Advances in labour analgesia

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LABOUR results in severe pain for most women. The ideal labour analgesia technique should dramatically reduce the pain of labour, while allowing the parturient to actively participate in the birthing experience. In addition, it should have minimal effect on the fetus or the progress of labour. New labour analgesia techniques approach this goal. This lecture will review these new methods of pain relief for the parturient and will highlight their benefits and risks. The discussion will include spinal opiates and combined spinal-epidural (CSE) analgesia, patient controlled epidural analgesia, and continuous spinal analgesia. I will also discuss the controversy surrounding the impact of epidural analgesia on the Cesarean section rate.

Regional analgesia for labour

Of all the possible methods of pain relief which can be used in labour, neuraxial blockade (epidural, spinal, CSE, continuous spinal) provides the most effective and least depressant analgesia. Epidural analgesia via a catheter technique provides excellent pain relief and the ability to extend the duration of the block to match the duration of labour, but it is not "instant" in onset and may be associated with motor block. One-shot spinal analgesia using a lipid soluble opioid is rapid and simple, but is associated with a limited duration of action. The combination of epidural and spinal anesthesia into one technique, termed "CSE" provides the advantages of a spinal (speed of onset, lack of motor block) with the additional flexibility of renewal with an epidural catheter. All three of these regional techniques have advantages and disadvantages and decision about which to use should be individualized to best fit the needs of the individual parturient. A recent article discusses all of these techniques and is an excellent review of the subject for the non-anesthesiologist.[1]

CSE analgesia

The first reports of CSE described placing an epidural catheter at one interspace and subsequently initiating a spinal anesthetic at a second interspace. The disadvantage of this technique as it was originally described, was that it necessitated two separate anesthetics at two different interspaces and utilized a "traumatic" spinal needle. The evolution of CSE has been in the direction of a "needle-through-needle" technique. For more information on this technique, I recommend a recent review which thoroughly describes the evolution of this technique from its introduction to its present use.[2]

CSE can be safely used to provide labour analgesia in parturients who are to receive an epidural for labour. There are, however, specific patients who will greatly benefit from this technique. These include patients in early or late labour. Patients in early labour can be made comfortable with spinal narcotics (such as sufentanil or fentanyl) which will last for approximately two to three hours, during which time the patient will not have a motor block and will be able to ambulate. The major advantage of CSE for patients in late labour is the almost immediate pain relief. Because CSE allows for ambulation of the parturient, it has been called the "walking epidural." A recent study has evaluated CSE and "mobile epidurals" and has concluded that CSE provides better pain relief in the early stages after insertion.[3]

CSE analgesia for labour is usually achieved using a short-acting lipid soluble narcotic such as fentanyl or sufentanil. Although morphine has been described as an intrathecal opiate for labour, it has several disadvantages including slow onset, incomplete analgesia, prolonged nausea and pruritus, and delayed respiratory depression. Although pruritus is associated with lipid soluble opioids, it is usually mild and short lived and does not generally need to be treated. A review of the complications associated with CSE has concluded that CSE is as safe a technique as a conventional epidural technique and is associated with greater patient satisfaction.[4]

The following opioids are most often used to produce analgesia in the labouring patient:

- sufentanil 2.5 to 10 μg;
- fentanyl 10 to 25 μg.

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Lipid soluble opioids, even administered via the subarachnoid route, may not always provide adequate analgesia if given to the parturient who is in advanced labour. In cases where the second stage of labour is imminent, the subarachnoid administration of a combination of local anesthetic plus opioid should be considered. The combination of sufentanil 2.5 to 5 μg plus bupivacaine 2.5 mg provides rapid analgesia without motor block, alleviates the pain of the second stage of labour, and lasts longer than sufentanil alone.[5]

Possible complications and side effects of intrathecal opioids for labour

CSE has been reported to be as safe as conventional epidural techniques. Side effects and complications, however, can occur and include the following:

- pruritus;
- nausea/vomiting;
- hypotension;
- urinary retention;
- uterine hyperstimulation and fetal bradycardia;
- maternal respiratory depression.

Uterine hyperstimulation/fetal bradycardia

It has been suggested that spinal opioids, perhaps due to their associated decrease in maternal catecholamines, may precipitate uterine hypertonicity and fetal bradycardia.[6] However, several recent reports have evaluated the incidence of fetal bradycardia and emergency Cesarean section following CSE and have not found an increase in these complications.[7,8]

Postdural puncture headache (PDPH)

Because the CSE technique includes a dural puncture, there has been concern regarding the potential for PDPH. The use of small bore "atraumatic" spinal needles will reduce the incidence of PDPH in patients receiving CSE to approximately 1% or less. In addition, it has been suggested that the incidence of unintentional dural puncture is less in CSE patients than in patients receiving conventional epidurals.[4] One possible explanation for this finding is that, as part of the CSE technique, the spinal needle may be used for verification of correct placement of the epidural needle when there is inconclusive loss of resistance.

Subarachnoid migration of the epidural catheter

This risk has been extensively studied and does not appear to be a risk of the CSE technique. Holmstrom[9] found in a cadaver study that it is almost impossible to pass an epidural catheter through a single dural hole made by a 25 g spinal needle. Special epidural needles with a separate port for the spinal needle are now available and should totally prevent the unintentional subarachnoid threading of the epidural catheter. Regardless of needle used, all epidural doses should be incremental.

Respiratory depression

Sufentanil and fentanyl-induced central respiratory depression have been reported[10] but are extremely rare. Although respiratory depression might have resulted from potentiation of the respiratory depressant effect of a parenterally administered opioid, respiratory depression following spinal opioids may also occur in patients who have not had parenteral opioids.[11] This respiratory depression occurs acutely and therefore any patient receiving CSE must be appropriately monitored for signs of respiratory depression for a period of at least 20 min following administration of the subarachnoid opioid.

Other advances in labour analgesia

Continuous infusion of dilute local anesthetic plus opioid

A major advance in epidural analgesia has been the routine use of continuous infusion of dilute local anesthetics plus lipid soluble opioids by continuous infusion. These infusions have provided better pain relief while producing less motor block. Maternal and neonatal drug concentrations have been tested and continuous infusions have been demonstrated to be safe for both mother and neonate.[12] A common infusion for labour analgesia is 0.0625% bupivacaine with 2 $\mu g \cdot mL^{-1}$ fentanyl, with or without epinephrine, infusing at 10 to 12 $mL \cdot hr^{-1}$.

Patient controlled epidural analgesia (PCEA)

PCEA may provide several advantages, including the ability to minimize drug dosage, flexibility and benefits of self administration, and reduced demand on professional time.[13] This technique may be of great benefit since self control and maintenance of self esteem may be vital to a positive experience in childbirth. It has been suggested that PCEA during labour is now a useful alternative and safe when small doses of dilute bupivacaine are administered with each bolus, reasonable hourly limits are prescribed, and periodic assessments by anesthesiologists are made.[14] Controversy still exists regarding the use of a continuous basal infusion in addition to patient controlled boluses. Although basal infusion plus patient demand may be associated with larger doses than if the basal infusion is withheld, the addition of a basal infusion provides for a more even block and may therefore produce greater patient satisfaction.

Continuous spinal analgesia with microcatheters

Due to an association with cauda equina syndrome, spinal microcatheters have been restricted by the Food and Drug Administration (FDA). An ongoing multi-institutional study which is being undertaken with FDA approval is evaluating the safety and efficacy of delivering sufentanil and/or bupivacaine into the intrathecal space via a 28-g catheter. Although results are still preliminary, to date it appears that continuous spinal analgesia for labour using a 28-g microcatheter is safe and may offer several advantages.[A] Currently, for very high-risk parturients, many anesthesiologists are using spinal "macrocatheters" (standard epidural catheters placed in the spinal space following an intentional "wet tap"). Although this technique has a high incidence of spinal headache, it gives the greatest control in providing neuraxial analgesia and anesthesia.

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