New Techniques for Labor Analgesia

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In the most recent survey (1997), results indicate that more than 50% of women in the United States have a regional anesthetic during labor (Table 1) (1). About 50% have parenteral medications, either alone or before receiving regional analgesia. Only about 10% of parturients receive no analgesia, but these women might incorporate "natural childbirth" techniques such as ambulation, warm water, breathing exercises, hypnosis, acupuncture, doula attendants (2), etc. Anesthesiologists are not usually involved with these patients, nor are we usually involved in the selection of single-dose parenteral medications. However, anesthesiologists can add to the analgesic options available to the patient.

IV Patient-Controlled Analgesia for Labor

Some patients are not candidates for regional analgesia for labor (because of coagulopathy, back instrumentation, etc.) or do not want to have a regional anesthetic. Parenteral opioids can be titrated via patient-controlled analgesia (PCA) to provide moderate analgesia and good patient satisfaction. Several studies have shown a 65% satisfaction score ("would use this method again") with IV PCA. The PCA doses may have to be adjusted up or down as labor progresses, depending on patient tolerance. Good analgesia during a contraction usually means maternal respiratory depression between contractions. Another difficulty is assessing the fetus for potential depression. Studies using fentanyl PCA have not shown any increase in neonatal problems; a large study using meperidine PCA had a 5% incidence of treatment with naloxone at delivery.

Some sample "formulas" for PCA use in labor include the following:

- The patient should receive 10 mg metoclopramide IV to potentiate analgesia (3).
- Nalbuphine (4), 5–10-mg loading dose IV.
  Concentration of 1 mg/mL.
  Increment of 1 mL.
  Lockout of 6 min.
  Discontinue when completely dilated.
- Fentanyl (5–7), 50–100-μg loading dose IV.
  Concentration of 25 μg/mL.
  Increment of 2 mL.
  Lockout of 10 min.
- Meperidine (8), 50-mg loading dose IV (with or without 25 mg promethazine).
  Concentration of 10 mg/mL.
  Increment of 1–1.5 mL.
  Lockout of 10 min.
- All patients should have respiratory rates and sedation scores monitored.
- Pulse oximetry and supplemental oxygen should be available.

Epidural PCA for Labor

Several studies have compared epidural PCA with continuous infusions or intermittent top-up doses for labor and found that patients using PCA will administer about half as much bupivacaine as the other techniques to achieve the same pain control and height of block (9,10). As in other PCA techniques, the psychological benefit of control for the patient seems to supplement the effect of the medication, leading

Table 1. Types of Labor Analgesia Provided in the United States in 1997 (%)

Type of analgesia	Stratum I (≥1500 births)	Stratum II (500–1499 births)	Stratum III (<500 births)
None	11	11	17
Parenteral	39	53	50
Paracervical	2	3	6
Spinal	4	7	12
Epidural	52	43	25
Combined spinal and epidural	10	5	5

to a smaller dose requirement. Interestingly, policy change by the Association of Women's Health, Obstetric, and Neonatal Nurses regarding care of epidural catheters in the laboring patient (i.e., labor and delivery nurses cannot increase infusion rates or give bolus doses from the pump) has made the option of epidural PCA more popular, especially for anesthesia practices in hospitals without a residency training program. Time-management studies have shown a 40% reduction in personnel requirements with epidural PCA versus continuous infusions, yet with excellent patient satisfaction.

Follow these steps to set up the epidural PCA infusion:

1. First, bolus the epidural to achieve adequate analgesia in the usual manner.
2. Concentration: 0.125% bupivacaine with 2 μg/mL fentanyl.
3. Increment: 5 mL.
4. Lockout: 15–30 min.
5. Basal: 10 mL/hr.

Any combination of basal rate and incremental dose that achieves a minimum of 12 mL/h seems to be equally effective (11), but much higher volumes—up to 30 mL—are often used.

Intrathecal (Spinal) Analgesia, or the "Walking Epidural"

Why bother with this technique of regional analgesia for labor? First, immediate gratification: the block is rapid in onset, gives complete analgesia, is never one-sided or spotty, and allows fairly controllable spread. Second, safety: the subarachnoid doses used are so small that the risks of local anesthetic toxicity or total spinal are negligible or absent. Third, flexibility: patients in the latent phase of labor can be given intrathecal fentanyl or sufentanil and allowed to ambulate, whereas multiparous parturients or patients dilated >8 cm can be a given single-shot spinal dose of a local anesthetic/narcotic combination for fast and complete pain relief during active labor and delivery.

Follow these guidelines for choice of drugs (12) and clinical management (Table 2):

- Early labor (<5 cm)
  Fentanyl 25 μg.
  Sufentanil 5–10 μg.
  Consider ambulation.
  Dose epidural catheter when pain returns, or immediately start a small-dose infusion at 12–15 mL/h.
- Active labor (>5 cm)
  Fentanyl 25 μg + 0.5–1 mL 0.25% bupivacaine (1.25–2.5 mg) (13).
  May use sufentanil 10 μg alone if the patient is motivated to ambulate.
  Begin usual epidural infusion at 12–15 mL/h.
- Second stage
  Need somatic anesthesia now with local anesthetic properties.
  Narcotic and local anesthetic mix, as above.
  Meperidine 20-mg saddle block.
  Duration is 60–90 min; may not even need an epidural catheter.

Following is a technique for combined spinal and epidural analgesia for labor:

- Identify the epidural space in the usual way.
- Insert a ≥120 mm, 24–27-gauge pencil-point needle through the epidural needle until it passes into the subarachnoid space. Ensure free flow of cerebrospinal fluid.
- Inject opioid, with or without local anesthetic, as a 1–3-mL volume.
  Remove the spinal needle.
  Insert the epidural catheter into the epidural space and secure.
  Monitor blood pressure, sedation, and fetal heart rate for 30 min.

In some cases, it may be preferable to convert to a continuous spinal technique that uses the epidural catheter (after a "wet tap" in morbidly obese patients, who have a very low incidence of postdural puncture headache, or in a patient with prior back surgery, such as placement of Harrington rods). In rare cases, a single-shot combination of fentanyl 25 μg and morphine 0.25 mg can be used to provide up to 6 h of analgesia with minimal hemodynamic changes, although side effects may be prohibitive (14,15).

The following list offers recommendations for managing complications:

- Itching
  Nalbuphine 2.5–5 mg IV.
  Propofol 10–20 mg IV.
  Naloxone 40 μg IV (last resort).
  Naltrexone 25 mg PO (after delivery).
  Use of diphenhydramine is questionable because it is too sedating.
- Nausea and vomiting
  Metoclopramide 10–20 mg IV.
  Nalbuphine 2.5–5 mg IV.
  Propofol 10–20 mg IV.
  Naloxone 40 μg IV (last resort).
  Naltrexone 25 mg PO (after delivery).
- Hypotension: treat with fluids and ephedrine.
- Respiratory depression (16)
  Nalbuphine 20 mg IV.
  Naloxone 0.2–0.4 mg IV.

Table 2. Lipid-Soluble Opioids for Labor Analgesia

Drug	Dose	Duration (min)	Comment
Fentanyl	15–30 μg	30–120	rapid onset, short duration
Sufentanil	5–10 μg	60–180	more itching, provides slightly better analgesia than fentanyl
Meperidine	10–20 mg	60–180	significant local anesthetic effect, vomiting common (20%–30%)
Hydromorphone	40 μg	60–180	preliminary data only

Most problems associated with the combined spinal/epidural technique are minor and easily managed (e.g., itching) (17). However, it is a relatively new technique in this country, and a number of concerns are often voiced by anesthesiologists when considering adding this to their practice. Fortunately, most have turned out to be potential rather than actual problems. Following are examples.

1. Is there an increased risk of postdural puncture headache?—No. In fact, the risk is the same or less than when using a standard epidural technique because the rate of "wet tap" is less (18). However, you must use an atraumatic spinal needle.
2. Is fetal distress more common after intrathecal narcotics?—Probably not, but maybe. There have been case reports of acute fetal bradycardias (variable decelerations), possibly associated with uterine hypertonicity. Recent studies indicate that nonreassuring fetal heart rate tracings are no more common after intrathecal sufentanil than after traditional epidurals (19) and that emergency cesarean delivery does not occur more often (20). However, another group found a higher incidence of profound fetal bradycardia requiring emergency cesarean delivery after intrathecal sufentanil than after IV meperidine (21). Because the etiology of the bradycardia is probably uterine hypertonicity, nitroglycerin or terbutaline is the logical treatment, rather than ephedrine.
3. What if there is no cerebrospinal fluid return from the spinal needle?—This happens about 10% of the time. Either the spinal needle is too short, you are off the midline and bypassing the dural sac, or your epidural needle is not actually in the epidural space.
4. Will my epidural catheter migrate through the hole in the dura?—In several large series, this does not seem to happen (16,22). Also, cadaver studies have shown that it is almost impossible to pass an epidural catheter through a single dural hole made by a 25-g spinal needle (23). There are now special kits in which the epidural needle has a back hole for introducing the spinal needle via a different path than the epidural catheter. However, these are quite expensive in comparison with adding a single pencil-point spinal needle to your epidural tray, and they have not been shown to have any advantage.
5. How do you test the epidural catheter once the intrathecal dose is working?—It is imperative that you always aspirate your catheter. (24) Whatever you use for the intravascular component of your test dose (epinephrine, fentanyl, air, etc.) can be the same. It is harder to test the intrathecal component, but a hyperbaric dose of local anesthetic will produce motor block. Alternatively, you can wait until the intrathecal dose wears off and test-dose the catheter in the usual fashion. Finally, you can start a dilute epidural infusion. If the catheter migrates intravascularly, the block will dissipate. If the catheter migrates intrathecally, the block will intensify and progress to motor block. Neither scenario is dangerous to the patient.
6. Will you pick up paresthesias when placing the catheter after the intrathecal dose?—Yes. In addition, patients often have a paresthesia with the catheter if they had one when the spinal needle was placed. Obviously, any paresthesia must resolve before drug is injected.
7. Why do I often see breakthrough pain about 90 min after the intrathecal dose when my epidural infusion is already running?—You're seeing a window between the intrathecal analgesia wearing off and the epidural infusion taking full effect. Try increasing the initial infusion rate to 15 mL/h or increasing the initial concentration in the pump to 0.125% bupivacaine. You can decrease the rate or concentration after a few hours if the patient is comfortable. Or, just plan to check on the patient after 90 min, and add a small (5 mL) top-up dose if needed.

Setting Up a Protocol for Ambulation

Although there are no data showing any impact of ambulation (12,25) on the outcome of labor (26,27), there is significant "political" benefit with patients, obstetricians, and midwives to be able to provide such effective analgesia and still allow the patients to be out of bed and ambulatory. The British have experience with thousands of patients in which ambulation has been safely allowed when following a set protocol. If

you wish to set up such a protocol, include the following:

1. There must be no obstetric contraindication to the patient ambulating or to intermittent fetal monitoring. Follow the American College of Obstetricians and Gynecologists guidelines on intermittent fetal monitoring.
2. After the anesthetic is placed, monitor maternal and fetal vital signs for 30 min. If hypotension occurs, it is almost always in the first 30 min. There should be a reassuring fetal monitor strip. There have been reports of increased variable decelerations after intrathecal narcotics, perhaps because of an increase in uterine contractility (28).
3. After 30 min, have the patient lift her leg off the bed, to assess motor strength. If it is normal, have her sit on the side of the bed, and reassess her blood pressure. If this also is normal, have her stand at the side of the bed, recheck orthostatic vital signs, and have her do a slight knee bend to be sure her motor function is completely intact. At this point, she can sit in a chair, walk to the bathroom, or walk in the halls on the labor and delivery unit, with someone in attendance.
4. The patient should be instructed to let the anesthetist know as soon as she feels a return of contractions, so a top-up dose can be given before all analgesia is lost.

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