Maternal History and Risk Factors
UCSF RNC Prep Course

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June, 2019

Objectives

- Cite 3 common preexisting medical conditions that may alter normal fetal development during pregnancy
- Describe the usefulness of maternal prenatal tests and fetal surveillance.
- Discuss intrapartum complications that place the newborn at risk for severe morbidity or death.

What to Know/Study

- Effects of maternal medical complications
  - Hematologic
  - Hypertension, Renal disease
  - Infections
- Problems associated with amniotic fluid & membranes
  - Amniotic bands
  - Oligohydramnios, Polyhydramnios
  - PROM & Chorioamnionitis
- Significance of findings
  - AFP/Triple screen
  - Biophysical profile
  - Diagnostic ultrasound
  - Lung maturation studies
- Recognize neonatal significance of fetal heart rate patterns
  - Variability, Decelerations
  - Tachycardia, bradycardia
- Neonatal effects of maternal medications
  - Tocolytics, Analgesia, anesthesia
- Labor complications – neonatal impact
  - Breech & other
  - Malpresentation
  - Maternal hemorrhage, Meconium
- OB emergencies (impact on neonate)
  - Abruptio placenta, Cord prolapse
  - Placenta previa
  - Impact of methods of delivery on the neonate (forceps, vacuum, C/S)
Maternal Medical/Obstetric History

- The prenatal record
  - Medical and prior obstetric history: Obesity, Diabetes, Thyroid, Chronic HTN, Renal, Cardiac
  - Risk factors can determine
    - Problems with the fetus
    - Potential problems with the newborn
  - Opportunity to prepare for plan of care
    - Induction versus spontaneous labor
    - Vaginal birth versus scheduled C/S
    - Staff in attendance at time of birth
    - Neonatal care/surveillance at birth and beyond

Fetal Risks: Obesity/Diabetes

- Structural birth defects
  - Neural tube: spina bifida, septal anomalies, cleft palate, cardiac defects, anorectal atresia, limb reduction defects, omphalocele
  - Prematurity
  - Macrosomia
  - Birth Injury
    - Shoulder dystocia
  - NICU admissions

Maternal History and Risk Factors: Prenatal Exposure

- There are various components of maternal history which identify risk factors
  - Prenatal exposures
    - Medication and drugs
      - Cigarettes, alcohol, methamphetamine, other substances
    - Radiation
    - Chemicals
    - Infections
      - Group B strep.
    - Viruses
      - Toxoplasmosis, Other viruses (Zica/Varicella), Rubella, CMV, HSV (TORCH)
    - Food
      - Listeria, mercury, lead, hepatitis A
Let’s review some physiology…

- Pregnancy is a high volume, low resistance state
- Circulating blood volume increases up to 45%
  - Hemodiluted Hyperdynamic
  - Increase blood volume ↑ 1200-1600 mL
- Cardiac Output ↑ 50%
- Renal blood flow ↑ GFR
  - More pronounced in multiple gestation pregnancies

Maternal Hematologic Issues

Anemia
- Low Hgb (<9mg/dL) associated with:
  - Decreased oxygen carrying capacity to fetus leading to:
    - Growth restriction
    - Prematurity
    - IUFD

Thrombocytopenia
- Most commonly from:
  - Preeclampsia
  - HELLP
- Most worrisome when plt's <50,000
- Effect on fetus/newborn
  - IUFD
  - Transient thrombocytopenia

Placenta Anatomy and Physiology

- Circulation by 17th day of gestation
- Placenta completely develops and functions by 10th week but continues forming until the end of the 16th week of gestation.
- 3 weeks after fertilization, small projections appear and form the chorionic villi.
- These villi erode the walls of the maternal blood vessels and open sinuses where maternal blood pools.
- It is a temporary endocrine organ and has a blood flow of 1000 mL per minute.
Placenta Anatomy and Physiology

- The maternal surface has 15-20 cotyledons each containing major branches of the umbilical blood vessels.
- The villi hang in the intervillous space inside the uterine wall that is filled with mom’s blood. This is where the exchange of nutrients, oxygen, and waste products occur.
- It serves as an organ for respiration, nutrition, excretion, and protection as well as secreting hormones to stabilize pregnancy.

Placental Abruption

- Premature separation of a normally implanted placenta
- Occurs in 1% of all births
- Abruption is a leading cause of antepartum hemorrhage

- Abruptio placentae is a leading cause of antepartum hemorrhage

- Abruptio placentae is associated with fetal death
Risk Factors for Placental Abruption

- Prior abruption
- Smoking
- Cocaine use
- Trauma
- Hypertension

- Thrombophilia’s
- Older age
- PPROM
- Intrauterine infections
- Hydramnios

Fetal Monitoring
Abnormal Cord Insertion

Rupture of Membranes

Vasa Previa
- Rare, potentially catastrophic complication.
- Often associated with a velamentous insertion of the umbilical cord.
- Fetal vessels run through the fetal membranes.
- Vessels are at risk of rupture with consequent fetal exsanguination.
- Affects 1:1,300 to 8,300 pregnancies.

Velamentous Insertion with accessory lobe
Placenta Previa

- Placenta previa refers to the presence of placental tissue overlying or proximate to the internal cervical os
- The main complication of placenta previa is bleeding
- Several forms of the disorder described

Types of Placenta Previa

All of these are considered placenta previa

Clinical Manifestations of Placenta Previa

- **Painless** vaginal bleeding in 70 to 80% of patients
- Only 10 to 20% of women present with uterine contractions associated with bleeding
- Initial bleed @ 34 weeks
- Emergent or Scheduled C/S @ 36 weeks
- Absence of abdominal pain and uterine contractions is the **distinguishing feature** between placenta previa and placenta abruptio

Sakombut E 2007
Acute Care Woman with Symptomatic Placenta Previa (24-37 weeks)

- Admit to L&D
- Two IVs with large bore needle (16-18 gauge)
- Stabilize X24 hours if possible
  - NPO
  - Strict bedrest
  - Continuous FHR monitoring
  - Type and screen
  - RhoGAM if RH negative
  - Steroids
  - Tocolytics are controversial

Maternal Preeclampsia/Hypertension

- Four categories
  - Preeclampsia/eclampsia
  - Chronic hypertension
  - Chronic hypertension with superimposed preeclampsia
  - Gestational hypertension

Hypertensive Disorders

- Most common medical complication of pregnancy
- **Chronic hypertension** is increasing in the general population
- Native American, African American, and Hispanic women affected disproportionately
- **Preeclampsia**
  - Complicates 3% to 6% of all pregnancies
  - Reason for up to 25% of VLBW births
  - Highest Morbidity occurs when GA <35 weeks (early onset)
Preeclampsia

- A multiorgan syndrome characterized by endothelial damage and vasospasm

Pathophysiology of Preeclampsia

- Failure of maternal spiral artery remodeling in early second trimester sets the stage
- Leads to release of vascular damaging agents
Cycle of Reactivity

Hypertensive Disorders: Pre-E, Eclampsia, HELLP

- Usual management:
  - Hospitalization if severe
  - Medication to lower blood pressure
  - Magnesium Sulfate for seizure prophylaxis
  - BMZ if premature
  - Close observation of fetal well-being
    - Fetal Heart Rate monitoring
    - Biophysical Profiles
    - Fetal Growth
  - Pre E with severe features → IOL or @ 37 weeks

Potential Fetal/Neonatal Effects

- Fetal
  - Decreased uterine blood flow
  - Decreased placental perfusion
  - IUGR
  - Abruption
  - Intolerance of labor → C/S
  - Intrauterine fetal demise

- Neonatal
  - SGA
  - Prematurity
  - Emergent delivery
  - Hypotonia
  - Thrombocytopenia
Maternal Renal Disease

**Maternal risks**
- Superimposed preeclampsia
- UTIs
- Bacteremia
- Risks increase if dialysis or transplant patient

**Fetal risks**
- Growth restriction
- Infection

**Neonatal risks**
- Preterm delivery
- Hyperviscosity

Intrauterine Infections

**TORCH(S)**
- Toxoplasmosis
- Other
- Rubella
- CMV
- HSV
- Syphilis

**Consider TORCH**
When a baby presents with:
- IUGR
- Hepatosplenomegaly
- Microcephaly
- Intracranial calcifications
- Conjunctivitis
- Hearing loss
- Rash
- Thrombocytopenia

Intrauterine Infections

**Congenital Rubella**
- Hearing loss 60%
- CHD: 45% (PDA, PPS)
- Cataracts 25%
- Microcephaly 27%
- IUGR (symmetric)
- Developmental delay
- Purpura
- “Blueberry muffin rash”

**Toxoplasmosis**
- May be asymptomatic at birth
- Classic triad of sx:
  - Chorioretinitis
  - Hydrocephalus
  - Cranial calcifications
Cytomegalovirus - CMV
- Primary exposure during pregnancy carries up to 50% chance of transmission to fetus
- CMV causes viral placentitis in turn causing uteroplacental insufficiency
- 5-20% newborns infected with CMV are symptomatic at birth
- Symptoms include: petechiae, jaundice, hepatosplenomegaly, microcephaly, IUGR, chorioretinitis, thrombocytopenia and anemia
- Long term sequelae include: hearing loss, vision problems, and psychomotor developmental delay

Maternal Infections

Intrauterine HSV - Rare

Perinatally acquired HSV
- Symptoms may be non-specific as in early sepsis
- Lesions may be noted on
  - Skin
  - Eyes
  - Mouth (SEM)
- Infection progresses rapidly to hypotension, DIC, shock

Maternal Infections: Syphilis
- Stillbirth
- Preterm
- Low birth weight
- Non-immune hydrops
- Rhinitis “snuffles”
- Rash
- Lymphadenopathy
- Radiographic bone abnormalities
- Hematologic issues
Amniotic Fluid: Review

- Protective from trauma
- Provide medium for fetal movement
- Provide space for chest breathing → lung development
- Cushions umbilical cord from compression
- Assists in maintaining temperature
- Provides nourishment to fetus
- Prevents amnion from adhering to fetus

Amniotic Fluid Disorders: Oligohydramnios

- Oligohydramnios (Hydramnios) is when amniotic fluid is severely reduced and is concentrated
  - Cause is unknown
  - Maternal risk → dysfunctional labor
  - Fetal and neonatal risk
  - Postmaturity
  - IUGR
  - Placental insufficiency
  - Hypoxia
  - Pulmonary hypoplasia
  - Renal and urinary malfunctions
  - Amniotic leak

Problems with Amniotic Fluid and Membranes

- Amniotic Band Sequence
  - Not genetic

- Fetal entanglement in the bands
- Birth defects from ↓ blood flow
- Impaired fetal development
Amniotic Fluid Index (AFI)

- Measurement total of the largest pockets of amniotic fluid in 4 different quadrants of the uterus
- If amniotic fluid index is less than 5 centimeters → Diagnosis: Oligohydramnios
- If it is ≥ 25 centimeters → Polyhydramnios

Problems with Amniotic Fluid and Membranes

**PROM:** Premature rupture of membranes
- Spontaneous rupture of membranes at term gestation prior to the onset of labor

**PPROM:** Preterm premature rupture of membranes
- Spontaneous rupture of membranes **before** 37 weeks gestation without onset of labor

**Meconium Aspiration**
- Associated with prolonged fetal stress
  - Late decelerations
  - Compensatory fetal gasping

Problems with Amniotic Fluid and Membranes: 
**Chorioamnionitis**

- Dysfunctional labor
- Foul smelling vaginal discharge
- Maternal fever
- Uterine tetany
- Uterine irritability
- Hemorrhage
- Endometritis
- Sepsis
Chorioamnionitis: Potential Fetal Effects

- Fetal tachycardia
- Fetal intolerance to labor
- Poor neurologic outcome, but why?
- Frequency highest in preterm deliveries with PROM
  - < 27 weeks (41%)
  - 28-36 weeks (15%)
  - Term (2%)

Mechanisms of Hypoxia/Asphyxia

**Acute**
- Placental abruption, vasa previa, maternal hemorrhage, uterine rupture

**Intermittent**
- Contraction, cord compression

**Chronic**
- Maternal: hypertension, preeclampsia, asthma, diabetes, lupus, renal disease, pulmonary edema
- Fetal: anemia, infection

FHR Patterns Consistently Associated with Newborn Acidemia: Category 3 Tracing

- Absent variability **and**
  - Recurrent late decelerations
  - Recurrent variable decelerations

- Absent variability **and**
  - Tachycardia
  - Bradycardia (< 80 bpm)
  - Sinusoidal pattern
Rh Isoimmunization

- Rh negative mother who has been exposed to Rh positive blood cells and now carrying Rh + fetus
- Fetal cells enter the maternal circulation, stimulating an antibody response
- Maternal antibodies cross the placenta and destroy fetal red blood cells
- Severity generally increases with subsequent affected pregnancies
  - First exposure (first pregnancy), usually not affected

RhoGAM

- Coats the antigens of the fetal cells in the circulation
- Masks the Rh+ cells from the maternal immune system, preventing sensitization
- Given at 28 weeks gestation, at delivery, and for any event that may transfer cells (amniocentesis, miscarriage, abdominal trauma, etc.)

Twins:
- Di/Di
- Mono/Di
- Mono/Mono
Antenatal Testing: Triple and Quad Screen

**Triple Screen**
- Measures presence of:
  - AFP
  - HCG
  - Estriol
- Done at 15-20 weeks gestation
- Screens for:
  - Trisomy 18, 21
  - Neural tube defects
  - Gastrochisis

**Quad screen**
- Measures presence of:
  - AFP
  - HCG
  - Estriol
  - Inhibin A
  - more specific for Trisomy 21
  - less false positive test
- Done at 15-20 weeks gestation
- Screens for:
  - Trisomy 18, 21
  - Neural tube defects

Testing for Lung Maturity

- **Lamellar body count**
  - Direct measure of surfactant production by Type II pneumocytes
  - >30,000-50,000 per microliter = maturity
- **Phosphatidylglycerol**
  - Produced at 35 wks
  - > 2% suggests maturity
- **L/S ratio (Lecithin/Sphingomyelin)**
  - Ratios equal at 32-33 weeks
  - "L" amt increases "S" doesn't
  - Ratio 2:1 suggests maturity

Antenatal Testing:
Non-Stress Test (NST) and Biophysical Profile (BPP)

**Reactive**
- 2 FHR accels >15 bpm lasting > 15 secs in 20 minute timeframe
- Prior to 32 weeks
- 2 FHR accels >10 bpm lasting > 10 secs in 20 minute timeframe
Maternal Medications and Effect on Fetus

- **NSAIDS/Indomethacin**
  - Decreased AFI
  - Premature closure of the PDA in utero

- **Magnesium Sulfate**
  - Decreased FHR Variability
  - Decreased muscle tone
  - Decreased calcium

- **Betamethasone**
  - Decreased FHRV and BPP scores

- **Anesthesia/Analgesia**
  - Respiratory depression
  - Fetal bradycardia
  - CNS depression

- **Terbutaline**
  - Increased growth
  - Elevated HR

Intrapartum Emergencies

- Umbilical Cord Prolapse
- Uterine Rupture
  - TOLAC
  - Nulliparous
    - Primary
  - Acute placental abruption
  - Fetal Bradycardia

Fetal Position and Risk

- Breech
  - Hypoxia
- Shoulder dystocia
  - HIE
  - Brachial plexus injury
  - Fractured clavicle
Be calm

- **B**: Breathe, do not push
- **E**: Elevate legs into a McRoberts position
- **C**: Call for help
- **A**: Apply suprapubic pressure
- **L**: Enlarge the vaginal opening (episiotomy)
- **M**: Maneuvers (Rubin, Woods, Gaskin)

Complications following Shoulder Dystocia

- **Mom:**
  - Postpartum hemorrhage
  - 3rd or 4th degree lacerations
  - Symphysis separation
  - Uterine rupture
- **Fetus:** 5% of fetus’s will sustain injury following SD
  - Brachial plexus palsy (3-16% transient)
    - *Endogenous* forces of labor and birth
    - *Exogenous* forces by birth attendant
  - Fractured clavicle or humerus (0.1 to 42%)
  - Hypoxic brain injury (0.3%)
  - Death (0.35%)

Instrumentation and Effect on the Neonate

- **Vacuum**
  - Scalp swellings
  - Subgaleal hemorrhage
  - Skin breakdown
  - Neuro sequelae
- **Forceps**
  - Skin breakdown
  - Bruising
  - Skull fracture
  - Nerve injury
Resuscitation of the Newborn

Communication
• Prenatal record
• Intrapartum changes

Resuscitation should be done by qualified team members
NRP Guidelines
Evidence based approached
Effective team performance

Prompt care of the newborn at the time of birth
• Apgar, growth chart, newborn assessment: Gest/Age
• Routine care or higher level of surveillance required based on newborn assessment

Nurses are a valuable source of information and support for women and their families

Thank You