

OB ANESTHESIA OPTIONS TO SUPPORT VAGINAL BIRTH

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No Disclosures



OBJECTIVES

- Discuss programmed intermittent dosing for Labor Epidural
- Review evidence of Eating/drinking in labor without and without epidural
- Discuss the Evidence for PCA in Labor
- Compare and Contrast Fentanyl vs Remifentanyl
- Review the Role of Nitrous Oxide in Labor

Gold Standard: Labor Epidural

- Catheter based technique utilized in early 1930's
- Advances made in early 80's with use of local anesthetics and opioids
- Techniques advanced: CSE and patient-controlled pumps
- Widely used in the U.S. with some centers up to 80% laboring women
- Survey of Women epidurals are the most common form of labor analgesia

Listening to MothersSM II

Pregnancy and Birth

Survey Item	<i>LTM I</i> 2000-02	<i>LTM II</i> 2005	<i>LTM III</i> 2011-12
Base: all survey participants			
Had epidural or spinal analgesia for pain relief	63%	76%	67%
Had narcotics by intravenous drip for pain relief	30%	22%	16%
Used nitrous oxide for pain relief	2%	3%	6%
Used no pain medications	20%	14%	17%

Ideal Labor Epidural

- Effective Pain Relief
- Safe
- Minimal Effects on Progress or Outcome of labor
- Minimal effects in the fetus or Newborn
- Minimal Maternal side effects
 - Lower limb motor block
 - Pruritus
 - Nausea

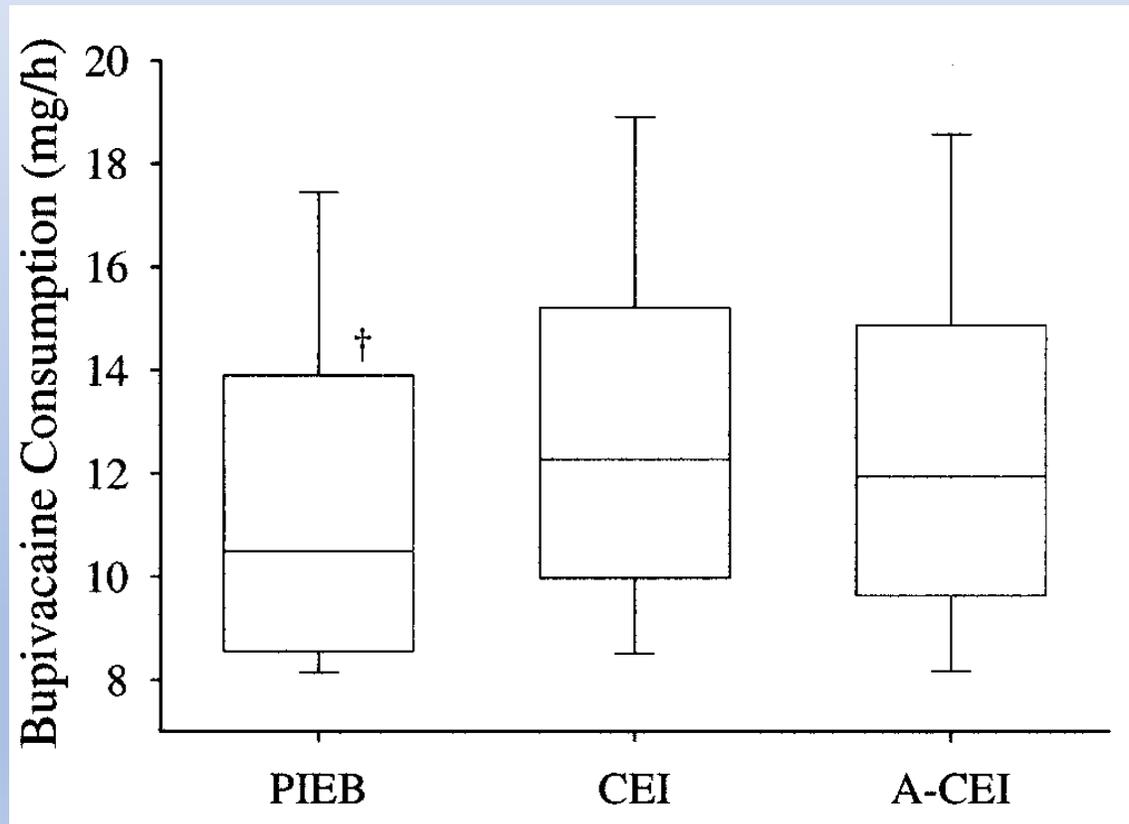
A Randomized Comparison of Programmed Intermittent Epidural Bolus with Continuous Epidural Infusion for Labor Analgesia

Wong et al. A&A 2006; 102:904-9

- Primary outcome: bupivacaine consumption (n=126)
- CSE epidural initiation
- 0.0625% Bupiv with fentanyl
- PIB 6ml q30min (400 ml/hr)
- Continuous 12 ml/hr
- PCEA for both set at 5ml q10min

A Randomized Comparison of Programmed Intermittent Epidural Bolus with Continuous Epidural Infusion for Labor Analgesia

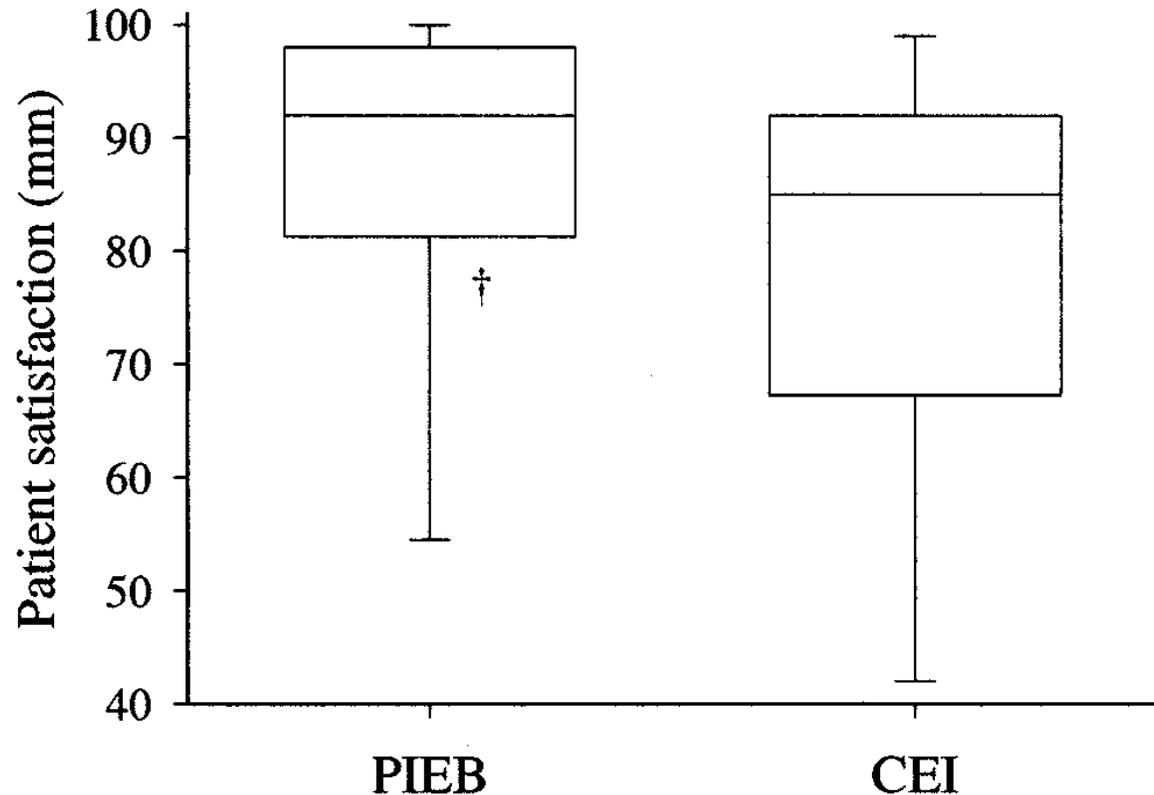
Wong et al. A&A 2006; 102:904-9



Less Local
Anesthetic Use with
PIB ($p < .01$)

A Randomized Comparison of Programmed Intermittent Epidural Bolus with Continuous Epidural Infusion for Labor Analgesia

Wong et al. A&A 2006; 102:904-9



Improved
Satisfaction with PIB
($p < .01$)

A Randomized Comparison of Programmed Intermittent Epidural Bolus with Continuous Epidural Infusion for Labor Analgesia

Wong et al. A&A 2006; 102:904-9

Fewer manual boluses by provider with PIB dosing ($p < .01$)

Programmed Intermittent Epidural Bolus Versus Continuous Epidural Infusion for Labor Analgesia: The Effects on Maternal Motor Function and Labor Outcome. A Randomized Double-Blind Study in Nulliparous Women

Giorgio Capogna, MD, Michela Camorcia, MD, Silvia Stirparo, MD, and Alessio Farcomeni, PhD

- Primary outcome: Motor Function (Bromage score)
- Secondary outcome: Mode of Delivery
- Initiation of epidural with 20 ml of Bupiv 0.0625% + sufentantil 0.5 mcg/ml (N= 145)
- PIEB dose 10ml every 60 min
- Continuous 10ml/hr
- Both groups at PCEA for breakthrough pain

Programmed Intermittent Epidural Bolus Versus Continuous Epidural Infusion for Labor Analgesia: The Effects on Maternal Motor Function and Labor Outcome. A Randomized Double-Blind Study in Nulliparous Women

Giorgio Capogna, MD, Michela Camorcia, MD, Silvia Stirparo, MD, and Alessio Farcomeni, PhD

Table 2. Labor Analgesia

	CEI (n = 70)	PIEB (n = 75)	P value
Total dose of levobupivacaine (mg)	37 (31–44)	31 (25–38)	0.001
Total dose of sufentanil (μg)	28 (24–34)	25 (20–30)	0.009
Patients requiring PCEA boluses (n)	28	6	<0.001
PCEA boluses for each patient (n)	1 (1–2)	1 (1–1)	<0.001

Data are presented as median (interquartile range) or number.

CEI = continuous epidural infusion; PCEA = patient-controlled epidural analgesia; PIEB = programmed intermittent epidural bolus.

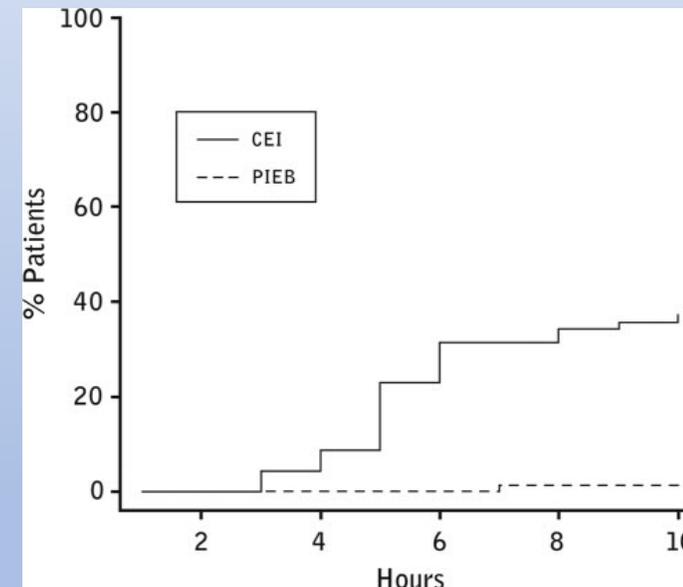


Figure 2. Percentage of patients from programmed intermittent epidural bolus (PIEB) or continuous epidural infusion (CEI) groups who had any motor block versus time after induction of labor analgesia. Data were censored for delivery. The groups were significantly different, $P < 0.001$.

Contraindications to Epidural & Spinal Anesthesia



- Patient Refusal or Inability to Cooperate
- Increased ICP from Mass Lesion
- Skin or Tissue Infection at Needle Placement Site
- Frank Coagulopathy
- Uncorrected Maternal Hypovolemia
- Inadequate Experience with Technique

Restriction of oral intake during labor: whither are we bound?

Jeffrey D. Sperling, MD; Joshua D. Dahlke, MD; Baha M. Sibai, MD

- Recommends loosening the oral intake restrictions
- In low risk laboring women allow them to eat and drink

TABLE 2

Recommendations of professional organizations on restriction of oral intake during Labor

Organization	Recommendation	Strength of recommendation
American College of Nurse-Midwives ³⁵	Self-determination regarding oral intake encouraged for women at low risk for aspiration.	Not provided
American Congress of Obstetricians and Gynecologists, American Society of Anesthesiologists Task Force on Obstetric Anesthesia ³	Clear liquids for women at low risk for aspiration. Small amounts of clear liquids up to 2 hours before anesthesia for women with no complications.	Not provided
World Health Organization (WHO) ⁴	Noninterference with desire for food or liquid intake without reason.	Not provided
Cochrane Review ⁸	Since evidence shows no benefits or harms, there is no justification for the restriction of fluids and food in labor for women at low risk of complications.	Not provided
Royal College of Obstetricians and Gynaecologists: NICE Clinical Guideline ³⁶	Women may eat a light diet in established labor unless they have received opioids or they develop risk factors that make a general anesthesia more likely.	Not provided
Society of Obstetricians and Gynaecologists of Canada ³⁷	A woman in active labor should be offered a light or liquid diet according to her preference.	Not provided
The Royal Australian and New Zealand College of Obstetricians and Gynaecologists	Women should be encouraged to only have clear fluids and light diet in the active phase of labor.	Not provided

Sperling. Restriction of oral intake during labor: Whither are we bound? Am J Obstet Gynecol 2016.

TABLE 1

Proposed high-risk conditions that may predispose to pulmonary aspiration in the setting of general anesthesia^{6,32-34}

1. Disorders/Disruption of the upper gastrointestinal tract: hiatal hernia, tracheoesophageal fistula, achalasia, esophageal stricture or neoplasm, severe gastroesophageal reflux, Zenker's diverticulum, intestinal obstruction, gastrostomy, tracheostomy, or nasogastric tube
2. Neurologic conditions: multiple sclerosis, previous cerebrovascular accident, Parkinson's disease, myasthenia gravis, chronic swallowing disorders, gastroparesis, head injury, Guillain-Barre syndrome, vocal cord paralysis, altered level of consciousness
3. Obstetric: placental abruption, preeclampsia, history of prior cesarean delivery, intra-uterine infection, severe thrombocytopenia or other concern precluding ability for neuraxial analgesia
4. Anesthesia: History of difficult intubation or airway management, or concern in present setting
5. Maternal: Class 3 Obesity (BMI ≥ 40), active seizure disorder
6. Fetal: non-reassuring fetal status, fetal growth restriction

Sperling. Restriction of oral intake during labor: Whither are we bound? Am J Obstet Gynecol 2016.

GASTRIC EMPTYING DURING LUMBAR EXTRADURAL
ANALGESIA IN LABOUR: EFFECT OF FENTANYL
SUPPLEMENTATION

P. M. C. WRIGHT, R. W. ALLEN, J. MOORE AND J. P. DONNELLY

- RCT evaluating the role of fentanyl in epidural for delayed gastric emptying
- Control-Bupivacaine
- Treatment-Bupivacaine + Fentanyl
- Delayed gastric emptying in Fentanyl group

The influence of epidural administration of fentanyl infusion on gastric emptying in labour

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Summary

The effect of epidural infusions containing fentanyl on maternal gastric emptying in labour was examined using the rate of paracetamol absorption. Women were randomly allocated to receive one of two epidural infusions, bupivacaine 0.125% alone or bupivacaine 0.0625% with fentanyl $2.5 \mu\text{g} \cdot \text{ml}^{-1}$ at a rate of $10\text{--}12 \text{ ml} \cdot \text{h}^{-1}$. Paracetamol 1.5 g was given orally to women after either 30 ml of the infusion solution had been given (mean time 2.5 h, study A) or 40–50 ml (mean time 4.5 h, study B). Six venous blood samples were taken over the next 90 min for measurement of plasma paracetamol concentration. There were no significant differences in maximum plasma paracetamol concentration, time to maximum paracetamol concentration and area under the concentration–time curve between the two groups for study A. In study B the time to maximum plasma paracetamol concentration was significantly delayed in women receiving $> 100 \mu\text{g}$ fentanyl compared with controls ($p < 0.05$). We conclude that the dose of fentanyl that may delay gastric emptying when given by epidural infusion is greater than $100 \mu\text{g}$.

Modern Obstetric-Anesthesia

- Low concentration local anesthetic
- Fentanyl added to the infusion
- Programmed intermittent bolus

Should we consider giving our patients food?

Maternal outcomes in women supplemented with a high-protein drink in labour

Manuel C. VALLEJO,¹ Benjamin T. COBB,² Talora L. STEEN,² Sukhdip SINGH¹ and Amy L. PHELPS³

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Background: Because of the potential aspiration risk, oral intake is restricted during labour.

Aims: To determine whether high-protein drink supplementation in labour decreases nausea and emesis and promotes patient satisfaction.

Materials and Methods: The study was registered with www.clinicaltrials.gov (NCT01414478). Labouring women were randomised into two groups: Group P received a high-protein drink (325 mL) with ice chips/water PRN; and Group C served as control and received only ice chips/water PRN (Study 1). Incidences of nausea and emesis were measured hourly until delivery and at 1 h postdelivery. Patient satisfaction was measured the following day. A secondary aim was to evaluate the rate of gastric emptying ($t_{1/2}$) in women who ingested either 325 mL of a high-protein drink or ice chips/water (Study 2) using ultrasound.

Results: In Study 1, 150 women were recruited (Group P = 75; Group C = 75). There were no differences in the overall incidences of nausea ($P = 0.14$), emesis ($P = 0.15$) or in the incidences at the measured time periods (MANOVA, $P > 0.05$). Median patient satisfaction scores were higher in Group P than in Group C ($P = 0.007$). In Study 2, 18 additional patients (Group P_G = 9; Group C_G = 9) were analysed to determine US gastric emptying $t_{1/2}$ rates (P_G: 25.56 ± 15.90 min [95% CI: 15.17 – 35.94] compared with C_G: 20.00 ± 8.70 min [95% CI: 14.34 – 25.66], $P = 0.19$).

Conclusion: In labour, patient satisfaction is improved with high-protein drink supplementation compared with ice chips/water with comparable gastric emptying rates.

Oral intake during labor: an alternative interpretation of recent data

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The authors report no conflict of interest.

Response- In contemporary times with limited oral intake, aspiration was associated with 7% of all maternal cardiac arrests

Providing Oral Nutrition to Women in Labor

American College of Nurse-Midwives



- Promote self-determination of appropriate oral intake
- Reaffirm pregnancy is a normal physiologic process
- Discuss the small risk of aspiration during labor and birth
- The use of epidural analgesia for intrapartum pain management in normal labor should not preclude oral intake
- Determine the practice patterns for anesthesia service

Distribution of Maternal Cardiac Arrests (n = 4,843), the Nationwide Inpatient Sample 1998–2011

	Potential Proximate Etiology of Maternal Cardiac Arrest, N (%)	Cause-specific Cardiac Arrest Frequency per 1,000 Women with Each Condition	Survival to Hospital Discharge,* N (%)
Postpartum hemorrhage	1,349 (27.9)	0.8	739 (55.1)
Antepartum hemorrhage	813 (16.8)	0.9	433 (53.2)
Heart failure	645 (13.3)	15.6	458 (71.1)
Amniotic fluid embolism	645 (13.3)	252.7	337 (52.5)
Sepsis	544 (11.2)	2.1	256 (46.9)
Anesthesia complication	379 (7.8)	29.5	310 (81.9)
Aspiration pneumonitis	346 (7.1)	20.3	287 (82.9)
Venous thrombo embolism	346 (7.1)	43.9	144 (41.5)
Eclampsia	296 (6.1)	6.2	226 (76.5)
Puerperal cerebrovascular disorder	212 (4.4)	13.6	85 (40.0)
Trauma	125 (2.6)	3.9	29 (23.3)
Pulmonary edema	118 (2.4)	11.2	83 (70.9)
Acute myocardial infarction	150 (3.1)	89.8	85 (56.3)
Magnesium toxicity	66 (1.4)	5.2	57 (85.9)
Status asthmaticus [†]	54 (1.1)	12.6	29 (53.7)
Anaphylaxis [†]	15 (0.3)	10.8	15 (100)
Aortic dissection/rupture [†]	14 (0.3)	31.0	0

Numbers of arrests from local anesthetic toxicity cannot be reported due to restrictions on reporting small cell sizes.

* Survival is missing for 0.2% of those with cardiopulmonary arrest.

[†] Estimates with a relative standard error (*i.e.*, standard error/weighted estimate) >0.30 may not be reliable.

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Practice Guidelines for Obstetric Anesthesia

*An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology**

- Recommendations oral intake of moderate clears may be allowed for uncomplicated laboring patients
- Scheduled cases clears 2h before induction of anesthesia, Solids 6 to 8h before
- Laboring patients with additional risk factors for aspiration should have further restriction for oral intake. Solid foods should be avoided in laboring patients.

Conclusion-Oral Intake

- Oral Intake during labor should take into consideration both maternal and fetal considerations
- Aspiration is still a REAL concern in Obstetrics
- Clear protein beverages did not change labor outcomes but improve patient satisfaction

Patient who is 34 yo G1P0 at 39 weeks with concern for Severe Pre-E vs. HELLP undergoing induction of labor and platelets dropping from 120k to 80k. Patient is requesting analgesia for contraction pain. Anesthesia consult called, but in the meantime and you start talking to her about her options you tell her...

A- She can have Fentanyl IV bolus or a Fentanyl PCA

B-There is new medication called Remifentanyl she could try

C-She can have an epidural you think it will be fine

D-You suggest Nitrous oxide

E-You give her a “bark of wood” and hope for the best

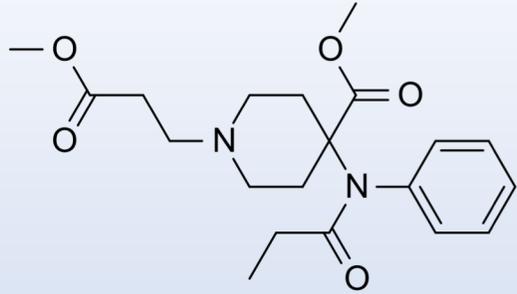
Opioids

- Bind to specific receptors in CNS
- 4 major opioid receptors- mu (μ_1 and μ_2), kappa, delta, sigma
- Modulated through descending inhibitory pathway from periaqueductal gray matter to dorsal horn of spinal cord



Fentanyl

- High protein binding
- Lipid soluble
- No active metabolites when crossing the placenta
- Metabolized by the cytochrome P system via liver
- Reversed by naloxone
- Slows gastric emptying
- Respiratory depression
- Crosses placenta quickly to fetal F/M = .50



Remifentanyl

- Ester structure
- Metabolized into inactive metabolite by non-specific esterases in plasma
- Metabolism allows for lack of accumulation
- Context sensitive half-life = 3.5 min, respiratory depression half-life = 2.5 min
- Rapid onset of analgesia = 30-60 sec; Peak at 2.5 min
- Crosses placenta and metabolized by placental and fetal nonspecific esterases
- F/M ratio = .50

Labor PCA

Is it a viable Alternative to Labor Epidural?

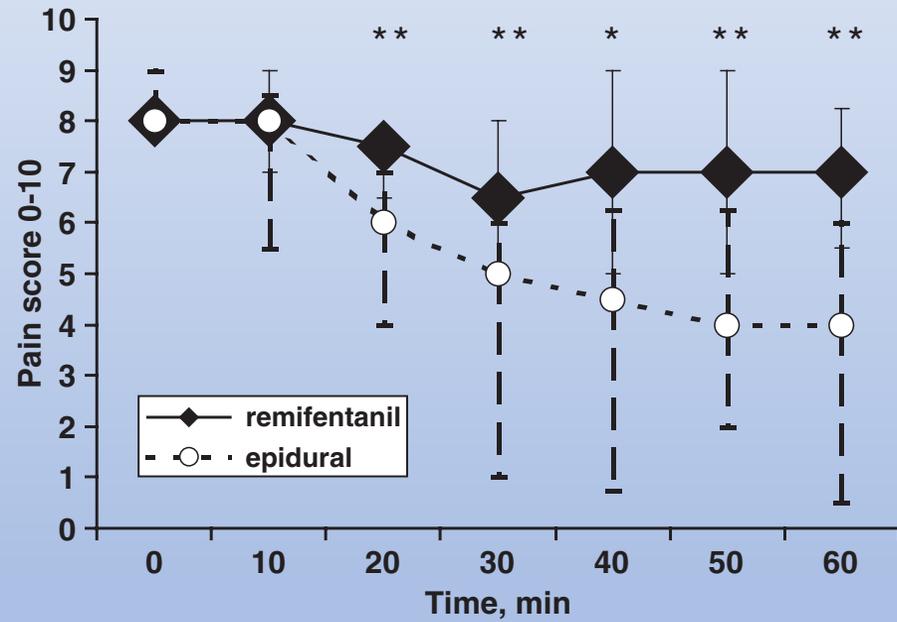
Intravenous remifentanyl vs. epidural levobupivacaine with fentanyl for pain relief in early labour: a randomised, controlled, double-blinded study

P. VOLMANEN¹, J. SARVELA², E. I. AKURAL³, T. RAUDASKOSKI⁴, K. KORTTILA² and S. ALAHUHTA³
¹Lapland Central Hospital, Rovaniemi, Finland, ²Department of Anaesthesia and Intensive Care, Helsinki University Central Hospital, Helsinki, Finland, ³Department of Anaesthesiology, University of Oulu, Oulu, Finland and ⁴Department of Obstetrics and Gynaecology, University of Oulu, Oulu, Finland

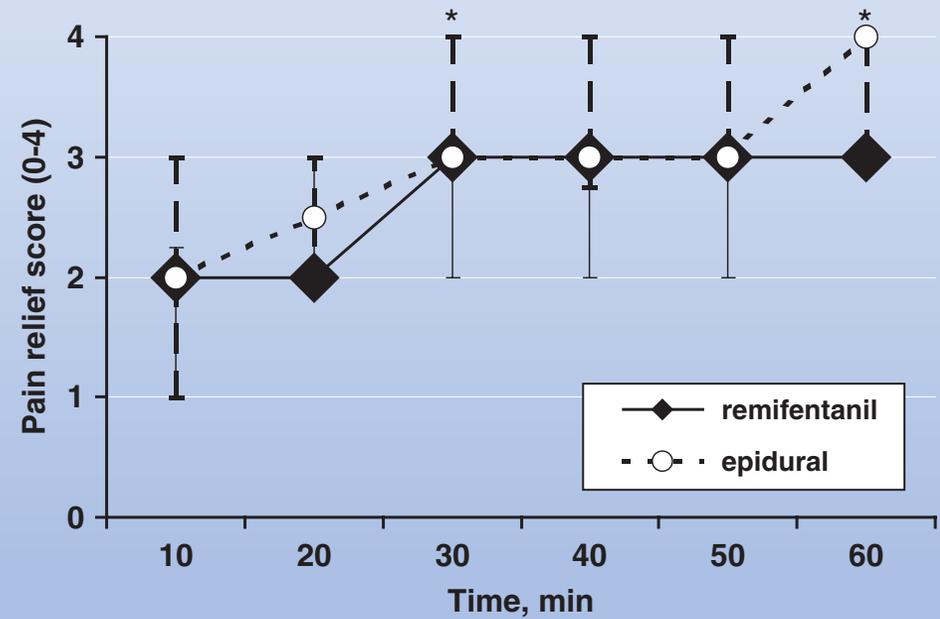
Pain scores were lower in epidural group, which indicates epidural was superior for pain control

However, pain relief scores were no different between the groups

Pain Score -VAS



Pain Relief Score- PRS



Remifentanil and Labor:

Table 1. Summary of Remifentanil Studies for Labor Analgesia

	Remifentanil PCIA bolus dose	No.	Comparator group	Lockout interval (min)	Nitrous oxide used	Median or reduction in pain scores	Conversion to neuraxial analgesia
Blair et al. ¹⁴	0.25–0.5 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	21	None	2	No	Median 50 mm	4 of 21
Thurlow et al. ¹⁶	0.2 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	18	IM meperidine	2	Yes	Median 48 mm	7 of 18
Volmanen et al. ¹⁸	0.4 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	20	Nitrous oxide	1		Reduction of 15 mm	Not reported
Blair et al. ¹⁵	40 μg	20	PCIA meperidine	2	Yes	Median 64 mm	2 of 20
Volmanen et al. ¹³	0.2–0.8 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	17	None	1	No	Reduction of 42 mm	Not reported
Evron et al. ¹⁷	0.27–0.93 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	43	Meperidine infusion	3	No	Median 35 mm	4 of 43
Volikas et al. ¹²	0.5 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	50	None	2	No	Mean 46 mm	5 of 50
Balki et al. ¹¹	0.25–1.0 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ variable bolus + fixed IV infusion	10	0.25 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$ variable infusion + fixed IV bolus	2	No	Reduction of 56 mm vs 41 mm(variable bolus versus variable infusion)	1 of 20
Volmanen et al. ¹⁹	0.3–0.7 $\mu\text{g} \cdot \text{kg}^{-1} \cdot \text{min}^{-1}$	24	Epidural	1	No	Median 73 mm	Not reported

All pain scores reported in millimeter (0–100 mm scale) for comparison between studies.

PCIA = patient-controlled IV analgesia.

VAS Scores: Remifentanil vs. Epidural

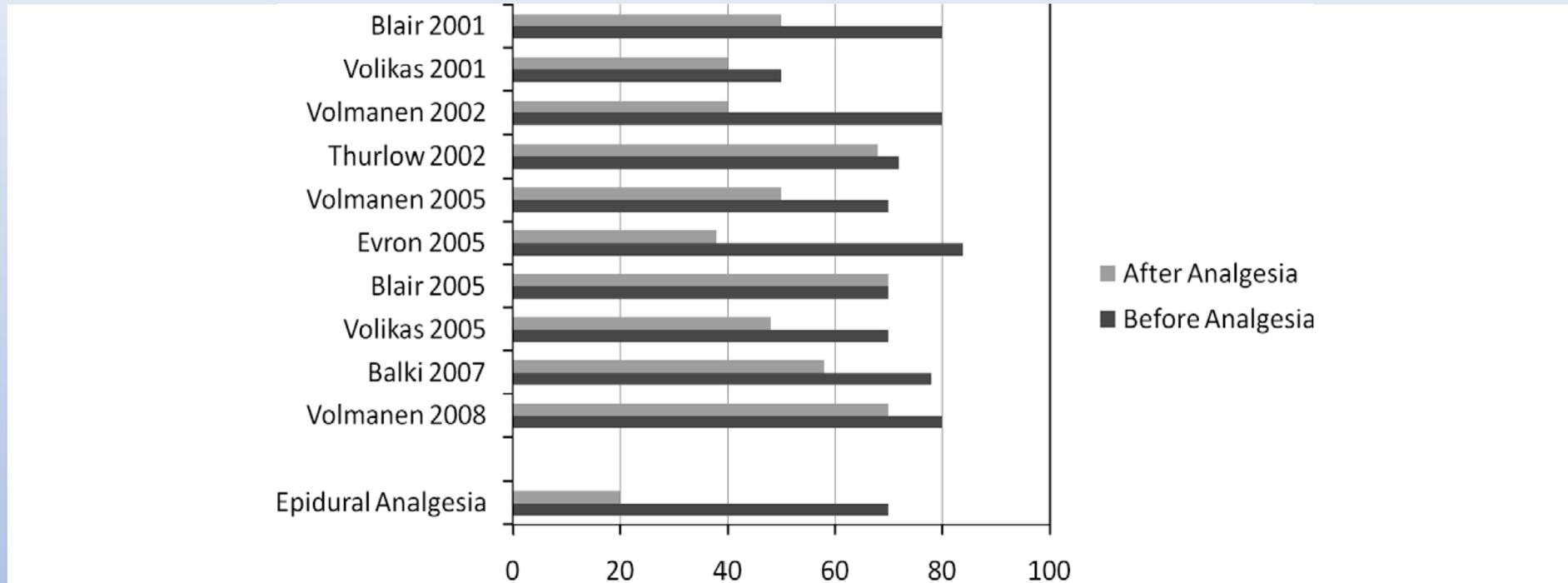


Fig. 1 Visual analogue scale (VAS, mm) scores for labour pain before and after initiation of epidural analgesia or remifentanil patient-controlled analgesia (PCA) in different studies. The VAS scores for epidural analgesia reflect what is usually reported in the literature.

Van de Velde, Controversy. Remifentanil patient-controlled analgesia should be routinely available for use in labor, International Journal Obstetric Anesthesia, 2008 October; 17(4):336-9

Routinely Available Remifentanil?

- Retrospective study in Ireland performed in 2007
- In 2005 remifentanil PCA for labor analgesia was routinely available
- During the two year period:
 - 28% opted for remifentanil
 - 22% opted for epidural
- Conversion from remifentanil to epidural was 10%

Remifentanil vs Fentanyl

Remifentanil versus fentanyl for intravenous patient-controlled labour analgesia: an observational study

Rémifentanil versus fentanyl pour l'analgésie intraveineuse contrôlée par les patientes en travail: étude observationnelle

**Radhika Marwah, MD · Samah Hassan, MD ·
Jose C. A. Carvalho, MD, PhD · Mrinalini Balki, MD**

There is no difference in pain scores between Remifentanil and Fentanyl PCA, Both provide a moderate amount of pain relief. Pick your poison...

Remifentanil-more maternal oxygen desaturation

vs.

Fentanyl-associated with higher need for neonatal resuscitation

Labour pain with remifentanil patient-controlled analgesia versus epidural analgesia: a randomised equivalence trial

SLM Logtenberg,^a K Oude Rengerink,^a CJ Verhoeven,^{b,c} LM Freeman,^d ESA van den Akker,^e MB Godfried,^f E van Beek,^g OWHM Borchert,^h N Schuitemaker,ⁱ ECSM van Woerkens,^j I Hostijn,^k JM Middeldorp,^d JA van der Post,^a BW Mol^l

N=408

Randomized Equivalence Trial

Remi-PCA vs Epidural Analgesia

Primary Outcome- satisfaction with pain relief measured hourly with VAS

Secondary Outcome-overall satisfaction with pain relief, Pain intensity scores during labor mode of delivery, and maternal and neonatal outcomes

Satisfaction with pain relief during labor with Remi-PCA and Epidural

NOT Equivalent methods of labor analgesia.

Lower satisfaction with analgesia in Remi-PCA group

Higher pain intensity in the Remi-PCA group

Please cite this paper as: Logtenberg SLM, Oude Rengerink K, Verhoeven CJ, Freeman LM, van den Akker ESA, Godfried MB, van Beek E, Borchert OWHM, Schuitemaker N, van Woerkens ECSM, Hostijn I, Middeldorp JM, van der Post JA, Mol BW. Labour pain with remifentanil patient-controlled analgesia versus epidural analgesia: a randomised equivalence trial. BJOG 2016; DOI: 10.1111/1471-0528.14181.

Any Other Alternatives?

Nitrous oxide



Nitronox

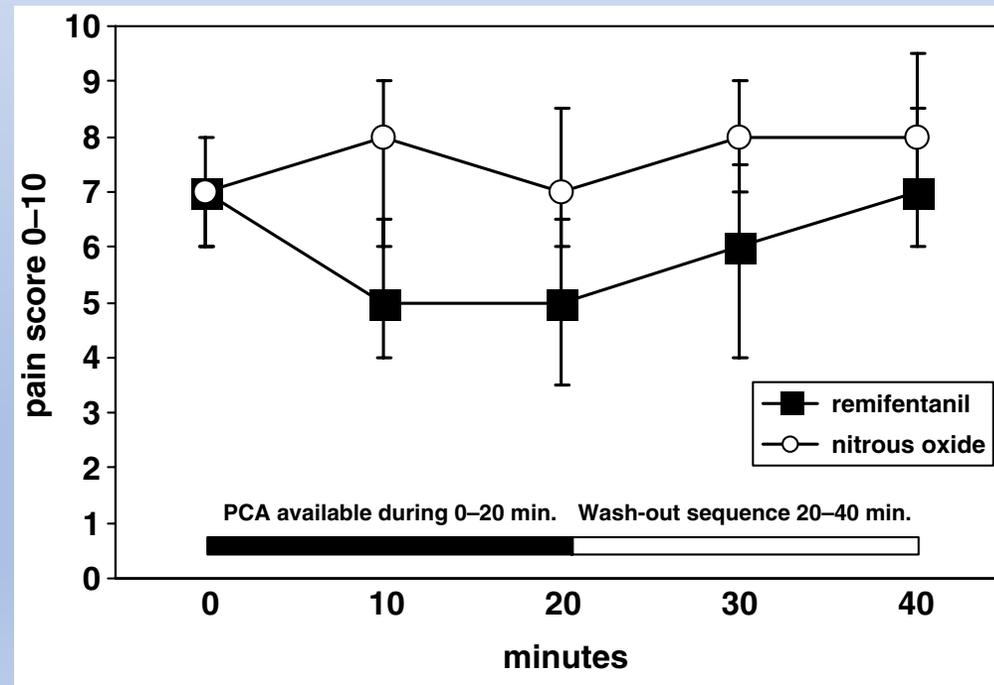


- Patient breathes nitrous oxide and oxygen via tight face mask
 - Nitrous oxide better than opioid
 - Usually 50% nitrous oxide in 50% oxygen
 - Rapid onset, rapid elimination
 - Patient control
- Effective for some patients
 - 11% complete pain relief
 - 30% little or no pain relief
 - Continuous administration more effective than intermittent
 - May be dysphoric
- No ongoing dose during pushing

Comparison of remifentanil and nitrous oxide in labour analgesia

P. VOLMANEN¹, E. AKURAL², T. RAUDASKOSKI³, P. OHTONEN⁴ and S. ALAHUHTA²

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Remifentanil IVPCA provides better labor analgesia compared to nitrous oxide

Conclusions

- Epidural analgesia provides overall best pain relief in labor
- PIB dosing provides reduction of motor block and less local anesthetic
- PCA opioid options exist, but with certain side effects
- Remifentanyl currently not routinely available for all laboring patients
- Nitrous is an alternative, but pain scores higher than PCA-opioid
- Nitrous does not require anesthesia provider to administer