Chapter 15

HYPERTENSIVE DISORDERS OF PREGNANCY

Hypertension in pregnancy is a leading cause of maternal morbidity and mortality.

CLASSIFICATION OF HYPERTENSION:

"Hypertension is classified as pre-existing or gestational. **Pre-existing hypertension** pre-dates pregnancy or appears before 20 wks, and **gestational hypertension** appears at or after 20 wks. For both pre-existing and gestational hypertension, there are two subgroups: (1) with comorbid conditions and (2) with preeclampsia, defined by three criteria:

- Hypertension
- Proteinuria
- and adverse conditions

The term **preeclampsia** has been reintroduced for its brevity and international use. It is now used to replace previously used terms such as:

- Pre-exisiting hypertension with superimposed gestational hypertension, proteinuria and / or an adverse condition(s)
- Gestational hypertension with proteinuria
- Gestational hypertension (without proteinuria) with one or more of the adverse conditions.

DEFINITIONS:

Hypertension: in pregnancy should be defined as a diastolic BP of ≥ 90 mmHg or systolic BP ≥ 140 mmHg, based on the average of at least 2 measurements, taken using the same arm. Mean arterial pressure (MAP) is no longer used as a criterion in the definition of hypertension as it is difficult to calculate.

Severe Hypertension: should be defined as a systolic BP of ≥ 160 mmHg or a diastolic BP of ≥ 110 mmHg. A repeat measurement should be taken for confirmation in 15 minutes.

Preeclampsia in women with pre-existing hypertension is defined as resistant hypertension, new *or* worsening proteinuria, *or* one or more adverse conditions. Resistant hypertension is elevation in blood pressure that requires ≥ three antihypertensive medications to control it. In women with gestational hypertension, preeclampsia is defined as new-onset proteinuria *or* one or more adverse conditions. Edema and weight gain have been excluded from the definition of preeclampsia.

Severe preeclampsia is defined as preeclampsia with an onset before 34 weeks' gestation, or associated with heavy proteinuria *or* with one or more adverse conditions.

Proteinuria is defined as ≥ 0.3g/d in a 24 hr urine collection or ≥ 30 mg/mmol urinary creatinine in a spot (random) urine sample**.** Proteinuria should be strongly suspected when urinary dipstick protein is ≥ 2+**.**

Heavy proteinuria is defined as 3 – 5 g/d. Proteinuria indicates glomerular dysfunction.

ADVERSE CONDITIONS OF GESTATIONAL HYPERTENSION

Adverse conditions include both end organ complications of the mother and direct fetal complications. These include:

1. Vascular/Pulmonary

- systolic BP > 160 mmHg *or* diastolic BP > 110mmHg
- pulmonary edema
- chest pain
- dyspnea

2. Renal

- ↑serum creatinine
- ↓ serum albumin (< 20g/L)
- proteinuria

3. Hepatic

- elevated AST, ALT, LDH
- Severe nausea / vomiting
- Persistent abdominal or right upper quadrant pain
- Jaundice

4. Hematologic

- Platelets <100,000
- disseminated intravascular coagulopathy (DIC)

5. CNS

- new or unusual headache
- visual disturbances
- hyperreflexia
- Seizures
- Stroke (may occur with a systolic BP $\geq$ 160 mmHg)

6. HELLP Syndrome

- Hemolysis
- Low Platelets
- Elevated Liver Enzymes

7. Fetal Effects

- intrauterine growth restriction
- oligohydramnios
- Absent *or* reversed end diastolic umbilical artery flow as indicted by Doppler flow studies
- atypical / abnormal fetal heart rate
- placental abruption
- prematurity
- intrauterine death

"The appearance of any of these manifestations of multi-organ involvement or the development of preeclampsia remote from term constitutes an obstetrical emergency. This emergency may need to be managed in conjunction with other professionals (including hematological, neonatal, nursing, obstetric experts), with access to laboratory, blood bank, pharmacy, and hospital facilities. Caregivers who lack ready access to many of these resources should develop protocols for their institutions to allow for the emergency management of such cases until appropriate transfer can occur." (More[OB,] p. 4)

ASSESSMENT

The initial and ongoing evaluation of the woman with gestational hypertension involves assessment of symptoms associated with adverse conditions (see above), laboratory findings and assessment of the fetal / placental unit.

Blood pressure should be determined using:

- Sitting position with arm at heart level
- Appropriate size cuff
- Accurate mercury or aneroid sphygmomanometer, or an automated BP monitor that has been calibrated against a mercury or aneroid sphygmomanometer (automated BP machines may underestimate the BP if not appropriately calibrated)
- Korotkoff sounds V (disappearance of pulse sound) recorded

Repeat BP in 4 hours unless very high (diastolic 110 mmHg). If the BP is consistently higher in one arm, the arm with the higher values should always be used.

Assessments include:

Hematologic

- Hemoglobin
- WBC & differential
- platelet count
- blood film
- INR and aPTT, Fibrinogen

Hepatic

- ALT, AST, LDH, bilirubin
- Albumin (if very low then increased risk of pulmonary edema)
- Glucose

Renal

- Serum creatinine
- Serum uric acid
- Urinalysis (routine & microscopy)
- Proteinuria

Assessment of Fetus

- Fetal movement count
- NST
- Fetal heart rate (intermittent or continuous electronic fetal monitoring depending on severity)
- Biophysical Profile
- Ultrasound for growth (gestational age dependant)
- Doppler flow studies (umbilical artery Doppler resistive index)

TREATMENT

The management of pregnancy related hypertension includes:

- Evaluation of the mother and fetus
- Prevention of adverse maternal and fetal outcomes
- Symptomatic support

Care can be managed through hospital day units or home care for women with non-severe preeclampsia or non-severe (pre-exisitng or gestational) hypertension. In-patient care is required for women with severe hypertension or severe preeclampsia. Obstetric consultation is mandatory for women with severe preeclampsia.

Delivery is the definitive treatment for preeclampsia …
Consider delivery when:

a) the hypertensive disorder is associated with progressively worsening adverse maternal and fetal conditions, regardless of gestational age.
b) the patient is at or near term (i.e. > 34 weeks gestation)

When the fetus is immature and there are no adverse conditions, expectant management is recommended. Women should be closely observed for the development of adverse conditions and their progression. Antihypertensive treatment should be considered.

Immediate treatment should include managing symptoms such as nausea and vomiting with an antiemetic to minimize maternal discomfort. Maternal pain (right upper quadrant pain, headache, etc.) should be managed appropriately. A component of maternal hypertension is adrenergic and may be modified by stress reduction. Some bed rest may be helpful but there is no evidence to support the use of strict bed rest to reduce the effects of pre-eclampsia.

Antihypertensive Therapy:

Antihypertensive medications are used to reduce the risk of developing severe hypertension and sequelae such as cerebral vascular accidents. They do not necessarily reduce the risk of seizure activity or prevent adverse fetal conditions such as IUGR. Whenever antihypertensive agents are used is it important to be mindful of avoiding a rapid drop in BP as this can reduce utero-placental perfusion resulting in fetal compromise.

For Severe Hypertension (systolic BP ≥ 160 mmHg, or diastolic BP ≥ 110)*:*

- BP should be lowered to < 160 mm Hg systolic and <110 mm Hg.
- Initial antihypertensive therapy should be with
    - Labetalol - Start with 20 mg IV, repeat 20 – 80 mg IV q 30 min, or 1 – 2 mg/min, max 300 gm (then switch to oral)
    - Nifedipine capsules - 5–10g capsule to be bitten and swallowed, or just swallowed q30 min.
    - Nifedipine PA tablets - 10 mg PA tablet q 45 in to a max. of 80 mg/d
    - Hydralazine - Start with 5 mg IV: repeat 5 – 10 mg IV q 30 min. or 0.5 – 10 mg/hr IV, to a max. of 20 mg IV (or 30 mg IM)

- Continuous FHR monitoring is advised until BP is stable.
- Consider appropriateness of environment, patient being in need for transfer

For Non-severe Hypertension (BP 140-159/90-109)

- For women who do not have co-morbid conditions, antihypertensive agents should be used to keep the systolic BP at 130 – 155 mmg Hg and the diastolic BP at 80 – 105 mm Hg.

- For women with co-morbid conditions, antihypertensive drug therapy should be used to keep the systolic BP at 130 – 139 mm Hg and the diastolic Bp at 80 – 89 mm Hg.

- Initial therapy can be with either
    - Methyldopa (Aldomet) 250 – 500 mg po BID – QID (max. 2 g/d)
    - Labetalol 100 – 400 mg. po BID – TID, (max. 1200 mg/d) *or* Nifedipine PA tablets (10 – 20 mg po BID – TID (max. 180 mg/d) *or* Nifedipine XL preparation (20 – 60 mg po OD (max. 120 mg/d)

Angiotensin Converting Enzyme (ACE) inhibitors and Angiotensin Receptor Blockers (ARBs) are contraindicated in pregnancy! Atenolol ® is not recommended due to increased rates of IUGR, hypotension and bradycardia.

Magnesium Sulphate:

Magnesium Sulphate is ***not*** an antihypertensive. Its use is recommended only for seizure prophylaxis and seizure treatment in women who have severe preeclampsia. Blood pressure is not always a reliable predictor for the risk of seizures. Phenytoin and benzodiazepines **should not** be used for seizure prophylaxis unless there is a contraindication to $MgS0_4$ or it is not effective. Magnesium sulphate should ideally be administered intravenously. The MgSo4 solution should be piggy-backed to a mainline infusion and administered through an infusion pump.

Prophylaxis for Seizure Prevention

Dosage:

- 4 g IV over 20 minutes, followed by 1-4 g/hour IV (usually 2 gm IV **Above** the Drip Chamber)

Side effects:

- Weakness
- Paralysis
- cardiac toxicity
- reduced respiratory rate or cessation of breathing

Monitor:

- reflexes
- respiration
- level of consciousness
- urine output

Magnesium toxicity has been reported when Nifedipine and MgSO4 are given together.

THE ANTIDOTE TO MAGNESIUM IS:
10cc OF 10% CALCIUM GLUCONATE, IV OVER 3 MINUTES
(Avoiding magnesium overdose is preferable!)

Seizure Treatment

If seizures (eclampsia) occur, the woman must be stabilized following which birth can be planned. MgSo4, 4 – 6 gm. IV over 2 – 3 minutes may be given to stop the seizure activity. Women at risk of seizure activity should be treated with MgSo4 during labour and for the first 24 hours following delivery.

Fluid Management:

Careful attention should be given to minimize intravenous and oral intake in women with preeclampsia to avoid pulmonary edema. The standard bolus of intravenous fluid usually given to women prior to epidural anesthesia should be considered with care. We normally use 0.9 NaCl in case the patient is in heart failure. In the third stage of labour lesser degrees of postpartum hemorrhage may result in hypotension and shock as a result of vascular space contraction. Total IV fluid intake should not exceed 80 -125 ml/hr. Plasma volume expansion is not recommended for women with preeclampsia. Beware of pulmonary edema

Urine output as low as 10 ml/hr can be tolerated in the absence of renal involvement. Urine output is best monitored with an indwelling urinary catheter, connected to an urometer in cases of severe preeclampsia. In the presence of oliguria consider:

- Clinical assessment of volume status
- Measure renal function (creatinine)
- Heightened awareness of magnesium toxicity
- Consider a small fluid bolus
- Monitor O_2 saturation, keep it $>$ 95%
- Consider appropriate consultation

HELLP SYNDROME

H Hemolysis
EL Elevated Liver Enzymes
LP Low Platelets

- Prophylactic transfusion of platelets is not recommended, even prior to Caesarean section, when platelet count is $>$ 50 x 10^9 /L and there is no excessive bleeding or platelet dysfunction.
- Along with appropriate consultations, consideration should be given to ordering blood products, including platelets, when platelet count is < 50 X 10^9 /L, platelet count is falling rapidly, and/or there is coagulopathy.

- Platelet transfusion should be strongly considered prior to vaginal and cesarean section delivery when platelet count is < 20 X 10^9 /L
- Corticosteroids may be considered for women with a platelet count < 50 x 10^9 /L.
- There is insufficient evidence to make a recommendation regarding the usefulness of plasma exchange or plasmapheresis.

STRESS REDUCTION

- Quiet environment
- Clear explanation of management plan to patient/family
- Minimization of negative stimuli
- Consistent, confident team approach (nursing, obstetrics, anaesthesia, hematology, paediatrics)

OTHER THERAPIES FOR TREATMENT OF PREECLAMPSIA:

- Thromboprophylaxis may be considered when bed rest is prescribed.
- Low dose aspirin is *not* recommended for treatment of preeclampsia.

TRANSPORT

When local resources are limited and maternal and fetal conditions permit, the outcome may be improved by transporting the mother to an appropriate referral centre. Principles to be addressed prior to transport include:

- Maternal blood pressure control
- Is the fetus stable?
- Seizure prophylaxis if appropriate
- Intubation/ventilation and calcium gluconate available

DELIVERY IS THE CURE

- Timely delivery minimizes maternal and neonatal morbidity and mortality
- Optimize maternal status before intervention to delivery
- Delay delivery to allow transfer only when maternal and fetal condition permit
- Delay delivery to gain fetal maturity only in selected cases, < 34 weeks and in a tertiary care centre
- When delivery is considered prior to 34 weeks gestation, antenatal corticosteroids should be administered to accelerate fetal pulmonary maturity
- Gestational hypertension is a progressive disease
- Expectant management is potentially harmful in the presence of severe gestational hypertension, fetal maturity, or suspected fetal compromise.

KEY POINTS:

PERIPARTUM MANAGEMENT

- Do not reduce diastolic BP below 90mmHg
- Do not fluid overload
- Epidural analgesia may be used in the absence of low platelets or Coagulopathy
- Avoid using ACE inhibitors or angiotensin receptor blockers
- Multispecialty approach
    - Obstetrics
    - Anaesthesia
    - Paediatrics/newborn
    - Internal medicine/haematology/nephrology/neurology as Needed

POSTPARTUM MANAGEMENT:

Gestational hypertension may present initially or worsen transiently following delivery. Proteinuria and other adverse conditions may also become worse in the early postpartum period.

- All women must be followed carefully in the postpartum period with ongoing attention to blood pressure control, renal function, seizure risk and laboratory testing.

- Postpartum thromboprophylaxis may be considered for women who have had a Ceasarean Section or who have been on bed rest for greater than four days.

- Non-steroidal anti-inflammatory drugs (NSAIDS) should *not* be given postpartum if hypertension is difficult to control or if there is oliguria, or an elevated creatinine level.

- Severe postpartum hypertension should be treated with antihypertensive agents to keep the BP < 160/110 mm Hg. Antihypertensive medications should also be considered to treat postpartum women with non-severe hypertension especially if they also have co-morbidities.

- Antihypertensives acceptable for use with breastfeeding include:
  - Nifedipine XL
  - Labetalol
  - Methyldopa
  - Captopril
  - Enalapril

- These patients should only be discharged when there is clinical and laboratory evidence of improvement and evidence that end organ failure has resolved. Arrangement for adequate outpatient surveillance should be made. Follow-up should be arranged for clinical and blood pressure assessment within one week of discharge.

- It is reasonable to discharge a woman whose BP remains at < 160/110 for at least 24 hours

REFERENCES

1. Society of Obstetrics and Gynaecology of Canada. Advances in Labour and Risk Management (ALARM) Course Syllabus, 22nd Ed., 2015-2016.

2. Society of Obstetrics and Gynecology of Canada Clinical Practice Guideline. Diagnosis, Evaluation, and Management of the Hypertensive Disorders of Pregnancy. 206: May 2014

3. SOGC MORE^{OB} Program 2018, pp 1- 23.