Hypertensive disorders in pregnancy

Blood pressure in pregnancy

- Physiological cardiovascular changes in pregnancy
  - + Blood volume
  - + Cardiac output
  - + Heart rate
  - + Systemic vascular resistance
  - + Blood pressure
  - Blood pressure falls gradually at first trimester, reaching a nadir (lowest point) around 22-24 weeks. Rising again from 28 weeks and reaching preconception levels by 36 weeks of gestation.
- Measuring BP accurately
  - • Five-minute rest before measurement, seated at 45-degree angle, arm at the level of the heart
  - • Avoid using automated devices (under-estimate BP)
  - • Use suitable cuff size (if circumference >= 33 cm use large cuff)
    • Keep the rate of deflation 2-3 mm/s
  - • Use Korotkoff 5
  - • Avoid digit preference
- Diagnosis of HTN
  - Systolic BP > 140 mmHg
  - Diastolic BP > 90 mmHg

Chronic hypertension

- Definition
  - • The presence of hypertension before 20 weeks' gestation
    OR
  - • Persistent hypertension beyond 6 weeks postpartum
- Affects 1 - 5% of pregnant women
- Types
  - Essential (primary) hypertension
    - Multifactorial with genetic and environmental contributions
  - Secondary hypertension
    - Renal disease is the most common cause in pregnant women
- Pre-pregnancy counselling
  - 1. Counsel about potential complications in pregnancy
    2. Address exacerbating factors and suggest lifestyle modifications (smoking cessation, weight loss, exercise, reduced alcohol intake, and low-salt diet)
    3. Optimize blood pressure control
    4. Screen for end-organ damage (e.g., creatinine levels)
    5. Medication review
    Stop teratogenic agents (ACEIs, ARBs, Statins, Thiazide diuretics) and switch to alternative
- Antenatal managment
  - Medications
    - Labetalol
      - nonselective β-adrenergic receptor blocker (β-blocker)
      - Avoid if asthmatic patient
    - Nifedipine
      - Nifedipine
    - Methyldopa
      - Centrally acting α2-adrenergic agonist
      - SE: tiredness, headache, depression, and occasionally hepatitis
    - Offer pregnant women with chronic hypertension Aspirin 75-150 mg once daily from 12 weeks (or before 16 weeks) to reduce the risk of pre-eclampsia
  - • Hypertension may improve in early pregnancy due to physiological changes and some women may stop their medication for several weeks.
    • Continue antihypertensive treatment unless:
    sustained systolic blood pressure less than 110mmHg
    OR
    sustained diastolic blood pressure less than 70mmHg
  - Follow up
    - Aim for a target blood pressure of 135/85 mmHg
      - There's an association between low diastolic BP in pregnancy and low birth weight therefore treatment should be reduced if diastolic BP is persistently < 80 mmHg
    - • Weekly appointments if hypertension is poorly controlled
      • Appointments every 2 to 4 weeks if hypertension is well-controlled
    - • Appointments should include measurement of BP and urine dipstick to check for proteinuria (superimposed pre-eclampsia)
- complications
  - Maternal complications
    - Superimposed pre-eclampsia : 20-30%
      - Superimposed preeclampsia is defined as preeclampsia in the setting of maternal chronic hypertension
    - Deterioration of renal function if already affected prior to pregnancy
      - if renal function was normal before; pregnancy does NOT affect the course of the disease
    - Placental abruption
      - risk increased 3 folds
  - Fetal complications
    - Intrauterine Growth Restriction (IUGR)
      - 10-15% (risk is further increased if superimposed pre-eclampsia occurred)
    - Prematurity: 20-30%
      - This is frequently iatrogenic due to maternal or fetal indications
    - Stillbirth
- Timing of birth
  - Timing of delivery should be guided by the severity of hypertension, the presence of proteinuria, and maternal and fetal wellbeing
  - • Women with chronic hypertension whom BP is stable < 160/110 should be delivered after 37 weeks unless there's maternal or fetal indications
  - • If BP is sustained > 160/110 or there's maternal or fetal compromise, a senior obstetrician can take the decision of a planned preterm birth (after a course of antenatal corticosteroids if time permits)
- Postpartum management
  - • Peak postpartum BP usually occurs at 3-5 days
    • After delivery, aim for a target BP of < 140/90 mmHg
  - In women with chronic hypertension who have given birth, measure blood pressure:
    • Daily for the first 2 days after birth
    • At least once between day 3 and day 5 after birth
    • As clinically indicated after that
  - If a woman has taken methyldopa to treat chronic hypertension during pregnancy, stop within 2 days after birth and change to an alternative antihypertensive treatment (to avoid exacerbation of postnatal depression)
  - Offer review at 6-8 weeks postpartum for appropriate contraception and future pre-pregnancy counselling
    • Avoid estrogen containing contraception (combined) in women with hypertension due to their potential to exacerbate sodium retention and hypertension

pregnancy induced Hypertension

- Gestational Hypertension
  - also known as : Non-proteinuric PIH
  - • No proteinuria!
    • In women with gestational hypertension, a full assessment should be carried out
    • Antenatal monitoring is needed to ensure that proteinuria does not develop, and pre-eclampsia becomes apparent (SCREENING)
    • Risk of progression to pre-eclampsia is 20-30%
  - Management
    - Admit to hospital for management if BP >= 160/110 mmHg
    - Start Antihypertensive treatment for all women diagnosed with PIH
      - Antihypertensive agents
        - Labetalol
        - Nifedipine
        - Methyldopa
    - Aim for a BP of 135/85 or less (but avoid hypotension)
  - Monitoring
    - Measure BP at least once or twice weekly
      - (unless admitted then measure every 15-30 minutes until it falls below 160/110 mmHg)
    - urine dipstick to check for proteinuria once or twice weekly
      - (daily if admitted to hospital)
    - Measure full blood count, liver function and renal function at diagnosis and then weekly
  - Fetal assessment
    - Offer fetal heart auscultation at every antenatal appointment
    - Carry out ultrasound assessment at diagnosis and, if normal, repeat every 2 to 4 weeks
    - Carry out a CTG only if clinically indicated (if BP >= 160/110 mmHg)
  - Delivery and postpartum
    - If BP remains under 160/110 mmHg delivery between 37-39 weeks is appropriate
      - (while monitoring closely for progression to severe hypertension, preeclampsia, and fetal growth restriction)
    - If delivery becomes indicated < 37 weeks gestation, consider a course of antenatal corticosteroids prior to planned preterm birth
      - (without delaying delivery)
    - Gestational hypertension may be predictive of chronic hypertension later in life and is important in regard to patient counselling and preventative medical decisions
- Pre-eclampsia
  - Definition
    - Elevated blood pressure + significant proteinuria after 20 weeks' gestation in a patient known to be previously normotensive. Is a systemic disease, and the placenta is the root cause of preeclampsia
    - Significant proteinuria:
      - Use an automated reagent-strip reading device for dipstick screening for proteinuria
      - If dipstick screening is positive (1+ or more) use
        - spot (protein : creatinine) ratio
        - spot (albumin : creatinine) ratio
      - Gold standard test to quantify proteinuria
        - 24-hour urine collection
          - Inconvenient so not routinely recommended
      - Thresholds for diagnosis of significant proteinuria
        - Spot Protein : Creatinine ratio >= 30 mg/mmol
        - Spot Albumin : Creatinine ratio >= 8 mg/mmol
        - 24-hour urine collection >= 300 mg
  - RISK
    - factors:
      - Trophoblastic disease or multiple gestation can present with preeclampsia before 20 weeks' gestation
      - Nulliparity
      - Multiple gestation
      - Obesity (BMI >= 35)
      - Medical disorders
        - chronic hypertension
        - pregestational diabetes
        - chronic kidney disease
      - Autoimmune disease
        - SLE
        - Antiphospholipid syndrome (APLS)
      - Personal or family History of preeclampsia
      - Molar pregnancy
      - Conception via assissted reproductive technologies
      - Advanced maternal age (40 years)
    - Reduction:
      - Low-dose Aspirin (75-150 mg)
        - starting before 16 weeks gestation until delivery for patients with one or more high risk factors OR two or more moderate risk factors
  - Pathophysiology
    - Immunologic alteration in trophoblastic function and reduction in trophoblast invasion>>> This reduces vascular remodeling and physiological vasodilation of spiral arteries>>>> reducing perfusion>>> increasing velocity of blood in the intervillous space >>>leads to both inflammation and endothelial damage and dysfunction
  - Signs, symptoms, or lab values of severe preeclampsia with any elevated blood pressure
    - Signs and symptoms of severe preeclampsia
      - Diagnostic
        - Pulmonary edema
        - Cerebral or visual disturbances (e.g.; persistent headache, blurred vision, scotomata)
        - Persistent epigastric or right upper quadrant pain
      - not diagnostic
        - nausea and vomiting, decreased urine output, hematuria, or rapid weight gain (5 lb or more in 1 week)
        - sign that does not establish a diagnosis but does need increased attention for preeclampsia
          - rapid elevation of the patient's blood pressure from baseline
    - Laboratory findings diagnostic of severe preeclampsia
      - Platelet count below 150 000 platelets per µL
      - Serum creatinine 90 micromol/litre or more, or a doubling of the patient's baseline creatinine level
      - Liver enzyme (aspartate aminotransferase/ alanine aminotransferase) elevation of more than double the upper limit of normal
    - preeclampsia with sever features
      - Blood pressure of 160 mmHg systolic or 110 mmHg diastolic which is persistent
  - Management of pre-eclampsia with severe features:
    - urgent delivery after maternal stabilization is indicated
    - Admission
    - IV line, foley catheter insertion, strict intake/ output recordings, fluid management
    - IV antihypertensive agent (+/- MgSO4)
      - Labetalol
        - 20 mg IV bolus, if persistently elevated: 40, 80, and 80 boluses up to a maximum dose of 220 mg, at 10-minute intervals
      - Hydralazine
        - 5 mg IV bolus, if persistently elevated: further 5 mg boluses up to a maximum dose of 15 mg, at 30-minute intervals
        - (Colloid should be infused prior to treatment if the baby is undelivered to protect the uteroplacental circulation and prevent hypotension and fetal distress)
        - >>> If no IV access, use immediate release oral nifedipine
    - Magnesium Sulphate
      - Benefits
        - Seizure prophylaxis (decrease the risk of eclampsia by more than 50%)
        - Neuroprotection (evidence of benefit from 24 weeks till 32 weeks)
      - Dose
        - 4 gram bolus over 5-15 minutes, then 1 g/h infusion for 24 hours
      - ATTENTION!!
        - MgSO4 has narrow therapeutic window -therapeutic range is 4 to 6 mEq/L
        - Check serum magnesium level 4 hours after the loading dose and then every 6 hours as needed or if symptoms suggest magnesium toxicity
      - Magnesium toxicity
        - Patients are monitored hourly for signs and symptoms of magnesium toxicity:
          - Loss of patellar reflexes (at 8 to 10 mEq/L)
            Respiratory depression or arrest (at 12 mEq/L)
            Mental status changes (at 12 mEq/L) followed by ECG changes and arrhythmias
        - If magnesium toxicity develops:
          - Stop magnesium sulphate
            Check the patient's vital signs
            Check plasma levels
            Administer 1-g calcium gluconate IV over 3 minutes, and consider diuretics
    - Course of antenatal corticosteroids (should NOT delay urgent delivery)
    - Laboratory assessments (repeat every 6 hours if still not delivered)
    - Delivery when the mother is stable (usually by CS)
  - Fetal findings associated with preeclampsia
    - Intrauterine growth restriction (IUGR)
    - oligohydramnios
    - Other signs of uteroplacental insufficiency
  - complications
    - fetal
      - Prematurity
        IUGR
        RDS
        IUFD
    - maternal
      - Renal failure
        Acute cardiac failure
        Pulmonary edema
        Thrombocytopenia
        Disseminated intravascular coagulopathy
        Cerebrovascular accidents
  - Management of pre-eclampsia without severe features (mild pre-eclampsia)
    - At term
      - Delivery, typically at 37 weeks or at time of diagnosis if after 37 weeks
    - Preterm
      - Optimal treatment prior to 37 weeks is usually expectant management
  - Urine output and fluid management:
    - Patients with preeclampsia are frequently hypovolemic due to third spacing and increased capillary permeability, these same abnormalities also increase their risk of pulmonary edema
    - Limit maintenance fluids to 80 ml/hour unless there are other ongoing fluid losses (for example, haemorrhage)
    - Urine output usually returns to normal about 12 to 24 hours after delivery
  - Fetal assessment and delivery:
    - CTG should be done at diagnosis and continuous fetal heart monitoring is required if in labour
    - Usually delivery by CS, unless mother and fetus are stable and cervix favorable then could try IOL by vaginal prostaglandins
    - If the patient is being delivered by CS, keep in mind:
      - Anaesthesia
        - GA can be dangerous as endotracheal intubation can exacerbate hypertension; regional anesthesia is preferred if time permits
      - Platelet count
        - regional anaesthesia
          - > 80 000 per µL
        - General anesthesia
          - minimum of 50 000 per µL is needed for CS
- Eclampsia
  - Is an obstetric emergency that can occur antepartum, intrapartum, or postpartum
    - Occurs in about 1% of patients with pre-eclampsia
    - should be the presumed diagnosis in obstetric patients with seizures and/or coma without a known history of epilepsy or other causes of seizures
  - pathophysiology
    - Is unknown but is related to arterial vasospasm and may occur when mean arterial pressure exceeds the capacity of cerebral autoregulation, leading to cerebral edema and increased intracranial pressure
  - Management
    - Appropriate management of ABCs (airway, breathing, and circulation) with measures taken to avoid aspiration
    - Seizure control with 6-g MgSO4 IV bolus
      - If the patient has a seizure during or after the loading dose, an additional 2-g IV bolus of MgSO4 can be given
    - Treat seizures refractory to MgSO4 with IV phenytoin or a benzodiazepine (e.g., lorazepam)
    - Treat status epilepticus with lorazepam
      - Patients with status epilepticus may require intubation to correct hypoxia and acidosis and to maintain a secure airway
    - Prevent maternal injury with padded bedrails and appropriate positioning
    - Control of severe hypertension
    - Delivery is indicated after maternal stabilization, and emergency cesarean delivery should always be anticipated in case of rapid maternal or fetal deterioration
      - During acute eclamptic episodes, fetal bradycardia is common. It usually resolves in 3 to 5 minutes
- HELLP syndrome
  - • Hemolysis
    • Elevated Liver enzymes
    • Low Platelets
  - Often presents with nonspecific complaints such as malaise, abdominal pain, vomiting, shortness of breath, or bleeding
  - Hypertension is not always a clinical feature
  - • Management is the same as for severe pre-eclampsia
    • Transfusion of red cells, platelets, or factors may be required immediately prior to delivery depending on severity of anemia and thrombocytopenia
- Postpartum management of PIH
  - BP monitoring and management of complications -shall any occur
  - Medication review
    - If a woman has taken methyldopa to treat pre-eclampsia, stop within 2 days after the birth and change to an alternative treatment if necessary (postnatal depression risk)
    - If she's breastfeeding, use safe antihypertensive agent
      - Enalapril (appropriate monitoring of maternal renal function and maternal serum potassium)
      - Nifedipine/ Amlodipine
  - Follow-up at 6-8 weeks postpartum
    - 1.Make sure BP stabilized and any laboratory abnormalities resolved
      2.Counselling about risk of recurrence: about 20%, if needed preterm delivery risk is higher
      3.Counselling about long term risks: chronic hypertension, ischemic heart disease, and stroke
      4.Risk reduction in future pregnancies (low-dose aspirin)

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