Maternal History and Risk Factors

UCSF RNC Prep Course

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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
- Problems in labor-impact on the neonate
  - 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 verses spontaneous labor
    - Vaginal birth verses 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 $\uparrow$ 1200-1600 mL
- Cardiac Output $\uparrow$ 50%
- Renal blood flow $\uparrow$ 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 plts <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

- Abruption can be occult or visible
- Abruption of more than 50% of the placenta is associated with fetal death
## Risk Factors for Placental Abruption

- Prior abruption
- Smoking
- Cocaine use
- Trauma
- Hypertension
- Thrombophilias
- Older age
- PPROM
- Intrauterine infections
- Hydramnios
Chronic vs Traumatic Abruption

library.med.utah.edu

neundimension.tistory.com
Abnormal Cord Insertion

midwifemuse.wordpress.com
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 have been described
Types of Placenta Previa

All of these are considered placenta previa
Placenta Previa
Clinical Manifestations of Placenta Previa

- Painless vaginal bleeding in 70 to 80% of patients
- 10 to 20% of women present with uterine contractions associated with bleeding
- Initial bleeding episode usually at approximately 34 weeks
- Emergency or scheduled delivery usually at a mean gestational age of 36 weeks
- Absence of abdominal pain and uterine contractions has been the distinguishing feature between placenta previa and placenta abruptio

Sakornbut E 2007
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

- Decreased organ perfusion
  - Intravascular fluid redistribution
  - Activation of coagulation cascade
  - Vasoconstriction

- Systemic resistance
- Decreased plasma volume and perfusion
- Endothelial cell activation
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
  • Hepatosplenicomegaly
  • 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
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

• Sx may be non-specific as in early sepsis

• Lesions may be noted on Skin Eyes, Mouth (SEM)

• Infection progresses rapidly to hypotension, DIC, shock

https://www.uptodate.com/contents/overview-of-torch-infections
Maternal Infections: Syphilis

- Stillbirth
- Preterm
- Low birth weight
- Non-immune hydrops
- Rhinitis “snuffles”
- Rashes
- 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 bathes fetus/embryo during gestational period
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 restricted blood flow
Impaired fetal development
Amniotic Fluid Index (AFI)

• Measurement total of the largest pockets of amniotic fluid in four different quadrants of the uterus
• If amniotic fluid index is less than 5 centimeters → 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
Rh Isoimmunization

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

Monochorionic/Monoamniotic

Monochorionic/Diamniotic

Dichorionic/Diamniotic (Fused Placenta)

Dichorionic/Diamniotic (Separate Placenta)
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
- 3\textsuperscript{rd} or 4\textsuperscript{th} 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: gestational 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

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