performed within 24 h of the onset of the headache. The mother is reviewed daily until discharge and is advised, that if she experiences any further headaches or unexplained symptoms, to return to the Obstetric Day Assessment Unit or the Labour Ward where she will be seen by a consultant anaesthetist. A copy of the patient's discharge summary is sent to the general practitioner and community midwife, who visits daily for 10 days. Subsequent to this patient, the consultant anaesthetist now writes a discharge letter to the general practitioner providing information about the dural puncture and its management, and advising that the mother be referred back to the Obstetric Day Assessment Unit in the event of further complications. A recent study, which highlighted the poor understanding of post-dural puncture headache amongst general practitioners, prompted the authors' to design pamphlets for general practitioners and patients with the intention of improving the early recognition and management of post-dural puncture headache.

Failure to recognize these rare cases of subdural haematoma can have permanent and fatal consequences. Therefore, in the puerperium, it is crucial to investigate persistent or recurrent headache, particularly those associated with neurological signs, and a CT or MRI scan should be performed as appropriate.

Whilst an epidural blood patch usually provides almost instantaneous relief for a post-dural puncture headache, its longer-term efficacy is probably only 60±70%. This case suggests that an epidural blood patch, contrary to popular belief, may not provide protection against the more devastating complications of a dural puncture and in addition highlights the ongoing responsibility anaesthetists have to mothers who suffer an accidental dural puncture.

References


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Incremental spinal anaesthesia for elective Caesarean section in a patient with Eisenmenger’s syndrome

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We describe a new approach to anaesthesia for elective Caesarean section in a woman with Eisenmenger’s syndrome. Incremental regional anaesthesia was performed using a microspinal catheter and haemodynamic monitoring included transthoracic bioimpedance cardiography. This approach allowed the disadvantages of general anaesthesia and invasive cardiac output monitoring to be avoided.

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Eisenmenger’s syndrome includes any condition in which a communication between the systemic and pulmonary circulations gives rise to pulmonary vascular disease, which in turn causes a right to left shunt. It is a rare condition that poses a significant risk of maternal death, with the mortality of between 30 and 70%, having changed little over the last 50 yr.1–4 Eighty per cent of deaths occur between the 2nd and 30th post-natal day,1 but it remains unclear whether the choice of anaesthetic technique influences the outcome. The primary anaesthetic goal is to avoid any haemodynamic change that might increase the right to left shunt and thereby increase hypoxaemia. With this in mind, many practitioners have avoided regional anaesthetic techniques in favour of general anaesthesia. We describe a regional technique that, to our knowledge, has not been previously reported in this context.

Case report
A 28-yr-old woman with complex cyanotic heart disease was referred at 27 weeks gestation to our Antenatal Anaesthetic Clinic. Her cardiac pathology had been classified as a form of Eisenmenger’s syndrome and consisted of mitral atresia, a single ventricle, atrial septal defect, transposition of great arteries with pulmonary hypertension, and subsequent pulmonary vascular obstructive disease. Her condition had not been considered amenable to surgery, other than by heart/lung transplant. This was contraindicated by her marked thoracic scoliosis, which had resulted in significant restrictive respiratory disease. Her medical management consisted of nifedipine and frusemide, and she underwent regular venesection for secondary polycythaemia to maintain haemoglobin at approximately 15 g dl⁻¹. Despite counselling and advice that pregnancy carried a significant risk of death, she was determined to have children. After four miscarriages, her fifth pregnancy had progressed without significant problems apart from some fetal growth retardation.

Her condition at 27 weeks gestation had deteriorated from her non-pregnant state, with central cyanosis and dyspnoea, worsening with speech. At that time, the obstetricians had made a provisional plan to perform an elective Caesarean section (LSCS) at 35 weeks, so the anaesthetic choices and risks were explained to the patient and her family at an Anaesthetic Antenatal Clinic consultation. A formal management plan was reserved until nearer the delivery date in order to take changes in her condition into consideration. She was subsequently admitted at 29 weeks because of increasing dyspnoea, and her diuretic and thromboprophylactic treatments were optimized. Because of continuing dyspnoea and poor fetal growth, it was decided to perform the LSCS at 32 weeks.

In the anaesthetic room, the patient was dyspnoeic with an oxygen saturation of 77% in air and an arterial pressure of 120/60. Peripheral venous and radial arterial lines were sited followed by a right internal jugular triple lumen catheter that revealed a central venous pressure (CVP) of 13 mm Hg. Meticulous attention was paid to the avoidance of bubbles in lines and syringes because of the risk of paradoxical embolus.

With the patient in the sitting position, a 32-gauge Ruschke catheter was inserted through a 24-gauge Sprotte spinal needle at the third to fourth lumbar spinal interspace. In order to avoid maldistribution of the injected solution, the catheter was pushed only 2–3 cm past the needle tip. Before giving any drugs through the catheter, the patient was placed in the supine position with left lateral tilt, and oxygen therapy was instituted via a Hudson mask. This increased the oxygen saturation from 77 to 80%. Non-invasive cardiac output monitoring was then established using the transthoracic bioimpedence method (NCCOM3, BoMED Manufacturing, Irvine, CA, USA), indicating a cardiac output of 3.0 litre min⁻¹. Antibiotic prophylaxis was administered. No formal fluid preload was performed, but a slow infusion of 0.9% saline was commenced.

After first giving diamorphine 300 μg through the spinal catheter, incremental doses of 0.25 ml 0.5% hyperbaric bupivacaine were titrated against anaesthetic and haemodynamic effects. Over a period of 30 min, a total of 2.25 ml produced a block height to the eighth thoracic dermatome tested to touch with blunt forceps. During this time oxygenation remained unchanged, arterial pressure fell by 10 mm Hg, cardiac output rose to 3.7 litre min⁻¹, and CVP gradually fell to 6 mm Hg. This latter change was corrected with a 300 ml bolus of saline. No maternal symptoms or fetal distress occurred.

The LSCS proceeded uneventfully without pain or discomfort and no further drugs were administered through the spinal catheter. The usual bolus of oxytocin was omitted in favour of uterine massage and a slow oxytocin infusion. This produced adequate uterine contraction and blood loss was minimal. During uterine repair, an episode of dizziness coincided with a decrease in arterial pressure to 93/50. A bolus of ephedrine 3 mg restored the arterial pressure, increased the cardiac output to its highest level of 4.9 litre min⁻¹, and resolved the dizziness. This was the largest haemodynamic change during the whole procedure. A total of 1500 saline was given. Haemodynamics and oxygenation in air were almost identical to pre-operative values at the completion of surgery.

Post-operative analgesia consisted of rectal diclofenac 100 mg at the end of surgery, followed by regular 8 hourly doses of 50 mg supplemented by a codeine/paracetamol combination on request. The patient was transferred to the Obstetric High Dependency Unit from where, after 36 h, she was transferred to a routine post-natal ward. At 48-h follow-up, she gave maximal scores for peri-operative comfort and overall satisfaction, experiencing no nausea, vomiting, or spinal headache. After 10 days she was discharged from hospital, and 1 yr later both the patient and child are doing well. Ignoring medical advice, she is now planning another pregnancy.
LSCS in a patient with Eisenmenger’s syndrome

Discussion

The exact mortality for Eisenmenger’s syndrome in pregnancy is unknown, as cases that are unsuccessful are often not reported in the literature. Two recent reviews found the mortality was found to be 36 and 40%, whilst another quoted a figure of 70%. Pregnancy prevention or early termination of pregnancy is the preferred measure for improving long term survival in women of childbearing age. Despite this, 80% of women with Eisenmenger’s syndrome, who are pregnant, have been given the diagnosis before the pregnancy.

Whatever anaesthetic technique is chosen the principle remains the same. The cardiac output must be maintained and the systemic vascular resistance (SVR) must not be allowed to fall. This should ensure that there is minimal change in the amount of right to left shunt.

Several factors affected our anaesthetic plan. First, the patient wanted to be awake at the time of delivery with her partner present. Second, whilst traditional teaching has been that general anaesthesia is to be preferred to a regional technique we felt that general anaesthesia posed clear risks and disadvantages. These included the potential for increasing pulmonary vascular resistance in response to catecholamine release after laryngoscopy, during anaesthesia and in recovery given the relatively poor pain control achievable with systemic opioids. Intermittent positive pressure ventilation increases intrathoracic pressure, reduces venous return and increases pulmonary arterial pressure. This would in turn increase the right to left shunt in this patient. Also, general anaesthesia has the potential to exacerbate her respiratory disease, thereby increasing post-operative hypoxia. These hazards are avoided by regional anaesthesia, although the level of block required using a regional technique might produce excessive sympathetic block and an uncontrolled decrease in the SVR.

Epidural anaesthesia has been used successfully in this condition and, because of its slow onset, this technique reduces the chances of precipitous haemodynamic changes. However, epidural anaesthesia can produce patchy or incomplete sensory block, which may result in undesirable sympathetic stimulation, or the need to convert to general anaesthesia. In addition, the large amount of local anaesthetic that is required when an epidural is used may result in blood concentrations high enough to cause myocardial depression in such a vulnerable patient. Spinal anaesthesia is, we believe, more reliable, but a single shot approach is too haemodymanically unstable.

Our experience with incremental spinal anaesthesia using spinal catheters gave us confidence that haemodynamic stability could be maintained, particularly given that aortocaval compression would be less of a problem at 32 weeks with a growth retarded fetus.

We proceeded with the LSCS with a block height to the 8th thoracic dermatome (T8) tested to touch with blunt forceps. A study investigating the block height required for Caesarean section, concluded that absent touch sensation to the level of T4 was necessary when using a solution of plain local anaesthetic. This study needs to be repeated with spinal using lipid soluble opioids as our audit results have shown T6 to be adequate in the presence of diamorphine 300 µg. We would not normally recommend proceeding with a block as low as T8, but in this case we were anxious to minimize the sympathetic block and were confident the level could be rapidly increased if pain ensued.

Our choice of monitoring requires some comment. Pulse oximetry was the most practical way of continuously assessing the degree of right to left shunt during the peri-operative period. Invasive arterial pressure monitoring was considered mandatory simply because of the immediacy of the information provided. The assessment of cardiac filling and output was not so straightforward given the unusual anatomy of the heart. CVP may not have correlated well with left ventricular end diastolic pressure, but central access was certainly required in case of the need for resuscitation. In fact, initial readings and waveforms were entirely appropriate for the patient’s clinical condition, and subsequent changes in CVP followed the clinical picture.

Cardiac output monitoring was not considered of critical importance, given that we expected the heart to be of relatively fixed, low output. However, the BoMED, with which we have extensive experience, is a simple non-invasive method for cardiac output monitoring that is quicker, less technically demanding and more comfortable than Doppler echocardiography. Once again, this monitor gave information and trends that fitted the clinical picture. The anatomical anomalies in this patient (mitral atresia and transposition of the great arteries) would have rendered the pressures measured with a pulmonary artery flotation catheterization (PAFC) of doubtful or potentially misleading values. Thus, the decision to avoid the potential hazards of a PAFC was justified.

We chose not to give oxytocin as a bolus because it causes direct vasodilatation and reduces SVR with a compensatory increase in heart rate and cardiac output in first trimester pregnant women. We have confirmed these findings in healthy term pregnant women under spinal anaesthesia in our own as yet unpublished work. Significant hypotension after 10 units oxytocin was prevented by a mean increase in cardiac output of 80% measured with the BoMED. It was our assumption that our patient would be unable to mount such a response. Indeed, in the survey by Weiss and colleagues two of the patients who had a complicated course after systemic hypotension did so after oxytocin was administered. The policy of using uterine massage followed by a slow oxytocin infusion proved safe and effective in this case.

Whether regional or general anaesthesia is used the importance of maintaining SVR has already been emphasized. The prophylactic and therapeutic use of vasoconstrictor drugs, therefore, seems logical and attractive. Ephedrine is the most commonly used vasoconstrictor in
obstetric practice, but the tachycardia it can produce would be undesirable in a patient with Eisenmenger’s syndrome. Whilst a norepinephrine infusion has been documented to maintain SVR throughout the peri-operative period, an excessive dose of metaraminol has caused near catastrophe, presumably by increasing pulmonary vascular resistance and increasing the degree of right to left shunt. Directly acting vasoconstrictors also have the potential to compromise placental perfusion. These agents, therefore, need to be used with caution. It was decided to proceed initially with our familiar agent, ephedrine, and change to a direct acting vasoconstrictor if necessary. In the end, by using an incremental spinal approach to anaesthesia, only 3 mg of ephedrine was required during the procedure and post-operative period.

Although there is general agreement that patients with significant cardiac disease should have their obstetric care at a centre where expert cardiological and cardiac surgical help is available, debate exists about whether elective LSCS should occur on the labour ward or in the cardiac operating theatre. Successful conversion of a planned cardiac operation during the third trimester to a combined emergency LSCS and cardiac operation is well documented. With the advent of improved neonatal care, physicians managing these patients are tending to move to an elective combined approach if patients decompensate during the third trimester with a surgically correctable lesion.

However, it is particularly uncommon for patients with significant cardiac disease, undergoing an elective LSCS (without concomitant cardiac surgery), to require emergency cardiac surgery. For this reason it is probably safe for the operation to be conducted on the labour ward. The theatre staff on the labour ward may be unfamiliar with some of the monitoring required and with some of the drugs used and for this reason we may opt to carry out the LSCS in a cardiac operating theatre. This is despite the knowledge that cardiac surgery will not be an option and that the obstetric and neonatal staff are working in a strange environment. The risks and benefits of each operating theatre are always considered before making a final decision about the place of delivery.

The FDA withdrew approval to use small-bore catheters for continuous spinal anaesthesia in April of 1992 after several case reports of cauda equina syndrome. The view in the UK was that this problem was because of the pooling of excessive doses of hyperbaric 5% lidocaine rather than the catheters per se. Although microspinal catheters were never withdrawn in the UK, the dwindling world market led to manufacturers abandoning their production. The Ruschke kit used for this case report is, therefore, no longer available. Larger catheters may introduce an unacceptable incidence of post-dural puncture headache, as they have to be passed through an even larger spinal needle. An alternative is the Braun ‘catheter-over-needle’ system where a 22-gauge spinal catheter covers a 27-gauge Quinke spinal needle with the sharp point outside the catheter.

References