

## **Maternal Collapse**

[See also Management of Obstetric Haemorrhage and Pre-eclampsia]

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### **Cardiac Arrest in pregnancy**

Cardiac arrest in the pregnant woman is uncommon, often unexpected and successful resuscitation is challenging. In addition it is likely to present in an environment of predominately young healthy women looked after by staff who have little experience of cardiac arrest in pregnancy.

There are many causes; however not all are obvious. Though some may be related to pregnancy, the increasing numbers of pregnant women of advanced age means cardiac arrest may present secondary to co-existing medical conditions. A team approach is vital.

Possible causes

- Haemorrhage
- Pulmonary embolism
- Cardiac disease: MI, cardiomyopathy, valve lesions, arrhythmias
- Pre-eclampsia / Eclampsia
- Amniotic fluid embolism
- Local anaesthetic toxicity
- High regional block (total spinal)
- Failed intubation/ventilation → Hypoxia
- Anaphylaxis
- Sepsis
- Intracranial pathology:
  - o Subarachnoid haemorrhage
  - o Cerebral haemorrhage
  - o Cerebral vein thrombosis

### **Physiological changes that impede resuscitation**

Cardiovascular: Aorto-caval compression by the gravid uterus. This results in reduced venous return and obstruction to forward flow of blood into the aorta

The gravid uterus accounts for 10% of cardiac output, resulting in a significant shunt that further impairs effective cardiopulmonary resuscitation (CPR).

Respiratory: Reduced functional residual capacity (FRC) and increased oxygen consumption increase rates of desaturation and greatly hinder adequate oxygenation during CPR. In addition, patients are at increased risk of difficult and failed intubation.

Gastrointestinal: Increased risk of aspiration due to delayed gastric emptying

### **Management**

- ABC.... 100% Oxygen
- Call for help, including obstetricians, anaesthetists, neonatologists.
- Adequate left uterine displacement is essential during cardiac massage to limit the impact of

aorto-caval compression. There are several methods to do this but the aim of all should be to tilt the mother leftwards into a position where chest compression can still be effectively generated. Methods include use of a Cardiff resuscitation wedge (not commonly available), cushions or pillows or back of an up-turned chair to incline the mother to the left. Alternatively a 'human' wedge can be use in which the patient is tilted on the bent knees of a kneeling rescuer.

- Commence CPR in line with current resuscitation guidelines.
- Intubate early with cricoid pressure. If unable to intubate, maintain oxygenation by bag mask ventilation or via a laryngeal mask airway.
- Remember maintaining adequate chest compression in the tilted position is difficult and energy consuming. Ensure members of the team are rotated.
- Caesarean section if adequate circulation not established after 5 min of cardiac arrest. This is performed not in an attempt to save the life of the fetus, but to enhance the likelihood of successful resuscitation of the mother by relieving aorto-caval compression. Delay in transfer to theatre should be avoided and if necessary caesarean section should take place where the arrest occurs. Equipment to do this quickly should be available. Continue CPR throughout the operation. Transfer mother and baby to appropriate intensive care units if resuscitation successful.
- In the event that resuscitation is unsuccessful a decision will need to be made by the team to discontinue CPR. Given the distressing nature of failed resuscitation in the pregnant woman, adequate counselling and de-briefing of the whole team involved in the resuscitation must be ensured.

## **Training**

All members of the team looking after pregnant women should undertake regular resuscitation training on mannequins and be aware of the most current resuscitation guidelines. More usefully, cardiac arrest scenarios should be set up where the whole team can participate within their own specialities. The use of high fidelity simulation may be useful in encouraging familiarity with the management of this rare event.

## **Massive Pulmonary Embolus**

Pulmonary embolism (PE) is still the leading direct cause of maternal death in the United Kingdom. In the last triennial report, failure to recognise risk factors was identified as the most important aspect of substandard care.

Pregnant women are at high risk of venous thromboembolism (VTE) due to the physiological changes of pregnancy which produce a hypercoagulable state. Additional risk factors should be identified namely: increased maternal age, family history, previous history, increased maternal weight, operative delivery, pre-eclampsia, immobility and travel

Given the challenges of resuscitation following massive pulmonary embolus, focus should be on prevention and appropriate treatment when VTE is identified. Acute symptoms suggestive of thromboembolism in known high-risk women are an emergency and anticoagulation may be indicated before the diagnosis is clear.

## **Diagnosis**

Symptoms and signs of pulmonary embolus:

- Maternal collapse
- Dyspnoea

- Syncope
- Anxiety
- Chest pain
- Haemoptysis
- Dizziness
- Distended neck veins/ parasternal heave/ loud 2nd heart sound
- Symptoms and signs associated with DVT.

#### **Investigations:**

- ECG
  - o Often normal. Sinus tachycardia, right axis deviation, right bundle branch block. S1 Q3 T3 pattern rarely seen
- CXR
  - o Often normal: may show wedge shaped infarct, pleural effusion
  - o Useful as means to exclude other causes of symptoms
- Arterial Blood Gas. Hypoxaemia and hypocapnia
- Ventilation perfusion scan if stable for transfer
- CT pulmonary angiography (CTPA) if stable for transfer
- Bedside transthoracic echocardiogram: useful but not entirely sensitive.
  - o May help confirm PE by identifying right ventricular dysfunction
  - o May help to exclude PE; e.g. aortic dissection, pericardial tamponade, MI

Massive pulmonary embolism is characterized by arterial hypotension and cardiogenic shock.

#### **Management options of massive pulmonary embolus:**

- ABC if collapse and management as cardiac arrest in pregnancy (see above)
- High dose iv unfractionated heparin followed by infusion is often preferred in cases of massive pulmonary embolus e.g. 40,000 units/24 h. Aim to prolong activated partial thromboplastin time (APTT) by 1.5 – 2. Otherwise use low molecular weight heparin (LMWH) e.g. Enoxaparin 1mg/kg twice a day
- In life threatening PE consider
  - o Systemic thrombolysis
  - o Open surgical embolectomy
  - o Percutaneous catheter thrombectomy

#### **Amniotic fluid embolism**

Amniotic fluid embolism (AFE) is rare but often fatal. The exact aetiology and pathophysiology is unclear but may relate to entry of amniotic fluid and fetal debris into the maternal circulation.

#### **Incidence**

- Has been reported as high as 1 in 20 000 deliveries
- Though maternal and fetal mortality remains significant, AFE is not universally fatal. Number of maternal deaths due to AFE in the UK has fallen significantly over the last three triennia with only 5 cases reported in the most recent confidential enquiry into maternal deaths. It remains,

however unpredictable, unpreventable and is rapidly progressive.

## Diagnosis

Classically, AFE occurs in an older multiparous woman in advanced labour who suddenly collapses. It can also occur following termination of pregnancy, amniocentesis, placental abruption and trauma, during caesarean section and up to 30 minutes after delivery. Most mortality occurs in the first few hours.

- Premonitory signs and symptoms (restlessness, abnormal behaviour, seizures, respiratory distress and cyanosis) may occur before cardiovascular collapse.
- Disseminated intravascular coagulation and haemorrhage may rapidly develop.
- There may be associated hypertonic contractions and fetal distress or recent obstetric intervention e.g. artificial rupture of membranes.

Diagnosis often confirmed at autopsy by the presence of fetal squames and lanugo hair in the maternal pulmonary vasculature.

## Management

Early consideration of a diagnosis of AFE and involvement of the resuscitation team and experienced specialists from obstetrics, anaesthesia, intensive care and haematology is essential.

- Supportive management with immediate oxygenation, correction of cardiovascular collapse with fluids and vasopressors, blood transfusion and replacement of clotting factors.
- Advanced life support if cardiac arrest occurs (with the woman tilted, wedged or with manual uterine displacement and early recourse to perimortem caesarean section if resuscitation unsuccessful after 5 minutes).
- Treat coagulopathy with appropriate platelets, fresh frozen plasma and cryoprecipitate.
- Women with symptoms suspicious of AFE should be transferred to intensive care as soon as possible.
- Invasive monitoring, though likely to be beneficial must not delay initial supportive management and resuscitation.

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