The ill obstetric case – lessons learnt from the NCCEMD

Several factors were involved in maternal deaths in the period covered by the report.

GILLIAN LAMACRAFT, ***MB BS, DA, MRCP, FRCA***
Chief Specialist and Head of Pain Control Unit, University of the Free State

Gillian Lamacraft trained in medicine at Guy's Hospital Medical School, London. She obtained qualifications in internal medicine before training as a specialist in anaesthesia in the Wessex Region of the UK. She emigrated to South Africa in 1999 where, after a year of community service, she has been working as a specialist in anaesthesia at the University of the Free State. Since 2000 she has been provincial assessor for maternal deaths related to anaesthesia and is completing a PhD on factors related to these deaths in Free State level 1 and 2 hospitals. Her current fields of interest are factors related to maternal deaths from anaesthesia in the Free State, implementing in-hospital cardiac arrest teams and pain management in HIV-infected patients.

The role of the National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD) is 'To make recommendations, based on the confidential study of maternal deaths to the Department of Health, such that the implementation of the recommendations will result in a decrease in maternal mortality'.[1]

The NCCEMD has produced three reports to date, using information derived from the maternal death notification system. The first *Saving Mothers* report covered maternal deaths in 1998.[1] The second and third reported on deaths during 1999 - 2001[2] and 2002 - 2004[3] respectively. All the reports contained a specific chapter on obstetric anaesthesia. This article discusses recommendations from these chapters.

Most anaesthetic-related deaths occurred in level 1 hospitals. A significant number of these patients were ill and should have been transferred to a higher level of hospital preoperatively. For example in 2004, 68% of all anaesthetic deaths occurred in level 1 hospitals. Of these patients, 33% had co-morbidity, either severe pre-eclampsia (77%) or morbid obesity (23%). Only one of these cases could not have been transferred to a level 2 hospital (cord prolapse).

Co-morbid factors described in anaesthetic-related deaths

Morbid obesity

Morbid obesity[4] and pregnancy[5] are associated with increased morbidity and mortality from anaesthesia. A combination of both factors is worse.[6] This is becoming more of a problem in South Africa, as the incidence of obesity rises.

In the *Saving Mothers* reports, both general anaesthesia (GA) and spinal anaesthesia resulted in deaths in the morbidly obese, particularly when administered in level 1 hospitals. Failed intubation was the usual problem with GA, morbid obesity being implicated in 2 NCCEMD reports as a contributory factor in 2 out of 6[1] and 4 out of 18[3] deaths from failed intubations.

Where intubation has been difficult and hypoxic brain damage may have resulted, the patient should remain intubated for transfer to an intensive care unit. This reduces secondary brain damage and prevents further difficulties in intubation in a patient with a now traumatised and swollen airway.

'...intubation difficulty was encountered (in a morbidly obese patient)...and the patient had a delayed recovery…and a grand mal convulsion. Nevertheless the patient was extubated and sent to a general ward prior to transfer to a level 3 hospital where she arrived *in extremis* and died following a cardiorespiratory arrest subsequent to further difficulty with reintubation'.[1]

A regional technique such as a spinal anaesthetic is preferred. A high block appears to be a risk and a slightly reduced dose of spinal bupivacaine may be used.[7] An alternative approach is a combined spinal-epidural anaesthetic, titrating the block to the correct level. This equipment and expertise is not generally available at level 1.

Blood loss is another problem in the morbidly obese. More is lost during surgery and operative times are longer. After caesarean section (CS) the obese are at increased risk of postpartum haemorrhage, due to poor uterine contractility.[8] Level 1 hospitals frequently have inadequate supplies of blood and this is a further reason for pre-emptive transfer.

Lesson

Morbidly obese parturients:

- increased morbidity and mortality with surgery and anaesthesia
- transfer to level 2/3.

Severe pre-eclampsia/eclampsia (Fig. 1)

While several problems can arise during anaesthesia in patients with pre-eclampsia/eclampsia, those described in the *Saving Mothers* reports include failure to obtund the intubation response and severe hypertension after administration of ergotamine. 'The patient with eclampsia died following the onset of pulmonary oedema at intubation. This is a recognised problem with general anaesthesia in severely hypertensive patients, but there are ways to obtund the severe adrenergic response to intubation and patients at increased risk can be identified by appropriate preoperative monitoring.'[2]

Pre-eclamptic and eclamptic patients are at risk from an exaggerated hypertensive response to intubation, potentially resulting in cerebrovascular haemorrhage or pulmonary oedema. Facial and airway oedema can make intubation difficult and where

no contraindication exists spinal anaesthesia is preferred. The possibility of a low platelet count must be considered. Fully alert and co-operative eclamptic patients are suitable for spinal anaesthesia, but if the level of consciousness is decreased, cerebral oedema may be present and GA is preferred.

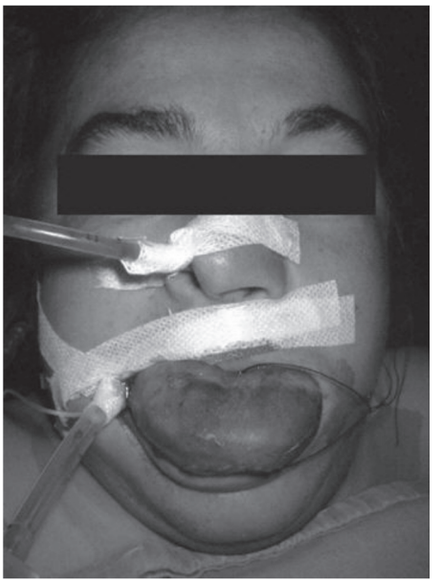

*Fig. 1. Eclamptic patient with facial oedema and swollen tongue. (*The Internet Journal of Gynecology and Obstetrics *2004; 3 (2).)*

Pulmonary oedema secondary to the intubation response is due to acute cardiac failure, with the heart not being able to pump sufficiently against an acutely increased afterload. Beat-to-beat measurement of blood pressure with an arterial line rapidly detects acute changes in blood pressure and enables one to correct the blood pressure with vasodilators in this scenario.

Obtunding the intubation response can prevent hypertensive complications. An effective regimen is a combination of magnesium sulphate (30 mg/kg IV) and alfentanil (7.5 µg/kg), given prior to induction of GA.[9] The opiate (alfentanil) occasionally results in neonatal respiratory depression, but this is reversible with naloxone. Maternal cerebrovascular haemorrhage or acute cardiac failure resulting from failure to prevent the intubation response can be irreversible.

Severe hypertension after ergotamine

'This hypertensive patient underwent caesarean section… under general anaesthesia. She had an episode of severe hypertension following the use of ergotamine and failed to regain consciousness…autopsy revealed a cerebral haemorrhage.'[1]

Ergotamine is well known to cause hypertension and should not be given to contract the uterus in a known hypertensive patient. Other effective agents in common use, e.g. oxytocin, could have been used and this death avoided.

Lesson

Pre-eclampsia/eclampsia:

- obtund intubation response
- severe: monitor blood pressure with an arterial line
- avoid ergotamine.

Ruptured uterus (Fig. 2)

Patients with a ruptured uterus are at risk for major haemorrhage; spinal anaesthesia is contraindicated in this condition, or any that results in haemodynamic instability.[10] Spinal anaesthesia can result in intractable hypotension, vomiting, aspiration, deterioration of consciousness, loss of airway and hypoxia. GA enables the anaesthetist to concentrate on the circulatory problems, with intubation and ventilation having secured the airway and maintaining oxygenation.

'Although a ruptured uterus is not always predictable, it is often associated with severe haemorrhage, and if a regional anaesthetic has been used it is often prudent to convert to general anaesthesia. In some circumstances, the risk of uterine rupture is so great as to warrant a choice of general anaesthesia *ab initio*. In one such case a spinal technique was chosen. Severe haemorrhage occurred with subsequent cardiac arrest...'[2]

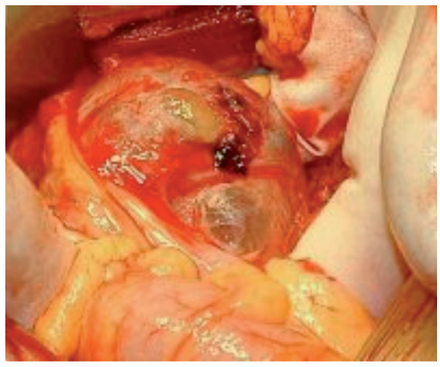

Fig. 2. Ruptured uterus.

Lesson

Ruptured uterus:

- anticipate major haemorrhage
- general anaesthesia preferred.

Retained placenta and sepsis

Patients with a retained placenta can also haemorrhage severely. Only those who are resuscitated and stable should be given spinal anaesthesia. If sepsis is also present, there is additional haemodynamic compromise from vasodilation, exacerbating hypotension with spinal anesthesia. 'A patient with a retained placenta and evidence of sepsis had an acute cardiovascular collapse following spinal anaesthesia.'[2]

Lesson

Retained placenta and/or sepsis:

- spinal anaesthesia only if resuscitated and stable
- if operation is required immediately, GA using cardiostable anaesthetic agents.

Cardiac disease

'Two patients with known cardiac disease died following general anaesthesia, one with cardiomyopathy managed at a level 2 hospital and the other a severe mitral stenosis at a level 3 hospital. In the latter case there was evidence to suggest excessive intravenous fluid therapy, despite central venous monitoring. All patients with cardiac disease should be managed at level 3 hospitals where pulmonary artery catheterisation should be available for use in severe cases.'[2]

The frequency of cardiac dysfunction in pregnancy is increasing due to HIV-associated cardiomyopathy. Induction of GA can result in worsening of cardiac function and spinal anaesthesia may result in acute collapse. This occurs because the myopathic heart is unable to increase cardiac output to compensate for the vasodilation induced by the sympathetic block. A slow-onset epidural or combined spinal-epidural anaesthetic is recommended.[11] This should be performed with invasive monitoring in level 3 institutions where staff are trained to manage such patients.

Patients with valvular heart disease, in particular stenotic lesions, are at high risk for anaesthesia and may also suffer cardiovascular collapse from spinal anaesthesia. GA was previously preferred for stenotic cardiac lesions, but even patients with tight lesions have been successfully anaesthetised with a very-slow-onset epidural.[12] These patients should also only be managed by skilled personnel with access to appropriate monitoring.

Lesson

Cardiac disease:

- refer to level 3.

Postmortem examinations

'Autopsy examination in one case subsequently revealed an undiagnosed intracardiac tumour as the cause of death'[1]

'…cause of death was ascribed on the basis of probabilities. In 10 cases it was impossible to establish a cause of death.'[1]

'Again, lack of autopsy findings hampered the review process.'[2]

The cardiac tumour case exemplifies how all deaths during anaesthesia must be referred for postmortem examination, otherwise unexplained deaths may be attributed incorrectly to anaesthesia. It is also a legal requirement that all anaesthesia-associated deaths are referred for postmortem examination.

Inadequate information from lack of postmortem examinations and incomplete anaesthetic record keeping hampers the interpretation of maternal death notifications. Personnel involved in anaesthetic-related deaths must ensure that as much information as possible is recorded to enhance the accuracy of the *Saving Mothers* reports. The anaesthetist concerned must actively participate in the Maternal Death Notification process to ensure completeness of documentation.

References

1. Pattinson RC, ed. *Saving Mothers. Report on Confidential Enquiries into Maternal Deaths in South Africa 1998.* Pretoria: Department of Health, 1998.
2. Pattinson RC, ed. *Saving Mothers. Second Report on Confidential Enquiries into Maternal Deaths in South Africa 1999-2001.* Pretoria: Department of Health, 2003.
3. Pattinson RC, ed. *Saving Mothers. Third Report on Confidential Enquiries into Maternal Deaths in South Africa 2002 -2004.* Pretoria: Department of Health, 2006.
4. Juvin P, Lavaut E, Dupont H, *et al.* Difficult tracheal intubation is more common in obese than lean patients. *Anesth Analg* 2003; 97: 595-600.
5. Hawthorne L, Wilson R, Lyons G, Dresner M. Failed intubation revisited: a 17-yr experience in a teaching maternity unit. *Br J Anaesth* 1996; 76: 680-684.
6. Vallejo MC. Anesthetic management of the morbidly obese parturient. *Curr Opin Anaesthesiol* 2007; 20(3): 175-180.
7. Harten JM, Boyne I, Hannah P, Varveris D, Brown A. Effects of a height and weight adjusted dose of local anaesthetic for spinal anaesthesia for elective Caesarean section. *Anaesthesia* 2005; 60(4): 348-353.
8. Zhang J, Bricker L, Wray S, Quenby S. Poor uterine contractility in obese women. *Br J Obstet Gynaecol* 2007; 114(3): 343-348.
9. Ashton WB, James MFM, Janicki P, Uys PC. Attentuation of the pressor response to tracheal intubation by magnesium sulphate with and without alfentanil in hypertensive proteinuric patients undergoing caesarean section. *Br J Anaesth* 1991; 67: 741-747.
10. Dyer RA, Rout CC, Kruger AM, van der Vyver M, Lamacraft G, James MF. Prevention and treatment of cardiovascular instability during spinal anaesthesia for caesarean section. *S Afr Med J* 2004; 94(3): 367-372.
11. Pryn A, Bryden F, Reeve W, Young S, Patrick A, McGrady EM. Cardiomyopathy in pregnancy and caesarean section: four case reports. *Int J Obs Anesth* 2007; 16: 68-73.
12. Kuczkowski KM, van Zundert A. Anesthesia for pregnant women with valvular heart disease: the state-of-the-art. *J Anesth* 2007; 21: 252-257.

In a nutshell

- Most anaesthesia-related deaths occurred in previously healthy patients.
- Severe pre-eclampsia and morbid obesity are the commonest co-morbid conditions associated with maternal anaesthesia-related deaths in level 1 hospitals.
- Referral pathways must be agreed upon and adhered to so that these patients can be transferred perioperatively to an appropriate level hospital.
- Ergotamine must not be given to hypertensive patients.
- Spinal anaesthesia should only be given to cardiovascularly stable patients.
- Avoid spinal anaesthesia in case of potential severe haemorrhage, e.g. suspected ruptured uterus.
- Patients with cardiac disease should be referred to a level 3 hospital.
- All anaesthesia-related deaths should have a postmortem examination.

Single Suture

Cardiovascular risk and polycystic ovarian syndrome

It appears that overweight women who suffer from polycystic ovarian syndrome may be at higher risk of cardiovascular disease. A study, published in *Clinical Endocrinology*, reports that such women have abnormal heart rate recovery after cardiovascular stress testing. The study matched 75 pairs of women for age and body mass index and found that heart rate recovery of the women with polycystic ovarian syndrome was inversely related to body mass index. The researchers say that heart rate recovery should be investigated as a potential marker for increased cardiovascular risk in polycystic ovary syndrome.

Clinical Endocrinology 2008; 68: 88.