manning, 1980
- -”first to show, last to go”
  - “how are you now and how have you been the last two weeks?”
- Indication: Nonreactive NST or high risk pregnancy

# Criteria for the Biophysical Profile Test

**Nonstress test:** 2 points if reactive

**Fetal breathing movements:** 2 points if one or more episodes of rhythmic breathing movements of ≥20 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 pocket of fluid is present measuring ≥2 cm in a verticle axis. However, some clinicians use other criteria such as the amniotic fluid index

**Fetal movement:** 2 points if two or more discrete body or limb movements within 30 minutes of observation

0 points are assigned for any criteria not met

# Modified BPP

- NST + AFI
- FT+ FBM+GBM+AFI

# THANK YOU