RECENT ADVANCES IN OBSTETRIC PAIN RELIEF

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Whilst the majority of pregnant women will deliver their babies without meeting an anaesthetist, or indeed even an obstetrician, a small fraction will require a caesarean section or request an epidural when the pain of labour becomes too severe to tolerate. Traditionally, an effective epidural produced a degree of motor block in the lower limbs which forced the patient to remain in bed and imposed a considerable burden of lifting on the midwife looking after her. Newer techniques aim to provide pain relief whilst retaining motor power in the legs, which means that walking is possible, and this is associated with a greater degree of satisfaction than the traditional epidural technique. Anaesthesia for caesarean section is most commonly a spinal or epidural, with only a minority performed under general anaesthetic. Developments in very fine bore pencilpoint spinal needles have reduced the risk of a post-dural puncture headache. The combined spinal epidural technique and use of intrathecal and epidural opioids have ensured an effective surgical block with pain relief extending well into the post-operative period.

EPIDURAL PAIN RELIEF FOR LABOUR

For most women labour is an extremely painful process. An ideal analgesic for labour needs to be effective with minimal side-effects for the mother and baby. None of the currently available techniques is ideal. Entonox (gas and air) is in fact a 50:50 mixture of nitrous oxide and oxygen. It is a potent analgesic and weak anaesthetic agent which is inhaled as a contraction starts and is generally thought to carry a very low risk. The use of entonox, however, encourages hyperventilation, respiratory alkalosis inhibits oxygen unloading by maternal haemoglobin and the low arterial pCO₂ causes apnoea once the contraction is over, leading to maternal hypoxia. Opiates are not very effective at dealing with the intermittent pain from contractions. They cause sedation and disinhibition which is greatly disliked by many women. Perhaps the aspect that worries parents most is the fact that the drug will cross the placenta and lead to sedation and respiratory depression in the baby. Meptazinol, an opiate agonist antagonist which is less potent than pethidine, has fewer harmful effects on the baby but is also less effective at relieving pain.

Epidural analgesia can completely abolish the pain from contractions without harmful effects on the fetus. The mother does not feel "drugged" and is able to participate fully in a painless birth. It is, however, an invasive procedure with the potential of a catastrophic outcome if improperly managed. Deaths have occurred due to local anaesthetic toxicity when large doses of bupivacaine have been injected intravenously by accident. Incorrect placement of the epidural catheter can lead to unexpectedly high blocks causing severe hypotension and if the block extends as high as the brain stem, loss of

consciousness and respiratory arrest will occur. It is essential that if an epidural analgesia service is provided the midwives looking after these women are fully aware of the potential problems and that an anaesthetist is rapidly available.

NEW TECHNIQUES

1 'Walking epidurals'

Until recently epidural analgesia inevitably produced some degree of motor block in the lower limbs and abdomen. As a result mothers were obliged to remain in bed and were often unable to push effectively in the second stage. Newer techniques have concentrated on producing analgesia with minimal motor block (Figure 1). This is achieved by reducing the concentration of local anaesthetic and adding an opiate to the epidural top-up mixture. It is postulated that if there is minimal motor weakness the rate of instrumental deliveries will be lower. This has not been confirmed by randomised trials comparing low dose epidurals with conventional techniques, but women report greater satisfaction and more feeling of self-control when motor power is not lost in the legs⁽¹⁾.

Figure 1 - Effective epidural analgesia no longer requires a mother to remain confined to bed

Much of the pioneering work on 'walking epidurals' was performed by Barbara Morgan, an obstetric anaesthetist at Queen Charlotte's Hospital in London. The concept that a patient with a functioning epidural could actually walk created considerable interest from both the anaesthetic community and the lay press. At Queen Charlotte's the epidural rate has increased from 38.4% when conventional epidural techniques were used, to 67.3% when the mother is aware that she will retain mobility and not feel numb⁽²⁾. The use of pethidine or other opiates in this unit is virtually non-existent. The Queen Charlotte's technique is combined spinal epidural analgesia. Initial pain relief is obtained with a spinal injection of a mixture of bupivacaine and fentanyl which has a very rapid onset of analgesia. This provides about 90 minutes of analgesia and further top-ups are given when required via an epidural catheter placed at the time of the initial injection. The majority of women are able to walk, sit in a chair and pass urine spontaneously. Often women are still aware of the contractions without pain and are able to push more effectively in the second stage of labour. Walking or remaining upright during labour has several theoretical advantages:

- 1 aortocaval compression is abolished, improving placental blood flow
- 2 the upright position allows gravity to assist in cervical dilatation and encourages correct positioning of the fetal head.
- 3 it has been shown to shorten the length of labour when compared with a group of women who remained recumbent in bed⁽³⁾.

Before the ambulatory epidural was introduced, any woman requiring potent analgesia was automatically forced to remain recumbent in bed. It has been argued that an easy labour allows ambulation rather than *vice versa*. At Queen Charlotte's I was one of a team who performed a randomised controlled study where women who had requested epidural analgesia were allocated either to remain in bed or to be mobile during labour. There was no difference in length of labour, mode of delivery or fetal condition between the groups (Harding, Collis, Morgan unpublished data). In fact the average proportion of the first stage of labour spent mobilising was only 33% but the mothers were very satisfied that they had the opportunity to do so if they wished.

The low-dose epidural which was introduced in Lancaster in February 1996 is a similar technique except that the first dose of analgesia is given via the epidural and consequently the onset of pain relief is slightly slower, in the order of 15 minutes compared with five minutes for a spinal injection. This is not clinically a problem and the greater technical difficulty and invasiveness of a combined spinal epidural mean that this technique is reserved for caesarean sections and other situations where rapid onset of pain is an advantage. The first dose of the epidural is given by the anaesthetist to exclude intravascular or intrathecal placement and to assess effectiveness. When the contractions start becoming painful again the midwife administers a top-up, from a syringe containing 15ml of a bupivacaine/fentanyl mixture prepared under aseptic conditions in pharmacy. Each top-up provides between one and two hours of pain relief and can be repeated throughout labour as required. In Lancaster we have found that, once their pain has been relieved, most women are happy to lie on their beds and rest although some find that sitting in a chair is more comfortable. The feedback

that I have received from mothers and midwives has been favourable and some have reported alternative positions for labour and delivery. The epidural rate in Lancaster is around 20% which is the national average.

2 Patient-controlled epidural analgesia

Another new technique which we hope to introduce in Lancaster in the near future is patient-controlled epidural analgesia or PCEA. As with PCA for post-operative pain management, the patient presses a button to deliver a top-up when she feels the pain returning. Advantages are the instantaneous delivery of the top-up on request and greater satisfaction of the woman being in control of her analgesia. Disadvantages are, of course, the cost of the infusion pumps and administration sets and the danger that the vigilance of the attending midwife will be reduced as he or she is no longer involved in the actual administration of the top-ups. For women who specially wish to remain mobile the PCEA infusion pump is yet another piece of medical machinery which will tie them to their beds.

Ropivacaine is a recently introduced local anaesthetic agent which is claimed to have a safer toxicity profile than bupivacaine⁽⁴⁾. It is also reputed to produce less motor block for equivalent analgesia than does bupivacaine⁽⁵⁾. It would be attractive to be able to avoid the use of fentanyl, an opioid drug with the possible side effects of respiratory depression, sedation, nausea and itching. Being a controlled drug it must be kept in a locked cupboard and every top-up must be signed out in the controlled drugs book. The results of clinical trials are awaited to see whether ropivacaine alone can provide satisfactory analgesia with the minimal motor block seen with low-dose bupivacaine/fentanyl mixtures.

HELPING PATIENTS TO DISCUSS EPIDURAL ANALGESIA

So what factors worry women and deter them from requesting the most effective form of pain relief in labour? The Cumberledge report⁽⁶⁾ stresses the principle of mothers having the right to choose, but in order for them to make a balanced choice they need accurate information. Common fears regarding epidural analgesia include getting backache afterwards, having a needle in the back, being permanently paralysed, not being able to push properly and needing forceps, not being able to move around during labour and taking away the natural childbirth experience⁽⁷⁾. The midwife's attitude to and experience of epidural analgesia naturally play a very important role in a mother's decision.

Epidurals have been accused of causing longterm backache, prolonging the length of labour and increasing the rate of instrumental delivery and caesarean section. Backache is very common following pregnancy and recent evidence suggests that having an epidural for labour does not increase its incidence^(8,9,10). The patients who benefit most from an epidural are those having a long, difficult labour, ie those more likely to require instrumental delivery or emergency caesarean section. An attempt has been made to resolve these issues at Northwick Park Hospital where a randomised controlled trial comparing pethidine with epidurals in labour has been performed (as yet unpublished). Women were asked to give their consent to be included in the trial before the onset of labour. Unfortunately many of the pethidine group ended up also having an epidural because the pain relief from

pethidine was inadequate. This demonstrates the difficulty in performing such a trial. An interesting audit of practice from Guildford demonstrated that a rise in the percentage of women choosing epidural analgesia did not lead to a corresponding rise in the instrumental delivery rate. Over a three-year period, coinciding with the introduction of low-dose epidurals, the epidural rate had increased from 34.1% to 42.4%. The spontaneous delivery rate in women with epidurals increased from 49.6% to 56.3% but the overall normal delivery rates, instrumental delivery and caesarean section rates remained unchanged⁽¹¹⁾. It is likely that an epidural is just one of the many contributory factors determining whether an instrumental delivery will be required.

When performing an epidural there is the risk that the needle may pass through the epidural space and puncture the dura surrounding the nerve roots and CSF. This is intentional when performing a lumbar puncture or spinal anaesthetic but if it occurs with the large epidural needle the leak of CSF will be significant. Most patients will suffer a debilitating spinal headache which can be longlasting and has been associated with serious morbidity including cranial subdural haematoma. The reported incidence of accidental dural tap in the UK varies between 3.6% and 0.3%⁽¹²⁾. Post-dural puncture headache is the commonest symptom associated with litigation following regional anaesthesia in the US⁽¹³⁾. All but the mildest of headaches with features typical of CSF leakage, ie marked postural exacerbation and neck stiffness, should be treated promptly with an epidural blood patch.

Neurological problems such as paraplegia, cauda equina syndrome, epidural abscess and nerve root palsy have been reported with and without epidural analgesia⁽¹⁴⁾. Pelvic entrapment neuropathies, once a well-recognised consequence of childbirth, are now likely to be blamed on the epidural, if one was used⁽¹⁵⁾. Serious neurological complications are extremely rare and their incidence is difficult to establish. What should we tell a woman who is asking us whether an epidural is safe? A recently published prospective audit of 10,995 obstetric epidurals from a specialist hospital in Australia is reassuring⁽¹⁶⁾. Over a five-year period there were no deaths. Eight blocks were unexpectedly high, two of which required intubation and ventilation. Both were mothers having an elective caesarean section. Mild local anaesthetic toxicity occurred in four women (0.04%). Convulsions or cardiotoxicity did not occur. Neurological complications were confined to a single epidural catheter-induced traumatic mononeuropathy causing numbness of the lateral aspect of the foot. No major neurological complications occurred. Holdcroft *et al*⁽¹⁷⁾ examined all neurological complications persisting for more than six weeks in association with pregnancy and delivery in the North West Thames region. They found that one in 2,530 deliveries had such a complication, but epidural analgesia was considered contributory in only one of 13,007 patients.

My advice to women wondering whether to opt for epidural analgesia is as follows: epidural analgesia is a complicated technique with possible serious side-effects. It is, however, the most effective method of pain control available. If labour is progressing normally most women will manage with other methods of pain relief and the pain will rapidly be replaced by a feeling of exhaustion and elation following delivery. Obviously, until a woman is experiencing the pain of her labour she cannot decide whether she

will need an epidural. If labour is prolonged due to a malpresentation or another factor, or if there is slow progress and a caesarean section looks a possibility an epidural will be particularly helpful. The commonest reason for requesting an epidural is to relieve pain. Women often say, after the birth, "I was dead set against an epidural before labour started but I don't think I could have managed without it", which is understandable. As for side effects, there will often be some tenderness at the site of insertion which will last for about three days but other backache is unlikely to be related to the epidural. There is about a 1% chance of a dural tap resulting in a severe headache. The blood pressure may fall, requiring an intravenous infusion and close monitoring. Serious neurological complications, local anaesthetic toxicity and high blocks are so rare that it is impossible to quantify the risk. The baby is not adversely affected provided maternal blood pressure does not fall significantly. Heavy legs and inability to push are rare with newer low-dose epidural techniques.

ANAESTHESIA FOR CAESAREAN SECTION

Over the last decade Lancaster has followed the national trend away from general anaesthesia (GA) for caesarean section towards an increasing use of spinal anaesthesia as the method of choice (Figure 2). In 1997 at the RLI only 16% of women having elective caesarean sections were asleep: the remainder all had a spinal or combined spinal epidural anaesthetic. This is mirrored by the emergencies where obviously urgency demands a greater use of general anaesthesia. The GA rate for emergency caesarean section has fallen from 77% in 1991 to 31% in 1997. A further 34% had an epidural, which had been sited for labour, topped up to

Figure 2 Proportion of elective caesarean sections in Lancaster, performed under spinal, epidural or general anaesthesia 1991, 1994 and 1997

Figure 3 Proportion of emergency caesarean sections in Lancaster, performed under spinal, epidural or general anaesthesia 1991, 1994 and 1997

provide anaesthesia for a caesarean section and 35% were performed under spinal (Figure 3).

The reduction in the use of general anaesthesia is due in part to the realisation that this population is at high risk for airway complications. Difficulty with intubation is increased in pregnant women and they are prone to regurgitation of gastric contents with the risk of pulmonary aspiration. This risk continues into the recovery period. The triennial Confidential Report into Maternal Mortality has persistently highlighted that the majority of maternal deaths directly attributed to anaesthesia have resulted from airway problems associated with general anaesthesia. As well as being safer, a well-conducted regional anaesthetic allows both parents to be present at the caesarean birth of their baby. Some surgeons are even happy to let the father cut the cord if he wishes. Maternal bonding can start immediately following delivery, rather than being clouded by a haze of anaesthetic and narcotic agents (Figure 4). During general anaesthesia the baby will inevitably be exposed to the anaesthetic as all the lipid-soluble general anaesthetic agents easily cross the placenta resulting in a greater need for neonatal resuscitation. Other advantages of regional techniques are a much lower requirement for postoperative opiate analgesia, a reduction in the incidence of deep vein thrombosis and a reduced requirement for blood transfusion when compared with general anaesthesia.

Spinal anaesthesia is a long-established technique which has several advantages over epidural anaesthesia. The onset is considerably faster, and the quality of block more reliable than an epidural, where patchy or incomplete anaesthesia can occur. The dose of bupivacaine required to produce an epidural block from T4 to S5 is often close to the maximum safe dose and significant systemic absorption will occur. Unrecognised intravascular or intrathecal injection would have disastrous consequences. A spinal is performed using one-tenth of the dose so that these problems do not occur. The major drawback of spinal anaesthesia is the possibility of the development of a post-dural puncture headache. A severe post-dural headache which classically disappears on lying down and may be associated with neck stiffness and photophobia is thought to be due to leakage of CSF through the puncture hole, resulting in low pressure in the CSF surrounding the brain. The development of post-dural

puncture headache is closely related to age, with younger patients more likely to suffer, and young obstetric patients are at extremely high risk. The last thing a young mother with a new baby to care for needs is a severe headache which confines her to bed in a darkened room. It has long been realised that a post-dural puncture headache is more likely and more severe the larger the needle used to perform the dural puncture. Very fine 26G and even 29G spinal needles have been developed in the hope that the smaller the puncture hole the less likely will be the development of a headache. These very fine needles are difficult to use and allow only a very slow flow of CSF. Even a 26G standard needle results in a post-dural puncture headache incidence of 10% which many feel is too large a risk to take⁽¹⁹⁾. The recent surge in popularity of spinal anaesthesia amongst obstetric anaesthetists has been due to the development of rounded or pencilpoint needles which were first advocated as long ago as 1926⁽²⁰⁾. These needles have a blunt tip which is thought to part the dural fibres rather than cut through them resulting in a smaller leakage of CSF. They did not achieve widespread popularity until the 1980s. The use of 25G or finer pencilpoint needles has reduced the incidence of post-dural puncture headache to below 1%, an incidence it is felt reasonable to accept given the other advantages of spinal anaesthesia. A recent editorial in the BMJ urges physicians performing diagnostic lumbar puncture to learn from anaesthetic experience and to alter their practice⁽²¹⁾. Whilst very fine needles cannot be used because the flow of CSF is too slow, by switching from the standard 20G needle to a 22G pencilpoint one the incidence of headache could be reduced sixfold from 30% to 5%.

Combined spinal epidural anaesthesia is a technique which has found increasing popularity with obstetric anaesthetists. The epidural space is located with a standard epidural needle. This serves as an introducer for a fine, usually 26 or 27G, spinal needle and a spinal block is performed. The spinal needle is withdrawn and an epidural catheter inserted into the epidural space. The epidural catheter can be used to top up the block if it does not reach a high enough dermatomal level, or if surgery is taking longer than anticipated and the spinal block begins to recede. The epidural catheter may also be used to administer postoperative pain relief. Small doses of intrathecal and epidurally-administered opiates give good quality pain relief with a reduction in the side effects such as drowsiness and nausea commonly seen with systemic administration.

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Figure 4 The majority of elective and emergency caesarean sections are performed under spinal or epidural anaesthesia, allowing both parents to be present at the birth of their baby

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