Problems in obstetric anaesthesia

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Abstract

Advances in medical management and technologies have increased the prospects of women with severe chronic disease achieving pregnancy. Women with complex needs are becoming more commonplace on labour suite and are posing an increasing challenge to healthcare professionals. The management of dilated cardiomyopathy, postpartum headache and haemophilia are discussed using three theoretical cases. These cases illustrate the issues for both the anaesthetic and obstetric teams and highlight the importance of a multidisciplinary approach where good communication is essential in achieving the safest possible outcome for such patients.

Keywords anaesthesia; cardiomyopathy; haemophilia; headache; obstetric

Introduction

A common theme in all of the triennial reports, most recently under the guise of Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK), is that good quality, timely communication and multidisciplinary collaboration is the cornerstone of safe, effective practice. The reports from MBRRACE-UK, and previously from CEMACH, have made a number of recommendations including early consultation with a senior multidisciplinary team, use of early warning scores in all obstetric units, adherence to obstetric emergency protocols and early identification and targeted management of high-risk obstetric women including appropriate escalation of care.

This review presents three hypothetical case scenarios to illustrate some of the challenges encountered by the obstetric anaesthetist as part of the multidisciplinary team caring for the complex obstetric woman. An understanding of these issues should inform the decision making process, in addition to promoting inter-specialty communication.

Case 1: cardiomyopathy and implantable cardioverter defibrillators

A 32-year-old woman in her first pregnancy presents to the anaesthetic antenatal clinic. She has a 4 year history of idiopathic dilated cardiomyopathy (DCM) for which she is under the care of a cardiologist and prior to her pregnancy was managed medically with bisoprolol and perindopril which has now been changed to bisoprolol and hydralazine. She also has an implantable cardioverter defibrillator (ICD) following two sustained episodes of ventricular tachycardia (VT) around the time of her diagnosis. She tells you that she does get short of breath but only if she is exerting herself.

In the United Kingdom cardiovascular disease is the leading cause of maternal mortality, and has remained so for more than two decades. Over that period there has been an increase in cardiovascular disease due to increasing maternal age and a growing number of women who have had corrective surgery for congenital cardiac abnormalities now reaching child bearing age, the so called grown-up congenital heart (GUCH). Another important, although rarer, group of women are those with cardiomyopathy, with an overall prevalence of just under 1 in 2000 deliveries. These comprise two distinct groups; those women with a pre-existing cardiomyopathy, and those developing peripartum cardiomyopathy, typically either in late pregnancy or in the early postnatal period.

The normal cardiovascular changes of pregnancy are well documented with an increase in cardiac output of 40% arising mostly from an increase in stroke volume and less significantly an increase in heart rate. From early pregnancy, progesterone has a vasodilating and fluid retaining effect helping to expand the intravascular volume. Other important changes include a decrease in both system vascular resistance and blood pressure. Further demand is put on the cardiovascular system in the early labour and particularly at the time of delivery with a further rise in cardiac output of up to 50%.

A normal heart will cope with the cardiovascular changes associated with pregnancy but a cardiomyopathic heart may not. In patients with cardiomyopathy these changes can overwhelm the functional reserve of the cardiovascular system which may then result in decompensation and heart failure.

In this case we will look at the pathophysiology of dilated cardiomyopathy and the measures that need to be taken in pregnancy. We will also discuss the anaesthetic management including consideration of patients with implantable cardioverter defibrillators who need surgery.

Pathophysiology of dilated cardiomyopathy

Dilated cardiomyopathy (DCM) is the commonest form of cardiomyopathy with a wide range of causes, of which 20–48% are familial. Acquired causes include myocarditis, secondary to viral, bacterial or protozoal infection, chronic alcohol or cocaine misuse and autoimmune disease to name just a few. A significant proportion of DCMs are idiopathic in origin, approximately 40%, where no cause can be identified. Peripartum cardiomyopathy is a subset of dilated cardiomyopathy affecting women in the late third trimester and up to 5 months post delivery.

DCM is characterised by dilatation of the left ventricle with associated systolic dysfunction in the absence of a hypertensive or valvular cause. Affected individuals can go on to develop both involvement of the right ventricle or diastolic dysfunction. These structural changes to the heart increase the risk of developing heart failure of either or both ventricles. In addition patients are

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also at risk of developing arrhythmias, particularly ventricular, conduction disorders, syncope and sudden death.

DCM and pregnancy

All patients with a pre-existing diagnosis of cardiomyopathy should be offered pre-pregnancy counselling to discuss their individualised risk based on history, examination and selected investigations. It is important to establish the woman's functional capacity. Examination may reveal signs of heart failure or a cardiac dysrhythmia. A 12-lead ECG and echocardiogram should be performed. Women who have a baseline functional capacity of New York Heart Association (NYHA) class III or IV, where they have functional limitation or shortness of breath after less than normal activity, have an increased risk of adverse outcomes during pregnancy as does having a left ventricular ejection fraction less than 40%. A review of current medication is also needed to change from those contraindicated in pregnancy such as angiotensin converting enzyme inhibitors (ACE-I) and anticoagulants.

For those women with no prior cardiac disease, diagnosis in pregnancy can be very difficult. Many of the symptoms and signs of heart failure, such as shortness of breath, ankle swelling and orthopnoea are common in the course of a normal pregnancy. A high index of suspicion is therefore needed not to miss either patients with a newly developed cardiomyopathy or pre-existing dysfunction unmasked by the cardiovascular changes of pregnancy.

Management of this patient

This patient is known to have a history of DCM and should ideally have received pre-pregnancy counselling. In the antenatal period she should be managed by a multidisciplinary team comprising obstetricians, cardiologists and anaesthetists. A thorough review of her medical history should be undertaken to assess her risk including a medication review. ACE-I are known to be linked to congenital abnormalities and should be stopped. An alternative vasodilator such as hydralazine should be considered.

Careful planning of her pregnancy and labour is necessary involving cardiology, obstetric and anaesthetic input. Women need regular reviews and, if prompted by a decline in functional status or signs of worsening heart failure, investigations including echocardiogram should be repeated. The third trimester is usually the most challenging time for such women.

In the event that there is deterioration in the woman's haemodynamic status that does not respond to medical management a decision about the risks and benefits of early delivery will have to be reached.

Women who are stable from a cardiac point of view can be allowed to labour spontaneously, however if there are concerns, a controlled induction of labour should be considered. Care should be taken with prostaglandin E used for induction, as it is possible to have systemic absorption and resultant cardiovascular effects. A shortened second stage of labour with assistance with forceps or ventouse delivery minimises pushing and the risk of a valsalva manoeuvre with its resulting circulatory effects.

An epidural sited in labour is recommended as it blunts the physiological demands through reduction in somatic and sympathetic stimulation. The epidural should be established slowly to allow time for the woman to adjust to fluid shifts that result from changing pre-load and after-load.

A well established epidural in labour can be cautiously "topped-up" for caesarean section in theatre with full monitoring. Use of invasive arterial monitoring is advisable and central venous access should be considered.

The patient presented in early labour at 34 weeks. She was breathless on minimal exertion and had clinical evidence of worsening heart failure with tachypnoea, bibasal crepitations and ankle swelling.

Her arrival was communicated to the anaesthetic team who sited an epidural early in labour. The cardiac physiology technicians were alerted to her presence as interrogation and deactivation of the implantable defibrillator would be needed in the event of her needing to go to the operating theatre.

Implantable cardioverter defibrillators

Although not as commonly used as pacemakers, insertion of ICD is on the increase due to a broadening of the insertion criteria. There are broadly two groups of patients for whom ICDs are recommended.

- Patients with a previous serious ventricular arrhythmia such as ventricular tachycardia (VT) or ventricular fibrillation (VF) not amenable to other treatment.
- Patients with a heritable cardiac disease with a high risk of sudden death, e.g. long QT and Brugada syndromes, hypertrophic cardiomyopathy or arrhythmogenic right ventricular dysplasia.

In addition to the defibrillation function, ICDs may also have the ability to pace, either for bradycardia or tachycardia, in much the same way as a standard pacemaker. The commonest form of device is implanted in the left pectoral region with trans-venous electrodes but becoming increasingly common is a subcutaneous version of the device with the electrode lying outside of the thoracic cage.

When looking after a patient with an ICD it is important to gain as much history about the device from the patient as possible. Useful information includes the original indication for insertion, frequency of counterchecks and device manufacturer and model. The patient will often carry a card with much of this information on it.

Carrying an ICD is safe during pregnancy and there are many examples in the literature of discharging ICDs in pregnancy without harm coming to the unborn fetus.

Transcutaneous electrical nerve stimulation devices (TENS) should be avoided and magnetic resonance imaging (MRI) is contraindicated.

If the woman needs to go to theatre the defibrillator and anti-tachycardia functions must be deactivated otherwise the device can interpret interference from diathermy as VF and deliver a shock. Precautionary trans-thoracic defibrillator pads should ideally be attached to the patient prior to starting surgery. Traditionally a magnet could be placed over these devices to revert them to a basic pacemaker function and disable the defibrillator circuit however the effect of magnet placement in modern devices varies, and formal device interrogation and reprogramming by a technician is advised.

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