

Hypertension in pregnancy predisposes the women to lethal complications (it is always serious!):

- Abruptio placenta*
- DIC
- Cerebral hemorrhage
- CVA
- Hepatic rupture*
- Acute renal failure
- Eclampsia*

* the leading causes of maternal death of HTN-complicated pregnancies

Hypertension in Pregnancy

- Defined as a Blood Pressure > than 140/90 or a mean arterial pressure > 105. Her baseline BP is not important...it's the amount of increase over the course of the pregnancy...an increase of 30/15 should be considered and watched carefully.
- Types of Hypertensive Disorders
 - Chronic Hypertension: BP >140/90
 - BEFORE twenty weeks of gestation
 - Occurs in 1-5% of pregnancies.
 - Not a good sign for things to come
 - Pregnancy induced hypertension (PIH) (aka Preeclampsia)
 - AFTER 20 weeks gestation.
 - Occurs in 5-8% of pregnancies.

Mom with PIH will have generalized edema. A lot of time you'll see it in the face and hands. You'll also hear wet lungs, may have multiples, will have protein in the urine, may have epigastric pain, may have headache, blurred vision. Will need to keep environment calm and soothing.

Chronic Hypertension

- Associated with ↑ incidence of abruption and preeclampsia.
- A woman with chronic hypertension is probably going to end up with PIH
- Many postpartum complications such as pulmonary edema, renal failure, hypertensive encephalopathy, heart failure
- Medical Management of Chronic Hypertension
 - Usually managed in consultation with primary care provider and perinatologist
 - Managed by
 - fetal and maternal assessment...may be every two weeks
 - lifestyle changes (exercise more)
 - nutrition (less salt)
 - Methyldopa (Aldomet)

Types of Pregnancy Induced Hypertension (PIH)

- Mild: BP > 140/90 and > 0.3 g protein in 24/h urine
- Severe BP > 160/110 and > 2 g protein in 24 urine
- Eclampsia: either of the above with **new onset seizures**
- HELLP: Hemolysis, elevated liver enzymes, low platelets (this is a SYNDROME!)
- Gestational: BP > 140/90 after 20 weeks gestation. **No proteinuria** in 24 hour urine.
 - Transient hypertension: Gestational hypertension - no signs of preeclampsia present at ??
 - May be 1st indicator of later hypertension
- Preeclampsia after 20 weeks

Preeclampsia

- Develops during pregnancy and disappears with expulsion of the placenta.
 - The treatment for this is essentially delivery of fetus and placenta.
- Cause remains unknown; there are no toxins in the body
- Many Risk factors:
 - primigravida, obesity, chronic HTN, renal disease, maternal age < 15 and > 40, diabetics, Rh incompatibility,
- Progression of Disease

- Multisystem disease
- Diagnostic Signs
 - hypertension (in all cases)
 - proteinuria (in all cases)
 - edema (not in all cases)
 - May progress from mild → severe → HELLP → convulsions → coma → death of mother and fetus
- Theories Regarding the Etiology of Preeclampsia
 - Vasoconstriction and vasospasm
 - Coagulation
 - Trophoblast invasion
 - Dietary deficiencies/excess: protein, Ca, N, Mag, Vit E, Vit A
 - Genetic predisposition (autosomal recessive)
 - Immune complex where maternal antibody system overwhelmed by fetal antigens in maternal blood. (an old idea...where the idea of “toxemia” came from)
 - Adverse immunologic response
 - Maternal antibody system being overwhelmed
 - Causes inappropriate endothelial cell activation (vasospasm)
 - Decreased production of Nitric Oxide (causes vasodilation)
 - Vasospasm
 - Caused by ↑ sensitivity to circulating vasopressors such as angiotension II and an imbalance between prostacyclin and thromboxane A2
 - Prostacyclin is produced by endothelial cells of blood vessels
 - Thromboxane is produced by platelets causes vasospasm
 - vasospasm leads to ↑ BP
 - Endothelial cells dysfunction
 - Both of these contribute to capillary permeability
 - This leads to ↑ interstitial edema (3rd spacing) and ↓ decreased blood flow leading to poor perfusion in both mom and baby (placenta won't work well and won't transport nutrients the way it should be). This puts the fetus at jeopardy b/c the placenta is it's lifeline...if this isn't working well, baby can get into big trouble.
 - Baby is not well oxygenated, can get..
 - IUGR
 - If in labor, we start to see decelerations (late decelerations) “late decels” = utero placental insufficiency
 - Functions may become depressed....not just in placenta, but in liver, brain and kidneys as well. This depression can account for up to 40-60% of a decrease in function. The kidney dysfunction causes protein in the urine.
 - See flowchart to the right

Epidurals cause vasodilation; Induction drugs cause vasoconstriction.

The Endothelium (the capillary wall)

- The endothelium is usually impermeable to the plasma proteins and lipids. Under normal conditions, these stay within the plasma where they belong.
- Oncotic pressure changes
 - Most of the fluid within the capillaries is retained
 - Some filters through pores between the cells...pushed by a pressure gradient.
- Colloid Oncotic Pressure
 - Water and small solutes can pass freely through capillary pores into the interstitial fluid.
 - Protein does not leak into the interstitium...but protein pressure is going to draw water out of the interstitium and into the plasma. (look this fluid shift stuff up....she sped through this, not sure if I got it right)
 - Following injury, the capillaries can leak protein
 - Water follows protein into the interstitial space causing interstitial edema (generalized edema)
 - Intravascular volume moves out results in hemoconcentration, and increased blood viscosity...this is a whole other category of problems d/t the thick blood.
 - Most of these women have +4 pitting edema at the knee. Will also look at hands, arms, feet)

Vasospasm also leads to...

- Ruptured capillaries that leads to a release of clotting factors leading to risk fo blood clots, then to risk of DIC
- ↓ retinal perfusion which leads to visual disturbances (pt may say “I see bright lights” or “I see spots”...this is now SEVERE...we will expect her to have a seizure)
- ↓ organ perfusion and IUGR
- Cardiac failure is the worst outcome.

Potential Maternal/Fetal Complications

- Cardiovascular
- Renal
- Hematological
- Neurological
- Hepatic
- Uteroplacental

Cardiovascular effects...watch for this stuff!

- Severe hypertension
- Hypertensive crisis
- Pulmonary edema (will use Lasix on this mom)

Reduced Kidney Perfusion

- Decreased GFR...can even be oliguric.
- Protein is lost in the urine (albumin)
- BUN, serum creatinine, and serum uric acid increase
- Sodium and water are retained, leading to weight gain. Take daily weights...look for anything inconsistent with normal pregnancy weight gain.

Hematological Effects

- Hemolysis
- Decreased oxygen carrying capacity
- Thrombocytopenia
- DIC

Cerebral changes

- Increased CNS irritability. Signs&symptoms:
 - Cerebral edema/hemorrhage
 - Changes in mood, emotion, consciousness
 - Headache

Increased CNS irritability S&S, cont'd

- Hyperreflexia/Clonus
- Eclampsia-Seizures
- CVA, amaurosis (blindness)

Decreased Liver Perfusion

- Impaired function, hypoglycemia
- Hepatic edema (liver will be tender if you can access it, but you'd actually use the lab values for this)
- Subcapsular hemorrhage
- ↑ liver enzymes AST,ALT
- This is what is causing the epigastric pain.

When you have a PIH patient, think multisystem involvement! Watch for complaints of HA, epigastric pain, seeing spots. The next stop on this path is convulsions!

Placental changes

- Decreased uteroplacental perfusion may lead to
 - IUGR
 - IUFD
 - Fetal intolerance to labor- fetal distress
 - Oligohydramnios
 - Abruptio placenta

Mild Preeclampsia Highlights/Review

- Criteria for diagnosis:
 - BP > 140/90 after 20 weeks
 - 1+ or 2+ protein
 - Generalized edema of face, hands abdomen that does not disappear after 12 hours bed rest.

Severe Preeclampsia Highlights/Review

- BP > 160/110
- Proteinuria > 2+ or 3+ on random dip/ 2g/24 hours
- Signs & Symptoms:
 - Hyperreflexia,
 - Generalized edema
 - Oliguria
 - Cerebral/visual disturbances,
 - Liver involvement,
 - Thrombocytopenia

Eclampsia Highlights/Review

- Either mild or severe preeclampsia with a new onset of seizures
- Coma
- Fetal/Maternal death

HELLP

- H Hemolysis
- E elevated liver enzymes
- L (↑ AST/ALT)
- L low platelets
- Platelets (< 100,000)
- May occur with mild or severe preeclampsia
- This person is now very very sick...will go to critical care unit.

Prenatal care

- Goal is to detect it early, so need to know S/S of preeclampsia
- Other goals are to stabilize condition, deliver a healthy mom and baby
- Identify women at risk (if preeclampsia prior, then at least a 50% chance of having it again)
- Past obstetric / family history
- Accurate recording at each visit

Management of Mild Preeclampsia

- Frequent clinic F/U
- Assess wt, urine protein, BP, edema
- Monitor fetal movement NST
- Ultrasound
- Biophysical profile
- Home /bed rest (bedrest promotes diuresis)
- Diversional activities/ gentle exercise

- Nutrition

Biophysical Profile

- Fetal breathing movements
- Fetal body movements
- Fetal tone
- Fetal heart rate pattern by NST
- Amniotic fluid index (6-19 cm normal)
- Normal score is 8-10 (as long as AFI is adequate)

Health teaching

- Review signs/symptoms of preeclampsia
- Assess home environment to determine if home care viable option
- Teach women self assessment of clinical signs.
 - eg. BP, urine protein, daily weight, edema, I & O, assessment of fetal activity
- When to notify doctor
- Relaxation to ↓ BP and promote diuresis

Management of Severe Preeclampsia and HELLP

- Hospitalization with goal of stabilization and birth of baby.
- OB management in consult with Perinatologist and Neonatologist
- Specialized Nursing care
 - Bed rest, decreased stimulation, low lights, limit visitors
 - Critical care: VS, I+O, cardiac monitoring, IVs, weight, reflexes, looking for clonus (?)
 - Continuous fetal and uterine monitoring maybe, but once stabilized will let mom have an hour or so off the monitor.
 - Medication to stabilize condition and improve outcomes
- Laboratory Monitoring
 - Blood: CBC, 'lytes, uric acid
 - Coagulation Profile: PT, PTT, fibrinogen
 - Urine: test for protein, look at Cr clearance
- Drug Treatment
 - Goals of therapy:
 - Decrease chance of seizures
 - Decrease BP to diastolic of 100-90
 - Promote fetal lung maturity
 - Stabilize patient to prolong pregnancy as long as possible
 - Delivery if unable to stabilize mom
- **Eclampsia (the seizure sequence)**
 - Onset of seizures
 - Eyes are fixed
 - Twitching of facial muscles
 - All body muscles are in tonic contraction
 - Muscles relax, respirations are long, deep, noisy inhalation
 - Followed by coma
- **Management of Eclampsia (woman has had a seizure and can't take care of herself, so you do this...)**
 - Airway management: suction and O2
 - Protect from injury during seizure
 - Record time, duration, type of seizure
 - R/O abruption (ultrasound eval) uterine tone
 - Chest X-ray, blood gases, labs
 - Pulmonary, renal function
 - Hygiene: Urine/ fecal incontinence, oral care

- Stabilize with Magnesium Sulfate
- Control BP
- Assess fetal status
- If birth can be delayed administer Betamethasone
- If situation critical prepare for emergency Cesarean section

HELLP SYNDROME

- Severe form of preeclampsia occurs in 1/1000 pregnancies
- May occur in 2nd or 3rd trimester
- Maternal symptoms: malaise, epigastric pain, N+V, Flu-like sx (docs with think this is the flu)
- Labs: hemolysis, ↑LFTs, ↓platelets
- HELLP is associated with increased risk for
 - Abruptio
 - DIC
 - Renal failure
 - Hepatic rupture
 - Recurrent preeclampsia
 - Fetal and maternal mortality

Common lab changes in Preeclampsia

- See attachment!

Medications used in treatment

- Anticonvulsants, Blood Pressure Meds, Betamethasone

Magnesium Sulfate (MgSO₄)

- Drug of choice to prevent seizure activity
- Decreases neuromuscular irritability
- Depresses CNS irritability
- Usually also ↓ diastolic BP slightly
- Another name for it is “Epsom Salts”
- Mom will feel like her body is a brick...very heavy! Need to remind her to turn b/c she is not going to feel like moving at all. She'll feel like a slug! If she's getting both Mag Sulfate and Terbutaline, she'll feel like she's stuck in cement with a racing heart...not fun!
- **Action:** CNS/Neuromuscular depressant
- **Indication:** Prevention of seizures, ↓contx
- **Dose:** 40 g MgSo₄ in 1000 ml LR
 - Loading dose: 4-6 g over 15-30 min
 - Maintenance dose- infuse at 2-4 g/ hour
- **Adverse reactions:** ↓ muscle tone, uterine atony, ↓ respirations, HA, Flushing, N+V, ↓maternal temp, cardiac arrest...this is a serious medication!
- Nursing Care of MgSo₄ Patient
 - Establish primary IV
 - Magnesium is always piggybacked to primary using Infusion pump
 - Keep antidote (calcium gluconate) at bedside- 1g of 10% solution at bedside
 - Assess VS (especially RR), Urine output, deep tendon reflexes
 - Continuous fetal monitoring (Maternal VS and FHR checked Q 15 min during bolus)
 - Nurse remains at bedside during bolus infusion
- Nursing care during continuous infusion
 - DTRs/Clonus Q 1-2 hours
 - BP, RR: Q 30-60 min -O₂ sat monitoring
 - Breath sounds Q 4 hours- eval for pulmonary edema
 - Monitor I+O hourly
 - Assess for signs of toxicity(↓ RR/apnea, ↓ LOC)

- Asses for worsening of Preeclampsia
- Mag levels as ordered
- May need Pitocin for augmentation/ atony
- Magnesium Toxicity Signs
 - Loss of DTRs
 - Respiratory depression <12/min,
 - Oliguria < 30 cc/hr
 - SOB/chest pain
 - Cardiac arrest
- Nursing priorities when Mag toxicity occurs
 - STOP MAG SULFATE IMMEDIATELY
 - Notify MD
 - Give calcium gluconate 1g (10ml of 10% solution) sloooooowly until calcium begins to antagonize effects of magnesium
 - Have bag and mask ready for assisted respirations if RR < 10
 - May need to intubate

Blood Pressure Medications

- Used if BP > 160/110
- These are used to prevent cerebral vascular events in mother and to decrease chance of Abruption placentae
- Goal is BP diastolic of 90-100mm Hg
- BP < 90 diastolic may lead to uteroplacental insufficiency
- Hydralazine Hydrochloride is the treatment of choice by ACOG
 - Action: arteriolar vasodilator
 - Indication: BP >160/110
 - Dose: depends on response
 - Adverse reaction: flushing, HA, Maternal/fetal tachycardia, Palpitations,uteroplacental insufficiency, Late decels,distress
- Labetalol
 - Action: decreases BP by vasodilatation, decreases heart rate
 - Indication: BP> 160/110
 - Dose: depends on response- usually 5-10 mg over 2-3 minutes
 - Repeat doses at 10 min intervals prn
 - Adverse reactions: hypotension, fetal/ maternal bradycardia, hypoglycemia, bronchospasm
 - Pt needs continuous cardiac monitoring. Contraindicated in patients with asthma or heart block > 1st degree
- Nursing actions
 - Monitor fetal and maternal response
 - Continuous monitoring
 - Frequent BP+ HR monitoring. Q 5 minutes during bolus, then Q 15 minutes until stable
 - Assess urine output
 - Side lying bed rest/Side rails up
- Betamethasone
 - Action: used to stimulate fetal lung maturity and production or release of fetal surfactant
 - Indication: to reduce or prevent the severity of respiratory distress syndrome in the preterm infant(24-36 weeks gestation)
 - Dose: Betamethasone 12mg IM x 2 doses 24° apart if possible.
 - Adverse reactions: maternal infection, pulmonary edema, worsening DM or BP
 - Give deep IM in gluteal muscle
 - Assess for pulmonary edema, worsening blood sugar,worsening hypertension
 - Do not give if the women has infection
 - Usually given if women is in preterm labor 24-36 weeks gestation
 - It takes at least 24° to develop lung maturity. Administer early!

Outcomes of PIH

- Symptoms usually resolve by 48 hours post delivery
- Convulsions may occur after delivery
- Usually remain on MgSo4 for 24 hr post delivery
- 30% chance of reoccurrence with subsequent pregnancy (earlier she said 50%)
- Essential hypertension may result

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