TECHNIQUES OF LABOR ANALGESIA

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GOALS OF LABOR ANALGESIA

- Dramatically reduce pain of labor
- Should allow parturients to participate in birthing experience
- Minimal motor block to allow ambulation
- Minimal effects on fetus
- Minimal effects on progress of labor

TECHNIQUES OF LABOR ANALGESIA

- Continuous epidural analgesia
- Patient-controlled epidural analgesia (PCEA)
- Combination of the above two techniques
- Combined spinal-epidural analgesia (CSE)
- Spinal opiates
- Intermittent epidural bolus injections
- Continuous spinal analgesia

CHOICE OF LOCAL ANESTHETIC

- Ideal local anesthetic should have:
- Rapid onset with minimal motor block
- Minimal risk of maternal toxicity
- Negligible effects on uterine activity and uteroplacental perfusion
- Limited uteroplacental transfer
- Long duration of action

LOCAL ANESTHETICS

- Bupivacaine: Onset 8-10 min, duration 2 hrs, dilute solution-no motor block, tachyphylaxis-rare, umbilical vein/maternal vein ratio 0.3
- Ropivacaine: Considered less cardio-depressant and arrythmogenic than bupivacaine
- Cleared more rapidly after IV injection than bupivacaine
- 40% less potent, equipotent doses (0.0625% bupivacaine≈0.1% ropivacaine), therefore, probably no advantage in terms of toxicity
- Longer duration of action, ? Less motor block

LOCAL ANESTHETICS

- Levobupivacaine: Levorotatory enantiomer of racemic bupivacaine, less potential for cardio toxicity than bupivacaine
- Lidocaine: May not provide analgesia comparable to bupivacaine, umbilical vein/ maternal vein ratio: twice than bupivacaine
- 2 Chloroprocaine: Ester, rapid onset, duration 40 min, adversely affects efficacy of subsequently administered bupivacaine and opioids
- Old preparations of chloroprocaine: EDTA or Na Bisulfite as preservative, current preparations preservative free with higher pH

LOCAL ANESTHETICS

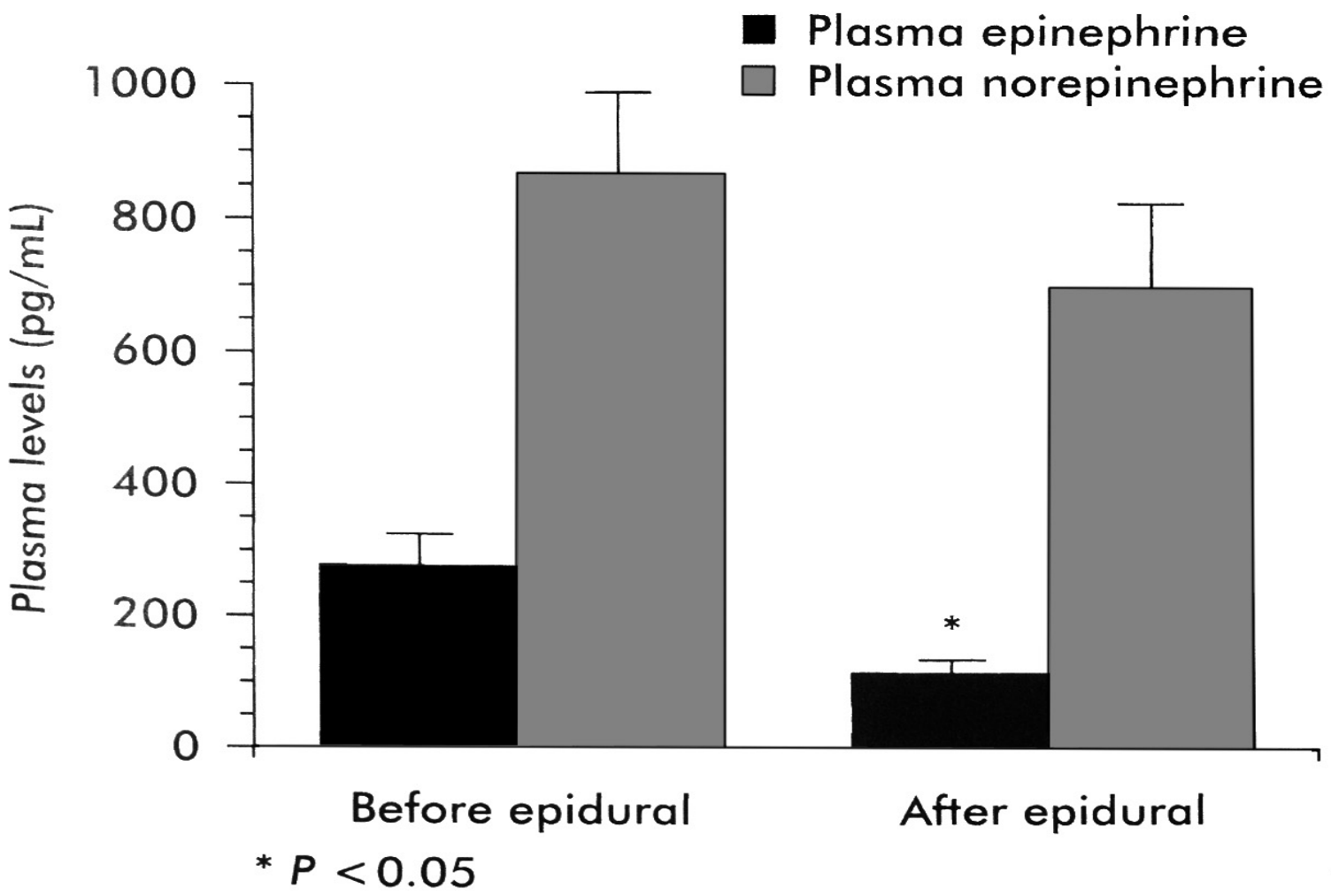
- Continuous infusion:
- Bupivacaine 0.0625%-0.25%-8 -15 ml/hr
- Ropivacaine: 0.125%-0.25%- 6 -12 ml/hr
- Lidocaine: 0.5%-1% -8-15 ml/hr
- 2-chloroprocaine 0.75% -27 ml/hr
- Intermittent bolus injections:
- Bupivacaine: 0.125%-0.375%, 5-10 ml, duration:1-2 hr
- Ropivacaine: 0.125%-0.25%, 5-10 ml, duration: 1-2 hr
- Lidocaine: 0.75%-1.5%, 5-10 ml, duration: 1-1.5 hr
- 2 chloroprocaine 1-2%, 5-10 ml, duration: 0.75-1 hr

NEURAXIAL OPIOIDS

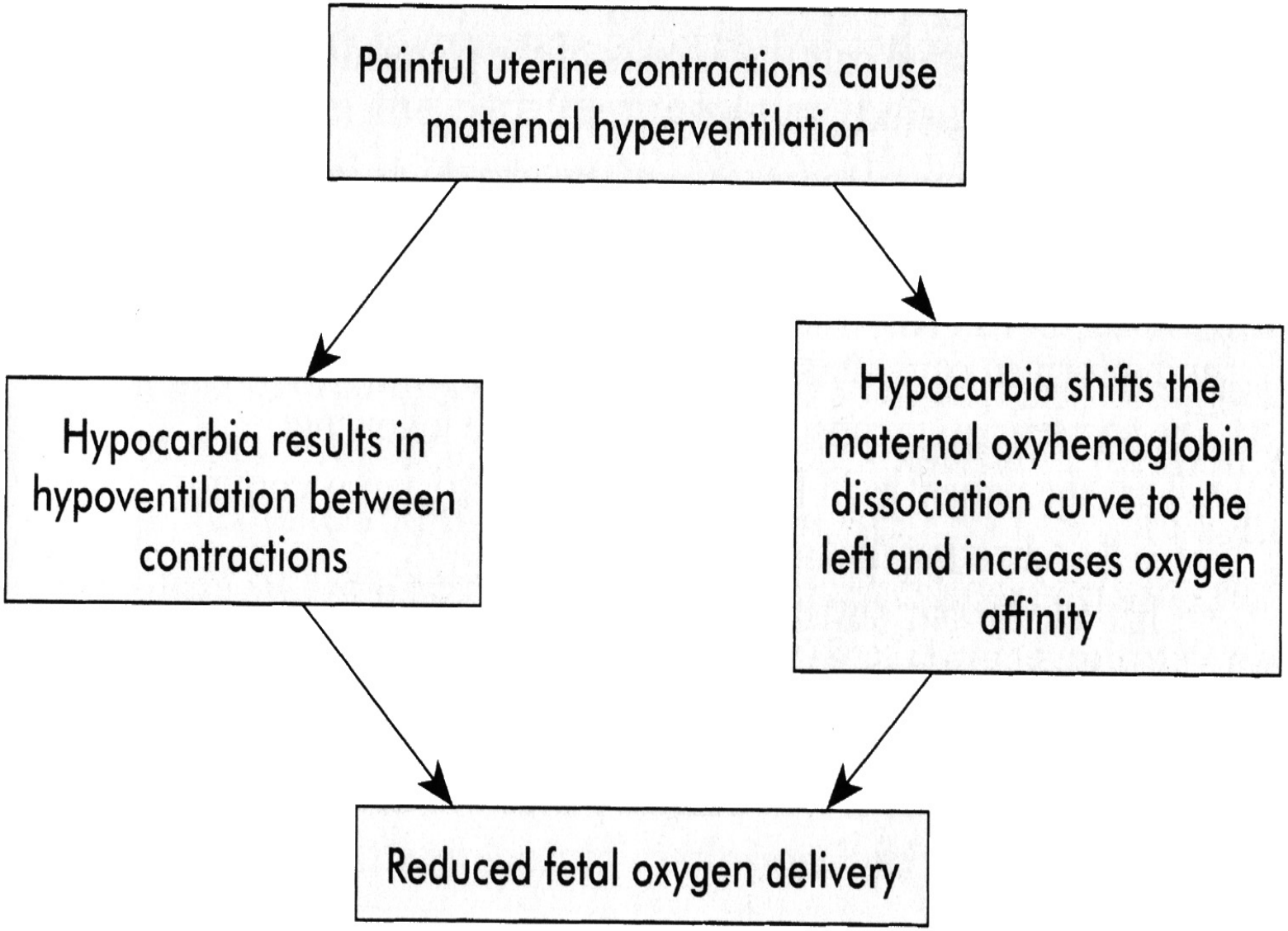
- The following opioids have been used:
- Morphine, fentanyl, sufentanil, meperidine, methadone, diamorphine, butorphanol
- Side effects: Pruritus, nausea and vomiting, hypotension, respiratory depression (first two hrs-fentanyl, sufentanil; up to 16 hrs with morphine), urinary retention, delayed gastric emptying, reactivation of herpes simplex virus, fetal bradycardia from uterine hyperstimulation (no increased incidence of cesarean section)

EPIDURAL ANALGESIA

- Provides excellent pain relief reducing maternal catecholamines
- Decreases maternal hyperventilation
- Ability to extend the duration of block to match the duration of labor
- Facilitates delivery of twins, delivery of preterm infants and vaginal breech delivery
- Blunts hemodynamic effects of uterine contractions: beneficial for patients with preeclampsia, mitral stenosis, spinal cord injury, intracranial neuro-vascular lesions.



Influence of epidural analgesia on maternal plasma concentrations of catecholamines during labor. Modified from Shnider SM et al. Maternal catecholamines decrease during labor after lumbar epidural analgesia. Am J Obstet Gynecol 1983;147:13-5.



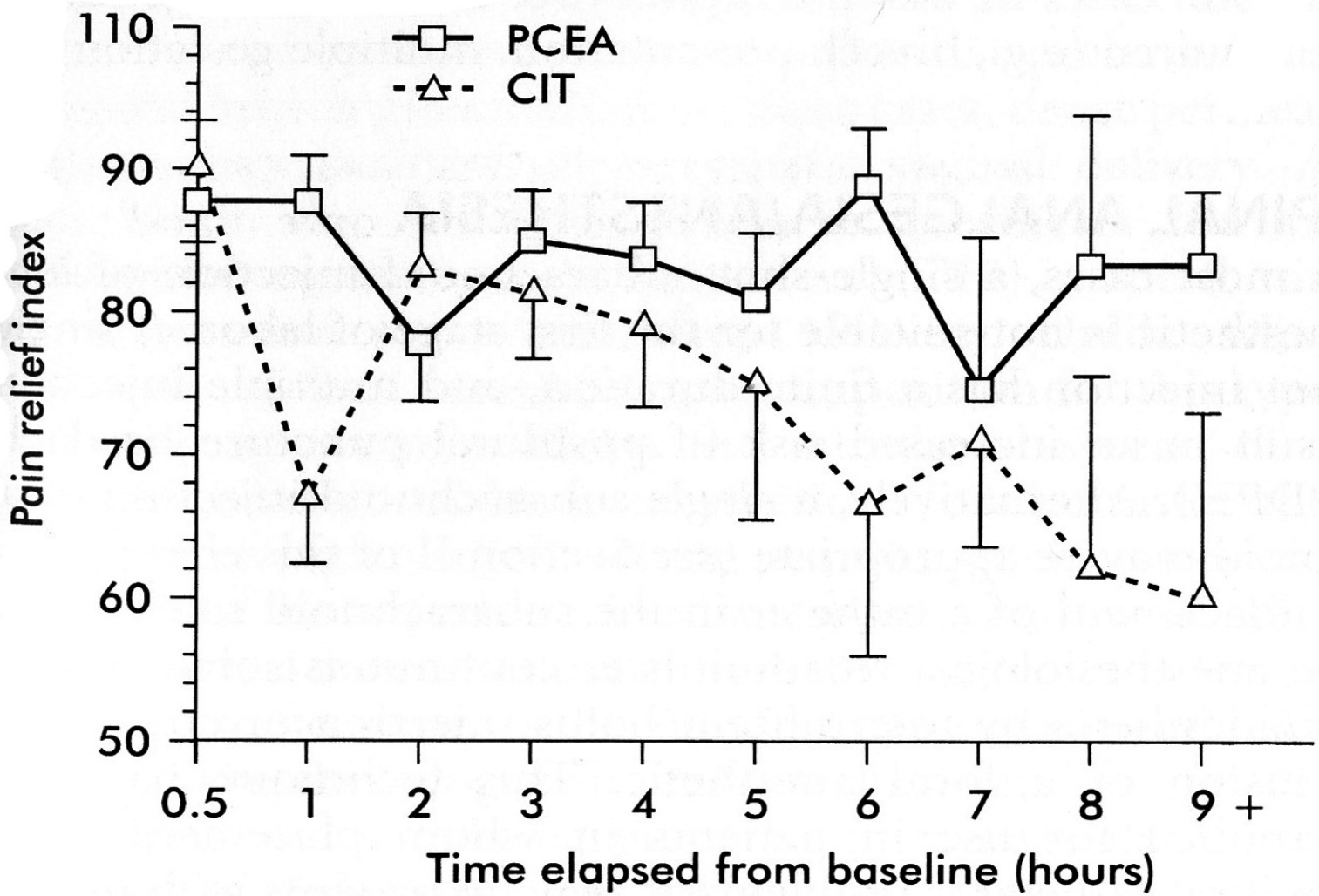
Potential effects of maternal hyperventilation and subsequent hypocarbia on oxygen delivery to the fetus

EPIDURAL ANALGESIA

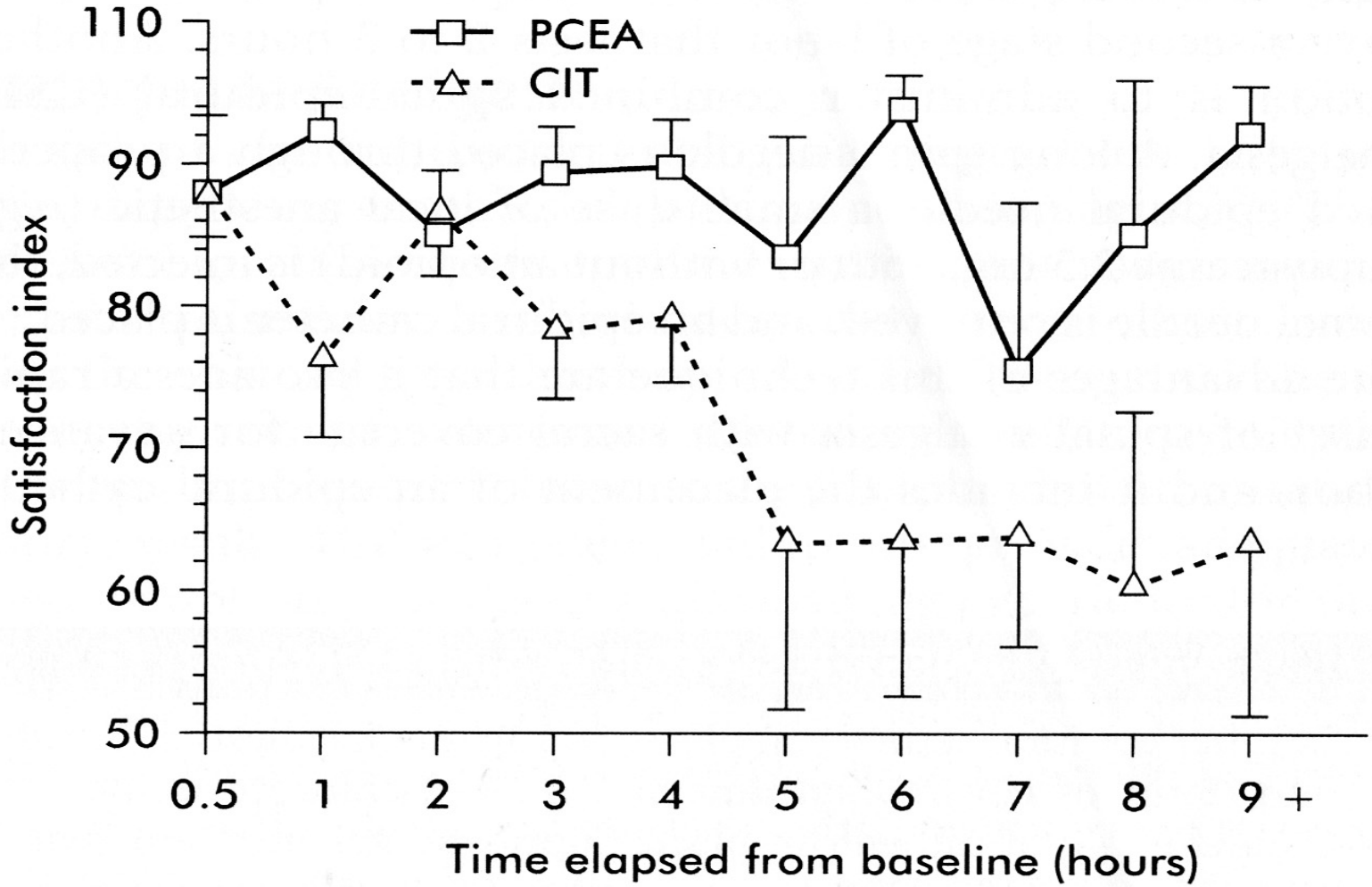
- Disadvantages:
- Not instant in onset
- May be associated with motor block
- Postdural puncture headache (50-85% with 16 or 18-G Tuohy's needle)

EPIDURAL ANALGESIA

- Continuous Epidural Infusion:
- Maintenance of stable level of analgesia
- More stable maternal heart rate and blood pressure with decreased risk of hypotension
- Studies suggest administration of greater dose of local anesthetic with continuous infusion technique
- Patient Controlled Epidural Analgesia (PCEA):
- Greater maternal satisfaction due to autonomy
- Lower dose requirement than continuous infusion
- Combination of continuous infusion+PCEA



From Gambling DR et al. Comparison of patient-controlled epidural analgesia and conventional intermittent top up injections during labor. Anesth Analg 1990;70:256-61.



From Gambling DR et al. Comparison of patient-controlled epidural analgesia and conventional intermittent top up injections during labor. Anesth Analg 1990; 70:256-61.

LEVEL OF BLOCK

- High Level: Can result from high dose or subdural/subarachnoid migration of catheter
- Low level: Can result from intravenous migration of catheter, catheter outside the epidural space or administration of inadequate dose of local anesthetic

COMBINED SPINAL-EPIDURAL

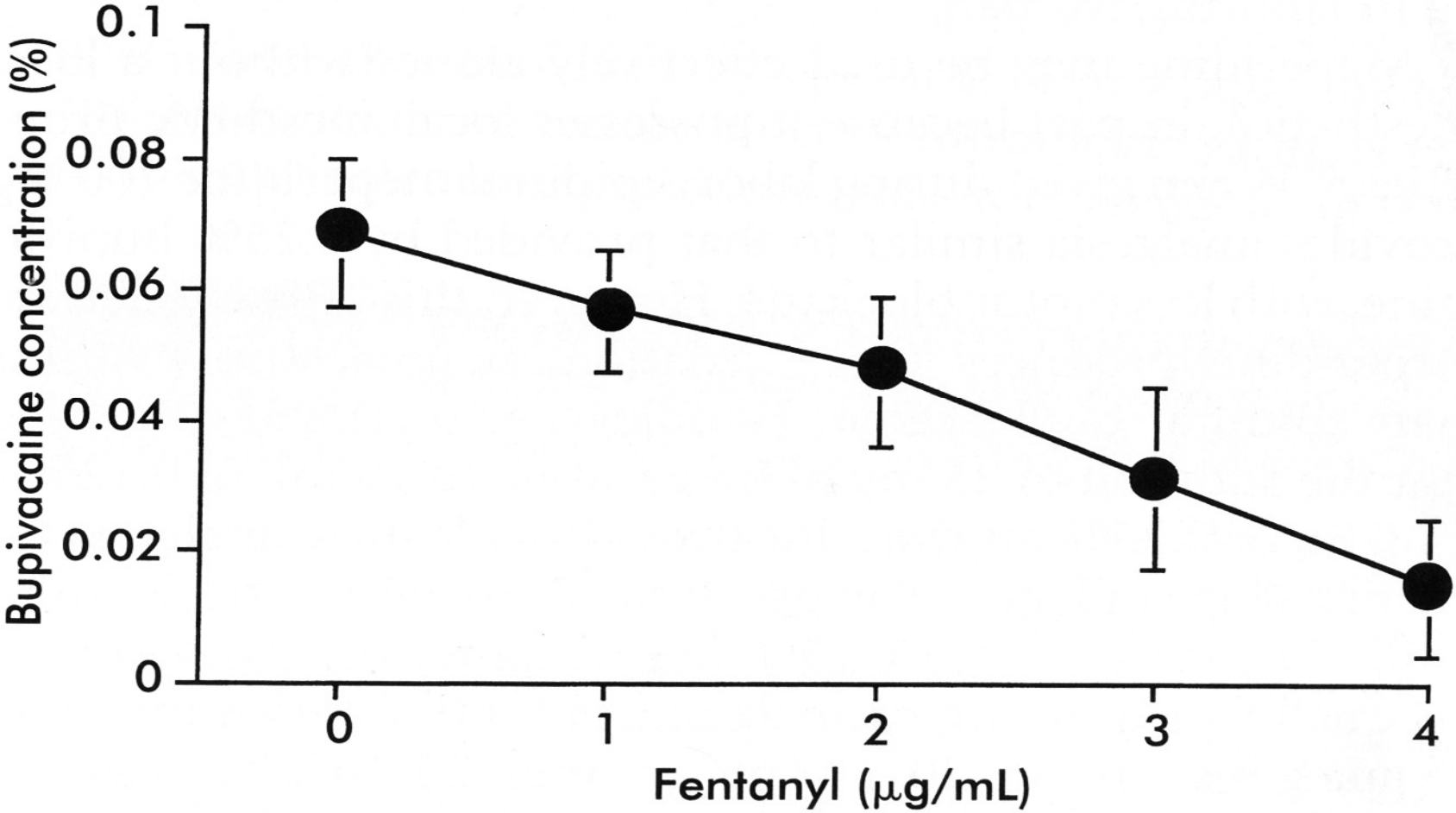
- Faster onset due to intrathecal injection
- Lack of motor block if only opioid used for spinal
- Additional flexibility of renewal/top ups with epidural
- Not recommended for morbidly obese, difficult airway or non-reassuring fetal heart rate
- Early labor: Consider using opioid alone or opioid+0.125 mg bupivacaine; Advanced labor: opioid+2-2.5 mg bupivacaine
- Doses of IT opioids: Fentanyl 5-25 μg, sufentanil 5-10 μg

COMBINED SPINAL EPIDURAL

- Initial reports: two interspace technique-epidural followed by spinal
- Later evolution of CSE in the direction of needle through needle technique
- Eldor modification: needle with small separate conduit for spinal needle with epidural needle
- Espocan needle: different exit points for spinal needle and epidural catheter through epidural needle
- Postdural puncture headache: 1% or less incidence for CSE with small bore atraumatic needles.
- Subarchanoid migration of epidural catheter: No added risk with CSE

CONTINUOUS EPIDURAL INFUSION

- Still used routinely at many centers
- Good pain relief
- Less motor block
- Maternal and neonatal drug concentrations safe if used cautiously
- We routinely use either
- 0.0625% bupivacaine+fentanyl 2.5 μg/ ml at 12 ml/hr (early labor)+demand dose: 4 ml q 15 min
- 0.125% bupivacaine+fentanyl 2 μg/ml at 8 ml/hr (advanced labor)+ demand dose : 3 ml q 15 min



Effect of epidural fentanyl on minimal local anesthetic concentration. Data from Lyons G et al. Extradural pain relief in labor: Bupivacaine sparing by extradural fentanyl is dose dependent. Br J Anaesth 1997;493-6.

PATIENT CONTROLLED EPIDURAL ANALGESIA

- Advantages:
- Flexibility and benefit of self administration
- Ability to minimize drug dosage
- Reduced demand on professional time
- Disadvantages:
- May provide uneven block
- Addition of a basal infusion provides:
- More even block producing greater patient satisfaction

CONTINUOUS SPINAL ANALGESIA

- Use of spinal microcatheters restricted by FDA in 1992 due to reports of Cauda Equina Syndrome
- 28 or 32-G catheters for 22 or 26-G spinal needles
- Ongoing multi-institutional study with FDA approval for evaluating the safety and efficacy of delivering sufentanil and/or bupivacaine via 28-G catheters
- Results still preliminary but it appears safe for labor analgesia and may offer some advantages
- Some routinely use spinal macrocatheters through standard epidural needles for obese parturients or parturients with kyphoscoliosis

INTRATHECAL OPIOIDS

- 150-300 μg morphine
- 15-30 μg fentanyl
- (ED 50:14-18 μg, ED 95: 20-30 μg)
- 5-10 μg sufentanil
- (ED 50:2-4 μg, ED 95:9-15 μg)
- 10 mg meperidine
- 0.2-0.5 mg diamorphine (heroin)

CAUDAL ANALGESIA

- First form of labor analgesia (before lumbar epidural)
- Caudal epidural associated with:
- Increased technical difficulties
- Increased local anesthetic dose requirement during first stage
- Risk of injection of local anesthetic into fetal scalp or perforation of fetal head.
- Double catheter technique: lumbar for first stage, caudal for second stage of labor

SUGGESTED READINGS

- Polley LS, Glosten B, Riley ET, Ross BK, Chestnut DH. Epidural and Spinal Analgesia/Anesthesia in Principles and Practice of Obstetric Anesthesia, Editor David Chesnut, Elsevier Mosby, PA.
- Birnbach DJ. Advances in Labor Analgesia. 2004 IARS Meeting Review Course Lectures

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