

Maternal collapse

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Abstract

In the UK, the most recent review of maternal mortality shows a reduction in deaths from both direct and indirect causes. The prompt and correct management of women who collapse in pregnancy and the puerperium is likely to have contributed to the significant reduction in deaths in pregnancy seen in the last 10 years. An appreciation of the wide range of pathologies, including some rarely encountered, that may cause collapse is essential for all obstetricians.

Keywords Cardiac arrest; maternal mortality; pregnancy; resuscitation

Introduction

A maternal collapse has been defined by the Royal College of Obstetricians & Gynaecologists as an acute event involving the cardiorespiratory systems and/or brain, resulting in a reduced or absent conscious level, at any stage in pregnancy and up to six weeks post partum. This is a rare occurrence with its incidence estimated to be between 0.14 and 6/1000 births. This potentially life threatening situation requires prompt and decisive management to mitigate the sequelae of maternal morbidity and potential mortality. It is therefore mandatory that all medical staff are appropriately trained and skilled in initiating effective resuscitation techniques, as well as, having the ability to investigate and diagnose the cause of the event. A large number of causes of maternal collapse exist and this article aims to address the main aetiological factors. The management of common obstetric complications and maternal medical problems causing maternal collapse are dealt with in detail in other articles published in this journal.

In the UK there is a comprehensive reporting system for maternal death, which can be the tragic consequence of maternal collapse. Until 2011 reporting was co-ordinated by CMACE (Centre for maternal and child enquiries) an independent organisation closely related to its predecessor CEMACH (Confidential enquiry into maternal and child health). Reporting is now under auspices of the National perinatal epidemiology institute in Oxford who have established a collaboration of a number of interested organisations to be known as MBRRACE-UK (Mother’s and babies: Reducing risk through confidential enquiries across the UK). MBRRACE published their first report in December 2014, which gives valuable information in relation to the current causes of maternal collapse.

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Haemorrhage

Obstetric haemorrhage is one of the major causes of maternal death worldwide, responsible for approximately 50% of the estimated 500,000 deaths per year. Fortunately in the UK, maternal deaths from haemorrhage are uncommon with 17 direct deaths reported in the last confidential enquiry. The vast majority of women will have no significant medical history and will only start to decompensate when a significant amount of blood loss has occurred, resulting in hypovolaemia and potentially maternal collapse. Although the haemorrhage may be revealed, the possibility of a concealed haemorrhage must be considered in any woman with signs that could be consistent with hypovolaemic collapse.

Antepartum haemorrhage (APH)

This is bleeding from the genital tract, occurring after 24 weeks’ gestation and prior to the birth of the baby. APH complicates 3–5% of pregnancies. The most important causes of APH are placenta praevia and placental abruption, although in many cases an exact diagnosis is not certain. The former typically presents with painless vaginal bleeding. A full medical and obstetric history should be obtained with specific emphasis on risk factors for placenta praevia such as previous uterine surgery, advancing maternal age, and smoking. While the exact aetiology of placental abruption is unclear, recognised associations include preeclampsia, underlying thrombophilia, trauma, smoking and drug misuse (cocaine), rapid uterine decompression, and previous abruption. Collapse from an APH will likely result in signs of hypovolaemic shock such as hypotension and tachycardia. There may be fetal distress secondary to hypoxia resulting from placental separation or profound maternal hypovolaemia. In circumstances where the placental location is unknown, an ultrasound scan will aid in identifying a low-lying placenta. However, it has a poor sensitivity for diagnosing an abruption.

Postpartum haemorrhage (PPH)

PPH is the most common form of major obstetric haemorrhage. Haemorrhage remains the 3rd highest cause of direct maternal death in the 2009–2012 report of UK Confidential Enquiries into Maternal Deaths. The most common cause is due to uterine atony, which may be a consequence of a prolonged labour, multiple pregnancies, polyhydramnios, operative vaginal delivery and grand multiparity. Other causes include a retained placenta, trauma to the genital tract, and rarely, coagulation defects. The presence of bleeding is usually obvious, however, intra-abdominal bleeding following caesarean section or vaginal haematomas may result in a concealed haemorrhage. Care must be taken to adequately assess the blood loss as the degree of haemorrhage is frequently underestimated.

Other haemorrhagic causes

Hepatic rupture is often associated with preeclampsia with deranged liver function tests but there have been also reports of occurrence in low risk pregnancies. Splenic artery aneurysm rupture is another potential cause of maternal collapse. It is extremely rare with only 17 maternal deaths recorded over a 23-year period in a study from the UK. The initial presentation of these conditions is usually acute abdominal pain or pleuritic chest pain with signs of hypovolaemia. The diagnosis is

challenging as these presenting symptoms more commonly indicate pulmonary embolus or placental abruption. An ultrasound scan may show evidence of intra-abdominal bleeding, however, the cause may only be found at laparotomy. Definitive management requires specialist surgical input in the case of hepatic rupture.

Cardiac causes

There are many physiological changes that occur in a healthy pregnancy. These adaptations result in haemodynamic stresses that can precipitate cardiovascular collapse in previously healthy women. The cardiac output increases by 40% reaching a maximum by the mid second trimester. Post delivery, there is an immediate rise in cardiac output due to the relief of pressure on the inferior vena cava. This increases preload and together with the expansion of the circulating volume, caused by the tonic contraction of the uterine musculature, the cardiac output rises by 60–80%, followed by a rapid decline to prelabour values by 1 hour after delivery. Women with cardiovascular compromise are at their highest risk at the end of labour and immediately post delivery; this is often overlooked with the assumption that the delivery of the baby denotes a reduction in risk. There were 54 deaths from cardiac disease in the MBRRACE-UK Confidential Enquiry 2010–2012 and this figure remains largely unchanged from the previous report. It is the most common cause of indirect maternal deaths in the UK.

Aortic dissection

This potentially catastrophic condition is rare, accounting for seven deaths in the 2006–2008 triennial report. Approximately 50% of aortic dissections that occur in women less than 40 years of age are pregnancy related. Specific connective tissue disorders such as Marfan's, Loeys Dietz, and Ehlers Danlos type IV (vascular type) syndromes are associated with an increased risk as are women with Turner syndrome, co-arcuation of the aorta, and bicuspid aortopathy. In some cases, women have no risk factors and it is just the haemodynamic and hormonal changes of pregnancy that precipitate this event.

This diagnosis should be considered in any pregnant women who presents with acute severe chest pain. The classic presentation prior to collapse is a constant retrosternal 'tearing' type chest pain that can radiate between the scapulae and associated with dyspnoea and jaw pain. There is often systolic hypertension and/or different blood pressures in each arm. Collapse may occur due to blood loss or secondary to a cardiac event related to the dissection reducing coronary blood flow. A chest X-ray is mandatory and may show mediastinal widening, although its absence does not rule out the diagnosis. The dissection can be confirmed by transthoracic or trans-oesophageal echocardiography, CT or MRI imaging.

Blood pressure should be promptly controlled and delivery of the fetus by caesarean section should be expedited before the cardiothoracic surgeons replace the aortic root.

Acute coronary syndrome (ACS)

Acute coronary syndrome is an uncommon event in women of childbearing age with an approximate incidence of 1/25,000 pregnancies and a maternal mortality rate of 5–7%. As women

are delaying childbirth into their late 30 s and 40 s, coronary artery disease and myocardial infarction have increased 3–4fold in pregnancy. The risk factors for ACS are ≥ 35 years, multiparous, obesity, smoking, hypertension, type 2 diabetes, positive family history, Asian ethnicity and poor attenders for antenatal care. Acute myocardial infarction 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 will alert any clinician to this diagnosis. However, in many cases, there is no history of angina and atypical cases may present with just epigastric pain and/or nausea. In all circumstances an ECG should be performed and a cardiologist's opinion obtained if there is any possibility of the diagnosis.

The ECG in an ST elevation myocardial infarction (STEMI) is not subtle and this is a medical emergency. Initial management consists of opioid analgesia, aspirin, and oxygen. Primary percutaneous intervention is the treatment of choice as it is associated with less bleeding risk and allows the management of spontaneous dissections with stent deployment. Non ST elevation myocardial infarction (NSTEMI) can present a difficult diagnostic problem for the obstetrician. ECG changes can include T wave inversion, left bundle branch block, and ST depression. Cardiac troponin levels should be performed and repeated six hours later, as the initial levels can be normal. A rise of 20% is diagnostic. There should be a low threshold for coronary intervention.

Decompensation of pre-existing disease

Congenital and acquired heart disease is now associated with longer survival such that childbearing is possible even in women with severe disease. Changing population demographics, with increasing numbers of immigrant women with a higher risk of acquired heart disease, are further increasing the incidence in the UK of cardiac conditions in pregnancy. Congenital heart disease (CHD) occurs in about 8/1000 pregnant women. Approximately 60% of the CHD in pregnancy are patent ductus arteriosus (PDA), atrial septal defects (ASD) and ventricular septal defects (VSD). The risk of decompensation is reduced by antenatal diagnosis with subsequent multidisciplinary optimisation and planning. Thus any woman with symptoms suggestive of cardiac disease should be investigated. Clinical symptoms such as oedema, fatigue, breathlessness and dizziness may easily be attributed to normal pregnancy but a high index of suspicion must be maintained for persistent, worsening or atypical symptoms. An ejection systolic murmur (heard loudest at the left sternal edge) can be a normal finding in more than 90% of healthy pregnant women. However, any other murmur or those in women with symptoms (dyspnoea or palpitations) or an atypical murmur require urgent investigation with echocardiography.

In any woman presenting acutely with suspected previously undiagnosed cardiac disease, urgent echocardiography and involvement of expert clinicians are essential to reduce morbidity and mortality. In women with diagnosed cardiac disease, multidisciplinary delivery planning in a tertiary centre involving a cardiologist, anaesthetist and obstetrician is essential. Hypertension, arrhythmia and cardiac failure should be treated aggressively. The avoidance of cardiovascular collapse must be the aim of the management by the use of invasive monitoring with pulmonary artery catheters in severe disease.

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