



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

•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 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

Yao, R., et al., (2014) Am J. Obstet and Gynecol



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 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**.



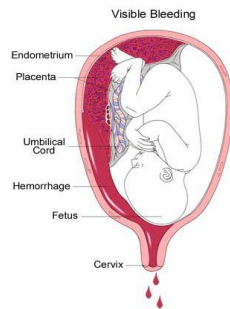
Placenta Anatomy and Physiology

- 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

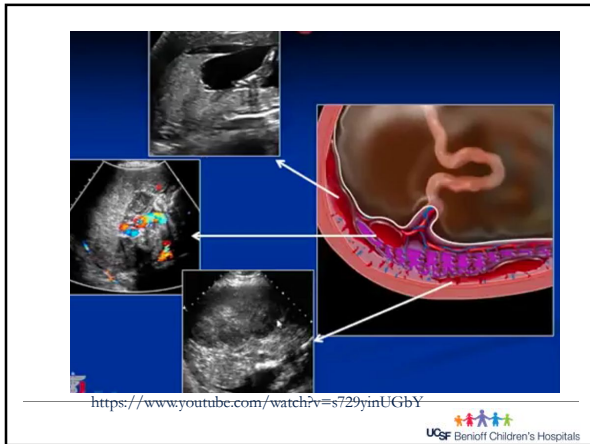
- Premature separation of a normally implanted placenta
- Occurs in 1% of all births
- Abruption is a leading cause of antepartum hemorrhage



Placental Abruption

- Abruption can be occult or visible
- Abruption of more than 50% of the placenta is associated with fetal death

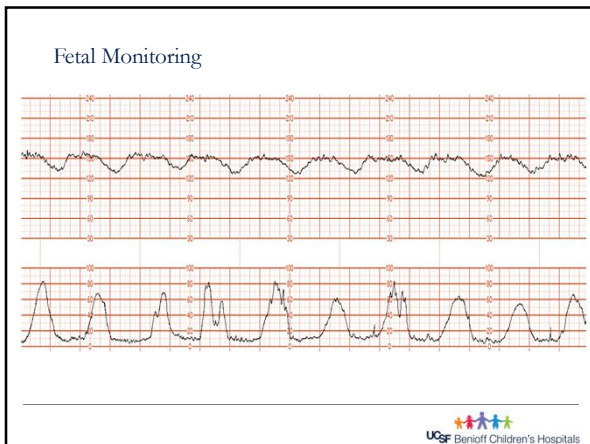




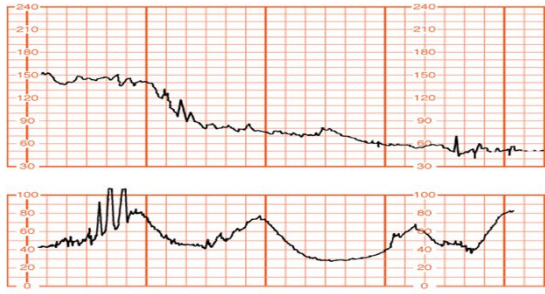
Risk Factors for Placental Abruption

- Prior abruption
- Smoking
- Cocaine use
- Trauma
- Hypertension
- Thrombophilia's
- Older age
- PPROM
- Intrauterine infections
- Hydramnios

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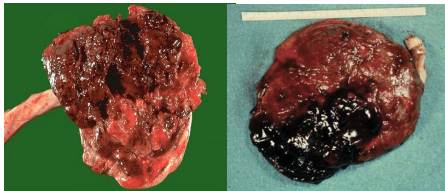
Fetal Monitoring



Source: Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse DJ, Spong CV. *Williams Obstetrics, 23rd Edition*; <http://www.accessmedicine.com>
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Chronic vs Traumatic Abruption

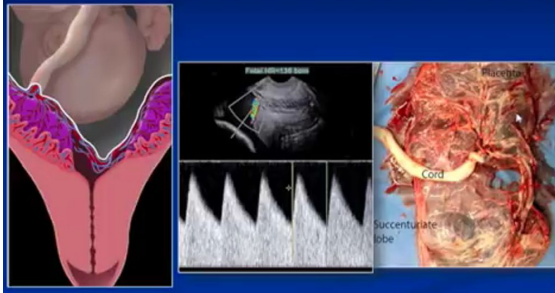


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neundimension.history.com



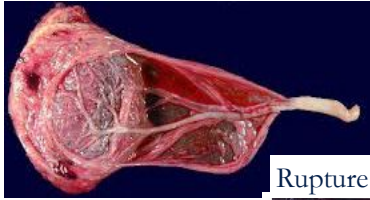
Vasa Previa



vasaprevia.com

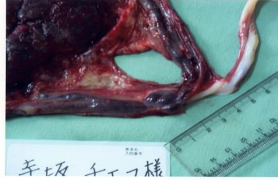


Abnormal Cord Insertion



midwifemuse.wordpress.com

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.

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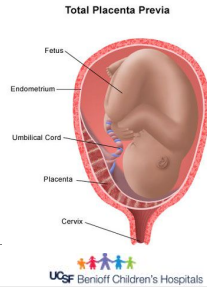
Velamentous Insertion with accessory lobe



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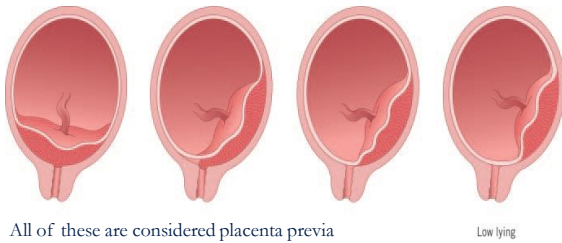
Placenta Previa

- 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



Sakornbut E 2007

Types of Placenta Previa



All of these are considered placenta previa

Low lying

Sakornbut E 2007

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

Sakornbut E 2007

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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)



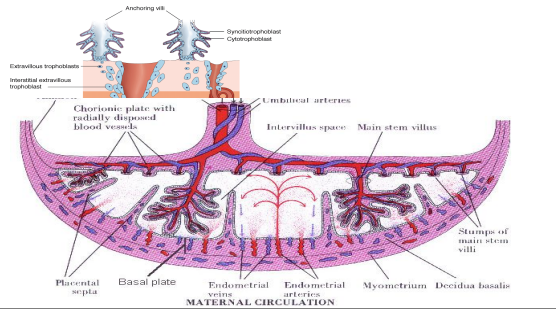
Preeclampsia

- A multiorgan syndrome characterized by endothelial damage and vasospasm



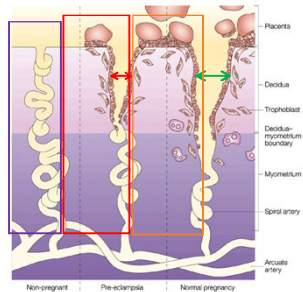
Preeclampsia

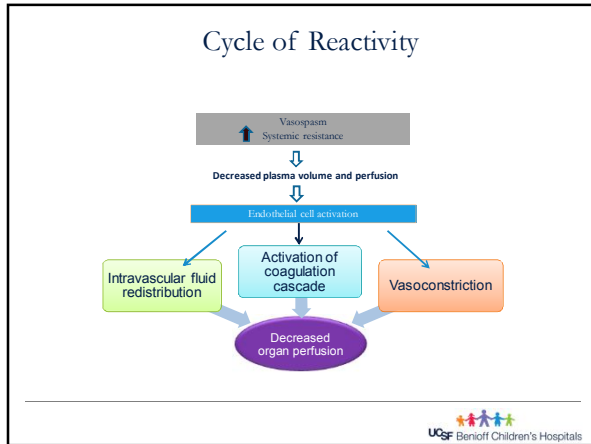
A multiorgan syndrome characterized by endothelial damage and vasospasm



Pathophysiology of Preeclampsia

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





- ### 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
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- ### Potential Fetal/Neonatal Effects
- | | |
|---|---|
| <ul style="list-style-type: none"> ▪ Fetal - Decreased uterine blood flow - Decreased placental perfusion - IUGR - Abruption - Intolerance of labor → C/S - Intrauterine fetal demise | <ul style="list-style-type: none"> ▪ Neonatal - SGA - Prematurity - Emergent delivery - Hypotonia - Thrombocytopenia |
|---|---|
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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
- Thrombocytophilia



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

- 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


Amniotic fluid bathes fetus/embryo during gestational period

- 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



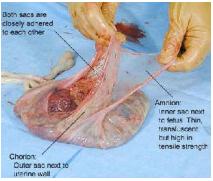
Amniotic Fluid Disorders: Oligohydramnios

- 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 \rightarrow 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

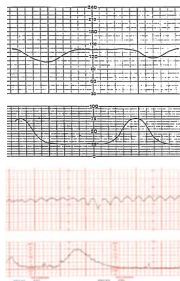
Chronic

- 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



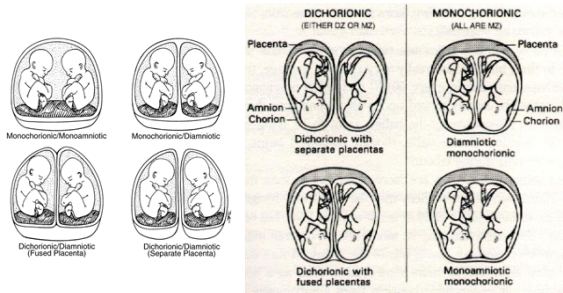
Rh Isoimmunization

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



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
 - Gastroschisis

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)

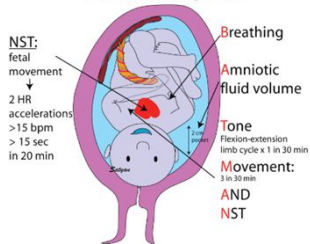
Reactive

- 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

Biophysical Profile (BPP) - Composed of 5 categories with each scoring 2 or 0



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

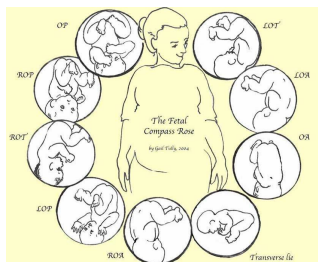


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Fetal Position and Risk

- 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)

Camure, B. and Brucker, Mary (2007) An Overview of Shoulder Dystocia. [Quintessence for Women's Health](#).



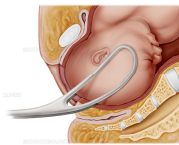
Complications following Shoulder Dystocia

- **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 | ▪ Forceps |
| - Scalp swellings | - Skin breakdown |
| - Subgaleal hemorrhage | - Bruising |
| - Skin breakdown | - Skull fracture |
| - Neuro sequelae | - Nerve injury |



Resuscitation of the Newborn

Communication

- Prenatal record
- Intrapartum changes

Resuscitation should be done by qualified team members

NRP Guidelines
Evidence based approach
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

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