What's new in obstetric anaesthesia?

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Introduction

Annually, the Society for Obstetric Anaesthesia and Perinatology recognises Gerard W Ostheimer, a former obstetric anaesthesiologist at the Brigham and Women's Hospital in Boston, by presenting an honorary lecture that highlights topics relevant to obstetric anaesthesia from the obstetrics and anaesthesia literature published the previous year. What follows is a brief discussion of the topics discussed in the 2011 lecture, namely maternal coexisting disease, complications of anaesthesia, the safe administration of oxytocin, and patient safety.[1]

Obesity

The body mass index (BMI) classification remains the preferred standard for stratification of maternal body weight, with overweight defined as a BMI of 25-29.9 kg/m^2, and obesity as a BMI of >30 kg/m^2. Obesity has been identified as a major public health dilemma in the USA, the UK, and most of the developed world.[1-3] In the USA, the age-adjusted prevalence of overweight and obesity among women is 64.1%, according to the National Health and Nutrition Examination Surgery (NHANES). Other research in the USA indicates that 22% of women are obese at the start of their pregnancy.[1] Among UK women, approximately 40% were overweight, and 25% were obese, in 2010.[2] The relevance of these facts to anaesthesia is that in most cases, the cumulative effect of the physiological changes of pregnancy and obesity alter the anaesthetic plan and subsequent management of the parturient. Existing risk factors associated with pregnancy are compounded by obesity and its associated complications.[2]

A thorough pre-clinical assessment is mandatory in the obese parturient because of the associated increased risk of co-morbid diseases, such as diabetes mellitus, hypertension, pre-eclampsia and thromboembolism, as well as a higher incidence of maternal and perinatal morbidity and Caesarean delivery.[3] Obesity has been implicated in contributing to maternal mortality in the Confidential Enquiry into Maternal and Child Health (CEMACH) published in 2007, where more than 50% of women who died were reported to be obese or overweight.[4]

Failed intubation occurs in 1 of 280 obstetric patients, compared to approximately 1 in 2 500 of the general population. In the obese obstetric population, one in three women will have a failed intubation.[2] Thus, thorough airway assessment and planning is crucial for all operative procedures in the obese parturient.

The respiratory changes that are inherent in pregnancy are further exaggerated by the presence of obesity. As a result of obesity in pregnancy, there is an increased ventilation-perfusion mismatch, predisposing hypoxia. Breathing work is increased. Obstructive sleep apnoea and asthma occur more frequently in obese patients. Pulmonary hypertension and cor pulmonale should be sought and optimised preoperatively. Postoperatively, obese patients have an increased risk of postoperative pulmonary complications, such as atelectasis and hypoxaemia. They should be given adequate monitoring, as well as chest physiotherapy and thromboprophylaxis as a priority.

The normal cardiovascular demands of pregnancy may be poorly tolerated in the obese parturient with co-morbidities associated with obesity. Aortocaval compression syndrome is exacerbated in the obese mother due to the presence of increased intra-abdominal adipose tissue. There is also a higher incidence of peripartum cardiomyopathy.

Some guidelines recommend routine six-hourly prophylaxis with ranitidine for women with significant risk who require general anaesthesia for surgical intervention, for parturients with a BMI > 30kg/m^2, for those who have had a previous Caesarean delivery, and for women with maternal diabetes.

The overall incidence of anaesthetic complications, including failure to establish a neuraxial blockade; failed neuraxial anaesthesia, requiring conversion to general

anaesthesia; and maternal mortality; was 8.4% in a study evaluating anaesthesia outcomes during scheduled Caesarean deliveries in morbidly obese women.[1] According to Ellinas et al, the odds of a difficult landmark palpation are 4.6 times higher in parturients with a BMI of 35, compared to those with a BMI of 30 kg/m². [1]

Regional anaesthesia is more challenging as a result of difficulty in palpating landmarks. The availability of longer spinal and epidural needles is necessary to improve success rates. General anaesthesia may carry a higher risk, due to airway distortion. Practically, dexterity with specialised equipment, such as ultrasound, can assist with central venous cannulation, as well as repuncture lumbar location of landmarks for neuraxial blockade. Invasive arterial pressure monitoring allows more accurate blood pressure monitoring. Extra-long epidural and spinal needles may facilitate the placement of neuraxial blocks.

The leading cause of maternal death in the UK is thromboembolic events.[4] Thus, it is recommended that pregnant women with a BMI of > 30kg/m², as well as two or more risk factors for thromboembolism, should be considered for prophylactic low-molecular-weight heparin early on in the pregnancy, until six weeks postpartum.[4]

In summary, obesity increases risk in pregnancy. It is important for anaesthetists to have practical skills to manage this high-risk group.

Gestational diabetes mellitus

Gestational diabetes is closely related to maternal obesity, and so the co-morbid disease that is often associated with obesity as discussed above, needs to be elicited and optimised. Patients with diabetes have a higher incidence of pregnancy-induced hypertension, polyhydramnios, Caesarean section delivery and pre-term labour.[3] In a study in 2008, the Hyperglycaemia and Adverse Pregnancy Outcomes (HAPO) research group demonstrated a strong, continuous association between maternal glucose levels and adverse pregnancy outcomes. Obese women with a BMI > 40kg/m² had greater odds of having a Caesarean delivery. Attenuation of the stress response is important in these patients in order to facilitate plasma glucose control, so epidural analgesia plays a key role.

Local anaesthetic toxicity[1]

Although local anaesthetic systemic toxicity (LAST), due to epidural anaesthesia, is relatively rare, with an estimated incidence of 4 per 10 000, failure to recognise and treat the condition promptly can have devastating results. Previously, the management of LAST was mainly supportive. However, in the past 15 years lipid emulsion has emerged as a possible antidote for systemic toxicity. The lipid emulsion acts as a "lipid sink" by binding the lipid soluble local anaesthetic molecules, thus reducing the concentration of tissue-bound local anaesthetic. Other theories include possible metabolic alterations in mitochondrial metabolism, as well as improved myocyte contractility.

The American Society of Regional Anaesthesia and Pain Medicine (ASRA) released a Practice Advisory in 2010 in which they recommended prompt airway management to prevent hypoxia and acidosis; treatment of seizures with benzodiazepines, propofol and thiopental; consideration of lipid emulsion administration at the first signs of LAST and Advanced Cardiac Life Support (ACLS) in the presence of cardiac arrest. Modifications to ACLS include avoidance of high-dose adrenaline (< 1 mg/kg) as it may impair the function of lipid emulsion in a rodent model, avoiding vasopressin because animal models have found poor outcomes and pulmonary haemorrhage in the setting of lipid emulsion administration, avoiding calcium-channel and beta adrenergic blockers, and treatment of ventricular dysrhythmias with amiodarone, instead of local anaesthetics. Both ASRA and the Association of Anaesthetists of Great Britain and Ireland (AAGBI) recommended the same dosing for 20% lipid emulsion: 1.5 ml/kg bolus administered over one minute, followed by a continuous infusion of 0.25 ml/kg/minute until 10 minutes after haemondynamic stability is obtained. Two additional boluses may be administered if there is no response to the first bolus. The infusion rate may be increased to 0.5 ml/kg if hypotension persists. The maximum recommended volume is 10 ml/kg in the first 30 minutes.

Maternal aspiration[1]

Controversy surrounds the question of parturients eating light meals during labour. The incidence of pulmonary aspiration of gastric contents is 1:661 in patients undergoing Caesarean delivery. The increased use of neuraxial anaesthesia and improved safety measures, such as routine incorporation of antacid prophylaxis as premedication prior to Caesarean delivery, has led to a decrease in the risk of aspiration in the past three years. An analysis of claims against the National Health Service in England between 1995-2007 demonstrated no claims for maternal aspiration. Instead, complications related to neuraxial anaesthesia, such as breakthrough pain, nerve damage and back pain. The National Institute for Health and Clinical Excellence (NICE) in the UK recommends that women in established labour may eat a light meal, unless they have received opioids, or are at high risk of having a Caesarean delivery. In addition, in a recent Cochrane review, there was no evidence of harm from allowing oral intake during labour.

Postdural puncture headache[1]

Conventional treatment for postdural puncture headache (PDPH) is conservative. It includes bed rest, fluids, oral caffeine, and nonsteroidals with use of an epidural blood patch if these measures fail. Recent case reports have described the use of adrenocorticotropic hormone (ACTH) in the form of cosyntropin (a synthetic ACTH analogue) for the treatment of PDPH. The potential mechanisms of action include ACTH-stimulated aldosterone release, which enhances salt and water retention, thus causing an increase in the circulating blood volume. This leads to dural oedema, or closure of the dural puncture, increased cerebrospinal fluid production, or an increase in the beta endorphins, which decreases the pain perception. A recent study showed a decreased need for an epidural blood patch in women receiving 1 mg of cosyntropin after unintentional dural puncture. Although this drug shows promise, further studies are required to evaluate the safety of cosyntropin in the postpartum period.

Oxytocin[1]

Oxytocin is administered prophylactically to prevent postpartum haemorrhage after delivery. The optimum dose and method of delivery thereof, remains unclear. Many guidelines recommend 5 units of oxytocin as an intravenous bolus after umbilical cord clamping, to prevent postpartum haemorrhage. A study by Butwick et al failed to demonstrate a difference in uterine tone scores six minutes after administration of oxytocin between the groups, who were given 0, 0.5, 1, 3, or 5 international units of oxytocin.[1]

King et al did not suggest any benefit to administration of oxytocin bolus before an infusion of oxytocin in women at high risk of postpartum haemorrhage. ST-segment depression is the most serious observed side-effect of oxytocin administration, even though it is unclear whether or not these changes are indicative of myocardial ischaemia. In a study by Jonsson et al, the incidence of ST depression associated with oxytocin bolus administration was lower in the group receiving 5 IU, compared to the group given 10 IU.

Thus, although it remains unclear what the optimal dose and method of administration of oxytocin is, it is prudent to give the lowest effective dose of oxytocin in order to avoid iatrogenic injury.

Patient safety checklists[1]

Currently, significant research is being carried out to determine the role of checklists in improving patient outcomes. The World Health Organization's (WHO) Safe Surgery Saves Live study has demonstrated a decrease in complications following its introduction. A number of checklists have been developed for research in obstetric anaesthesia. However, further research is still needed to evaluate their effect on patient outcome.

Conclusion

Co-morbid disease in pregnancy increases the risk of anaesthesia significantly. It remains incumbent on the anaesthetist to ensure that he or she has the skills and dexterity with specialised equipment to manage such patients optimally, to ensure the safety of both the mother and the child. Advances in the area of LAST management mandate a familiarity with the use of lipid emulsion for anaesthetists performing epidural anaesthesia and analgesia in parturients. Cosyntropin is emerging as a possible prophylactic agent for PDPH, although more research is still needed into its use for prophylaxis. The lowest possible dose of oxytocin should be used to balance the side-effects of the drug against optimal uterine tone. Surgical safety checklists that are specific to obstetric practice are still undergoing research, but existing checklists, such as the WHO Surgical Safety Checklist, may still be of use in the interim.

References

1. Toledo P. What's new in obstetric anaesthesia: the 2011 Gerard W Ostheimer lecture. Int J Obstet Anaesth. 2012;21(1):68-74.
2. Gupta A, Faber P. Obesity in pregnancy. Contin Educ Anaesth Crit Care Pain. 2011;11:4.
3. Francis S, May A. Pregnant women with significant medical conditions: anaesthetic implications. Contin Educ Anaesth Crit Care Pain. 2004;4:3.
4. The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving mothers' lives: reviewing maternal deaths to make motherhood safer, 2003-2005. The seventh report on confidential enquiries into maternal deaths in the United Kingdom. London: CEMACH; 2007.