

Maternal cardiac arrest during elective caesarean birth: a diagnostic challenge

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How common is cardiac arrest during caesarean birth?

- Maternal cardiac arrest is rare (approx. 1 in 17,000¹)
- Increased risk during caesarean birth (approx. 1 in 8,600²).
- Increased risk with general vs regional anaesthesia (approx. 1 in 1,220 vs 1 in 17,000²).
- Overall survival rates for maternal cardiac arrest in hospital are high (73–82%^{1,2}).
- There are modifications specific to the management and differential diagnoses of obstetric cardiac arrest.³

Differential diagnoses³

Box A: Reversible causes 4Hs and 4Ts (specific to obstetrics)	
Hypoxia	Respiratory – Pulmonary embolism (PE) Failed intubation, aspiration Heart failure Anaphylaxis Eclampsia / PET – pulmonary oedema, seizures
Hypovolaemia	Haemorrhage – obstetric (remember concealed), abnormal placentation, uterine rupture, atony, splenic artery/hepatic rupture, aneurysm rupture Distributive – sepsis, high regional block, anaphylaxis
Hypo/hyperkalaemia	Also check blood sugar, sodium, calcium and magnesium levels
Hypothermia	
Tamponade	Aortic dissection, peripartum cardiomyopathy, trauma
Thrombosis	Amniotic fluid embolism, PE, myocardial infarction, air embolism
Toxins	Local anaesthetic, magnesium, illicit drugs
Tension pneumothorax	Risks include trauma, positive pressure ventilation (including general anaesthesia) Can be exacerbated by Entonox / nitrous oxide

Case report

- 25-year-old, G4P2 with Asherman syndrome.
- Elective caesarean birth for suspected anterior placenta accreta spectrum at 37 weeks’ gestation.
- Combined spinal epidural anaesthesia was established with 0.5% heavy bupivacaine 2.5mL and diamorphine 300 micrograms intrathecally, and a phenylephrine infusion was commenced.
- Delivery involved surgical incision through the placental bed.
- Within a minute of the birth the patient became acutely dyspnoeic, with coughing, agitation, and cyanosis.
- In the next 15–20 seconds she became bradycardic then asystolic.

- She received 30–45 seconds of cardiopulmonary resuscitation (CPR) before return of spontaneous circulation (ROSC), whilst the surgeon performed uterine compression.
- She remained haemodynamically stable thereafter, but was initially hypoxaemic, requiring high-flow oxygen.
- This hypoxaemia resolved after 10–15 minutes, and the patient remained well enough to decline general anaesthesia.
- Measured blood loss was 1,170 mL and there was no evidence of coagulopathy on TEG®.
- Bedside transthoracic echocardiogram within 30 minutes of ROSC showed no obvious cardiac abnormality (with normal right ventricle).
- There was no rash or wheeze.

Discussion

- This case highlights the diagnostic uncertainty in sudden maternal cardiac arrest.
- Venous air embolus (VAE) seems the probable cause, although this cannot be definitively confirmed.
- The timing of onset of symptoms, rapid cardiovascular collapse and hypoxia following ROSC are all consistent with an embolic phenomenon affecting the right heart and pulmonary circulation.
- Absence of coagulopathy and rapid resolution of symptoms upon CPR seems consistent with VAE, as opposed to amniotic fluid embolus or pulmonary embolus.

Venous air embolism (VAE)

- VAE is the entrainment of air into the venous system leading to air bubbles in the right heart and pulmonary vasculature.
- VAE may cause hypoxaemia via V/Q mismatch.⁴
- Cardiovascular effects of VAE may be due to acute pulmonary vasoconstriction and acute RV failure.⁴
- Likely a common occurrence during caesarean birth (10–97%⁴) but is rarely clinically significant.
- Risk factors include:⁴
 - exteriorisation of uterus
 - Trendelenburg position
 - placenta praevia
 - hypovolaemia.

Learning points

- Vigilance is required in cases where significant VAE is at increased risk.
- Suspicion of VAE should prompt immediate repositioning, surgical compression of the uterus (or flooding of the surgical field) alongside attempts to raise systemic venous pressure.
- Prompt resuscitation and management can lead to rapid resolution of symptoms and good outcomes.
- The mechanical act of chest compressions may have a therapeutic role in itself.