The changing profile of patients presenting for Caesarean section in South Africa

Introduction

The new challenges facing those practicing obstetric anaesthesia are reflective of changes in the demographics of the South African parturient.

Factors such as HIV and AIDS, obesity, advanced maternal age, and co-existing diseases are known to increase the risk of maternal morbidity and mortality. As more high risk patients present for Caesarean section, anaesthetic challenges increase. Predisposing factors for anaesthesia-related maternal mortality are inexperienced anaesthesia personnel, airway problems, and a lack of appropriate monitoring or resuscitation equipment.

Human immunodeficiency virus (HIV) infection

The average HIV infection rate amongst pregnant women has increased from 0.7% in 1990, to 29.3% in 2008.1 There has been a 20% increase in maternal deaths between 2005 and 2007 when compared with the previous three-year period, with HIV and AIDS accounting for 43.7% of the deaths.2

HIV is a systemic disease with multi-organ involvement. The pulmonary, neurologic, cardiovascular, and haematological manifestations of HIV are of particular interest to the anesthesiologist.3 Prior to the administration of any anaesthetic agent, the anaesthesiologist should be aware of the possible interaction of antiretroviral drugs with the anaesthetic and/or toxic side effects. Pre-operative assessment of the patient should include a thorough history and review of medications, as well as an accurate CD4+ T-cell count.4 Patients with high T-cell counts (500 - 700 CD4+ cells/mm³) are less likely to have complications and are usually not on antiretroviral medications.5 Although modern medical care and current therapies save and prolong the lives of many patients with HIV and AIDS, the disease process has no cure and will continue to present during the peri-operative period. The anaesthesiologist must, therefore, have sound knowledge of the disease, treatment, complications, and multi-organ manifestations.4

Obesity

Obesity (a body mass index equal to or greater than 30) is recognised as a pandemic nutritional disorder by the World Health Organization.6 Countries in economic transition from undeveloped to developed, such as South Africa, are particularly affected, and have an increased rate of obesity across all economic levels and age groups.6 South Africa is facing an explosion in the number of obese people. Almost half of South Africans over the age of 15 are overweight or obese.7 For women, the obesity rate was the highest in Africans (32%), followed by coloureds (26%), whites (23%) and then Indians (21%). This is because of urbanisation and globalisation. A large segment of the population is rapidly moving to the cities and adopting Western eating habits. The shift to higher dietary fat intake and lower physical activity is contributing to a higher prevalence of obesity.8 Few overweight African women view themselves as overweight, and some associate thinness with HIV and AIDS.9-11 Many overweight and obese South African women do not want to lose weight, although they may be aware of the health consequences of being overweight.

Consequently, the anaesthetist is increasingly confronted with the problems associated with anaesthetising obese patients, and even more so the obstetric anaesthetist. In obstetric anaesthesia practice, the challenges posed by obesity are enormous. There is considerable evidence indicating that obesity in pregnancy is associated with an increased occurrence of pregnancy-induced hypertension, gestational diabetes mellitus, pre-eclampsia, venous thromboembolism, foetal macrosomia, foetal distress, and Caesarean delivery.12 For anaesthetists, the morbidly obese parturient presents an increased risk of failed regional anaesthesia and a difficult or failed intubation.13,14 Morbid obesity has been identified in Confidential Enquiry into Maternal and Child Health (CEMACH) reports as an independent risk factor for maternal mortality.15 The pathophysiological changes of obesity are multi-systemic and there is an overall reduction in the functional reserves.

The combination of obesity and pregnancy has a profound effect on the maternal cardiovascular system. Obesity-induced pathological changes have effects on cardiac, endothelial and vascular function. Pregnancy results in cardiovascular changes in order to comply with the increased oxygen demand, and the cardiovascular system is placed under further stress in obese patients. The endocrinological, inflammatory and microvascular changes associated with obesity remain, and are further augmented, in pregnancy.16,17

The extent of cardiovascular pathological changes secondary to obesity is dependent on the duration and severity of the obesity.18 An extra amount of body fat increases the cardiac output and the blood volume. The volume load initially causes left ventricular hypertrophy. The myocardium then subsequently starts to dilate against the increased pressure overload, secondary to increased sympathetic

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activity due to the effects of hormones such as leptin, insulin and inflammatory mediators. The elevated cardiac output causes the heart rate to increase and, thereby, decreases the diastolic interval and thus the time for myocardial perfusion. The impaired myocardial diastolic relaxation leads to diastolic dysfunction. If fat deposition occurs in myocardial tissue, then conduction and contractility can be affected. It is therefore not uncommon to see systolic, diastolic or both systolic and diastolic dysfunction of the left ventricle. Right ventricular failure can be present in patients with pulmonary hypertension and obstructive sleep apnoea. Any additional stress can cause congestive heart failure. Body mass index (BMI) is a significant independent predictor of heart failure. Insulin resistance and dyslipidaemias affect the vascular function, and increased inflammatory mediators such as C-reactive protein, IL-6, and TNF-α affect endothelial function. This endothelial dysfunction in pregnant women may predispose to the development of pregnancy-induced hypertension. Obesity in pregnancy is thus associated with higher rates of pregnancy-induced hypertension and pre-eclampsia, higher rates of gestational diabetes and higher rates of venous thromboembolism. The supine hypotension syndrome can be exacerbated in obese parturients where a large panniculus adds to the uterine compression on the abdominal vasculature.

In the obese parturient, oxygen consumption is increased in direct proportion to the additional adipose tissue. The physiologic demands and added weight of the excess adipose tissue frequently result in respiratory compromise. Rib cage mechanics are diminished, resulting in increased work of breathing. Chest wall adipose tissue exerts pressure on the thorax, and intra-abdominal adipose tissue enhances the cephalad shift of the diaphragm. This results in a further reduction in functional residual capacity (FRC), greater atelectasis formation, and an increase in closing volume.

The combination of obesity and pregnancy greatly increases the risk for gastric content regurgitation, and possibly pulmonary aspiration.

A thorough understanding of physiology, pathophysiology, associated conditions, their complications and the implications for anaesthesia should place the anaesthetist in a better position to provide care for these patients. Advance consultation, early provision of regional labour analgesia, attention to details such as positioning (for both regional and general anaesthesia), and preparation for the worst case scenario are necessary. Changes in our usual technique may be necessary. We may have to change the anaesthetic doses we use, and we may have to use ultrasound to assist epidural placement. Ultrasound can determine the optimal insertion point, the distance from the skin to the ligamentum flavum and the exact interspace for needle placement. Obese women have a much higher risk for urgent or emergency cesarean delivery. From an anaesthetic perspective, having a flexible regional technique is optimal, as we try to avoid general anaesthesia, and a single-shot spinal is risky from the perspectives of having to choose an appropriate dose and also because of the unpredictable duration of surgery. Continuous spinal catheters are sometimes preferred in these patients, because of the relative high failure rate with epidural catheters and the importance of having a “working catheter” in case an emergency operative delivery is required. Continuous spinal analgesia can be readily converted to surgical anaesthesia if necessary. This technique provides predictability and reliability, allowing tight control of the anaesthetic level and duration of the block. Currently, the available catheters are essentially epidural macrocatheters. One possible complication of spinal macrocatheters is postdural puncture headache, but it has been suggested that the risk thereof is significantly decreased in morbidly obese patients.

The incidence of difficult tracheal intubation in morbidly obese obstetric patients has been reported to be as high as 33%. Difficult or failed tracheal intubation in obese parturients is very common, and optimal assessment and management of the airway is very important. Fat deposition in obese patients, soft tissue changes during pregnancy and oedema influence the airway. Poor head positioning and cricoid pressure can contribute to the difficulty. The anatomical and physiological changes caused by both obesity and pregnancy can cause rapid desaturation during the apnoeic phase.

Obesity is an intrinsic risk factor for both increased operative blood loss and postpartum haemorrhage. Obese parturients are at increased risk of postoperative complications such as hypoxaemia, atelectasis and pneumonia, deep vein thrombosis and pulmonary embolism, and wound complications. In the recovery room, critical respiratory events (desaturation, hypoventilation, and airway obstruction) occur twice as often. Even after spinal anaesthesia, there is a BMI-dependent decrease in respiratory function.

An increased incidence of postoperative complications and antepartum medical disease probably contributes significantly to longer hospitalisation for the morbidly obese. The costs associated with the care of an obese parturient increase in direct proportion with the BMI.

Increasing maternal age and co-existing disease

In developed countries, the average age of the pregnant woman is rising. There are specific adverse pregnancy outcomes associated with parturients older than 35 years. Studies have reported that older mothers are at a higher risk of operative delivery. In South Africa, those 35 years and older were at greater risk of dying of haemorrhage, ectopic pregnancies, embolism, acute collapse and pre-existing medical disease. Assisted reproductive techniques have advanced considerably, allowing older women and women with chronic disease to conceive, as well as increasing the number of pregnancies with multiple foetuses. With increasing maternal age comes increasing numbers of women with co-existing diseases such as hypertension and coronary artery disease. CEMACH identified cardiac disease as the number one cause for maternal mortality in the United Kingdom in the 2003 - 2005 triennium. Coronary artery disease manifesting in pregnancy is no longer a rarity, and the majority of maternal deaths in the United Kingdom from cardiac causes were secondary to myocardial infarction and/or ischaemia.

Modern medicine is saving the lives of patients with various congenital diseases, and extending the lives of young adults with serious systemic disease who then desire to have their own children. We are now regularly confronted with pregnant women with a variety
of diseases, with little reported in the literature other than case reports to guide us in their anaesthetic management.

**Recommendations**

The general principles to apply in order to provide women who suffer from complex disease with safe anaesthesia for delivery include:25

Understand the physiological changes of pregnancy, and how these affect maternal disease. The cardiac physiological changes of pregnancy place stress on the abnormal heart. One should pay particular attention to those patients at risk for cardiac events, starting at 28 weeks when peak cardiac output and blood volume are reached.

- Ensure access to antepartum anaesthesia consultation. Offer obstetric colleagues a list of conditions that qualify for consultation, to enhance the safety of anaesthetic care. Obstetrical care providers are not all necessarily aware of anaesthetic concerns.
- Conduct appropriate testing to adequately assess the pregnant patient, and utilise advances in technology (including ultrasound to guide regional techniques).
- Consider inserting an epidural catheter early in labour, as this will control the sympathetic responses to the second stage of labour and enable the anaesthetist to provide rapid general anaesthesia for Caesarean section.
- Be aware that anticoagulation therapy is being prescribed in pregnancy with increasing frequency. Anaesthetists need to develop consistent guidelines for the use of regional anaesthesia in anticoagulated parturients. (See, for example, the Belgian guidelines concerning central neural blockade in patients with drug-induced alteration of coagulation: An Update. The BARA (Belgian Association for Regional Anesthesia) Working Party on anticoagulants and central nerve blocks: Vandermeulen E, Singelyn F, Vercauteren M, et al.)
- Whenever in doubt, use a titratable regional technique rather than single-shot spinal, as it provides flexibility and better haemodynamic control.
- Manage hypotension aggressively (with phenylephrine) during regional anaesthesia. Its prophylactic use may also be a good idea.
- Be prepared for a general anaesthetic.

**Conclusion**

Despite the growing complexity of problems and increasing challenges such as HIV and AIDS, obesity, increasing maternal age, and pre-existing maternal disease, anaesthesia-related maternal mortality is extremely rare in the developed world. Anaesthesia-related maternal mortality rates are, furthermore, decreasing, but there is still room for improvement. Maternal mortality can be decreased further by continuing to increase the use of neuraxial anaesthesia and improving airway management skills, because complications of regional anaesthesia may also involve airway management. In many obstetric disasters, early intervention and skills of an anaesthetist can make the difference between life and death. Effective communication and good teamwork between anaesthetist and obstetrician is essential. Future developments in obstetric care should focus on multidisciplinary approaches utilising the skills and knowledge of all those involved in the care of the pregnant patient.26

**References**

1. Available from: www.matzem.co.za
7. Available from: www.who.int