Maternal Collapse
An Obstetric Medicine perspective

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Please acknowledge the author if you are adapting and using this slide set.
Disclosure of Interest

Principal trainer of the Intensive Course in Obstetric Emergencies (ICOE)
Who is the obstetrician?
Overview

Definition
Common causes
Hemorrhagic causes
Cardiac
Neurological

Amniotic fluid embolism
Anaphylaxis
Sepsis
Metabolic
What is new
Definition
Challenges during resuscitation

- Intubation – difficult
- Risk of aspiration – higher
- Blood loss – can be rapid
- Clinical signs - may be late
- Aortocaval compression – reduces cardiac output
- Hypoxia - may be severe
Eclampsia and preeclampsia
Hypoxia
- Aortic dissections
- Aneurysms
- Peripartum cardiomyopathy
- Myocardial infarction
Hypo/hyperkalaemia
Cardiac tamponade
Hypoglycaemia
Toxicity/Hypothermia
- Magnesium sulphate
- Local anaesthetic
- Illicit drugs
Hypovolaemia
- Splenic artery rupture
- Hepatic rupture
- Uterine haemorrhage (ante-partum/post-partum)
- Sepsis
- Dense spinal block
- Neurogenic shock
Intercranial haemorrhage
Tension pneumothorax
Pulmonary embolism
Amniotic fluid embolism
Common obstetric causes

Ante / post partum haemorrhage

Eclampsia

Thromboembolism
Haemorrhagic causes - hypovolemia

Common causes
- Antepartum
- Postpartum haemorrhage

Uncommon causes
- Splenic aneurysm
- Liver rupture

Acute abdomen
Pleuritic chest pain
Cardiac emergencies

- Aortic dissection
- ACS
- PPCM
Acute Coronary Syndrome

- Most commonly occurs in the third trimester, peripartum and post delivery
- Crushing central chest pain or heaviness with or without radiation to the jaw or left arm
- Serial Troponin T – 20% increase
- Primary percutaneous intervention is the treatment of choice
## Normal vs abnormal ECG in pregnancy

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>ECG changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute myocardial infarction</td>
<td>ST elevation, ST depression, Symmetrical T wave inversion, Newly developed Q waves</td>
</tr>
<tr>
<td>Normal variations in pregnancy</td>
<td>15–20 degrees left axis shift, ST segment depression, T-wave inversion in inferior and lateral leads, Small Q wave and inverted T wave in lead III, Q wave in lead AVF, Inverted T waves in V1, V2 and occasionally V3</td>
</tr>
</tbody>
</table>
Peripartum cardiomyopathy (PPCM)

- Progressively worsening dyspnoea and orthopnoea

- Clinical signs - tachycardia and tachypnoea, raised JVP, bibasal crepitation and hepatomegaly

- The diagnosis is one of exclusion; confirmed left ventricular dysfunction (ejection fraction <45%)
Aortic dissection

- Retrosternal ‘tearing’ type chest pain (between scapulae) and dyspnoea – needing opioids!
- Marfan’s, Loeys Dietz, Ehlers Danlos type IV, Turner syndrome, co-arctation of the aorta and bicuspid aortopathy.
- Mediastinal widening on a chest x-ray / CT / MRI
<table>
<thead>
<tr>
<th>Aortic diseases</th>
<th>Marfan&lt;sup&gt;19,175&lt;/sup&gt;</th>
<th>Bicuspid aortic valve&lt;sup&gt;176&lt;/sup&gt;</th>
<th>LoeysDietz&lt;sup&gt;182-184&lt;/sup&gt;</th>
<th>Turner&lt;sup&gt;178,179&lt;/sup&gt;</th>
<th>Vascular Ehlers–Danlos&lt;sup&gt;26&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location of aneurysm/dissection</strong></td>
<td>Everywhere (sinus of Valsalva)</td>
<td>Ascending aorta</td>
<td>Everywhere</td>
<td>Ascending aorta, arch and descending aorta</td>
<td>Everywhere</td>
</tr>
<tr>
<td><strong>Risk of dissection</strong></td>
<td>High: 1–10%</td>
<td>Low: &lt;1%</td>
<td>High: 1–10%</td>
<td>High: 1–10%</td>
<td>High: 1–10%</td>
</tr>
<tr>
<td><strong>Comorbidity</strong></td>
<td>Dural abnormalities</td>
<td>Aortic stenosis or regurgitation</td>
<td>Dural abnormalities</td>
<td>Low height</td>
<td>Dural abnormalities</td>
</tr>
<tr>
<td></td>
<td>Mitral regurgitation</td>
<td></td>
<td>Mitral regurgitation</td>
<td>Infertility</td>
<td>Uterine rupture</td>
</tr>
<tr>
<td></td>
<td>Heart failure</td>
<td></td>
<td></td>
<td>Hypertension</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arrhythmias</td>
<td></td>
<td></td>
<td>Diabetes</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bicuspid aortic valve</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Coarctation</td>
<td></td>
</tr>
<tr>
<td><strong>Advise not to become pregnant</strong></td>
<td>Ascending aorta &gt;45 mm (or &gt;40 mm in family history of dissection or sudden death)</td>
<td>Ascending aorta &gt;50 mm</td>
<td>Ascending aorta &gt;45 mm (or &gt;40 mm in family history of dissection or sudden death)</td>
<td>ASI &gt;25 mm&lt;sup&gt;2&lt;/sup&gt;</td>
<td>All patients</td>
</tr>
</tbody>
</table>
Thrombolytic treatment of PE

Approved thrombolytic regimens for pulmonary embolism

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose and Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streptokinase</td>
<td>250,000 IU as a loading dose over 30 minutes, followed by 100,000 IU/h over 12-24 hours.</td>
</tr>
<tr>
<td></td>
<td>Accelerated regimen: 1.5 million IU over 2 hours.</td>
</tr>
<tr>
<td>Urokinase</td>
<td>4400 IU/kg as a loading dose over 10 min, followed by 4400 IU/kg per hour over 12-24 hours.</td>
</tr>
<tr>
<td></td>
<td>Accelerated regimen: 3 million IU over 2 hours.</td>
</tr>
<tr>
<td>rtPA</td>
<td>100 mg over 2 hours; or</td>
</tr>
<tr>
<td></td>
<td>0.6 mg/kg over 15 minutes (maximum dose 50 mg).</td>
</tr>
</tbody>
</table>

The Use of Tissue Plasminogen-activator in Pregnancy
A Taboo Treatment or a Time to Think Out of the Box

Magdy H. Selim, MD, PhD; Carlos A. Molina, MD, PhD
Neurological emergencies

- Epilepsy
- Subarachnoid haemorrhage
- Intracranial Haemorrhage
- Brain tumours
- Cerebral vein thrombosis
Eclampsia Vs Status Epilepticus

Eclampsia
4g

Status Epilepticus
4mg
Subarachnoid haemorrhage

- Sudden maternal collapse or a severe headache
- There can be associated vomiting, neck stiffness and impaired or loss of consciousness
- In pregnancy – AV malformations
- Outside pregnancy – Berry’s aneurysm
Cerebral Vein Thrombosis

- Severe sudden-onset headache, focal neurological signs
- Vomiting and photophobia, impaired consciousness and seizures.
- CT brain will be normal! Think of MR or CT venography
Amniotic fluid embolism

- Pulmonary hypertension, hypoxia and acute right ventricular failure
- Sudden collapse in labour or shortly after delivery with signs of central cyanosis, and profound hypotension with dyspnoea and hypoxia
- DIC
Anaphylaxis

- Asthma, atopy or a history of allergies to drugs
- Patients initially develop a rash or wheeze; to profound breathlessness due to facial/laryngeal oedema & bronchospasm with consequent hypotension and shock.
- 0.5 mg of adrenalin IM, 10 mg of chlorpheniramine IV and 200 mg of hydrocortisone IV.
- Tryptase levels
Surviving sepsis campaign

**Within 3 hours of diagnosis**
- Measure lactate
  - If hypotensive or lactate > 4 mmol/l: resuscitate with 30 ml/kg of crystalloids
- Obtain blood cultures
- Start broad spectrum antibiotics
- Involve consultant and physician

**Within 6 hours of diagnosis**
- If hypotensive despite fluid resuscitation, start inotropes (norepinephrine) and maintain MAP > 65 mmHg
- If septic shock
  - Maintain CVP > 8 mmHg
  - Central venous oxygen saturation (ScvO₂) > 70%
<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Respiratory system</th>
<th>Cardiovascular system</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>A weak cough, or early signs of dyspnoea</td>
<td>RR ≥ 12–15 per min</td>
<td>Hypotension and no bradycardia*</td>
<td>High spinal anaesthesia is unlikely</td>
</tr>
<tr>
<td>Progressive dyspnoea</td>
<td>RR: 12-15 per minute</td>
<td>Hypotension, and no bradycardia*</td>
<td>Early signs of high spinal anaesthesia</td>
</tr>
<tr>
<td>Weak hand grip strength (C8/T1)</td>
<td>SpO₂ ≥ 95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can’t touch nose (C5/C6)</td>
<td>Function is at preoperative status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ineffective cough</td>
<td>RR: 12-15 per minute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to speak</td>
<td>SpO₂ ≤ 95%</td>
<td>Hypotension ± bradycardia*</td>
<td>High spinal anaesthesia is likely</td>
</tr>
<tr>
<td>Unable to speak</td>
<td>Function diminished</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apnoea</td>
<td>SpO₂ ≤ 90%</td>
<td>Hypotension + bradycardia*</td>
<td>High spinal anaesthesia is established</td>
</tr>
<tr>
<td>Unable to speak</td>
<td>Function poor</td>
<td></td>
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</tr>
</tbody>
</table>
Metabolic disorders

- Hypoglycemia
- Hypokalemia
- Hyperkalemia
- Hyponatremia
What is new?
Shock index

\[
\text{Shock Index} = \frac{\text{Heart Rate (bpm)}}{\text{SBP (mm Hg)}} \geq 0.9
\]
Manual uterine displacement

Double hand pull is the preferred technique

One hand pull or.push is NOT recommended
Non Pneumatic anti shock garments

Use of non-pneumatic anti-shock garment (useful for transfer of patient).
Resuscitation in hypovolemia

**Fluids**
- Crystalloids
- Colloids

**Blood**
- RBC

**Coagulopathy**
- Blood products & platelets
“Damage control resuscitation – DCR”

Fluids

Blood

Blood products

Blood reviews, July 2015.
BJA 2014.
Plasma: FFP ratio for DIC

RBC: FFP RATIO

6:4:2

1:1:1

Haematocrit - 26%, coagulation factor activity - 40–50%, platelet count - 90,000 x 10^6
The lethal triad

Blood clotting problem (coagulopathy)

- Decreased coagulation
- Increased lactic acid in blood

Severe blood loss

- Low body temperature (hypothermia)
- Acidic blood (acidosis)

Decreased heart performance
ISBAR & EOWS
Resuscitative hysterotomy
### Medications during resuscitation

<table>
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<tr>
<th>Diagnosis</th>
<th>Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac arrest</td>
<td>1mg adrenaline IV (every 3-5 minutes)</td>
</tr>
<tr>
<td>VF/VT</td>
<td>300 mg amiodarone IV after 3rd shock</td>
</tr>
<tr>
<td>Opiate overdose</td>
<td>400 – 800 micrograms naloxone IV</td>
</tr>
<tr>
<td>Magnesium toxicity</td>
<td>10 mL of 10% calcium gluconate IV</td>
</tr>
<tr>
<td>Local anaesthetic toxicity</td>
<td>1.5 mL/kg 20% lipid emulsion (e.g. intralipid®) IV</td>
</tr>
</tbody>
</table>
2. Assess rhythm
   a. Shockable
   i. Ventricular fibrillation
   ii. Pulseless ventricular tachycardia

   Use 360 joules (J) monophasic or 120 to 200 J biphasic per shock. There is no evidence that these affect the fetus.

   b. Non-shockable
   i. Asystole
Maternal collapse

Haemorrhage
- Uterus, Brain, Liver, Spleen

Toxicity
- Intralipid, Calcium gluconate

Chest pain
- Aneurysm, ACS

Metabolic
- Hypoglycemia, K

Neurology
- Eclampsia, Epilepsy, Cerebral Thrombosis

Embolism
- VTE, Amniotic
Take home message

- Fast & effective
- Pulse oximeter
- Lactates
- ECG
- Rhythms & defibrillators
- Resuscitative hysterotomy
- Systematic approach
- Multi-professional team
The Obstetric ICU

One machine for mother & fetal monitoring
THANK YOU

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