

Anaesthesia for obstetricians

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Abstract

Anaesthesia and the anaesthetist have an important contribution to make to the provision of safe and effective maternity care. This is particularly relevant for current obstetric practice which is providing care to an older obstetric population with an increasing incidence of co-morbidities. In this review, the role of the anaesthetist in maternity care is described and the issues for providing anaesthesia and analgesia to pregnant women are discussed.

Keywords anaesthesia; anticoagulants; epidural; labour analgesia; obesity; patient care team; pregnancy complications; remifentanyl; spinal

Introduction

Best practice in obstetrics requires good effective multidisciplinary teamwork. The anaesthetist is a vital member of the team whose contribution is essential for many aspects of the peripartum care pathway. This is in the context of changing maternity care with an increasing proportion of women having induced labours and a rising caesarean section rate in a maternity population which is getting older and more obese with more co-morbidities. Despite this challenging background, maternal mortality in the UK remains low at 9.8 per 100, 000.

The anaesthetist contributes to maternity care in many ways, including:

1. The planning and management of peripartum care of women with complex health needs
2. The management of women who develop severe or complex peripartum complications
3. The planning and provision of effective labour analgesia
4. The planning and provision of anaesthesia for obstetric surgical procedures

1. Planning and Management of Peripartum Care

Anaesthetists are frequently involved in all stages of a woman's care, from the antenatal period through to postpartum. Antenatal referral pathways must be established to ensure that those patients with pre-existing comorbidities, or new unanticipated complications of their pregnancy, receive prompt referral to appropriate multidisciplinary teams. Good communication between the specialities is pivotal in order to

ensure safe planning of all aspects of maternal care. There should be local guidelines in each maternity hospital helping to ensure the appropriate referral of pregnant women for review by an experienced obstetric anaesthetist.

The antenatal role of the anaesthetist encompasses planning anaesthetic intrapartum and postpartum care of women with complex needs and certain co-morbidities. As well as allowing a thorough assessment of the patient and the impact of the pregnancy on the specific condition, the antenatal appointment helps ensure co-ordination of care with other relevant specialities. The anaesthetist also acts as a patient-educator who can provide information on analgesic and anaesthetic choices. This can help allay maternal anxieties about labour and delivery.

The anaesthetist has a role in the development of multi-disciplinary evidence-based care guidelines and policies for women with complex medical co-morbidities. Examples of co-morbidities which have specific requirements for the planning and provision of anaesthesia include morbid obesity, women who have an increased risk of spinal bleeding, and women who have cardiac disease.

A. Morbid obesity

The prevalence of obesity in pregnancy is increasing worldwide, and currently 25% of women in the UK are obese. Obesity and excessive gestational weight gain are associated with adverse maternal and neonatal outcomes.

The particular issues for the anaesthetist, presented by morbid obesity include:

i. Complications during general anaesthesia

Obese women may be difficult to intubate after induction of general anaesthesia, risking subsequent hypoxia, if she cannot be easily ventilated without tracheal intubation, and pulmonary aspiration if the trachea is not protected by the endotracheal tube. The risk of failed intubation increases from 1 in 5000 in the non-pregnant population to 1 in 250 in pregnancy, but is one in three in the morbidly obese parturient. Anaesthetists are increasingly using videolaryngoscopy to assist with intubation.

Functional residual capacity (FRC), which provides a physiological reservoir of air during apnoea, decreases by 25% during pregnancy and is reduced further by obesity, and when the pregnant woman lies supine. As a result, the obese pregnant woman becomes hypoxic rapidly following apnoea after induction of general anaesthesia. Strategies used to minimise the rate of blood oxygen desaturation include pre-oxygenation using a facemask so that the oxygen content in the FRC is close to 100% at the moment of induction of anaesthesia and, more recently, use of high flow nasal oxygen to prolong oxygenation during apnoea after induction of anaesthesia, which may be particularly important in the obese parturient.

Obese pregnant women also have larger gastric volumes and are subsequently at increased risk of aspiration of gastric contents. Therefore, meticulous positioning in the head-up position and antacid prophylaxis is essential should general anaesthesia be required. This risk of aspiration is also present at the end of anaesthesia when the woman is extubated and therefore many anaesthetists will

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insert an oral gastric tube to empty the gastric contents prior to extubation.

ii. *Difficulty with regional analgesia and anaesthesia*

In the obese woman, spinal analgesia and anaesthesia can be difficult particularly if the spinous processes are impalpable. Ultrasound has been used to help identify the spinal anatomy and to facilitate insertion of epidural and spinal needles. The raised intra-abdominal pressure associated with morbid obesity reduces epidural volume which may, in turn, result in higher sensory block levels and lower epidural local anaesthetic requirement. Adjusted doses may be required to avoid excessive blocks and their associated consequences.

iii. *Cardiovascular complications*

Obese parturients are predisposed to ischaemic heart disease and congestive cardiac failure. The physiological cardiovascular consequences of pregnancy may precipitate decompensation. When supine, their large body habitus exacerbates aortocaval compression. Exaggerated left-lateral tilt may be necessary to combat this.

Due to the risks associated with obesity, patients with a BMI >40 (or BMI >35 with co-morbidities) should be reviewed antenatally by a consultant anaesthetist in order that a thorough evaluation can be performed, and management planned accordingly. Early regional analgesia is recommended in order to allow for the difficulties that have been highlighted.

B. Anticoagulation and thrombocytopenia

Anticoagulation has implications for the timing of safe regional analgesia and anaesthesia so to minimise the risk of spinal haematoma with potential neurological injury (Table 1).

Following prophylactic low molecular weight heparin (LMWH) administration, 12 hours should lapse before regional analgesia is attempted and 24 hours should lapse following therapeutic LMWH administration. Following spinal anaesthesia or epidural catheter removal, a period of 4 hours should lapse prior to LMWH administration.

Platelet count is another crucial consideration. A platelet count that is stable at $75 \times 10^9/L$ or above is generally considered to be safe for spinal anaesthesia.

Antenatal involvement of the haematologist is essential when planning perioperative care of women who take anti-coagulant therapy or who have abnormal platelet function or counts. There are national guidelines available that can assist with decision-making.

C. Cardiac disorders

Cardiac disease remains the single leading cause of indirect maternal death and complicates pregnancy in up to 4% of women. Due to advancing maternal age and associated co-morbidities the incidence of cardiac disease in pregnancy is rising. Also, women with more complex congenital heart disease are surviving to adulthood and conceiving. All women with cardiac disease require multidisciplinary antenatal, perinatal and postnatal input from obstetricians, cardiologists and anaesthetists.

The cardiovascular physiological changes that occur during pregnancy may be poorly tolerated in women with pre-existing cardiac disease. The increase in total blood

volume and cardiac output combined with hormone-induced vasodilatation may cause breathlessness, orthopnoea and decompensation. During labour and postpartum, autotransfusion and surges in cardiac output further increase the risk of critical decompensation.

In women with cardiac co-morbidities, effective regional analgesia in labour can reduce afterload and the work of the heart, and attenuate the stresses of labour. Meticulous care with labour epidural dosage minimises cardiovascular instability. Frequent review of the quality of the regional analgesia is essential and inadequate epidurals should be replaced promptly. Regional anaesthesia is usually recommended for operative delivery and time should be allowed so that adequate anaesthesia can be achieved whilst maintaining cardiovascular stability, and for the instigation of invasive monitoring as needed. General anaesthesia is an alternative but care is required to minimise the sympathetic response to laryngoscopy and intubation, which can cause significant detrimental tachycardia and hypertension. These women require postnatal care in an obstetric high dependency area for at least 24 hours with multidisciplinary input and management of cardiac medications.

2. Management of Women with Severe or Complex Peripartum Complications

Pregnant women should have the same access to good quality medical care as the non-pregnant population. They should also be able to have timely access to critical care and be treated by specialised teams that are capable of rapidly detecting, escalating and managing the critically unwell obstetric patient. Implementation of enhanced maternal care requires education of, and co-operation between, members of the multidisciplinary team. Whatever the location of the higher-level care, there should be equity of access to specialist investigations and prompt availability of treatment. Anaesthetists, as a result of their training and skills, are ideally placed to supervise and co-ordinate critical care support to women in maternity care.

Improvements in the training of health professionals involved in maternity care including education about the role of human factors in decision-making, and the participation in multidisciplinary simulation training courses focusing on good teamwork, should lead to better care of women who develop severe or complex complications. Examples of these complications include:

A. Massive haemorrhage

Major haemorrhage remains the second leading cause of direct maternal death. Over the past decade in England the incidence of postpartum haemorrhage has doubled. More recently, there has been an increase in number of maternal deaths from haemorrhage due to abnormally invasive placentation which may be a consequence of the increase in rate of caesarean sections. Early recognition of women at risk of placental morbid adherence is essential. This allows for antenatal multidisciplinary investigation, and the planning and management of all aspects of care. This care should be guided by established care pathways for women suspected of having a morbidly adherent placenta. The early involvement of the anaesthetist in the planning of care should be an essential part of these care pathways.

Neuraxial anaesthesia risks in obstetric patients with abnormalities of coagulation

	Normal risk	Increased risk	High risk	Very high risk
Prophylactic LMWH	>12 hours	6–12 hours	<6 hours	<6 hours
Therapeutic LMWH	>24 hours	12–24 hours	6–12 hours	
Infusion UFH	Stopped >4 hours and APTTR ≤ 1.4			APTTR above normal range
Bolus prophylactic UFH	Given >4 hours	Given <4 hours		
NSAID/aspirin	Without LMWH	With LMWH 12–24 hours ago	With LMWH <12 hours	
Warfarin	INR ≤ 1.4	INR 1.4–1.7	INR 1.7–2.0	INR >2.0
Pre-eclampsia	Platelets >100 within 6 hours of block	Platelets 75–100 (stable) and normal clotting	Platelets 75–100 (decreasing) and normal clotting	Platelets <75–100 or abnormal clotting (INR >1.5) or HELLP
Idiopathic thrombocytopenia	Platelets >75 x 10 ⁹ /L within 6 hours of block	Platelets 50-75 x 10 ⁹ /L	Platelets 20-50x10 ⁹ /L	Platelets <20x 10 ⁹ /L
Interuterine fetal death	FBC + clotting normal within 6 hours of block	No clinical problems but no results available		With abruption or overt sepsis
Cholestasis	INR <1.4 within 24 hours	No other clinical problems but no results available		

Table 1

Major obstetric haemorrhage (MOH) may be recognised relatively late due to both the physiological changes of pregnancy and the difficulties with visual estimation of blood loss. It is defined by the Royal College of Obstetricians and Gynaecologists as a blood loss of >1000 ml (Green-top Guidelines No. 52). Safe management requires teamwork and communication between obstetricians, midwives, anaesthetists and haematologists. The activation and use of established MOH protocols aid the delivery of appropriate blood products in a timely fashion. Whilst the anaesthetist expedites the woman's rapid transfer to theatre, coordinates the provision of blood products and leads resuscitation of the critically unwell parturient, the obstetrician manages the cause of haemorrhage and delivers vital surgical measures required to stop the bleeding. Treatment aims in massive haemorrhage include maintaining haematological and biochemical physiological homeostasis (i.e. Haemoglobin >80 g/L; Haematocrit >0.3; platelets >100 x 10⁹/L; fibrinogen >2 g/L; ionised calcium >1 mmol/L; and temperature >36 °C) until the bleeding can be stopped. Cell salvage should be considered where appropriate as it can mitigate the need for allogenic blood transfusions. Care must be taken in the peripartum period to avoid fluid overload following treatment of MOH.

B. Hypertensive disorders

Maternal deaths in association with hypertension occur most commonly as a result of poor blood pressure control, or secondary to eclamptic seizures. Multidisciplinary care involving the anaesthetist is essential to assist with the management of fluid balance, attainment of blood pressure goals, provision of safe regional analgesia and the critical care management of the parturient.

In the absence of contraindications (e.g. severe thrombocytopenia), regional anaesthesia for labour and delivery is the technique of choice, as the resulting sympathetic block and good analgesia enhances blood pressure control. Although hypotension following spinal anaesthesia is less common in these women, extra care must be taken if intravenous infusions of antihypertensives are required, and invasive monitoring may be indicated. Adoption of national guidelines on best care standardises the management of hypertensive disorders.

3. Planning and Provision of Effective Labour Analgesia

Information on the benefits and potential risks of different analgesic options should be available to all women in labour in order to empower them to make appropriate choices. The overlap of the specialities in the provision of labour analgesia necessitates clear communication and detailed understanding of the available modalities.

During the first stage of labour, stimulated nociceptors from the lower uterine segment and cervix transmit signals to the spinal cord at the 10th–12th thoracic and 1st lumbar segments. During the second stage of labour, nociceptors in the vagina and perineum signal via somatic afferent fibres at the 2nd–4th sacral segments. These larger diameter sacral nerve roots may be more resistant to the effects of local anaesthetics.

Non-pharmacological options may be initially chosen for labour analgesia. These include labour/delivery in water, breathing and relaxation exercises, aromatherapy, hypnotherapy and transcutaneous electrical nerve stimulation (TENS). Although there is no strong evidence to suggest that these modalities deliver significant analgesia, maternal experience of pain during labour varies, so maternal

preference should be supported.

Pharmacological options can be provided by midwives and obstetricians (Entonox, and oral or intramuscular opioids) or anaesthetist-provided (intravenous opioids, regional analgesia).

A. Non-anaesthetist provided analgesia

Entonox® is a 50:50 mixture of nitrous oxide and oxygen and has had a place in labour analgesia since 1880. It was approved for use by midwives in 1970.

Nitrous oxide is an N-methyl D-aspartate (NMDA) receptor antagonist, with a low anaesthetic potency, exerting only mild analgesic and anxiolytic properties. As its analgesic onset and offset is rapid, user technique is important, and this may limit compliance. Side effects include nausea, disorientation and sedation, making it unacceptable to some.

Opioids may be administered orally, intramuscularly or intravenously. When administered intravenously, opioids are delivered via Patient Controlled Analgesia (PCA) pumps, which should be prescribed by an anaesthetist and will be discussed later.

Despite being less efficacious than regional analgesia, opioids are still widely used as first-line analgesia for labour pain. All opioids cross the placenta and are associated with maternal and neonatal sedation and respiratory depression. Diamorphine is the most potent opioid available on delivery suite. Whilst there is no clear evidence suggesting that it provides superior labour analgesia to pethidine, diamorphine is associated with less unpleasant side effects and greater patient satisfaction. The pharmacokinetic properties of pethidine result in ionisation and it remains in the fetal circulation once it crosses the placenta. This effect is further exaggerated in the compromised, acidotic fetus. It has also been associated with a delay in established neonatal feeding. Consequently some centres have stopped offering pethidine for labour analgesia.

B. Anaesthetist-provided analgesia

i. Remifentanyl

Remifentanyl PCA is usually reserved for those women for whom regional analgesia is contraindicated or has been unsuccessful.

Remifentanyl has a rapid effect (within 1–2 minutes) and does not accumulate following infusion. Like the other opioids, it crosses the placenta but it is rapidly metabolised and redistributed by the neonate and is not associated with neonatal respiratory depression or poor Apgar scores. Remifentanyl PCA can achieve better pain control at 1 hour, and increased patient satisfaction compared to alternative intramuscular opioids. Although it does not provide as effective analgesia as an epidural, it is associated with a significant degree of patient satisfaction. Factors limiting its use include difficulty timing maximum analgesic effect with contractions, the need for 1:1 midwifery care and the requirement for continuous patient monitoring. Case reports of cardio-respiratory arrest associated with the use of remifentanyl PCA in obstetric parturients has reiterated the need for meticulous monitoring and the use of an intravenous cannula dedicated to the remifentanyl infusion.

ii. Regional Analgesia

This provides the best analgesia for labour pain and is associated with superior pain scores and patient

satisfaction when compared to the other modes of analgesia. It can be extended to provide anaesthesia for obstetric surgical interventions. Epidural analgesia is chosen by approximately 30% of women in the UK for labour. The risks of regional analgesia are shown in Table 2.

The anaesthetist uses a loss-of-resistance syringe technique to locate the epidural space with the needle. After the epidural space has been located, a catheter is passed through the needle and a local anaesthetic-opioid mixture is injected. This local anaesthetic mixture diffuses across the meninges and acts at the spinal cord. This results in a fairly slow onset of action of 20 minutes or more. Cold or light touch modalities are commonly used to assess the spinal level of sensory anaesthesia. Achievement of sensory anaesthesia to a level equivalent to the T10 dermatome is associated with adequate analgesia for labour.

A combined spinal-epidural (CSE) is offered when a more rapid onset of analgesia is required. It is associated with more uniform analgesia and better sacral spread than an epidural. It can be performed as either a single spinous interspace “needle through needle” approach in which the spinal needle is inserted through the epidural needle. Alternatively, a two spinous interspace technique may be used in which the needles are inserted separately at different spinal levels.

A dural puncture epidural (DPE) is performed in the same way as a “needle through needle” CSE, except drug is not administered via the spinal needle. Theoretically, the spinal puncture hole allows more rapid transfer of epidural drug into the intrathecal space, a shorter time to achieve adequate symmetrical analgesia and better sacral block than an epidural, plus less maternal hypotension and pruritis than a CSE. This practice has not yet been widely adopted in the UK.

Patient controlled epidural analgesia (PCEA) pumps allow greater control and flexibility of analgesia, a reduction in overall amount of drug administered, reduced motor block and increased maternal satisfaction when compared with continuous epidural infusions or midwife

Risks associated with regional analgesia

Risk	Epidural	Spinal
Itching	1 in 3–10	1 in 3–10
Hypotension	1 in 50	1 in 5
Failure (not adequate for labour)	1 in 8	NA for labour
Failure (not adequate for LSCS requiring GA)	1 in 20	1 in 50
Post dural puncture headache	1 in 100	1 in 500
Nerve damage	1 in 1000 (temporary)	1 in 13,000 (permanent)
Epidural abscess	1 in 50,000	
Epidural haematoma	1 in 170,000	
Accidental unconsciousness	1 in 2000	
Severe complication including paralysis	1 in 250,000	

Table 2

administered boluses. Pumps that provide programmed intermittent epidural boluses (PIEB) in addition to PCEA have the advantages of providing more consistent analgesia with less need for rescue boluses.

Combining local anaesthetic (usually bupivacaine/levobupivacaine) with an opioid (usually fentanyl) allows satisfactory analgesia to be achieved with smaller doses of local anaesthetic. The smaller the dose of local anaesthetic given, the lower the risk of the woman experiencing significant leg weakness and impaired mobility during labour. There is an increase in analgesic requirement with advancing labour, an important consideration when troubleshooting epidurals, and a reduced analgesic requirement in obese parturients.

For managing inadequate epidural labour analgesia, the administration of large volumes of low-concentration local anaesthetic (as opposed to low volume-high concentration) enhances the sensory spread of anaesthesia. There should be a low threshold to re-site an epidural with inadequate analgesia that cannot be improved. Approximately one in eight epidurals provide unsatisfactory labour analgesia. Reasons for failed analgesia include incorrect initial placement, or later migration, of the epidural catheter.

As well as providing excellent analgesia, epidurals have the benefit of reducing the maternal stress-response to labour which may improve fetal acid-base balance at delivery. Furthermore, unlike intramuscular opioids, the opioid content of epidurals does not interfere with the establishment of breastfeeding. There is no detrimental effect on the duration of the first stage of labour, nor an increase in the risk of caesarean delivery. Whilst earlier studies suggested an association between epidurals and increased risk of instrumental deliveries, more recent evidence suggests there is less risk with the modern low-dose local anaesthetic epidural analgesia. The adoption of low-dose epidural techniques has resulted in enhanced patient mobility and allowed for the preservation of pelvic muscle tone. There is evidence that adopting a lying down position (right or left lateral) during the second stage of labour increases the chance of spontaneous vaginal delivery as opposed to adopting the upright position at this stage. The reason for this effect is unknown, but one mechanism could be due to a reduction in density of block in the sacral area allowing more effective maternal expulsive efforts. Whilst epidural analgesia is associated with development of maternal pyrexia, it is not accompanied with bacteraemia. Epidural-associated pyrexia may cause diagnostic confusion with peripartum septic events and result in unnecessary antibiotic administration.

4. Planning and Provision of Anaesthesia for Obstetric Surgical Procedures

Over the last 25 years, maternal mortality secondary to anaesthesia has decreased and remains low despite an increase in the number of women with co-morbidities or complex obstetric needs. This has been achieved by the development of obstetric anaesthesia as a consultant-led subspecialty, and the widespread practice of regional anaesthesia, with a subsequent reduction in the use of general anaesthesia for caesarean section. In the last triennia of

the MBRRACE-UK report, two women died as direct complications of anaesthesia, and maternal mortality secondary to anaesthesia remained at 0.08 per 100,000 maternities.

Effective two-way communication between the obstetrician and anaesthetist is essential when planning the safest mode of anaesthesia for operative delivery. Factors influencing the choice of anaesthetic technique include the urgency of the situation (both maternal and fetal condition), expected mode of delivery and anticipated complications. Communication should be pre-emptive as opposed to reactive.

Regional anaesthesia remains the gold standard for operative delivery and rates for conversion to general anaesthesia should be audited. The Royal College of Anaesthetists recommend that <1% of category 4 (elective) caesarean sections are performed under general anaesthesia but accepts that up to 15% of category 1 caesareans may require general anaesthesia.

A. Regional Anaesthesia

Regional anaesthesia is assessed as being adequate for operative delivery if there is demonstrable complete motor block of both lower limbs (e.g. unable to straight leg raise either leg) and anaesthesia to the sensation of cold up to the T4 dermatome and light touch up to the T5 dermatome. Ideally two sensory testing modalities should be utilised.

i. Epidural top-up

The majority of established and effective labour analgesia epidurals can be topped-up for operative delivery. Despite many trials to date, there is no evidence to recommend an optimal top-up solution mixture. Commonly used doses include 20 ml of either a 2% lidocaine with epinephrine mixture or a 0.5% bupivacaine solution (the isomer levobupivacaine may be preferred due to the reduced risk of cardiotoxicity).

Not every epidural top-up achieves adequate anaesthesia for surgery, and approximately 20% are inadequate. Management options for a failed epidural top-up include removing and replacing the epidural, performing a single-shot spinal, insertion of a CSE or conversion to a general anaesthetic.

Re-siting an inadequate epidural may not be appropriate when there is the need for immediate surgery. Performing a single-shot spinal may provide rapid anaesthesia but with the risk of a total spinal, as the local anaesthetic dose previously injected into the epidural space may spread through the spinal dural puncture into the CSF, contributing to the unpredictability of the block height. Reducing the dose of spinal drug by 20–30% following a failed epidural top-up may temper this effect. Alternatively a CSE technique with a small dose of spinal drug and gradual extension of the block (as appropriate) using the epidural may be the safest and more predictable course of action.

ii. Spinal

Intrathecal administration of a local anaesthetic (usually 0.5% hyperbaric bupivacaine) and opioid mixture results in rapid sensory and motor anaesthesia. Intravenous infusions of vasopressors mitigate hypotension secondary to the spinal sympathetic blockade. The optimal dose of local anaesthetic for spinal anaesthesia whilst minimising

hypotension is controversial. Lower dose spinals reduce hypotension, and nausea and vomiting, but are associated with increased intraoperative analgesic supplementation and shorter duration of anaesthesia. Diamorphine is the most common spinal opioid given with the spinal local anaesthetic in the UK, as it has a prolonged duration of action into the post-operative period. The opioid dose given is a balance between achieving optimal intraoperative (and postoperative) analgesia and the adverse effects which include pruritis and nausea. Intrathecal diamorphine doses of 0.3–0.4 mg are recommended by the National Institute of Clinical Excellence.

Inadequate spinal anaesthesia for operative delivery occurs in approximately 1 in 50 spinals. Management options include repeating the spinal, performing a CSE and conversion to general anaesthesia. The decision depends on the clinical situation, extent of existing (albeit inadequate) block and the experience of the anaesthetist.

B. General anaesthesia

General anaesthesia for operative delivery is usually provided when immediate delivery is required, for maternal refusal of regional anaesthesia, where there is a contraindication to regional anaesthesia (e.g. coagulopathy and haemorrhagic hypovolaemia), and following failed or inadequate regional anaesthesia. The issues associated with providing general anaesthesia for parturients have already been discussed in the previous section addressing the management of the obese parturient. These problems include the increased risk of failed intubation (1 in 250), risk of pulmonary aspiration and the risk of risk of accidental awareness (1 in 670 for women having caesarean sections compared to 1 in 19,000 for non-pregnant adults having general anaesthesia).

The Difficult Airway Society guidelines for the management of failed intubation in obstetrics should be displayed in all obstetric theatres as they provide an algorithm to follow to enhance decision-making and allow other health professionals to understand the issues faced by the anaesthetist (<https://das.uk.com/files/01-15%20DAS-algorithms-web-PRINT20092015.pdf>). Regular simulations and drills of perioperative obstetric airway emergencies are essential in maintaining skills.

Since the advent of regional anaesthesia in obstetrics, the frequency of general anaesthesia for caesarean section has declined. Whilst acknowledging the risks, in practice the vast majority of women who require general anaesthesia have it safely and without significant complication. The main driver for the use of regional anaesthesia for caesarean section in 90% of women has been the benefit to the woman of being conscious at the time of the delivery of her baby and the superior postoperative recovery and analgesia.

C. Anaesthesia and aortocaval compression

Radiological studies have shown that all pregnant women in the third trimester occlude their inferior vena cava by the gravid uterus when they lie supine, however only about 10% experience significant supine hypotension as a result of the

resulting impeded cardiac venous return. The other 90% of women can compensate through adequate venous return through a collateral spinal venous circulation. However, with regional anaesthesia the resultant sympathetic block impedes the recruitment of the collateral venous circulation. As a result, significant supine hypotension is experienced by 80–90% of pregnant women who have spinal anaesthesia. This hypotension is often treated with intravenous vasoconstrictors such as phenylephrine, but this does not treat the cause and refractory hypotension or severe cardiovascular instability may require immediate lateral displacement of the uterus manually or by pelvic tilt.



FURTHER READING

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Practice Points

- The anaesthetist is a vital member of the multidisciplinary team and close involvement in maternal peripartum care is recommended.
- Increasing maternal medical complexity and co-morbidities means that the provision of maternity care is changing to address this.
- Obesity, cardiovascular disease and anticoagulation have important implications on the provision of analgesia and anaesthesia, therefore early antenatal anaesthetic review is advised in order to safely plan care.
- All pregnant women should have timely access to critical care and specialist interventions as required, and the obstetric anaesthetist is ideally placed to assist and co-ordinate this.
- Effective communication between the anaesthetist and obstetrician on delivery suite should be pre-emptive and two-way as opposed to reactive.
- Simulation training and skills-drills will increase awareness of human factors and should improve teamwork and the provision of joined-up maternity care.