Blood Pressure in normal pregnancy

- 6/52: ↓ 5-10 (sbp) /10-15 (dbp) mmHg
- 26/52: nadir
- after 26/52: ↑
  - Less than pre-pregnancy
In NSW about 4% of women get preeclampsia: What is it?

- A *multisystem* disorder specific to pregnancy characterised by *vasospasm* and *endothelial injury* with resultant *endorgan damage* whose most common signs are hypertension and proteinuria and which is curable only by *delivery*.

- Think of SLE
Why is Pre-eclampsia Important?

- Affects 2-8% of pregnancies worldwide
- Increases Morbidity and Mortality mother and baby
- 15% of preterm births
- 12% of maternal deaths
- 1/3 of severe obstetric complications
- Increase IUGR, NND, PNMR, abruption, CP
If you were a baby where would you live?

- Not in an organ that was on a non-protected blood supply

- Wouldn’t want to lose my blood supply every time mum ate or exercised
The problem for the baby is that it lives where the blood supply can be diverted to *more important* structures.

NOW THAT SIMPLY WON’T DO!
What can baby do about that?
CHEAT!
Cheat HOW?

- Mother has systems to direct blood away from the uterus

- Based on the ability to constrict small blood vessels (spiral arteries) which in turn depends on the muscle in the small vessels media
What if you could make all that nasty muscle go away? Wouldn’t that help?
So in pre-eclampsia the trophoblastic invasion of the spiral vessels is incomplete.

The placenta is relatively ischaemic.
This leads to inflammatory mediators being released into the circulation which cause endothelial damage and vasospasm.

So where-ever there is endothelium there can be damage
Isn’t that just about everywhere?

That’s why pre-eclampsia is a multisystem disorder.

It certainly isn’t just hypertension, proteinuria and oedema!
What constitutes hypertension?

- Hypertension in pregnancy is diagnosed when:
  - Systolic blood pressure is >140 mmHg
  - and/or
  - Diastolic blood pressure (Korotkoff V) is >90 mmHg.

- These blood pressures should be confirmed by repeated readings over several hours in a clinic or day assessment unit or after rest in hospital.
Not all Hypertension is pre-eclampsia

- Hypertension effects just under 10% of all pregnancies in NSW
  - 0.6% Chronic Hypertension
  - 4.2% pre-eclampsia
  - 0.3% Pre-eclampsia superimposed on chronic
  - 4.3% gestational hypertension
Pre-eclampsia superimposed on chronic hypertension

- Between 20% and 40% of women who have chronic underlying hypertension will develop superimposed pre-eclampsia.
- The prognosis for this group is worst of all.
Gestational Hypertension

- Hypertension occurring de novo after 20 weeks gestation but without any signs of multisystem involvement.

- Very good pregnancy outcome compared with women who develop pre-eclampsia.
Who is at increased Risk PET?

Primigravid state

- Multigravida pregnant by a different partner
- Prior pre-eclampsia in a pregnancy by the same partner
- Family history of pre-eclampsia
- Multiple pregnancy
- Obesity
- Renal disease
- Essential hypertension
- Diabetes
- Autoimmune disease, especially SLE and antiphospholipid syndrome
- Thrombophilic state
- Severe alloimmunisation
What constitutes severe PET

- Systolic ≥ 160 or diastolic ≥ 110
- >5g proteinuria
- Severe oliguria
- Cerebral or visual disturbance
- Abn LFT, plt
- IUGR
- Onset < 35 weeks
Complications of preeclampsia

“Sure, we could make it simpler but that would only complicate matters.”
Renal

- **Proteinuria** - >300 mg/24h or spot urine protein/creatinine ratio >30 mg/mmol

- **Renal insufficiency** – serum/plasma creatinine > 0.09 mmol/L or oliguria

- **ATN/pre-renal failure**
Liver

- Raised AST / ALT
- Epigastric/right upper quadrant pain
- Subcapsular bleeds
- Liver rupture
Heart

- Left ventricular failure
- Pulmonary oedema
CNS

- convulsions (eclampsia)
- hyperreflexia with clonus
- severe headaches
- persistent visual disturbances (scotomata)
- Cerebral oedema
- Haemorrhagic stroke
Haematological

- Thrombocytopenia
- disseminated intravascular coagulation
- haemolysis
Baby

- IUGR
- CP (even at term)
- Prematurity
- Encephalopathy (severe PET OR 6.3 big baby at term & severe PET OR 18)
Can it happen before 20 weeks

Rarely with
- hydatidiform mole
- Multiple pregnancy
- Fetal triploidy
- Prothrombotic disorders such as antiphospholipid syndrome
- Severe renal disease.
The hypertension of pre-eclampsia will have returned to normal within 3 months post partum.
Aspirin for prevention in high risk women.

- Decrease incidence PET in high risk group by 24%
- Decrease preterm birth in treatment group by 14%
- Decrease risk IUGR in treatment group by 20%
# Aspirin for prevention

**US preventativeservices taskforce 2016**

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Risk Factors</th>
<th>Recommendation</th>
</tr>
</thead>
</table>
| High†      | History of preeclampsia, especially when accompanied by an adverse outcome  
             Multifetal gestation  
             Chronic hypertension  
             Type 1 or 2 diabetes  
             Renal disease  
             Autoimmune disease (systemic lupus erythematosus, antiphospholipid syndrome) | Recommend low-dose aspirin if the patient has ≥1 of these high-risk factors |
<table>
<thead>
<tr>
<th>Moderate ±</th>
<th>Nulliparity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity (body mass index $&gt;30$ kg/m$^2$)</td>
<td></td>
</tr>
<tr>
<td>Family history of preeclampsia (mother or sister)</td>
<td></td>
</tr>
<tr>
<td>Sociodemographic characteristics (African American race, low socioeconomic status)</td>
<td></td>
</tr>
<tr>
<td>Age $\geq 35$ years</td>
<td></td>
</tr>
<tr>
<td>Personal history factors (e.g., low birthweight or small for gestational age, previous adverse pregnancy outcome, $&gt;10$-year pregnancy interval)</td>
<td></td>
</tr>
</tbody>
</table>

Consider low-dose aspirin if the patient has several of these moderate-risk factors §
Clinical warnings of increased risk PET

- Failure of blood pressure to fall in the first half of pregnancy
- Development of proteinurias *de novo* after 20 weeks
- Uterine artery doppler
Management determined by

- Gestation
- Fetal wellbeing
- Extent of multiorgan dysfunction
- Degree of hypertension
Management principles

- Anticipate (F/Hx, P/Hx, Twins...)
- Closely monitor BP, proteinuria
- Look for evidence of endorgan dysfunction
- Control hypertension
- Monitor the fetal growth and wellbeing
- Time the delivery
- Choose the route of delivery
Medical management

- Oxprenolol
- Aldomet
- Labetalol
- Hydralazine
- Clonidine
- Nifedipine
Acute Management

- Acute treatment (for severe hypertension: BP >170 mmHg systolic and/or >110 mmHg diastolic)
  - oral nifedipine tablets
  - iv or im hydralazine
  - iv diazoxide
Don’t drop the BP too much

- Reducing systolic BP initially by only 20-30 mmHg and diastolic by 10-15 mmHg should protect the mother from cerebral haemorrhage without jeopardising the fetus.

- Continuous **CTG monitoring** should be used to ensure that lowering the blood pressure does not cause fetal distress.
Volume manipulation

The risk of sudden hypotension with vasodilators such as nifedipine and hydralazine can be minimised by the use of concomitant plasma expansion.

However there is a risk of inducing pulmonary oedema,

Women with severe PET about to have parenteral anti-hypertensives, epidural anaesthesia or immediate delivery may benefit from infusion of up to 500mls of IV fluid
Endpoints for Delivery

- pre-eclampsia occurring at term (>37 weeks)
- inability to control blood pressure despite adequate hypertensive therapy
- deteriorating liver function
- deteriorating renal function
- progressive thrombocytopenia
- neurological complications or imminent eclampsia
- placental abruption
- concern regarding fetal welfare
Fetal management

- Monitor growth, liquor and dopplers
- Steroids if <34 weeks and delivery anticipated in <1 week.
- Appropriate transfer to a tertiary centre
Fluids postnatally

- Women with pre-eclampsia are at significant risk of LVF and pulmonary oedema especially postnatally
- Be conservative with IV fluids
- Replace losses then aim for 1500mls per day until diuresis begins
- Be careful of fluid loading in response to oliguria
Complications of Pre-eclampsia

Maternal:
- Eclampsia
- Renal impairment
- LVF and Pulmonary Oedema
- CVA
- DIC
- Abruption
- Liver rupture
- Death
- Hospitalisation

Later life 8x increased cardiovascular or cerebrovascular death
Fetal
- IUGR
- Prematurity
- CP
- Abruption
Recurrence risk

- Mild PET      5%
- PET overall  14%
- Severe early onset PET    70%
Eclampsia:

- Seizures occurring due to the pathology of pre-eclampsia
- Usually in patients with known pre-eclampsia
- May be the first presentation
- Nearly 50% occur post-partum
- Significant risk of maternal and fetal death and damage.
Anticipate

- Severe rapid onset especially early onset pre-eclampsia
- Symptomatic pre-eclampsia
- Agitation
- Hyper-reflexia with clonus
- Unremitting headache
- Blurred vision
Magnesium has been shown to be superior to phenytoin in preventing the first and in preventing repeated eclamptic seizures.
Treat

- ABC
- Truncate the seizure:
  - Establish IV access
  - Clonazepam 1mg boluses IVI
  or
  - Diazepam 10mg IVI boluses
- Control hypertension
- Prevent subsequent seizures-Magnesium
- Deliver after stabilisation
- Check for other complications eg DIC, abruption, CVA, renal impairment
Magnesium

- Remember not to use with glucose solutions or Ampicillin
- Use an infusion pump and preferably a dedicated line
- Comes as a 5 ml ampoule of 50% solution =2mmol/ml
- 4g=16mmol
- Load with 4g over 15-30 minutes
- Maintenance 1g/hour for at least 24 hours
- Recurrent seizures increase to 2g/hr
Monitoring with Mg

- SaO2
- Respiratory rate
- Deep tendon reflexes
- Mental state
- Magnesium levels
# Magnesium Toxicity

<table>
<thead>
<tr>
<th>Plasma Level (mmol/l)</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8-1.2</td>
<td>Normal range</td>
</tr>
<tr>
<td>2.0-3.5</td>
<td>Therapeutic</td>
</tr>
<tr>
<td>4.5-6.5</td>
<td>Nausea, vomiting somnolence,</td>
</tr>
<tr>
<td></td>
<td>double vision, double vision,</td>
</tr>
<tr>
<td></td>
<td>slurred speech</td>
</tr>
<tr>
<td>&gt;5.0</td>
<td>↓reflexes, ECG changes</td>
</tr>
<tr>
<td>&gt;6.0</td>
<td>Muscle paralysis respiratory</td>
</tr>
<tr>
<td></td>
<td>arrest</td>
</tr>
<tr>
<td>&gt;12.0</td>
<td>Cardiac arrest</td>
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