Management of Medical Emergencies in Pregnancy

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Abstract

Medical emergencies in pregnant women pose many challenges if both the baby and mother are to have an optimal outcome. Multidisciplinary team working is essential to ensure that the correct treatment is offered, and that potentially life-saving options are not discarded because of unwarranted concerns about safety in pregnancy. Expertise should be sought from doctors with a special interest in obstetric medicine.

Clinical problems include those unique to pregnancy such as eclampsia or acute fatty liver of pregnancy, exacerbations of chronic medical diseases some of which can be predicted such as pulmonary hypertension, or conditions which have an increased frequency in pregnancy including thromboembolism, urinary tract infection and Bell's palsy. Cardiopulmonary resuscitation in pregnancy should be managed in the left lateral position, with early recourse to delivery of the fetus

Keywords

Pregnancy, Medical Emergencies, Eclampsia, Amniotic Fluid Embolism, Thromboembolism.

Introduction

A medical emergency in a pregnant woman may reflect an exacerbation of an established condition, or the first presentation of a new problem. In some respects, the management is the same regardless of whether the patient is pregnant or not. This article will focus on the principles of care which need to be adopted in pregnancy and on medical emergencies which are unique to pregnancy eg eclampsia; amniotic fluid embolus; acute fatty liver of pregnancy. It will also consider the management of a first fit in pregnancy, chest pain in pregnancy and pregnancy-specific liver disorders.

A comprehensive overview of the vast subject of obstetric medicine is beyond the scope of this article; interested readers are referred to the reading list at the end.

General Principles of Care in Pregnancy

In pregnancy there are two patients, the pregnant woman and the fetus, who must each be considered when investigating and treating medical problems. It is important to take account of physiological changes of normal pregnancy; pregnancy-specific changes to reference ranges for laboratory investigations and the effect of the condition, its investigation and treatment on the fetus. It is helpful to inform an obstetrician with an interest in the medical aspects of pregnancy, when a pregnant woman is admitted. Depending on the gestational age, and severity of the medical problem, it may be preferable to admit the woman into a maternity bed, as this allows monitoring of fetal wellbeing and provides safe delivery facilities. Preterm delivery is a complication of many medical problems, particularly if there is sustained fever or hypoxia.

In women with chronic medical illnesses, there should be discussion prior to conception so that there is a clear understanding of the impact of pregnancy. Physicians and obstetricians trained in this area should offer this service. Diabetes is a good example. Conception during a period of good glycaemic control results in fewer congenital anomalies. However, outcome in diabetic pregnancy is still suboptimal.[1]

Doctors prescribing long-term medication for women of childbearing age must discuss the implications should a pregnancy occur. When they do not, some women will abruptly stop therapy, resulting in a relapse. A common example of this is a woman with stable asthma who stops her inhaled steroid because she is erroneously concerned that it may damage her baby, and then suffers a relapse.[2]

Physiological changes of pregnancy

Massive physiological changes take place to accommodate the extra demands of pregnancy. Circulating volume increases by 50%, resting heart rate rises by 20 beats per minute, and glomerular filtration by 50%. Peripheral vasodilatation, haemodilution, reduced protein binding, enhanced renal excretion and placental function can each significantly affect maternal symptoms and the results of investigations.

Thyroid function testing

The clinical diagnosis of hypothyroidism is challenging in pregnancy. Amenorrhoea, weight gain, hair loss, lethargy and tiredness, constipation and goitre are nonspecific findings present in normal pregnancy. The biochemical diagnosis of thyroid disease can also be complex in pregnancy. In the first trimester women with hyperemesis gravidarum

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(severe vomiting in early pregnancy) can have thyroid function tests suggesting hyperthyroidism due to Thyroid stimulating hormone (TSH) receptor stimulation by human chorionic gonadotrophin (HCG); in the third trimester increased placental deiodinase production causes a fall in circulating T4. At all gestations, oestrogen-driven sialylation of thyroxine binding globulin prolongs its half life from 15minutes to 3 days, causing an increase in total T4.

Other biochemical tests

Great care must be taken in correctly interpreting blood results in pregnant women. Many blood tests have altered reference ranges in pregnancy; few if any laboratories substitute these for the non-pregnant ranges when they print results from pregnant women (Table 1).

Test	Pregnancy range	NP range	Comment	Ref
Haemoglobin	LLN 10.0/ 10.5g/dl	LLN 12.0g/dl	Partly dilutional	
White cell	ULN≈20x10⁹/l	ULN 11x10⁹/l		
Creatinine	ULN 85 µmol/l	ULN 120µmol/l		3
Aspartate transaminase	11-30 u/l	7-40 u/l	≈20% lower than NP	4
Alkaline phosphatase	ULN 375 iu/l	ULN 125iu/l	300% rise by 3rd trimester	4
Urate	ULN 0.28 @28wk 0.32 @32wk and 0.38 mmol/l@38wk	0.15-0.42mmol/l	Gestation - dependent	5
ESR	18-48mm/hr<20wks; 30-70mm/hr>20wks	<20 mm/hr	Anaemia raises the ULN to 95mm/hr	6
Fibrinogen	2.9-6.2g/dl	2.0-4.0g/dl	D dimers also raised in pregnancy	7
Cholesterol	8.3mmol/l	5.5mmol/l	Mean levels from a small study; avoid measurements in pregnancy unless essential	8
Triglycerides	2.7mmol/l	0.8mmol/l		

Table 1. pregnancy-specific reference ranges for common blood tests (ULN = upper limit of normal; LLN = lower limit of normal; NP = nonpregnant).

Arterial Blood Gases

Arterial blood gas results are affected both by pregnancy, and by the position of the pregnant woman. Additional maternal respiration is required to meet the increased oxygen demands of pregnancy. This results in a fall in pCO_2, to 4kPa: this is particularly important in the assessment of severe asthma, as carbon dioxide retention could be overlooked if nonpregnant normal values are applied. PO_2 is unchanged in the upright position. In the supine position, the gravid uterus may compress the inferior vena cava reducing cardiac output causing a functional reduction in the residual capacity and closing volume (the volume at which airways in the dependent parts of the lung close). Together these result in hypoxia in the supine position, typically a pO_2 of 11kPa.

Electrocardiogram(ECG)

This may be significantly altered by pregnancy. A sinus tachycardia is common, as is a shift to the right in the

cardiac axis with development of S waves in lead I, and Q wave and T wave inversions in lead III: these do not necessarily imply a significant pathological event.

Renal Ultrasound

Kidneys are normally increased in length by 1cm during pregnancy, and the smooth muscle relaxing-effect of progesterone causes dilatation of the renal pelves, calyces and ureters. This is more prominent the right than the left, due to additional pressure effects from the uterus, and can be confused with ureteric obstruction.

Maternal Death

The Confidential Enquiry into Maternal Deaths (CEMD) was first reported was in 1952, making this the oldest national professional self-evaluation in existence. In the most recent report, covering the years 1997-1999[9] there were 242 deaths (Table 2). Medical causes of death outnumbered more 'traditional' obstetric causes such as haemorrhage. In 60% of cases care was considered to be substandard (Table 1).

It is likely that these deaths represent the 'tip of the iceberg' of serious morbidity due to medical problems, occurring in pregnant women.

Cause of death	Number of deaths	Comments
Thromboembolism	35	Failure to take symptoms seriously
Cardiac	35	10 congenital including 7 with pulmonary hypertension; 25 acquired, including puerperal cardiomyopathy and rupture of aneurysm
Hypertensive diseases	15	7 due to cerebral haemorrhage; 5 to HELLP syndrome
Psychiatric	15	Suicide and drug abuse
Sepsis	14	Only 1 related to Caesarean; most remote from delivery

Table 2. Medical causes of death in pregnancy in the United Kingdom, 1997-1997.[9]

Cardiopulmonary Resuscitation in Pregnancy (CPR)

The process of CPR in pregnancy must be modified to allow for the restriction imposed by the gravid uterus which splints the diaphragm, occludes the inferior vena cava (IVC) and physically restricts access to the thorax. CPR should be carried out in a left lateral position, using a wedge to maintain the roll. The right lateral position is not an acceptable alternative as this would increase pressure on the IVC which is to the right of the midline.

Haemorrhage is a common cause of cardiovascular collapse in a pregnant woman. This may be due to abruptio placenta in the second half of pregnancy, dissection or rupture of aneurysms or ruptured ectopic pregnancy. Amniotic fluid embolism is another pregnancy specific cause of collapse (see later).

If resuscitation is not successful in the first 15 minutes, serious consideration must be given to delivering the baby by Caesarean section. This may improve the ability to perform CPR. Near term healthy babies have been born after 15minutes' resuscitation.

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A first fit in pregnancy

The broad differential diagnosis for a first fit should additionally include

- Eclampsia
- Cortical sinus thrombosis
- Antiphospholipid syndrome
- Thrombotic thrombocytopenic purpura;
- 'Denial' of epilepsy
- Amniotic fluid embolus
- Gestational epilepsy

Eclampsia

Eclampsia occurs in 1 in 2000 pregnancies, with a case fatality of 2%.[10] Most hospitals with maternity units see 1 or 2 cases each year. An eclamptic fit is a tonic clonic generalised seizure: 38% occur in the antenatal period, 18% intrapartum and 44% postnatally, usually in the first 48 hours and rarely up to 2 weeks. Classically eclampsia occurs in the presence of features of pre eclampsia, including hypertension, proteinuria, intrauterine growth restriction, and biochemical and haematological abnormalities (for example hyperuricaemia, raised transaminase levels, thrombocytopenia). The British Eclampsia Survey[10] revealed that in this country only around 60% women have hypertensive proteinuria at the time of eclampsia. 15% have hypertension alone, 15% have proteinuria alone and 10% have neither at the time of the fit, but go on to develop them subsequently. In clinical practice this means that eclampsia cannot be excluded on the basis of normal blood pressure and clear urine.

Eclampsia is best treated with magnesium sulphate ($MgSO_4$), which is superior to diazepam and phenytoin in prevention of recurrent episodes[11] and causes fewer maternal and neonatal side effects. The usual regimen is 4g $MgSO_4$, diluted to 40ml, as a slow intravenous infusion over 10 to 15minutes, followed by a continuous intravenous infusion of 1g per hour for 24 to 48 hours.

Cortical sinus thrombosis

Cortical sinus thrombosis affects 1 in 10,000 pregnancies, typically in the postpartum period, with a significant mortality. Usually it presents with severe headache, vomiting, photophobia, raised intracranial pressure and in up to two thirds of patients, focal neurological signs. Fever and leucoytosis are frequent features which may confuse the diagnosis. Magnetic resonance imaging with angiography is needed to confirm or refute the diagnosis; CT scanning is often unhelpful.

Denial

In pregnancy some women will discontinue medication because of concerns regarding teratogenesis. They may be reluctant to admit this when they present with a 'first' fit: a probing history should reveal the truth. The most commonly prescribed 'traditional' anticonvulsants, carbamazepine, sodium valproate and phenytoin all carry a small risk of teratogenesis, of approximately 5 to 7%. This must be compared with a background rate of 2% in the general population and 3 to 4% in untreated epileptics, and balanced against the potential risks to the mother and fetus of uncontrolled epilepsy. Women should also be reminded that organogenesis occurs early and that the 3 main systems which may be affected by anticonvulsants have completed development by 13 weeks' gestation. There is evidence that sodium valproate may cause some neurodevelopmental problems when taken throughout pregnancy,[12] and so whenever appropriate, carbamazepine is the drug of choice in pregnancy. There is insufficient evidence regarding many newer anticonvulsants to evaluate their safety in pregnancy, which should not be assumed because there is no evidence of harm. An ongoing study of lamotrigine use in pregnancy has encouraging results to date.

Chest Pain and Cardiac Events during Pregnancy

Thromboembolism

Thromboembolism is 6 times more common in pregnant women compared with nonpregnant women. The risk is evenly distributed between all gestational ages, but increases in the period from delivery to 6 weeks postnatal.

Risk factors for PE in pregnancy include personal or family history of thrombosis, obesity, age over 35years, bed rest, dehydration (including hyperemesis gravidarum), and delivery by Caesarean section. There should be a low threshold for performing a Chest x-ray (CXR) or V/Q scan if the diagnosis of PE is considered as the amount of irradiation is negligible. D dimer measurements are unhelpful as they are usually elevated in normal pregnancy; ECG and arterial blood gas measurements should be interpreted as discussed above. Doppler ultrasound of the femoral veins is safe, and recommended in the presence of symptoms / signs of lower limb venous thrombosis.

Treatment of a proven thromboembolic episode is now usually with low molecular weight heparin. The Royal College of Obstetricians and Gynaecologists[13] recommends a slightly higher dose than outside pregnancy, eg 1mg/kg bd of enoxaparin because of the altered pharmacokinetics during pregnancy.[14] Heparins do not cross the placenta or into breast milk. Low molecular weight heparin may cause heparin-induced thrombocytopenia, but with an incidence of 1 in 10,000 this is rare. Symptomatic vertebral collapse may occur in up to 1 in 500 pregnancies if LMWH is used for more than 8 weeks. The incidence of these side effects is greater with unfractionated heparin.

Warfarin crosses the placenta and should not be used in pregnancy unless absolutely essential. In the first trimester there is a small risk of teratogenesis. In the second and third trimesters, the fetus is at risk of haemorrhage. Warfarin may be taken safely during lactation.

All pregnant women who are admitted to hospital should be assessed regarding their risk of thromboembolic disease. As a minimum they should wear thromboembolic stockings, mobilise as much as possible and be well hydrated. Depending on individual risk factors, thromboprophylaxis with a low molecular weight heparin should be considered.

Amniotic fluid embolism

Amniotic fluid embolus usually presents in labour or shortly after delivery, though may be unheralded by obstetric interventions. Classically there is sudden collapse, profound cyanosis and rapid demise, with a case fatality of 75%. Clues to the diagnosis come from the combination of severe cyanosis with disseminated intravascular coagulopathy. The diagnosis may be confirmed by identifying fetal squames in central blood or endotracheal washings: samples should be taken at the time of insertion of central lines and intubation in patients in whom this forms part of the differential diagnosis. Seizures may occur as a response to hypoxia. A register of survivors of suspected cases is kept by Mr D Tufnell, Consultant Obstetrician, Bradford Royal Infirmary, Bradford BD9 6RJ.

Pulmonary Hypertension

Pulmonary hypertension has a 30 to 50% risk of maternal mortality, whether primary or secondary. Prepregnancy symptoms are not a good guide to outcome in pulmonary vascular disease. Ideally, women with pulmonary hypertension should be counselled prior to conception about the risks. Management should be multidisciplinary and delivery planned to minimise the risks of overload that follow contraction of the uterus after expulsion of the placenta.

Peripartum Cardiomyopathy

Peripartum cardiomyopathy typically presents in the last 12 weeks of pregnancy or the first 3 months after delivery, with dyspnoea, palpitations, pulmonary or peripheral oedema and peripheral or systemic emboli. Mortality can be up to 60%. Laboratory investigations are rarely helpful, although there may be release of cardiac enzymes, sometimes reaching high levels. In postnatal cases it must be remembered that the myometrium contains the MB isoenzyme of creatinine phosphokinase (CKMB), so other cardiac enzymes should be used (e.g. troponin I). Other investigations include ECG, CXR, echocardiography, coronary angiography and endomyocardial biopsy. Treatment must include delivery if still pregnant, anticoagulation, conventional support for heart failure and immunosuppression: in severe cases, especially where there is florid myocarditis, prednisolone, 1.5mg.kg.day plus a steroid sparing dose of azathioprine at 1mg/kg/day until there is sign of improvement may be beneficial.[15] Cardiac transplantation should be considered in severe and unresponsive cases.

Arterial Dissection

Dissection of the thoracic aorta or its branches (and indeed of other arteries particularly the splenic and adrenal vessels outside the chest) is more common in pregnancy. Pregnancy causes arterial dilatation and all arteries are more likely to rupture in pregnancy. CXR, transoesophageal echocardiography and MRI scanning should be used as necessary to make the correct diagnosis in the management of severe chest or back pain. In women known to have a risk of dissection (e.g. hypertension, collagen disorders), propranolol is safe and may reduce the risk of dissection.

Liver Problems Specific to Pregnancy

The three main pregnancy-specific conditions to consider in a woman with abnormal liver function are
- Acute fatty liver of pregnancy
- HELLP syndrome
- Obstetric cholestasis

Hepatitis E is rare in the United Kingdom, but has a high maternal mortality.

Spider naevi and palmar erythema are common in normal pregnancy as a consequence of the hormonal and vascular changes. The liver is displaced posteriorly and superiorly, so a palpable liver edge is significant. Liver function tests are changed significantly in pregnancy (Table 2), including dilutional hypoalbuminaemia.

Acute fatty liver of pregnancy (AFLP)

AFLP affects 1 in 10,000 pregnancies. Typically it presents in the third trimester with rapidly progressive liver failure, although in many cases this may have been preceded by a more indolent phase lasting several weeks. Initially the symptoms are vague, with vomiting, right hypochondrial pain and malaise. Later jaundice, ascites and frank liver failure may develop with encephalopathy, coagulopathy and hypoglycaemia. In some cases, AFLP may be a variant of pre eclampsia, although usually hypertension and proteinuria are not a dominant part of the presentation. It may also be associated with transient diabetes insipidus. In practical terms, doctors looking after pregnant women with vague gastrointestinal symptoms should always check liver function, repeating regularly if a mild abnormality is discovered.

Transaminase levels may reach 10 times the upper limit of normal for pregnancy (see above), and progression to frank jaundice and liver failure can be rapid. Clotting and glucose should also be measured serially and appropriate supportive measures used to correct any deficits: often large amounts of 50% glucose are required. Without immediate delivery of the fetus about 20% of mothers and babies die. Multidisciplinary care in an intensive care unit is usually required, with the involvement of a hepatologist. A few women will not recover despite aggressive management, and liver transplantation may be required. In those who survive, there are no long-term hepatic sequelae.

The diagnosis of AFLP is often presumptive, on the basis of the clinical picture and exclusion of other causes of rapidly progressive liver failure. Liver biopsy may be helpful, but in practice, patients are often too sick for this to be performed. Radiological evaluation should be considered, although again this may be unrewarding and impractical. In one small series, fatty infiltration was seen in only 25% of patients on ultrasound, 50% on CT scanning and 0 (out of 5) on MRI.[17]

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HELLP syndrome

HELLP syndrome is one of several serious complications of pre eclampsia, which may occur in the second half of pregnancy, or in up to one third of cases in the postnatal period. Typically the presentation is with epigastric pain (due to liver capsule oedema), plus nausea and vomiting. Other aspects of pre eclampsia such as hypertension, proteinuria and intrauterine growth restriction may not be dominant. Liver enzymes may be modestly elevated, platelets low or falling and a blood film will show evidence of intravascular haemolysis. If this diagnosis is not considered, the woman may be labelled as having heartburn, gastroenteritis or cholecystitis. The main pregnancy-specific differential diagnosis is often AFLP. In HELLP syndrome, deterioration is usually less rapid, jaundice is uncommon, and hepatic failure with hypoglycaemia and prolonged prothrombin time does not occur.

The mortality from HELLP syndrome is 1%. This may be from subcapsular liver haematoma, liver rupture, massive hepatic necrosis or placental abruption and subsequent disseminated intravascular coagulopathy. Management is usually centred on delivery of the baby, control of hypertension and multisystem support. Most women recover rapidly after delivery, although they may initially deteriorate. There is some evidence that high dose corticosteroids (e.g. dexamethosone 10mg IV 12 hourly) may enhance recovery.[20] There may also be some benefit in giving dexamethasone in postnatal cases of HELLP.[21] Plasma exchange has been considered in severe cases which are slow to recover.

Obstetric cholestasis (OC)

Obstetric cholestasis occurs in 1 in 130 pregnancies but rarely presents as a true medical emergency.[22] The typical complaint is of severe and debilitating pruritus afflicting the soles of the feet, palms of the hands and the rest of the body, which is relieved rapidly after delivery. Transaminase and bile acid measurements are moderately elevated. Jaundice is rare and epigastric pain is not a feature. Clinically the differentiation from other pregnancy-specific causes of abnormal liver function is usually clear, although there may be an overlap with pre eclampsia.

There is a 2% risk of intrauterine fetal death and a very high rate of recurrence in future pregnancies. Bland emollients and antihistamines rarely relieve the distressing pruritus. Ursodeoxycholic acid may improve both the symptoms and biochemical abnormalities, although it is not yet certain that there is any fetal benefit.[23]

Further reading

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