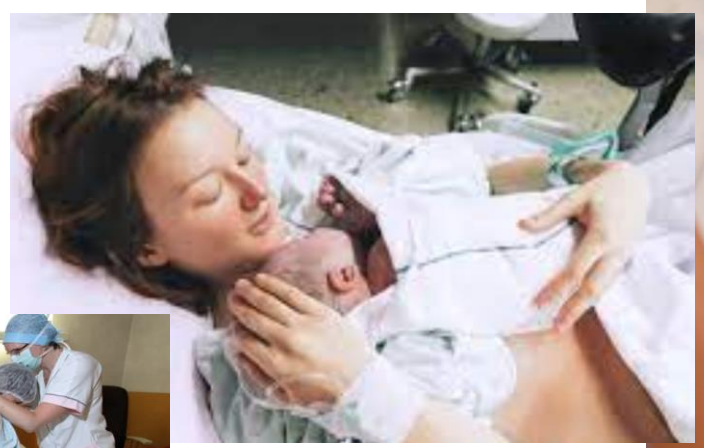


ANALGESIE OBSTETRICALE

Ph GOFFARD, MD

Anesthésie obstétricale

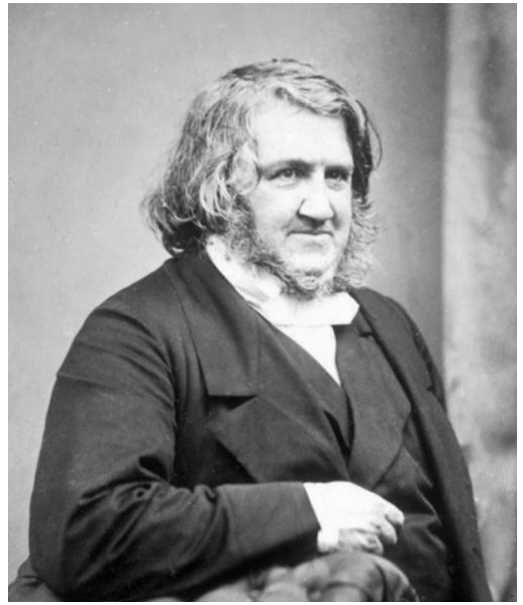
CHU Saint-Pierre

Bruxelles

ULB CONTINUING EDUCATION

CHU Saint-Pierre
UMC Sint-Pieter

UN PEU D'HISTOIRE…



1847 *: "naissance" de l'anesthésie obstétricale avec l'introduction de l'analgésie du travail à l'éther par l'obstétricien James Young Simpson:*

- *Sécurité?*
- *Toxicité?*
- *Droits des femmes controversés (clergé, académie)*

Début du XXe siècle *: Suffragettes et autres militantes féministes*
Analgésie/anesthésie à l'éther/chloroforme -> "sommeil crépusculaire" (une combinaison de morphine et de scopolamine)

Milieu du XXe siècle*: anesthésie générale pour l'accouchement par césarienne mais beaucoup de complications des voies respiratoires*

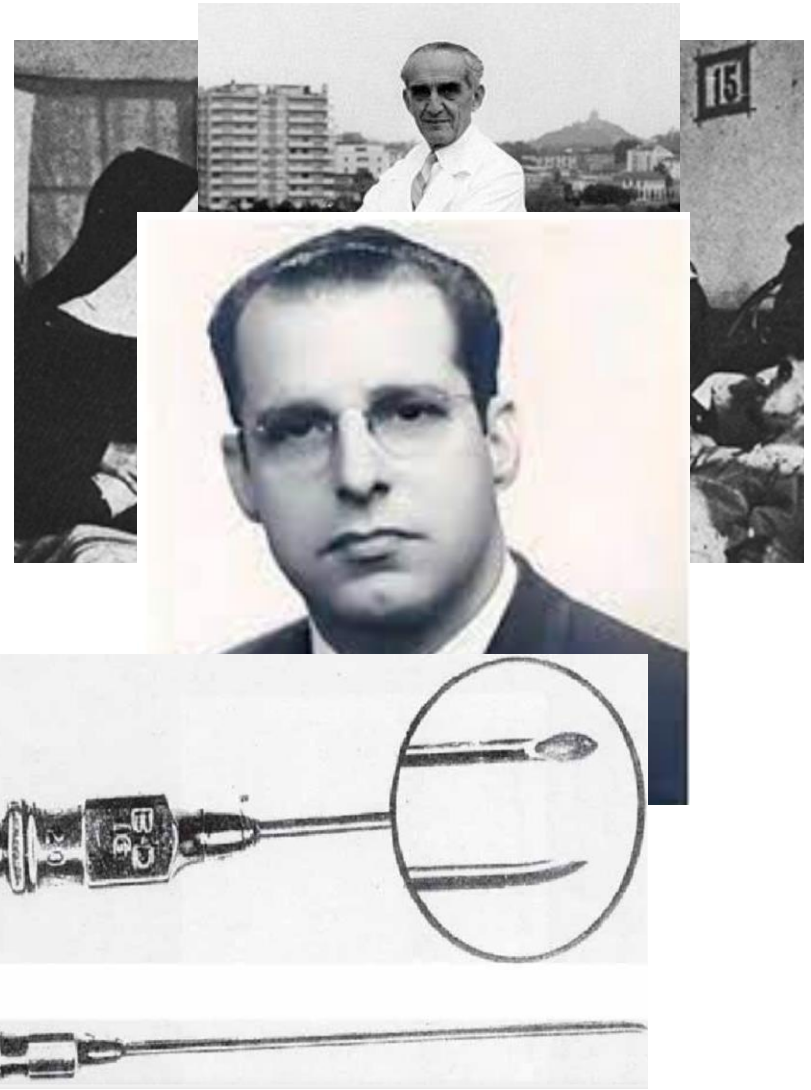
UN PEU D'HISTOIRE…

- ***Fidel Pagés Miravé*** *« invente » la péridurale en 1921*

- ***Achile Mario Dogliotti*** *décrit pour la première fois la technique de « perte de résistance »*

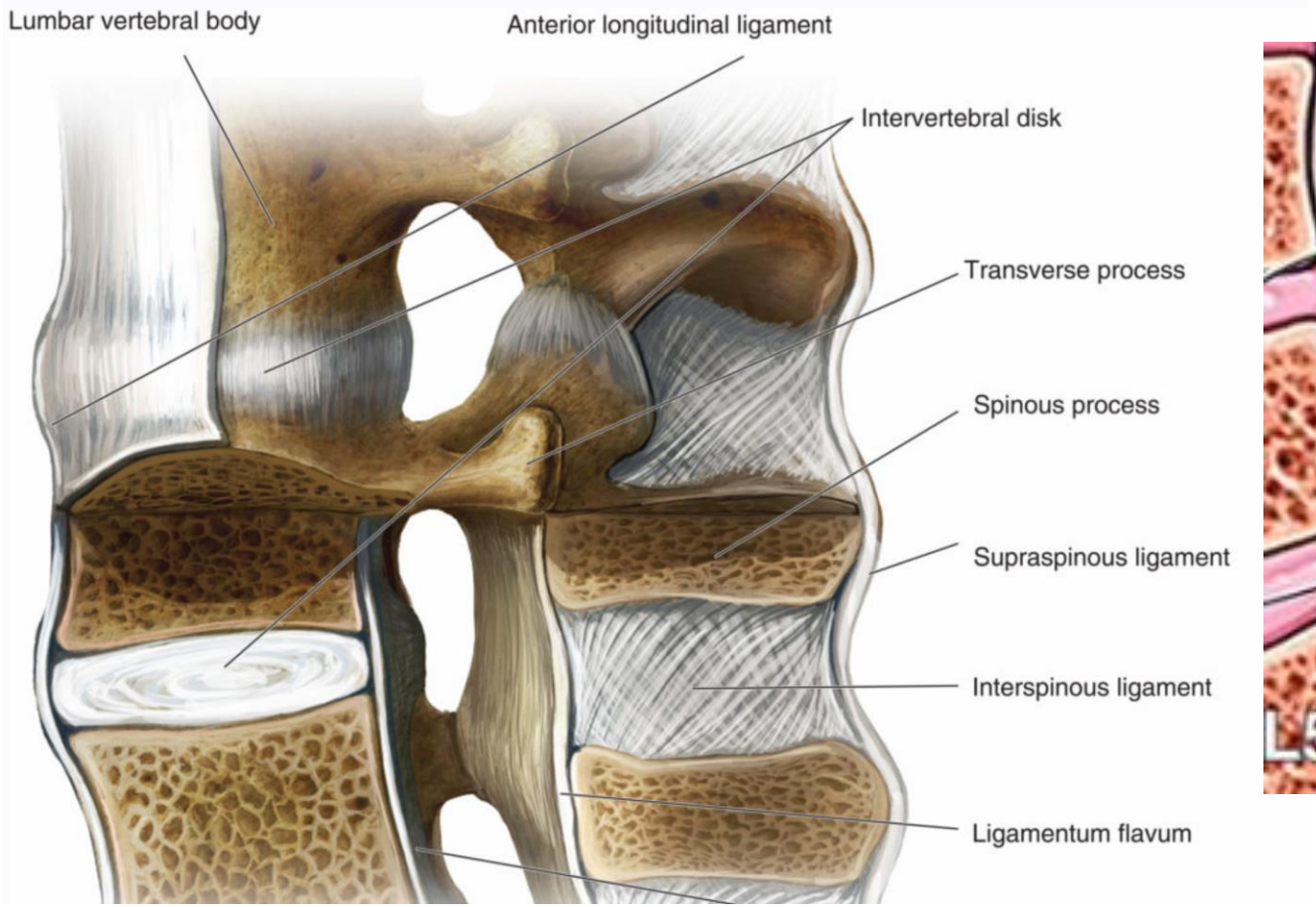
- *1949:* ***Pio Manuel Martinez Curbelo*** *a l'idée d'utiliser un cathéter urétéral en le plaçant dans l'espace péridural.*

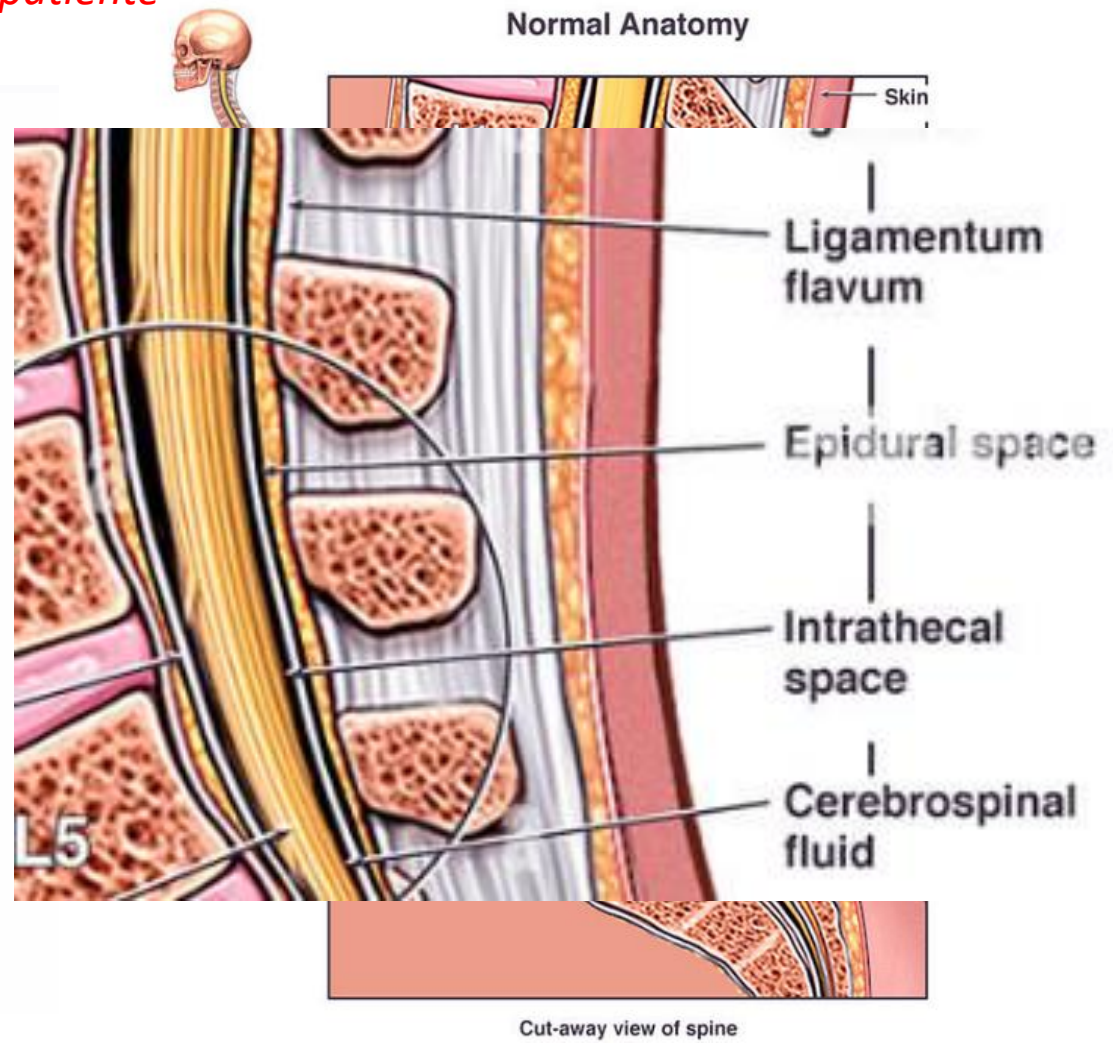
- *L'anesthésie neuraxiale du travail devient de plus en plus populaire dans les* ***années 1960****; ponction unique avec dose élevée*
- *Développement des KT épiduraux dans les* ***années 70****, véritable essor de l'analgésie obstétricale par voie périmédullaire.*
- *Nouveaux AL arrivent dans les* ***années 90****.*



UN PEU D'ANATOMIE…

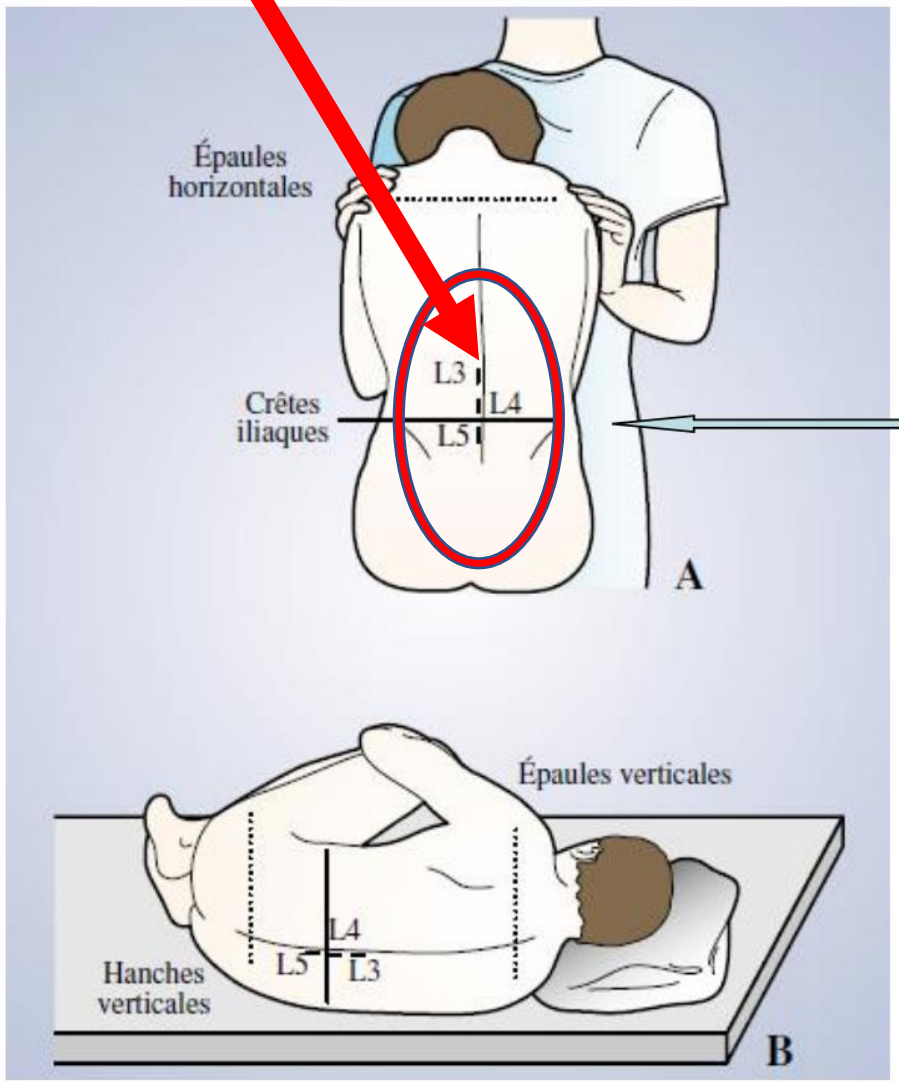
***OBJECTIF**: bloquer la transmission nerveuse des terminaisons sensitives des racines thoraciques basses, lombaires et sacrées sans altérer les capacités motrices de la patiente*





UN PEU D'ANATOMIE…

L2–L3 or L3–L4



Ligne de Tuffier

Anaesthesia
Peri-operative medicine, critical care and pain

Association of Anaesthetists

Free Access

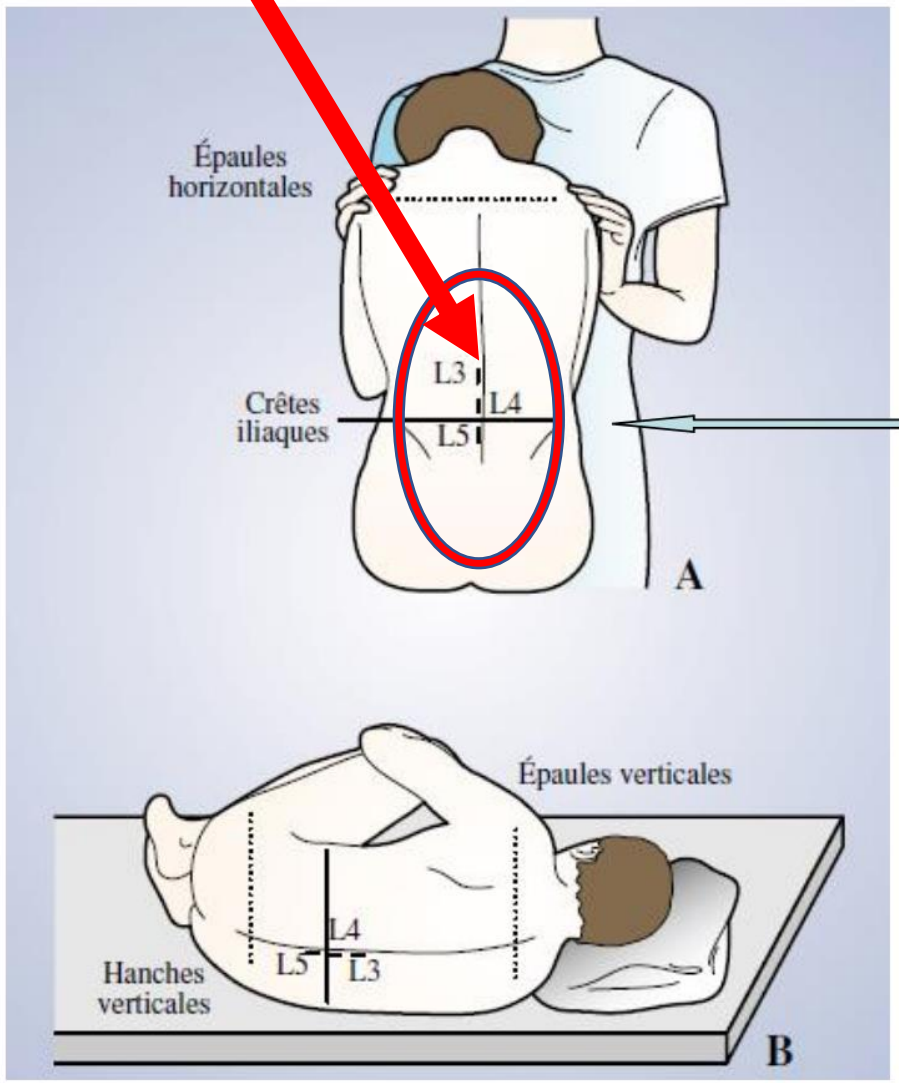
Ability of anaesthetists to identify a marked lumbar interspace

- ***Correct lumbar space only in 29% of patients***
- ***Tendency to select higher interspaces than desired (51%)***

Anaesthesia. 2000 Nov;55(11):1122-6.

UN PEU D'ANATOMIE…

L2–L3 or L3–L4

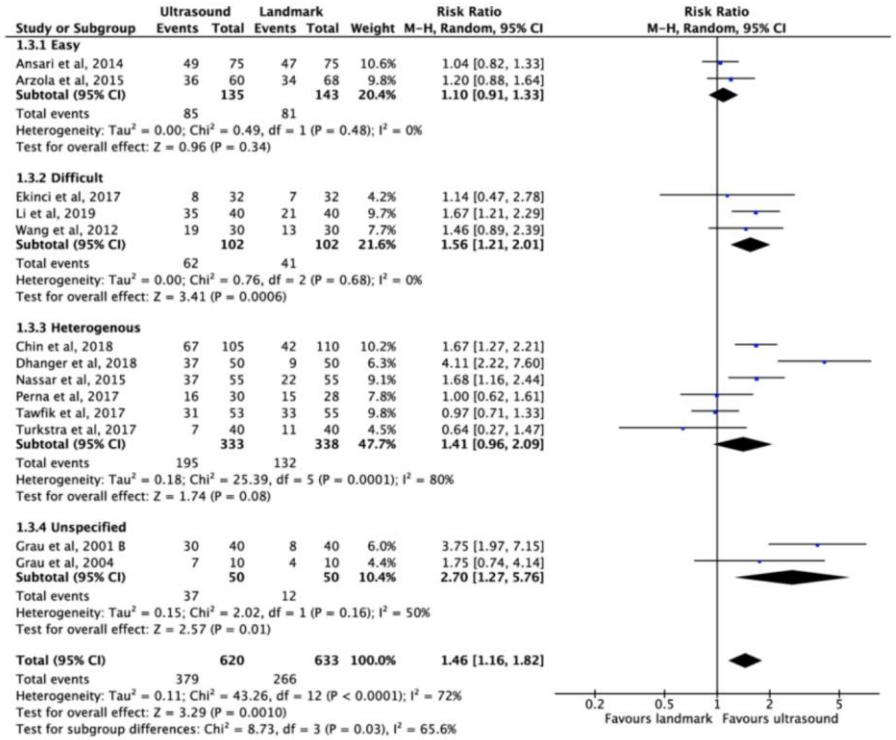


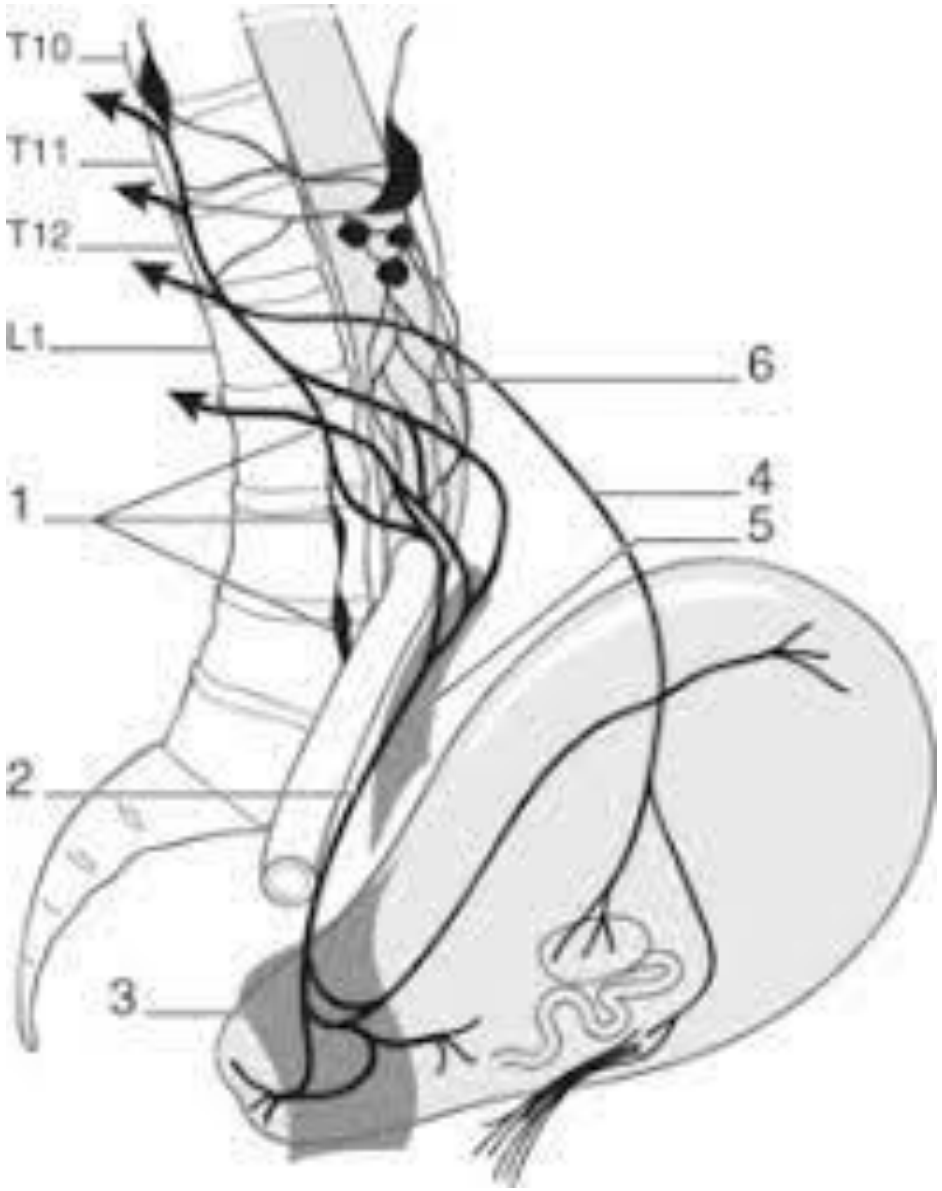
Ligne de Tuffier

REGIONAL ANAESTHESIA

Conventional landmark palpation versus preprocedural ultrasound for neuraxial procedures in nonobstetric patients

A systematic review with meta-analysis and trial sequential analysis of randomised controlled trials





DOULEUR DU TRAVAIL DIVISÉE EN DEUX PHASES

1ère phase

Contraction du segment inférieur et dilatation du col utérin

- *Au début du travail, ce sont surtout les racines T_{11} et T_{12} qui sont stimulées, puis lorsque les contractions utérines deviennent plus intenses, les racines adjacentes T_{10} et L_1 sont également intéressées*
- *Douleur viscérale (fibres C)*

2ème phase

Dilatation, distension et rupture des tissus du périnée avec la descente du fœtus

- *Les douleurs de la phase d'expulsion sont liées à la distension de la filière génitale et du plancher pelvien. L'innervation des structures responsables dépend essentiellement des racines S_2, S_3 et S_4 (donc T10-L1 à S2-S4)*
- *Douleur somatique*
  (les fibres somatiques S2-S4 sont plus larges que les fibres viscérales du 1er stade du travail et peuvent nécessiter un bloc plus dense, surtout si il y a instrumentation de la naissance avec forceps ou ventouse)

Haberer JP, Diemunsch P, Anesthésie obstétricale, généralités. Encyclopédie Médico- Chirurgicale Anesthesie-Réanimation ; 36-595-A-10.

Intrapartum Platelet Count

The anesthesiologist's decision to order or require a platelet count should be individualized and based on a patient's history (e.g., preeclampsia with severe features), physical examination, and clinical signs.

A routine platelet count is not necessary in the healthy parturient.

Blood Type and Screen

- *A routine blood cross-match is not necessary for healthy and uncomplicated parturients for vaginal or operative delivery.*
- *The decision whether to order or require a blood type and screen or cross-match should be based on maternal history, anticipated hemorrhagic complications (e.g., placenta accreta in a patient with placenta previa and previous uterine surgery), and local institutional policies.*

Anesthesiology February 2016, Vol. 124, 270–300

CI ABSOLUES

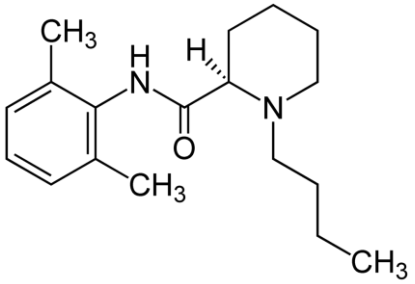
- *Manque de connaissance/maîtrise de la technique*
- *Absence des moyens de surveillance*
- *Refus du patient*
- *Anomalies graves de la coagulation (p. ex., coagulation intravasculaire disséminée franche, HELLP,…)*

Le reste est relatif et/ou controversé, à évaluer au cas par cas

***OBJECTIF**: bloquer la transmission nerveuse des terminaisons sensitives des racines thoraciques basses, lombaires et sacrées de façon prolongée et avec le moins d'effets secondaires possibles (BM, ARCF, hTA,…)*

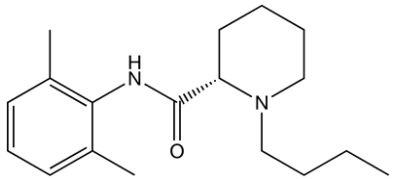
CHOIX DES MOLÉCULES

- *BUPIVACAINE*



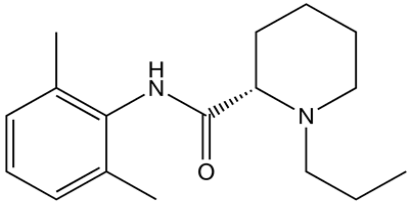
$C_{18}H_{28}N_2O$

- *LEVOBUPIVACAINE*



$C_{18}H_{28}N_2O$

- *ROPIVACAINE*



$C_{17}H_{26}N_2O$

***OBJECTIF**: bloquer la transmission nerveuse des terminaisons sensitives des racines thoraciques basses, lombaires et sacrées de façon prolongée et avec le moins d'effets secondaires possibles (BM, ARCF, hTA,…)*

CHOIX DES MOLÉCULES

CHOIX DES DOSES

TRADITIONAL vs LOW DOSES vs « ULTRA-LOW » DOSES

***OBJECTIF**: bloquer la transmission nerveuse des terminaisons sensitives des racines thoraciques basses, lombaires et sacrées de façon prolongée et avec le moins d'effets secondaires possibles (BM, ARCF, hTA,…)*

CHOIX DES MOLÉCULES

CHOIX DES DOSES

CHOIX DES ADJUVANTS

- OPIOIDES
- CLONIDES,…

***OBJECTIF**: bloquer la transmission nerveuse des terminaisons sensitives des racines thoraciques basses, lombaires et sacrées de façon prolongée et avec le moins d'effets secondaires possibles (BM, ARCF, hTA,…)*

CHOIX DES MOLÉCULES

CHOIX DES DOSES

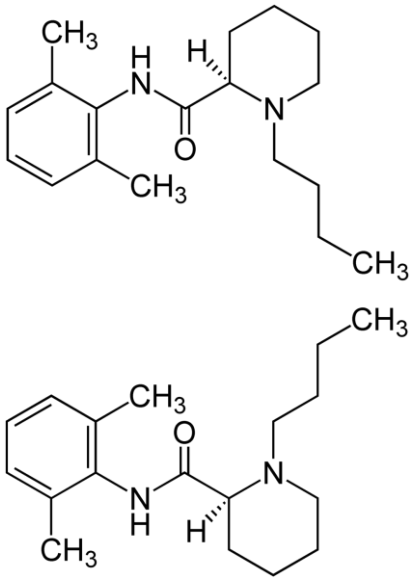
CHOIX DES ADJUVANTS

CHOIX DES MOYENS D'ADMINISTRATION

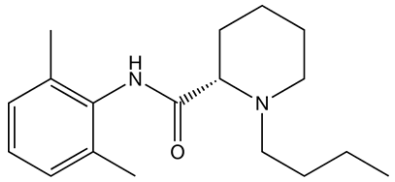
- *Manual intermittent boluses*
- *Continuous Epidural Infusion (+ Patient-Controlled Epidural Analgesia)*
- *Programmed Intermittent Epidural Bolus + Patient-Controlled Epidural Analgesia (PIB + PCEA)*

CHOIX DES MOLÉCULES: QUEL AL CHOISIR?

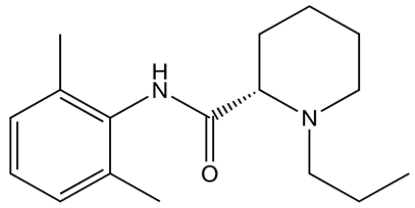
BUPIVACAINE vs LÉVOBUPIVACAINE vs ROPIVACAINE



$C_{18}H_{28}N_2O$



$C_{18}H_{28}N_2O$



$C_{17}H_{26}N_2O$

BUPIVACAINE vs ROPIVACAINE

BUPIVACAINE

- ***MORE CARDIOTOXIC THAN OTHER LOCAL ANESTHETICS***
- ***EXCESSIVE MOTOR BLOCKADE***
- ***INCREASED INSTRUMENTAL DELIVERY***
- ***LONG DURATION OF ACTION***

BUPIVACAINE vs ROPIVACAINE

BUPIVACAINE

- MORE CARDIOTOXIC THAN OTHER LOCAL ANESTHETICS
- EXCESSIVE MOTOR BLOCKADE
- INCREASED INSTRUMENTAL DELIVERY
- LONG DURATION OF ACTION

OBSTETRIC ANESTHESIOLOGY: FOCUSED REVIEW

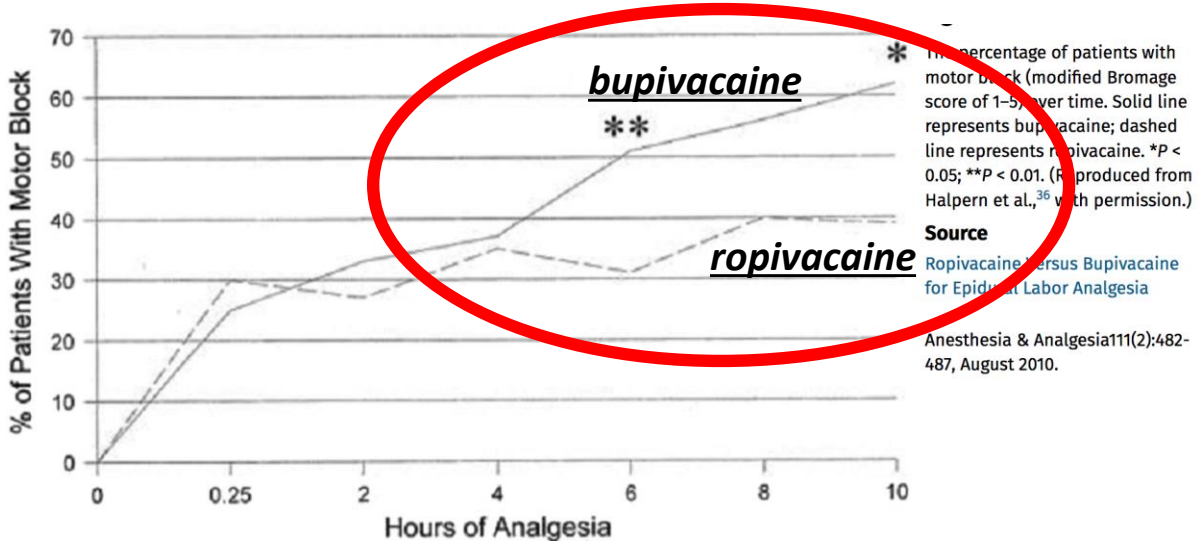
Ropivacaine Versus Bupivacaine for Epidural Labor Analgesia

Beilin, Yaakov MD*; Halpern, Stephen MD†

3 randomized controlled trials. Equal concentrations of ropivacaine and bupivacaine (0.0625%–0.1%) combined with fentanyl 2 µg/mL

Summary

Overall, both bupivacaine and ropivacaine are effective for providing labor analgesia with little or no difference in maternal satisfaction, mode of delivery, or other labor characteristics. Ropivacaine seems to cause less motor block, particularly in long labors, but this finding may be attributable to differences in drug potency rather than intrinsic differences between drugs. It is possible that ropivacaine is less cardiotoxic than bupivacaine when high doses are used, but this is clinically unimportant in the usual dose range used for labor analgesia. Therefore, from a clinical and safety perspective, either drug is a reasonable choice for labor analgesia. The last consideration is the cost of the medications, which cannot be ignored in today's environment. Because of cost, it is difficult to justify the routine use of ropivacaine for labor analgesia.



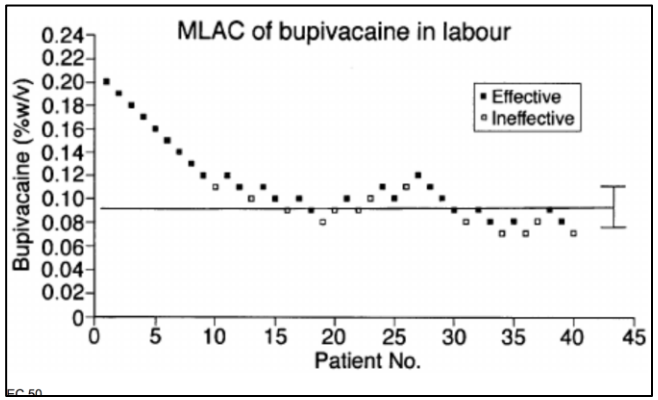
Anesthesia & Analgesia: August 2010 - Volume 111 - Issue 2 - p 482-487

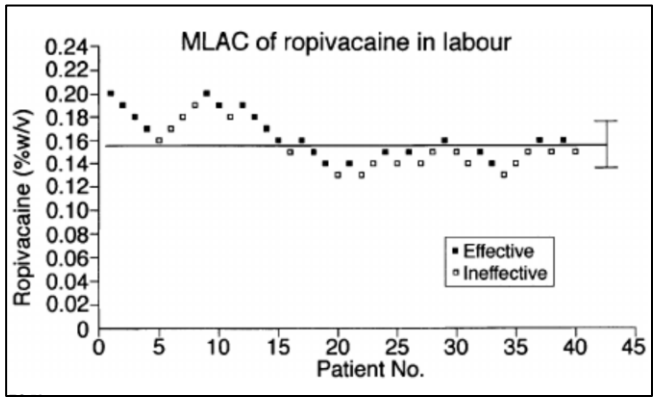
BUPIVACAINE vs ROPIVACAINE: EQUIPOTENCE

British Journal of Anaesthesia **82 (3)**: 371–3 (1999)

Relative potencies of bupivacaine and ropivacaine for analgesia in labour

G. Capogna[1], D. Celleno[2], P. Fusco[3], G. Lyons[4] and M. Columb[5]





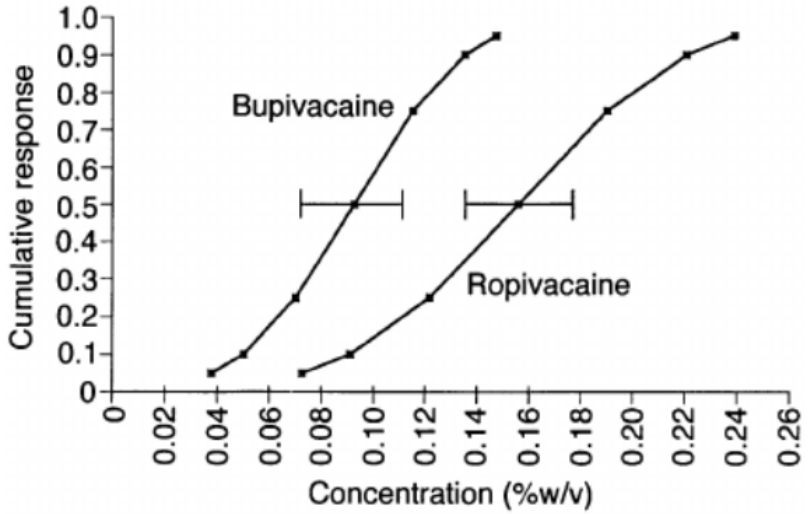


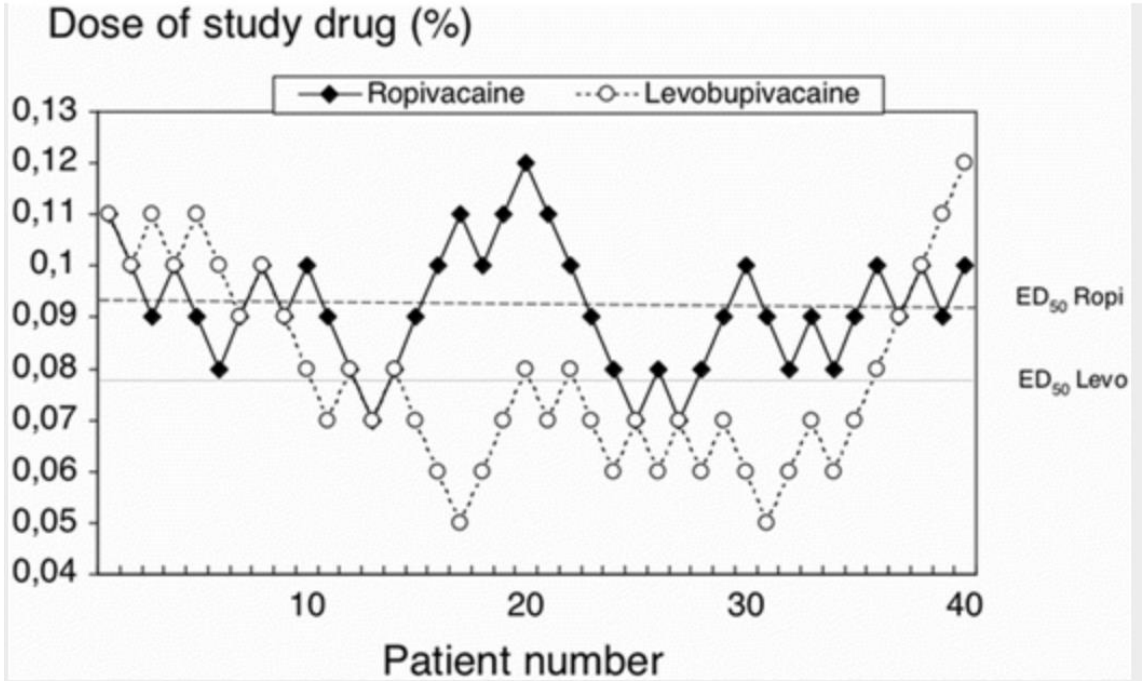
Fig 3 EC_{50} for ropivacaine and bupivacaine with 95% confidence intervals. Derived point estimates are plotted to demonstrate the concentration–response relationship.

« The analgesic potency of ropivacaine was 0.6 relative to bupivacaine.
Claims for reduced toxicity and motor block must be considered with differences in analgesic potency in mind. »

LEVOBUPIVACAINE vs ROPIVACAINE: EQUIPOTENCE

A Randomized Sequential Allocation Study to Determine the Minimum Effective Analgesic Concentration of Levobupivacaine and Ropivacaine in Patients Receiving Epidural Analgesia for Labor

Dan Benhamou, M.D.; Caroline Ghosh, M.D.; Frédéric J. Mercier, M.D., Ph.D.



Conclusions

Levobupivacaine was 19% more potent than ropivacaine and provided similar safety results.

Anesthesiology December 2003, Vol. 99, 1383–1386.

TOXICITE

Central nervous and cardiovascular effects of i.v. infusions of ropivacaine, bupivacaine and placebo in volunteers†

I.V. infusions of ropivacaine, bupivacaine and placebo. Acute tolerance of I.V. infusion of 10 mg min^{-1} was studied in a crossover, randomized, double-blind study in 12 volunteers

Average maximum tolerated IV dose: 115 mg versus 103 mg in the ropivacaine and bupivacaine groups, respectively

Table 2 Maximum tolerated plasma concentrations of ropivacaine and bupivacaine at the end of i.v. infusion of 10 mg min^{-1} (mean SD) (min.–max.) Crossover study in 12 volunteers. ***$P<0.001$ (ropivacaine *vs* bupivacaine)

	Plasma concentration (mg litre^{-1})	
Sampling/drug	Total	Unbound
Arterial		
Ropivacaine	4.3 (0.6) (3.4–5.3)	0.56 (0.14)*** (0.34–0.85)
Bupivacaine	4.0 (1.4) (1.1–6.2)	0.30 (0.11) (0.13–0.51)
Venous		
Ropivacaine	2.2 (0.8) (0.5–3.2)	0.15 (0.08) (0.01–0.24)
Bupivacaine	2.1 (1.2) (0.8–4.5)	0.11 (0.10) (0.01–0.38)

Br J Anaesth 1997;78:507–14

CHOIX DES DOSES

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

1,054 nulliparous women in labor:

- ***Traditional****: boluses of 10 ml 0.25% bupivacaine on request (but no more than hourly).*
- ***Combined spinal-epidural (CSE) analgesia****: 1 ml bupivacaine 0.25% and 25 µg fentanyl + bolus of 15 ml 0.1% bupivacaine with 20 µg fentanyl; rescue: boluses of 10 ml 0.1% bupivacaine with 2 microg/ml fentanyl, on request (but no more frequently than half hourly).*
- ***Low-dose infusion (LDI)****: bolus of 15 ml 0.1% bupivacaine with 2 microg/ml fentanyl followed by 10 ml/h; rescue: 10 ml of the mixture (but no more frequently than half hourly).*

-> Visual analog scale pain assessments were collected throughout labor and delivery and 24 h later

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

Table 6. Requirement for Anesthesiologist Reattendance in Preceding Hour, as a Percentage of Epidurals at Time Reported by Study Group

Time (T) after Epidural Insertion	Percentage of Epidurals in Each Group Requiring Anesthesiologist Attendance in Preceding Hour			Number of Records at Time (T)
	Trad (n = 353)	CSE (n = 351)	LDI (n = 350)	N = 1054
1 h	10	39**	15	881
2 h	9	40**	13	825
3 h	10	18*	17*	730
4 h	8	13	15*	589
5 h	9	17*	10	477
6 h	13	11	14	363
7 h	7	11	10	258
8 h	16	13	10	185

*$P < 0.01$, **$P < 0.001$ chi-squared. N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.
Trad = traditional; CSE = combined spinal–epidural; LDI = low dose infusion.

Table 4. Median Visual Analogue Pain Scores (VAS) during Labor and Percentage of Women Reporting VAS < 20/100 (% VAS < 20) by Study Group, after Epidural Insertion

VAS for Epidural Technique Allocated				
CSE (n = 351)		LDI (n = 350)		
VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	N (Total) 1,054
20†	50%†	57	13%	939
0†	69%†	38	26%	941
0†	74%†	28	38%	955
0†	80%†	18	52%	945
0†	83%†	10	55%	941
0†	84%†	9*	60%	936
4†	66%	10	63%*	881
12	60%	11	58%	825
21*	44%*	12	59%	730
20	49%	10	61%	589
21	48%	10	60%	477
20	49%	10	62%	363
15	52%	7	64%	257
25	44%	9	60%	185
20	47%	6	66%	111
42	35%	0	69%	72

sts of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

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Time (T) after Epidural Insertion	Percentage of Epidurals in Each Anesthesiologist Attendance in: Trad (n = 353)	CSE (n = 351)
1 h	10	39**
2 h	9	40**
3 h	10	18*
4 h	8	13
5 h	9	17*
6 h	13	11
7 h	7	11
8 h	16	13

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Time after Insertion	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	N (Total) 1,054
5 min	64	8%	20†	50%†	57	13%	939
10 min	44	24%	0†	69%†	38	26%	941
15 min	27	43%	0†	74%†	28	38%	955
20 min	12	57%	0†	80%†	18	52%	945
25 min	7	65%	0†	83%†	10	55%	941
30 min	0	71%	0†	84%†	9*	60%	936
1 h	14	59%	4†	66%	10	63%*	881
2 h	15	55%	12	60%	11	58%	825
3 h	15	56%	21*	44%*	12	59%	730
4 h	10	56%	20	49%	10	61%	589
5 h	18	52%	21	48%	10	60%	477
6 h	20	49%	20	49%	10	62%	363
7 h	20	48%	15	52%	7	64%	257
8 h	28	46%	25	44%	9	60%	185
9 h	22	47%	20	47%	6	66%	111
10 h	20	45%	42	35%	0	69%	72

* $P < 0.01$, † $P < 0.001$, (Mann–Whitney U test). N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

Anesthesiology December 2002, Vol. 97, 1567–157

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	Traditional (n = 353)		CSE (n = 351)		LDI (n = 350)		
	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	N (Total) 1,054
5 min	64	8%	20†	50%†	57	13%	939
10 min	44	24%	0†	69%†	38	26%	941
15 min	27	43%	0†	74%†	28	38%	955
20 min	12	57%	0†	80%†	18	52%	945
25 min	7	65%	0†	82%†	10	55%	941
30 min	0	71%	0†	84%†	9*	60%	936
1 h	14	59%	4†	66%	10	63%*	881
2 h	15	55%	12	60%	11	58%	825
3 h	15	56%	21*	44%*	12	59%	730
4 h	10	56%	20	49%	10	61%	589
5 h	18	52%	21	48%	10	60%	477
6 h	20	49%	20	49%	10	62%	363
7 h	20	48%	15	52%	7	64%	257
8 h	28	46%	25	44%	9	60%	185
9 h	22	47%	20	47%	6	66%	111
10 h	20	45%	42	35%	0	69%	72

* $P < 0.01$, † $P < 0.001$, (Mann–Whitney U test). N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

Given the proven benefit to obstetric outcome, the case for the uniform introduction of mobile epidurals into labor ward practice and the abandonment of traditional epidural techniques would seem irrefutable.

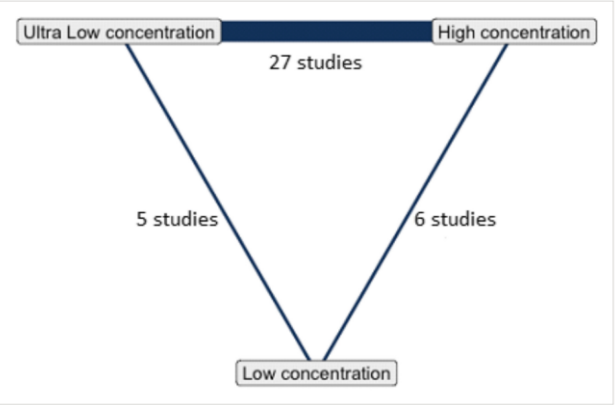
Anesthesiology December 2002, Vol. 97, 1567–157

Comparison of ultra-low, low and high concentration local anaesthetic for labour epidural analgesia: a systematic review and network meta-analysis

32 randomised controlled trials *comparing* ***high (>0.1%)***, ***low (>0.08% to ≤0.1%)*** *or* ***ultra-low (≤0.08%)*** *concentration local anaesthetic (bupivacaine, levobupivacaine or ropivacaine) for labour epidural.*

3665 women*: 1578 women received high concentration, 746 received low concentration and 1341 received ultra-low concentration.*

Opioids *were included in the epidural infusion in all study groups investigating low concentration (8 out of 8 studies), in 27 out of 30 study groups investigating ultra-low concentration and in 16 out of 30 study groups investigating high concentration.*



Outcomes

- *Mode of delivery*
- *Duration of labour*
- *Maternal/neonatal outcomes*

Halliday et al. Anaesthesia, Volume 77, Issue 8, August 2022, Pages 910-918

Estimated probability

Table 1. Odds ratios/weighted mean difference and 95% credible intervals for all outcomes.

Outcome	Total studies	High: low OR [95% credible interval]	High: ultra-low OR [95% credible interval]	Low: ultra-low OR [95% credible interval]
Spontaneous vaginal delivery	32 (n = 3665)	1.36 [0.97 to 1.94] **96%**	1.46 [1.18 to 1.86]	1.07 [0.75 to 1.56] **65,5%**
Assisted vaginal delivery	32 (n = 3665)	0.71 [0.43 to 1.25] **95,5%**	0.87 [0.64 to 1.16] **88,5%**	1.23 [0.68 to 2.04] **22%**
Caesarean section	32 (n = 3665)	1.03 [0.65 to 1.57] **45%**	0.78 [0.58 to 1.05] **96%**	0.76 [0.49 to 1.22] **88,5%**
Top-up dose required	16 (n = 1494)	1.15 [0.31 to 4.35]	1.27 [0.75 to 2.16]	1.10 [0.30 to 4.04]
Pruritus	20 (n = 2048)	4.13 [0.94 to 20.4]	5.55 [2.18 to 16.3]	1.35 [0.31 to 5.74]
Nausea and vomiting	19 studies (n = 1912)	1.09 [0.51 to 2.18]	1.30 [0.85 to 2.08]	1.20 [0.63 to 2.47]
Hypotension	20 (n = 1584)	0.85 [0.02 to 29.89]	1.08 [0.36 to 2.95]	1.28 [0.04 to 40.13]
Urinary retention	10 (n = 1078)	1.06 [0.24 to 4.59]	0.83 [0.29 to 2.10]	0.78 [0.18 to 3.04]
Bromage score >0	27 (n = 2529)	0.72 [0.26 to 2.05]	0.32 [0.18 to 0.54]	0.44 [0.16 to 1.17]
Apgar score <7 at 1 min	18 (n = 2315)	2.00 [1.16 to 3.81]	0.85 [0.55 to 1.27]	0.43 [0.21 to 0.79]
Apgar score <7 at 5 min	19 (n = 2428)	3.05 [0.17 to 243.69]	0.35 [0.02 to 4.49]	0.11 [0 to 2.26]

Halliday et al. Anaesthesia, Volume 77, Issue 8, August 2022, Pages 910-918

Comparison of ultra-low, low and high concentration local anaesthetic for labour epidural analgesia: a systematic review and network meta-analysis

Total local anaesthetic dose *(2825 parturients)*

- *Significantly lower for both low and ultra-low compared with high concentration.*
- *Ultra-low total dose was significantly lower than low concentration.*
- *There were no significant differences in the number of rescue top-ups required between low and ultra-low concentration groups*

Maternal outcome

- ***Duration of the first***
  Significantly reduced
- ***Duration of the seco***
  Decreased in ultra-lo
- ***VAS***
  The 30- or 60-min VAS pain scores and maternal satisfaction scores were similar between the three groups.
  No significant differences in the rates of pruritus, nausea and vomiting, urinary retention or hypotension
  Bromage score >0 : significantly lower with ultra-low concentration compared with high concentration; no difference between low and ultra-low concentration

Ultra-low concentration local anaesthetic for labour epidural achieves similar or better maternal and neonatal outcomes as low and high concentration, but with reduced local anaesthetic consumption and maternal/neonatal outcomes

Neonatal outcomes

Apgar score < 7 at 5 min

No significant differences between the three local anaesthetic concentrations.

Halliday et al. Anaesthesia, Volume 77, Issue 8, August 2022, Pages 910-918

CHOIX DES ADJUVANTS

Anesthesiology
74:809–814, 1991

CLINICAL INVESTIGATIONS

The Effects of the Addition of Sufentanil to 0.125% Bupivacaine on the Quality of Analgesia during Labor and on the Incidence of Instrumental Deliveries

Jan D. Vertommen, M.D., Eric Vandermeulen, M.D.,† Hugo Van Aken, M.D., Ph.D.,‡ Leo Vaes, M.D.,§ Maurits Soetens, M.D.,§ A. Van Steenberge, M.D.,¶ Piet Mourisse, M.D.,** Jan Willaert, M.D.,†† Henk Noorduin,‡‡ Hugo Devlieger, M.D., Ph.D.,§§ André F. Van Assche, M.D., Ph.D.¶¶*

695 women

- *Bupivacaine 12,5 mg with epinephrine 1/800.000*
- *Bupivacaine 12,5 mg with epinephrine 1/800.000 + sufentanil 10 µg*

TABLE 3. Incidence of Instrumental Deliveries (Forceps or Vacuum)

Type of Delivery	Parity	Incidence (%)* Control (n = 304)	Incidence (%)* Sufentanil (n = 324)
Spontaneous	Nulliparous	55	66*
	Parous	78	88*
	Total	64	76*
Instrumental	Nulliparous	45	34*
	Parous	22	12*
	Total	36	24*

* The percent of women having either spontaneous or instrumental delivery after exclusion of the women who underwent cesarean section or who required higher concentrations of bupivacaine because of insufficient analgesia (see text).
* $P < 0.01$ *versus* control.

TABLE 5. Motor Blockade (Bromage Test)

Score	Women (%)* Control (n = 69)	Women (%)* Sufentanil (n = 81)
0	42	63*
1	49	36
2	9	1
3	0	0

* The percent of women in each category of the Bromage scoring system.
* $P < 0.01$ *versus* control.

Anesthesiology
74:809–814, 1991

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Jan D. Vertommen, M.D., Eric Vandermeulen, M.D.,† Hugo Van Aken, M.D., Ph.D.,‡ Leo Vaes, M.D.,§ Maurits Soetens, M.D.,§ A. Van Steenberge, M.D.,¶ Piet Mourisse, M.D.,** Jan Willaert, M.D.,†† Henk Noorduin,‡‡ Hugo Devlieger, M.D., Ph.D.,§§ André F. Van Assche, M.D., Ph.D.¶¶*

695 women

- *Bupivacaine 12,5 mg with epinephrine 1/800.000*
- *Bupivacaine 12,5 mg with epinephrine 1/800.000 + sufentanil 10 µg*

TABLE 2. Time of Onset and Duration of Analgesia

Injection	Control n	Control Time (min)	Sufentanil n	Sufentanil Time (min)
Onset				
1	318	9.8 ± 5.4	344	8.7 ± 4.3
2	301	8.4 ± 3.8	274	6.3 ± 3.9*
3	212	8.3 ± 5.2	168	6.4 ± 4.1*
Duration				
1	299	60 ± 42	270	90 ± 42*
2	208	72 ± 36	163	96 ± 84*
3	147	60 ± 30	83	78 ± 54†

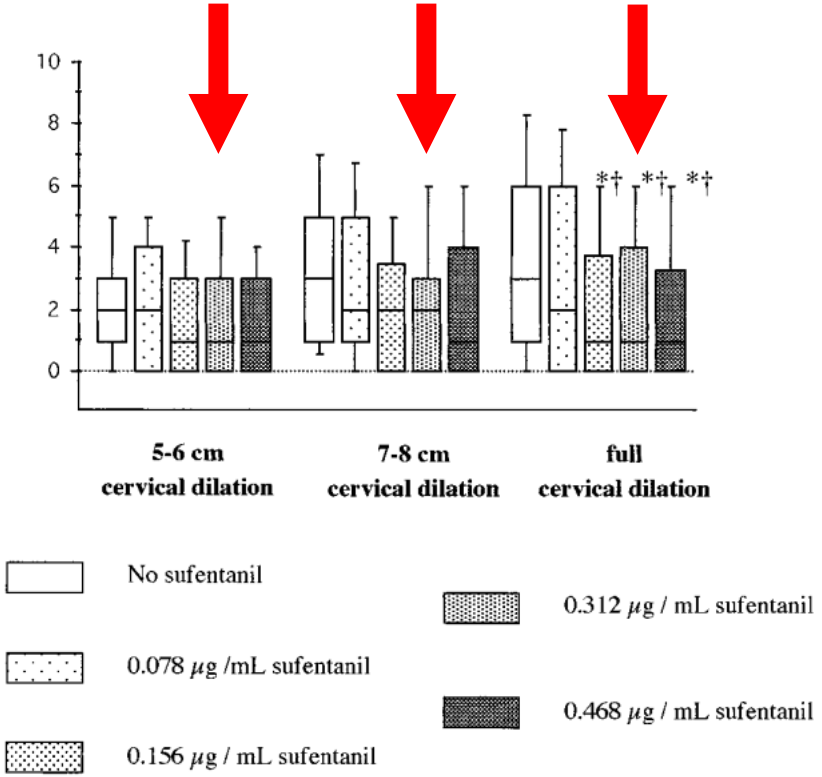
Data are means ± SD.
* $P < 0.001$ *versus* control.
† $P < 0.01$ *versus* control.

***Mean dose of bupivacaine*: 34,3 +/- 17,1 mg (Sufentanil group) vs 42,2 +/- 19,4 mg (Control group) (P < 0,0001)**

The Dose-Range Effects of Sufentanil Added to 0.125% Bupivacaine on the Quality of Patient-Controlled Epidural Analgesia During Labor

Jean-Marc Bernard, MD, PhD*, Daniel Le Roux, MD*, Alexandre Barthe, MD*,
Olivier Jourdain, MD†, Louis Vizquel, MD*, and Claude Michel, MD†

Département *d'Anesthésie-Réanimation and †Clinique Gynécologique et Obstétricale, Polyclinique Jean-Villar, Bruges-Bordeaux, France



In conclusion, adding a small concentration of sufentanil to the 0.125% bupivacaine solution for PCEA improves the quality of analgesia without modifying the bupivacaine requirement during labor. It is likely that the use of PCEA, small-dose sufentanil, and relatively large bupivacaine concentration in our study obscured differences in the local anesthetic-sparing ability. Reducing the sufentanil concentration to 0.156 μg/mL decreased the pruritus intensity without impeding the quality of analgesia. Whether this result is applicable to smaller bupivacaine concentrations and other PCEA settings remains to be determined.

Anesthesia and Analgesia, Jan 2001, 92(1):184-188

The Dose-Range Effects of Sufentanil Added to 0.125% Bupivacaine on the Quality of Patient-Controlled Epidural Analgesia During Labor

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Département *d'Anesthésie-Réanimation and †Clinique Gynécologique et Obstétricale, Polyclinique Jean-Villar, Bruges-Bordeaux, France

Table 2. Therapeutic Characteristics

Variable	Sufentanil dose				
	0 μg/mL	0.078 μg/mL	0.156 μg/mL	0.312 μg/mL	0.468 μg/mL
Total dose of sufentanil, μg (mean ± SD)	0 ± 0	4.5 ± 1.8*	8.6 ± 2.9*†	16.4 ± 6.0*†‡	23.4 ± 7.8*†‡§
Hourly dose of sufentanil, μg/h (mean ± SD)	0 ± 0	0.8 ± 0.2*	1.6 ± 0.5*†	3.1 ± 1.0*†‡	4.6 ± 1.4*†‡§
Total dose of bupivacaine					
From PCEA, mg (mean ± SD)	68.4 ± 22.0	73.5 ± 27.5	68.8 ± 23.6	65.5 ± 24.1	62.5 ± 20.8
From rescue analgesia, mg (mean ± SD)	2.0 ± 6.5	1.5 ± 4.7	3.7 ± 8.5	2.4 ± 6.7	2.0 ± 5.6
Hourly dose of bupivacaine (PCEA + rescue), mg/h (mean ± SD)	14.4 ± 4.1	13.5 ± 5.3	13.7 ± 4.7	12.6 ± 4.0	12.6 ± 4.2
Successful/total PCEA demands, % (mean ± SD)	70 ± 24	78 ± 22	74 ± 27	68 ± 29	71 ± 29
Patients requesting rescue analgesia, *n* (%)	6 (9)	7 (11)	9 (14)	8 (12)	8 (12)

* $P < 0.05$ vs 0 μg/mL.
† $P < 0.05$ vs 0.078 μg/mL.
‡ $P < 0.05$ vs 0.156 μg/mL.
§ $P < 0.05$ vs 0.312 μg/mL.

Anesthesia and Analgesia, Jan 2001, 92(1):184-188

The Dose-Sparing Effect of Clonidine Added to Ropivacaine for Labor Epidural Analgesia

Landau, Ruth MD*; Schiffer, Eduardo MD*; Morales, Michel MD†; Savoldelli, Georges MD*; Kern, Christian MD*

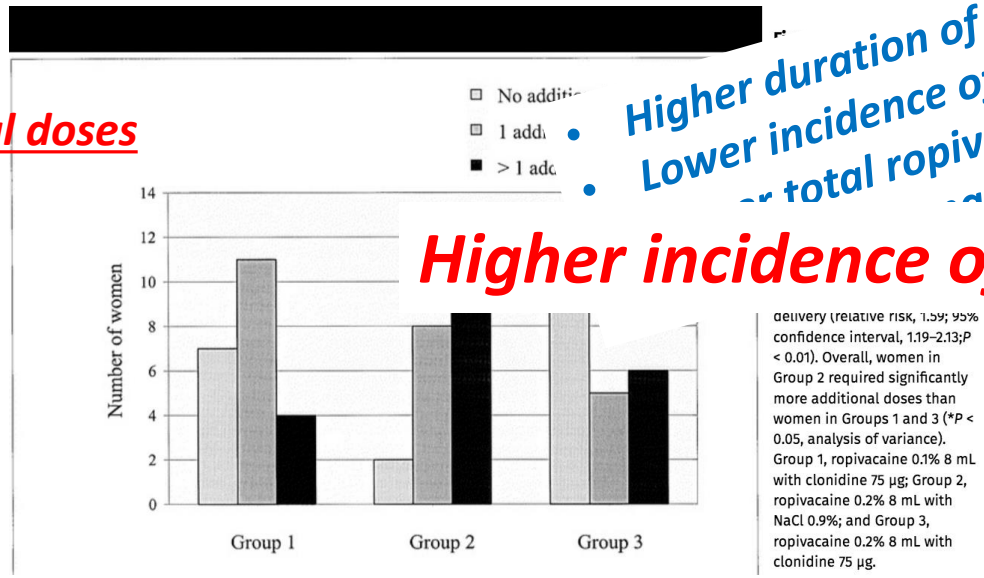
3 groups

- *ropivacaine 0.1% 8 mL plus 75 µg of clonidine (Group 1)*
- *ropivacaine 0.2% 8 mL plus 0.5 mL of NaCl 0.9% (Group 2)*
- *ropivacaine 0.2% 8 mL plus 75 µg of clonidine (Group 3)*

Additional doses

- ***Higher duration of analgesia***
- ***Lower incidence of motor block***
- ***total ropivacaine dose***
- ***boluses***

Higher incidence of hypotension



delivery (relative risk, 1.59; 95% confidence interval, 1.19–2.13; $P < 0.01$). Overall, women in Group 2 required significantly more additional doses than women in Groups 1 and 3 (*$P < 0.05$, analysis of variance). Group 1, ropivacaine 0.1% 8 mL with clonidine 75 µg; Group 2, ropivacaine 0.2% 8 mL with NaCl 0.9%; and Group 3, ropivacaine 0.2% 8 mL with clonidine 75 µg.

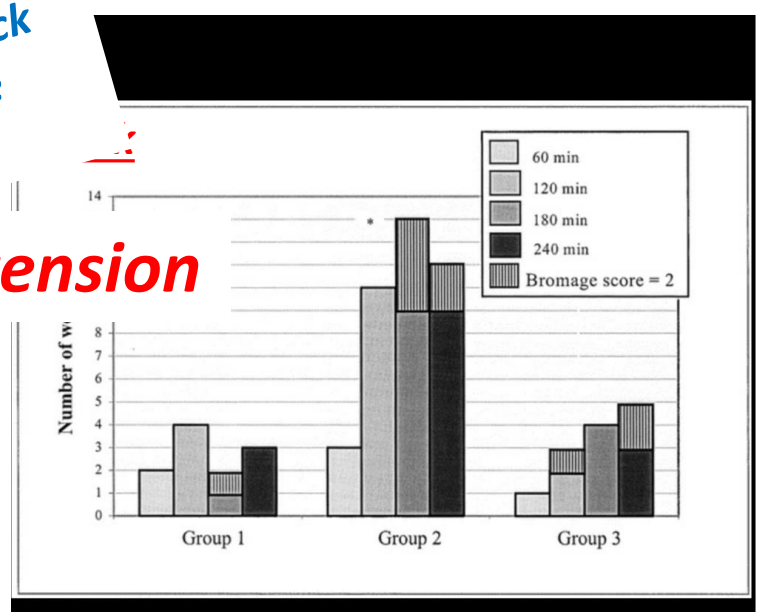
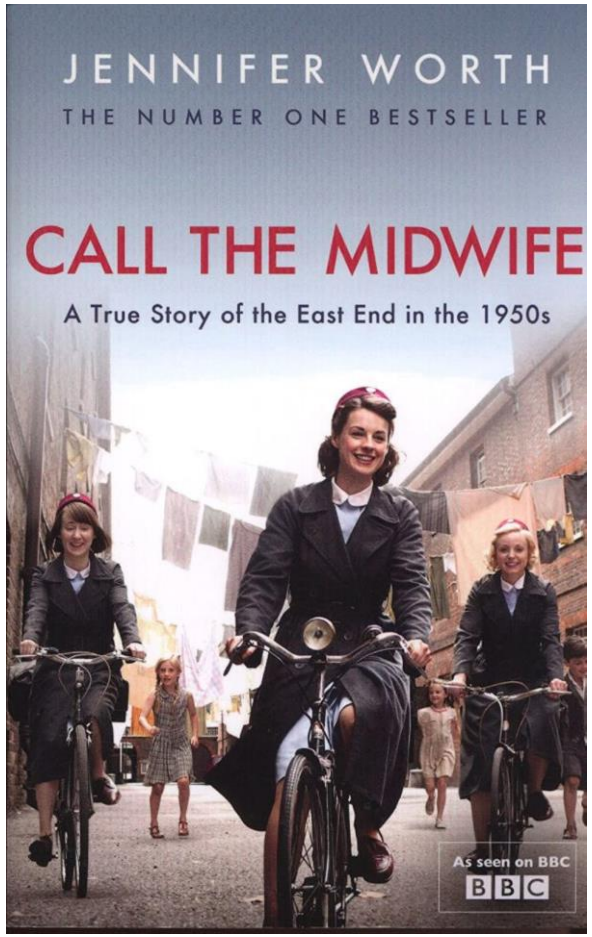


Figure 2

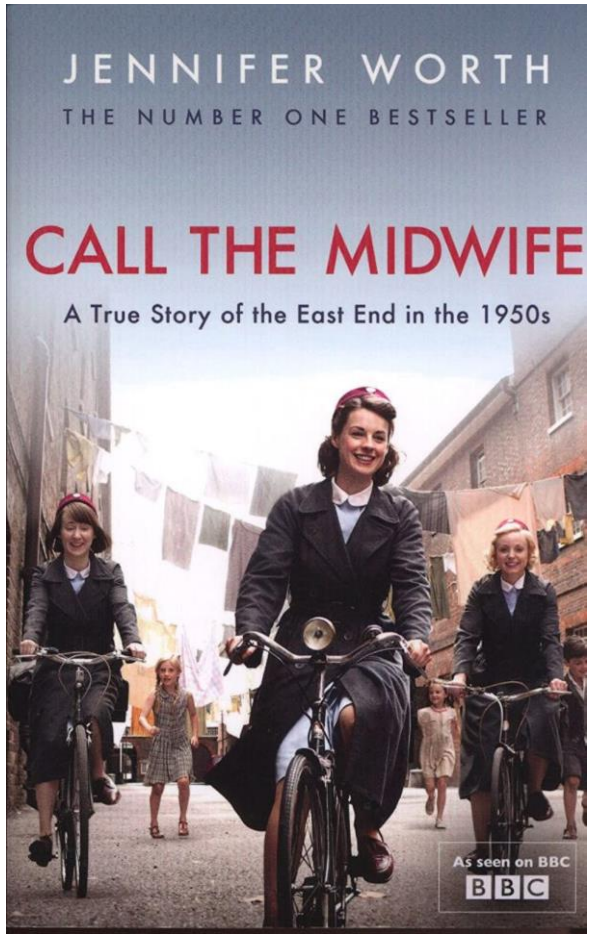
Number of women with motor block (Bromage score 1) at 60, 120, 180, and 240 min (shaded bars). Number of women developing more intense motor block (Bromage score 2) are represented with hatched vertical bars (one woman in Group 1, six women in Group 2, and three women in Group 3). Because the ropivacaine infusion rate was reduced in women developing an intense motor block, Bromage score 2 was never noted twice (on two different assessment times) in the same woman. Women in Group 2 developed significantly more motor block than women in Groups 1 and 3 (*$P < 0.05$, analysis of variance). Group 1, ropivacaine 0.1% 8 mL with clonidine 75 µg; Group 2, ropivacaine 0.2% 8 mL with NaCl 0.9%; and Group 3, ropivacaine 0.2% 8 mL with clonidine 75 µg.

Anesthesia & Analgesia: September 2002 – Volume 95 – Issue 3 – p 728-734

CHOIX DES MOYENS D'ADMINISTRATION

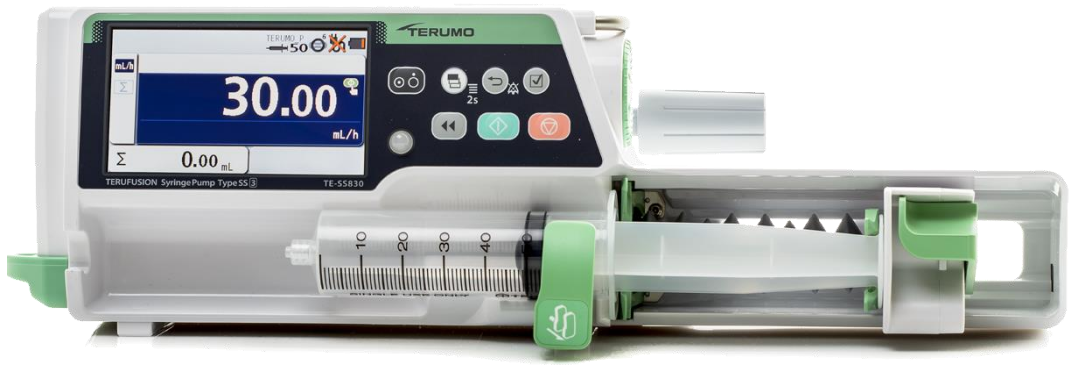


Manual intermittent boluses



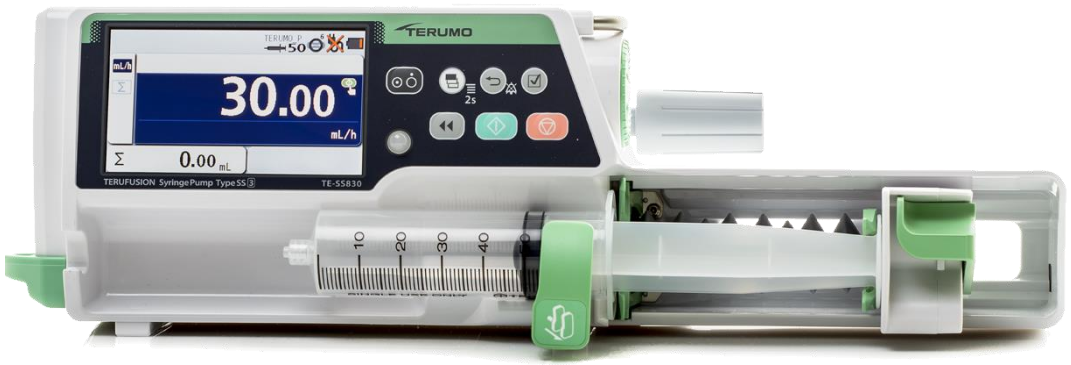
Manual intermittent boluses

Continuous epidural infusion (+ patient-controlled epidural analgesia)



Manual intermittent boluses

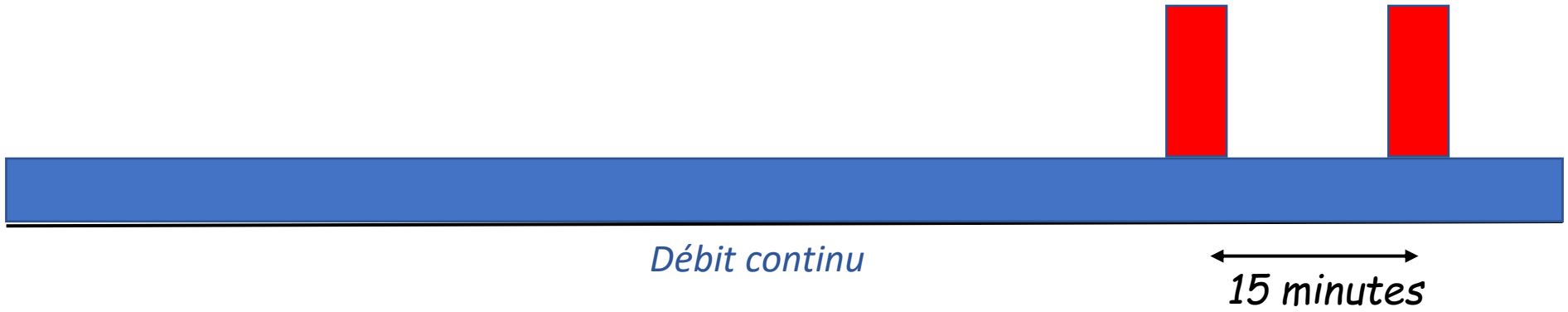
Continuous epidural infusion (+ patient-controlled epidural analgesia)



Programmed intermittent epidural bolus + patient-controlled epidural analgesia (PIB + PCEA)

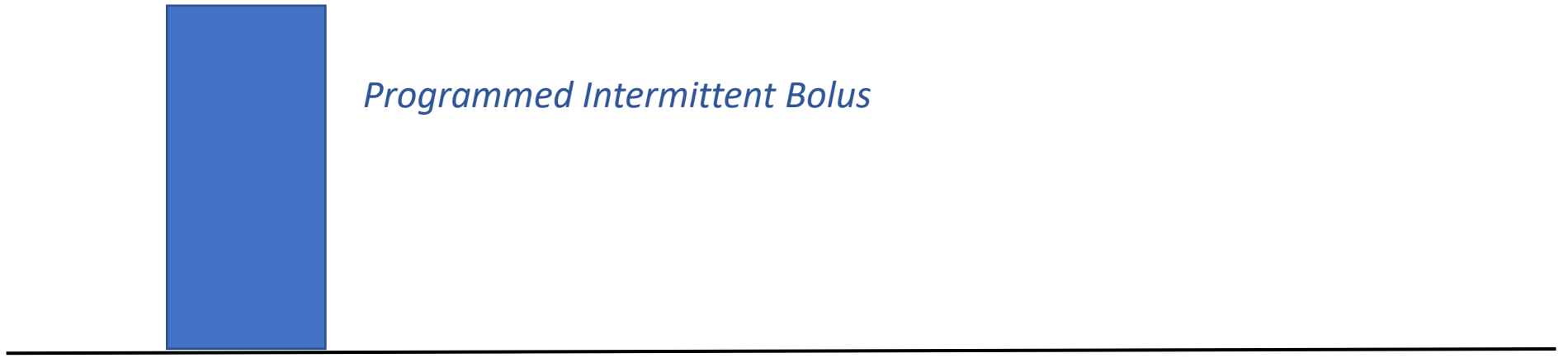
CONTINU + PCEA

Patient Controlled Epidural Analgesia



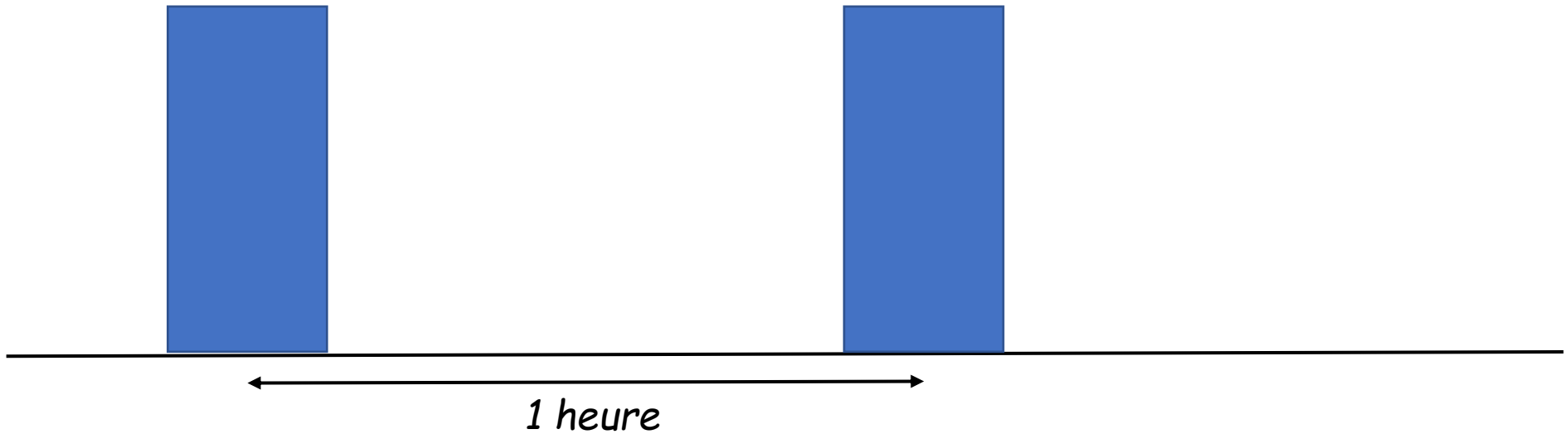
PIB et PCEA

PIB

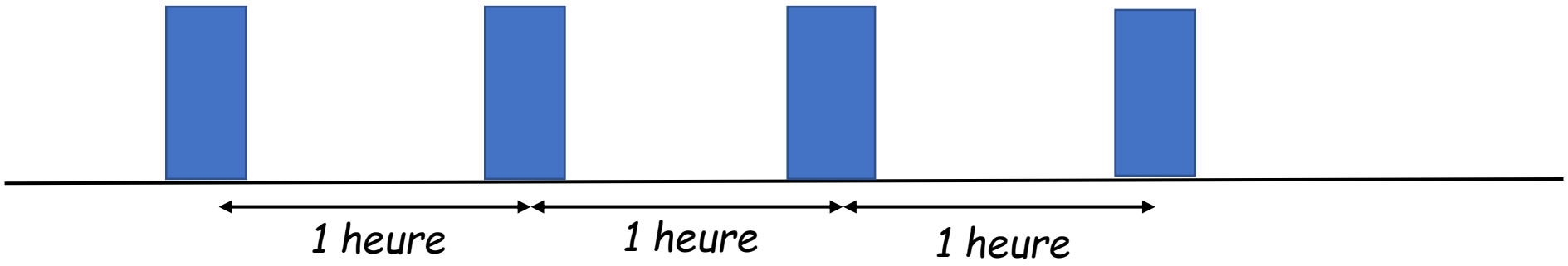


Programmed Intermittent Bolus

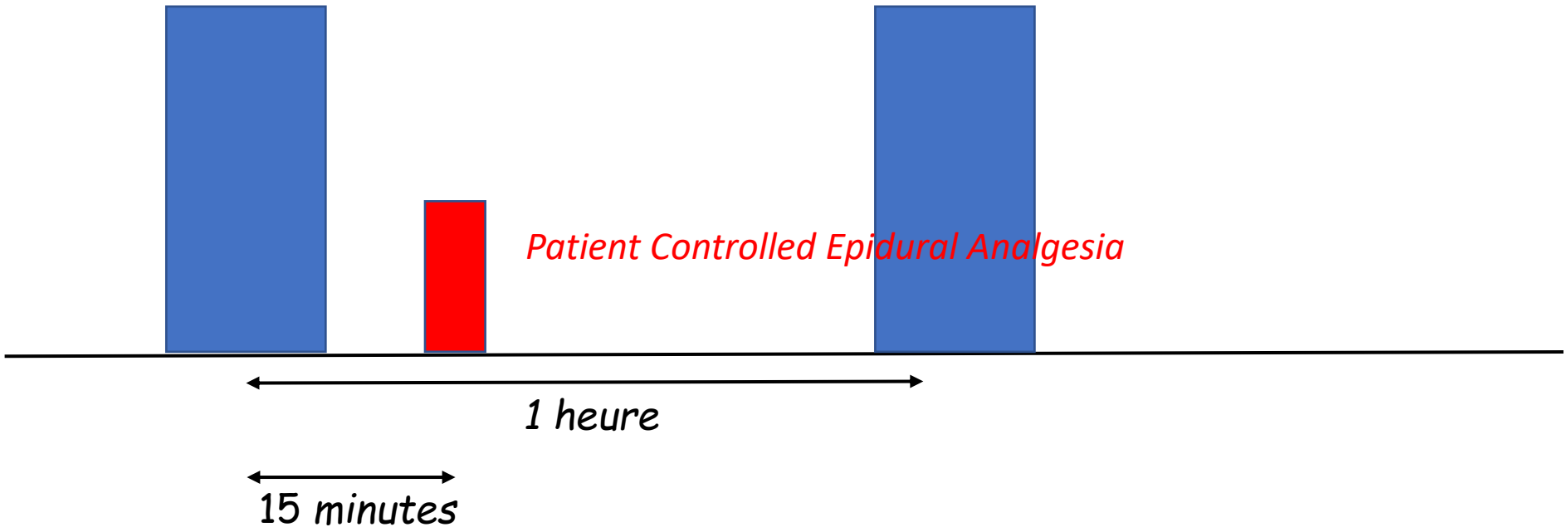
PIB



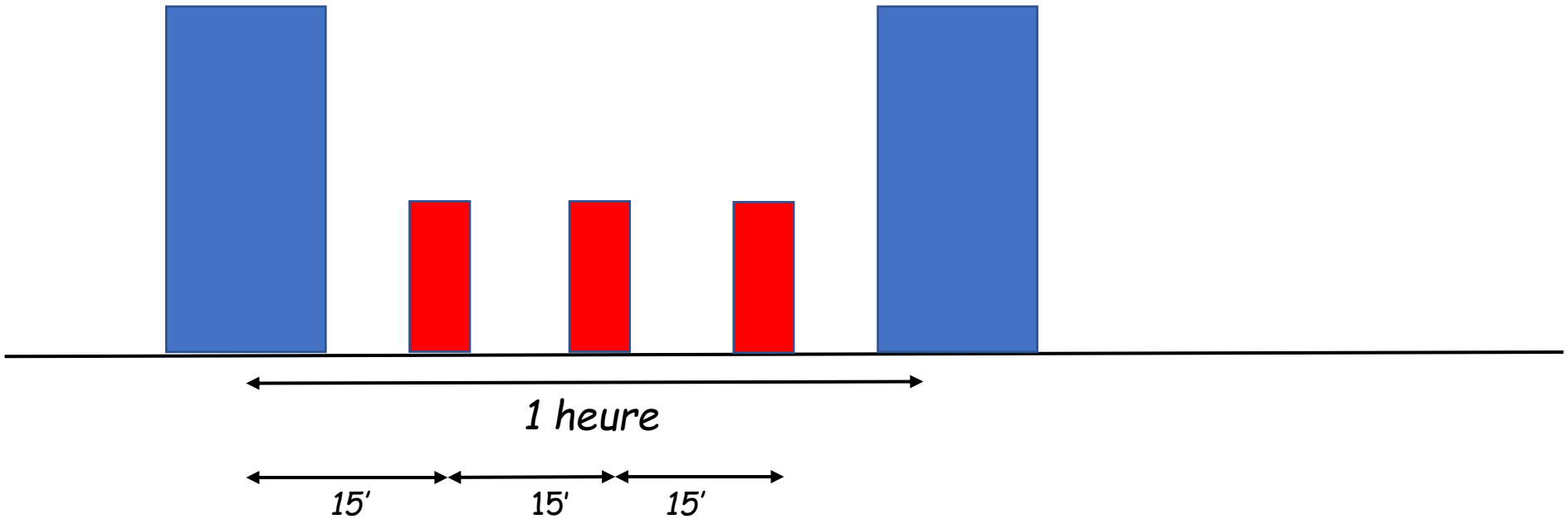
PIB



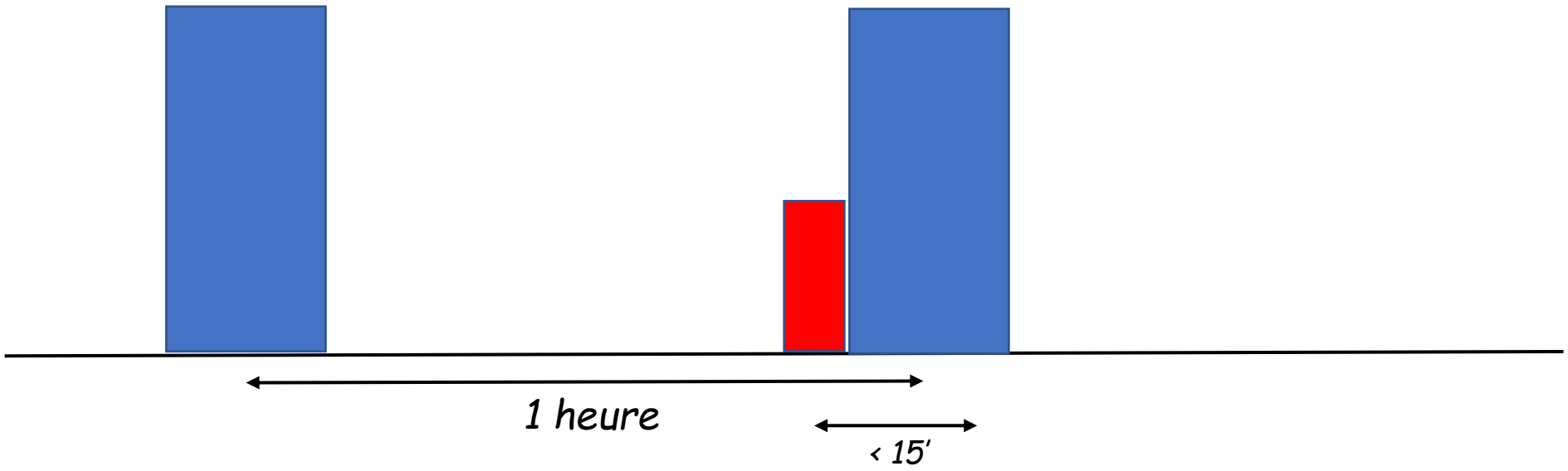
PIB + PCEA



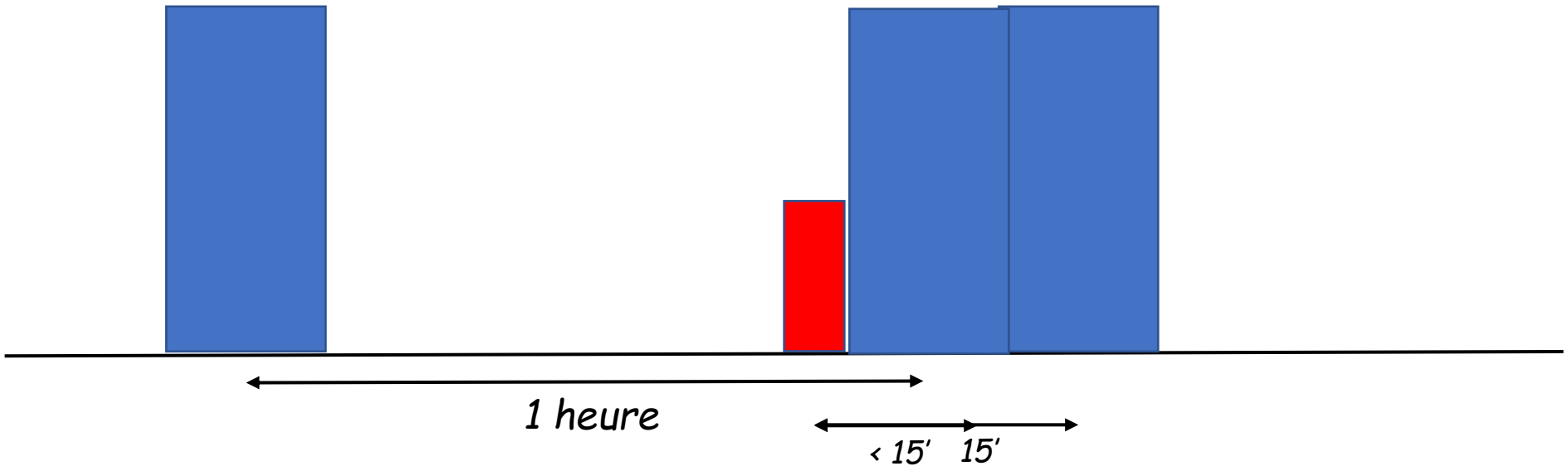
PIB + PCEA



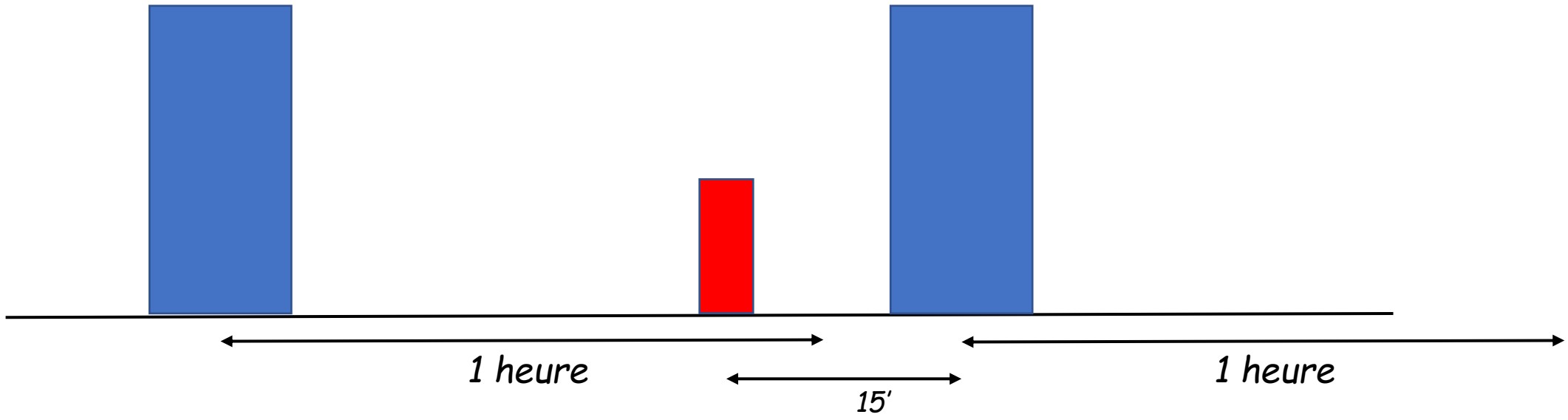
PIB + PCEA



PIB + PCEA



PIB + PCEA



Comparison of continuous background infusion plus demand dose and demand-only parturient-controlled epidural analgesia (PCEA) using ropivacaine combined with sufentanil for labor and delivery

Ropivacaine 0.16% plus sufentanil 0.5 μg/mL

Table 1. Parturient-controlled epidural analgesia (PCEA) infusion regimen

	PCEA plus background infusion	Demand-only PCEA
Background infusion (mL/h)	4	0
Bolus size (mL)	4	4
Lock-out time (min)	20	15
Maximum dose *per* hour (mL)	16	16

In parturients receiving PCEA plus background infusion, 25% of the maximum dose *per* hour was administered continuously.

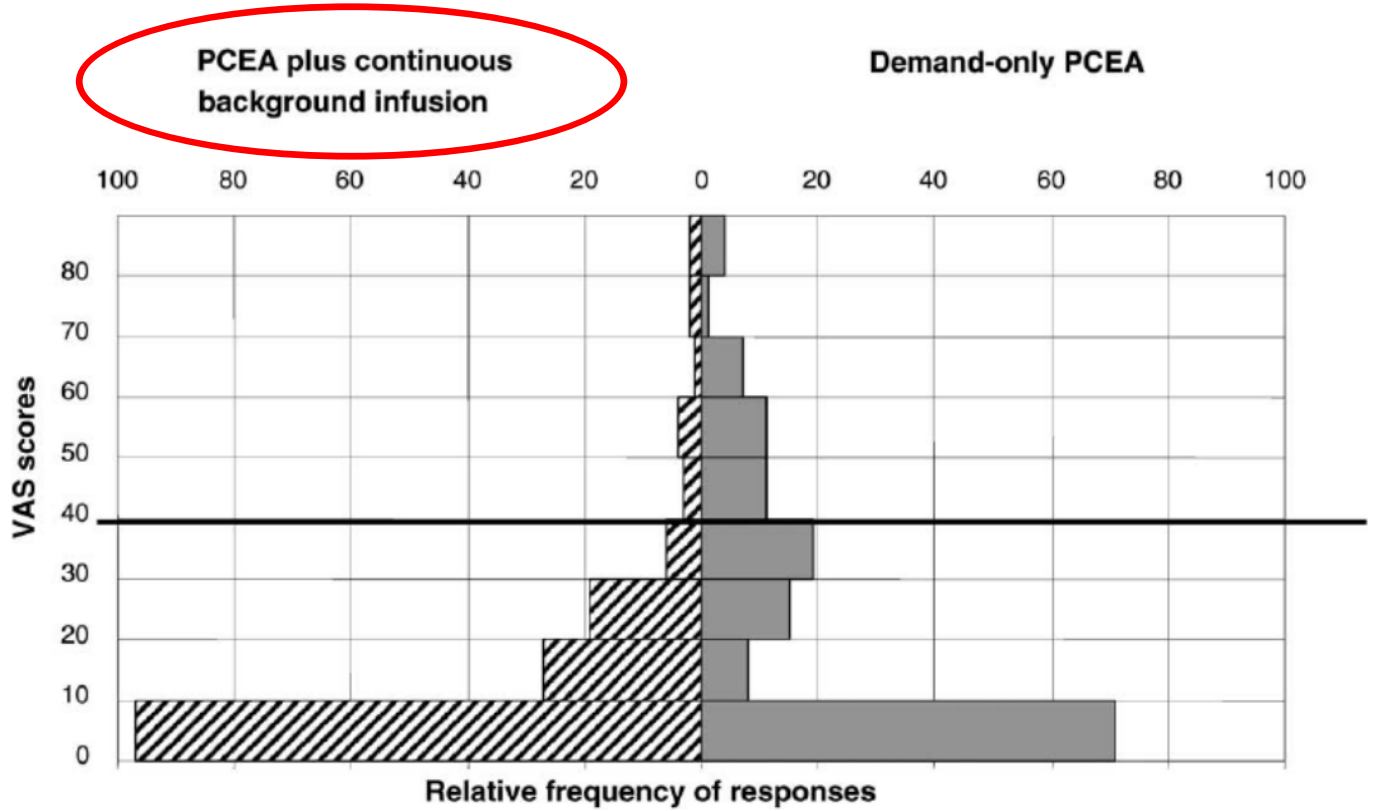


Fig. 1 Histogram of the different visual analogue scale (VAS) scores determined during the study. In the PCEA plus background infusion group (left side of the histogram), pain intensity was greater than 40 out of 100 mm at 12 time points (7.5%), compared to 33 time points (22.4%) in the demand-only PCEA group (right side of the histogram). This difference was statistically significant ($P = 0.0003$).

International Journal of Obstetric Anesthesia (2005) 14, 114–120

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

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

Loading dose

0.0625% levobupivacaine 20 mL + sufentanil 10 µg

- ***PIEB + PCEA (group PIEB)***
  Pump was programmed to deliver 0.0625% levobupivacaine with sufentanil 0.5 µg/mL, 10 mL every hour, beginning 60 minutes after the administration of the initial epidural loading dose.

- ***CEI + PCEA (group CEI)***
  The CEI group pump was programmed to deliver levobupivacaine 0.0625% with sufentanil 0.5 µg/mL at a rate of 10 mL/h beginning immediately after the loading dose administration.

Anesthesia & Analgesia: October 2011- Volume 113 – Issue 4 – p 826-831

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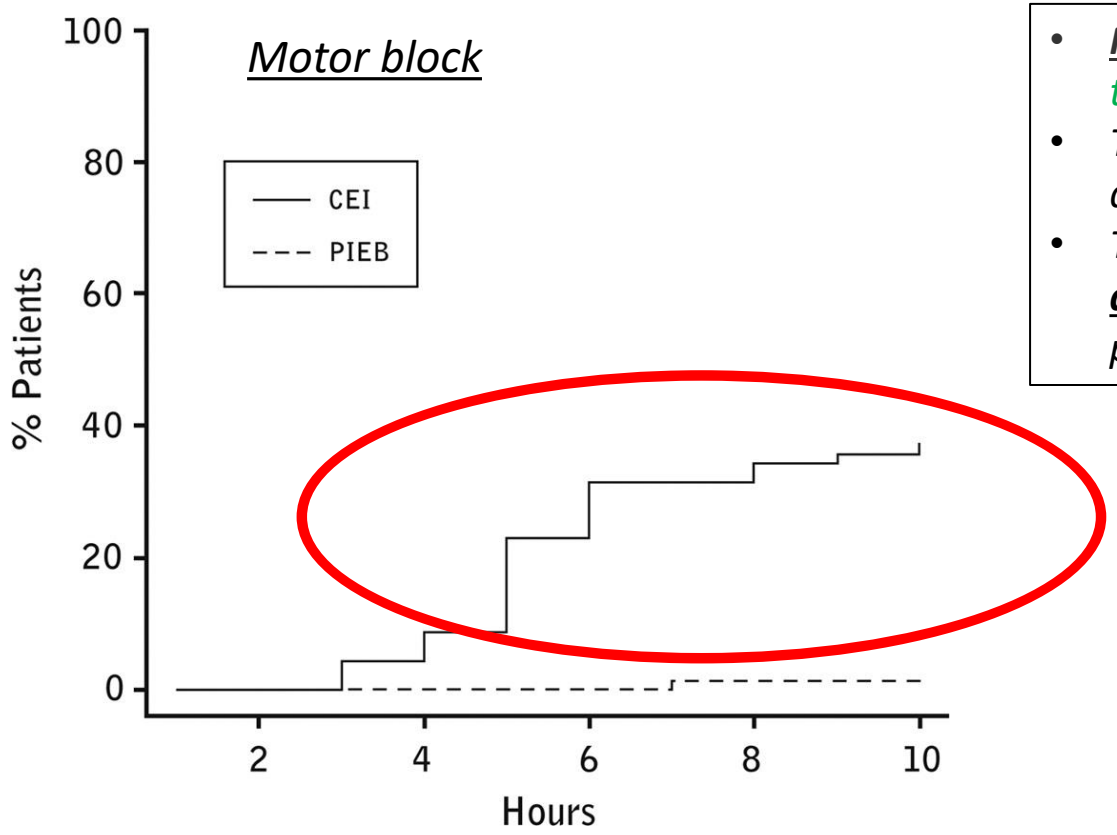
The Effects on Maternal Motor Function and Labor Outcome. A Randomized Double-Blind Study in Nulliparous Women

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



- ***Motor block*** *was reported in 37% in the CEI group and in 2.7% in the PIEB group (P < 0.001)*
- *The incidence of* ***instrumental delivery*** *was 20% for the CEI group and 7% for the PIEB group (P = 0.03)*
- *Total* ***levobupivacaine consumption****, number of patients requiring* ***additional PCEA boluses****, and* ***mean number of PCEA boluses*** *per patient were lower in the PIEB group (P < 0.001)*

Anesthesia & Analgesia: October 2011- Volume 113 – Issue 4 – p 826-831

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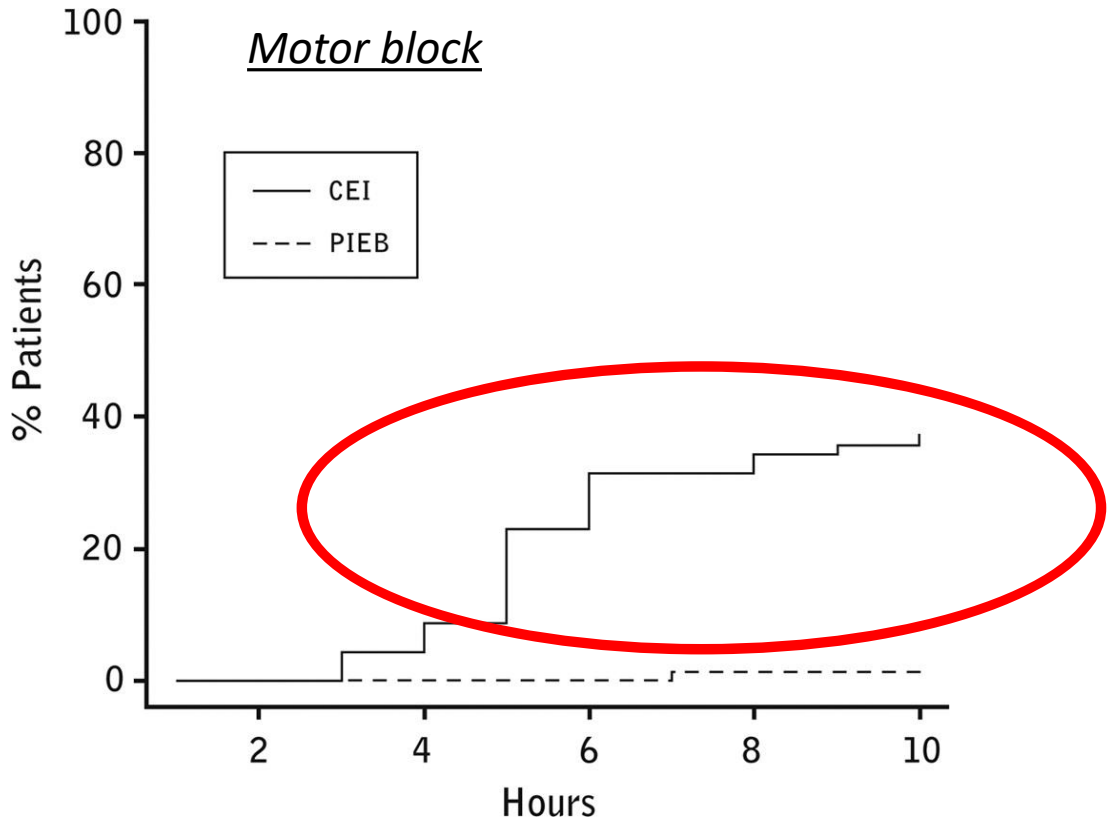
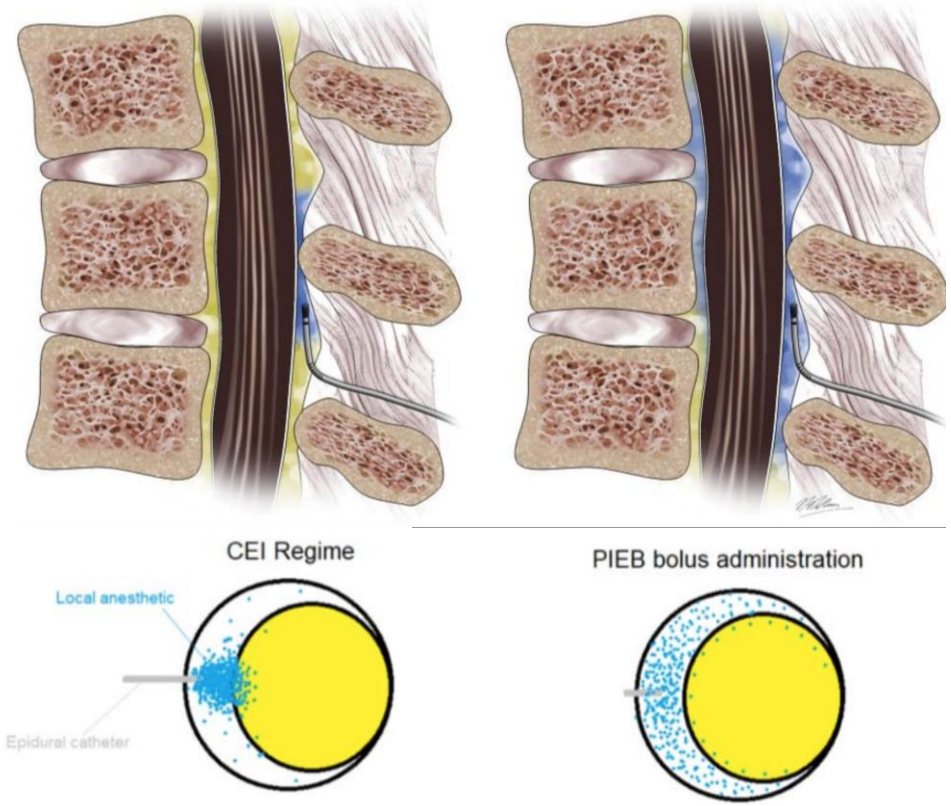
Capogna, Giorgio MD; Camorcia, Michela MD; Stirparo, Silvia MD; Farcomeni, Alessio PhD





LETTERS TO THE EDITOR

Epidural Infusion

Continuous or Bolus?

Kaynar, A. Murat MD; Shankar, K. B. MD

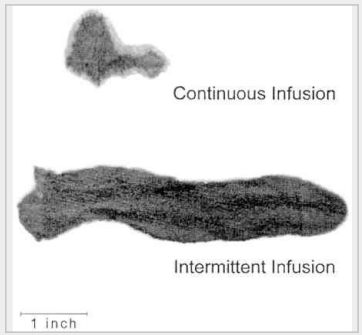


Figure 1: Area of diffusion of the contrast agent during continuous and intermittent infusions.

In this experiment, we showed that intermittent bolusing of the epidural catheter has a wider spread, which probably contributes to the better quality of the block in the clinical setting.

LETTERS TO THE EDITOR

Epidural Infusion

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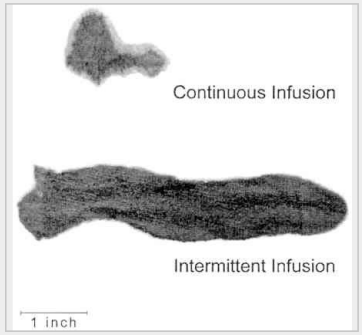


Figure 1: Area of diffusion of the contrast agent during continuous and intermittent infusions.

In this experiment, we showed that intermittent bolusing of the epidural catheter has a wider spread, which probably contributes to the better quality of the block in the clinical setting.

RESEARCH PAPER

The effect of epidural injection speed on epidural pressure and distribution of solution in anesthetized dogs

Table 1 Epidural (EP) and injection (IP) pressures before (baseline pressure) and after (peak pressure) injection, and epidural distribution (ED) and sensory block (SB)

Evaluation parameters		Injection speeds: 1 mL minute^{-1}	2 mL minute^{-1}
Baseline pressure (mmHg)	EP	2.1 ± 6.1	
	IP	2.6 ± 7.1	
Peak pressure (mmHg)	EP	23.1 ± 8.5	35.0 ± 14.5*
	IP	68.5 ± 10.7	144.7 ± 32.6*
Maximum ED (vertebrae)		11.5 (4–22)	12 (5–21)
Maximum SB (dermatomes)		3.5 (0–20)	1 (0–20)

Data are mean ± SD or median (range). *Significant difference between injection speeds ($p < 0.05$).

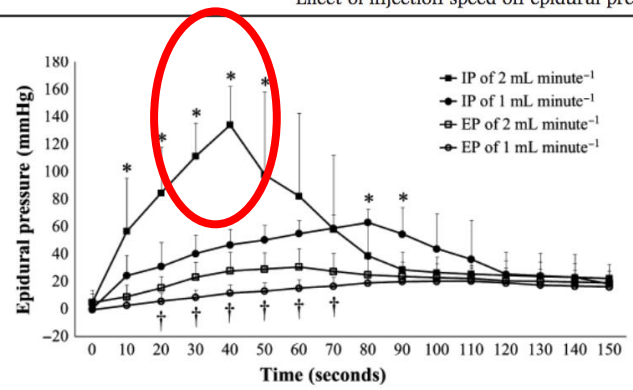


Figure 2 Changes in injection pressure (IP) and epidural pressure (EP) during and after injection of epidural solution at 1 and 2 mL minute^{-1} in 10 dogs. *Significant difference between IP ($p < 0.05$). †Significant difference between EP ($p < 0.05$).

Wong et al. Veterinary Anaesthesia and Analgesia, 2016, 41, 526–533

A Systematic Review and Meta-Analysis Comparing Programmed Intermittent Bolus and Continuous Infusion as the Background Infusion for Parturient-Controlled Epidural Analgesia

SCIENTIFIC REPORTS
nature research

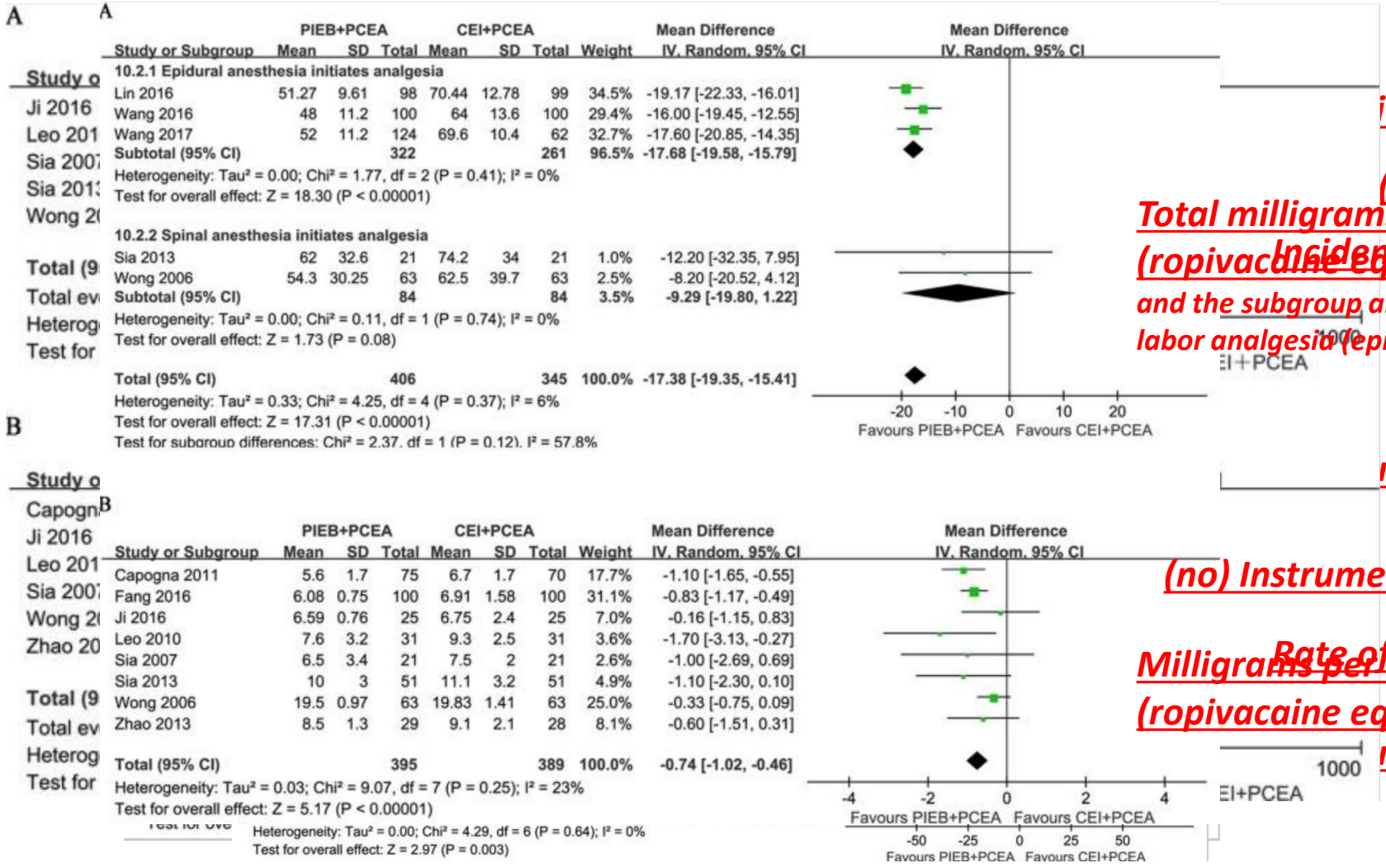
Eleven eligible trials

- ***717 participants allocated to the PIEB + PCEA group***
- ***650 patients allocated to the CEI + PCEA group***

Jiqian et al. Sci Rep. 2019; 9: 2583

A Systematic Review and Meta-Analysis Comparing Programmed Intermittent Bolus and Continuous Infusion as the Background Infusion for Parturient-Controlled Epidural Analgesia

SCIENTIFIC REPORTS
nature research



ivery

(minutes) of labor

Total milligrams of local anesthetic (ropivacaine equivalents) consumption

Incidence of breakthrough pain

and the subgroup analysis for the initiating form of labor analgesia (epidural or spinal initiation)

ıtes) of the first stage of labor

(no) Instrumental delivery

Rate of using PCEA for labor analgesia

Milligrams per hour of local anesthetic (ropivacaine equivalents) consumption

ıtes) of the second stage of labor

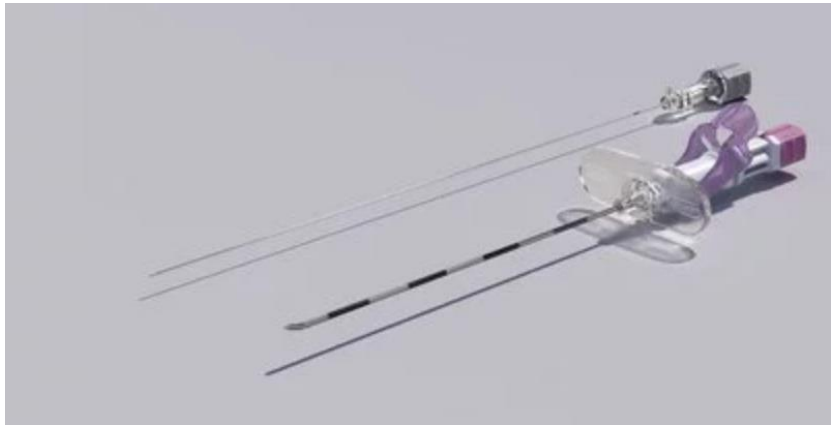
Jiqian et al. Sci Rep. 2019; 9: 2583

ADVANTAGE OF PROGRAMMED INTERMITTENT EPIDURAL BOLUSES

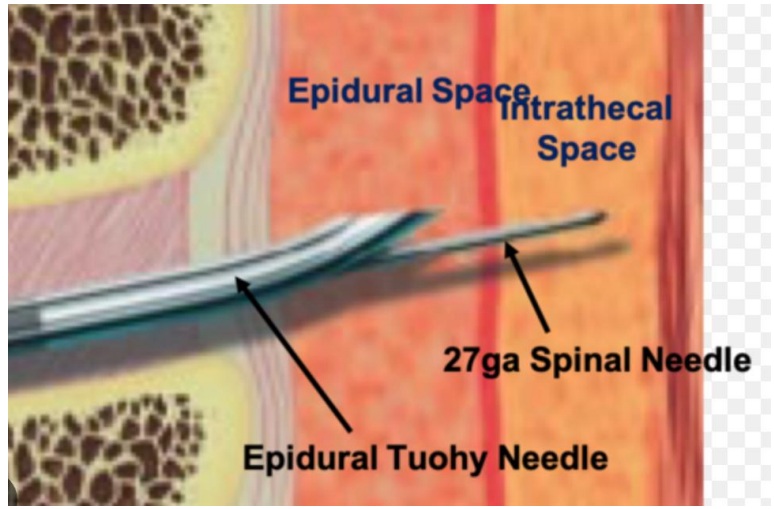
- ***Greater spread of medication into the epidural space***
- ***Maintenance of analgesia with less local anesthetic without altering maternal analgesia and satisfaction associated with fewer additional epidural doses (less acute pain)***
- ***Reduced risk of motor block and instrumented delivery***

Levobupivacaine 0.625% with sufentanyl 0.1 to 0.2 µg/mL
-> PIB 6 mL every 30 minutes + PCEA 5 mL/10 minutes

Wong et al. *Anesth Analg.* 2011;112:904–11.
Capogna et al. *Anesth Analg.* 2011;113:826–31.



COMBINED SPINAL-EPIDURAL (CSE)



Intrathecal Sufentanil and Fetal Heart Rate Abnormalities: A Double-Blind, Double Placebo-Controlled Trial Comparing Two Forms of Combined Spinal Epidural Analgesia with Epidural Analgesia in Labor

Van de Velde, M. MD, PhD*; Teunkens, A. MD*; Hanssens, M. MD, PhD, FRCOG†; Vandermeersch, E. MD, PhD*; Verhaeghe, J. MD, PhD†

300 parturients:

- ***EPD group:***
  Epidural analgesia was initiated with 12.5 mg of bupivacaine, 12.5 µg of epinephrine, and 7.5 µg of sufentanil in a volume of 10 mL
- ***BSE group:***
  Initial intrathecal analgesia consisted of 2.5 mg of bupivacaine, 2.5 µg of epinephrine, and 1.5 µg of sufentanil.
- ***SUF group:***
  Spinal analgesia consisted of 7.5 µg of sufentanil .

Analgesia was maintained in all groups with patient-controlled epidural analgesia using bupivacaine 0.125%, 1.25 µg/mL of epinephrine, and 0.75 µg/mL of sufentanil (bolus, 4 mL; lockout, 15 min).

Anesthesia & Analgesia: April 2004

Intrathecal Sufentanil and Fetal Heart Rate Abnormalities: A Double-Blind, Double Placebo-Controlled Trial Comparing Two Forms of Combined Spinal Epidural Analgesia with Epidural Analgesia in Labor

Van de Velde, M. MD, PhD*; Teunkens, A. MD*; Hanssens, M. MD, PhD, FRCOG†; Vandermeersch, E. MD, PhD*; Verhaeghe, J. MD, PhD†

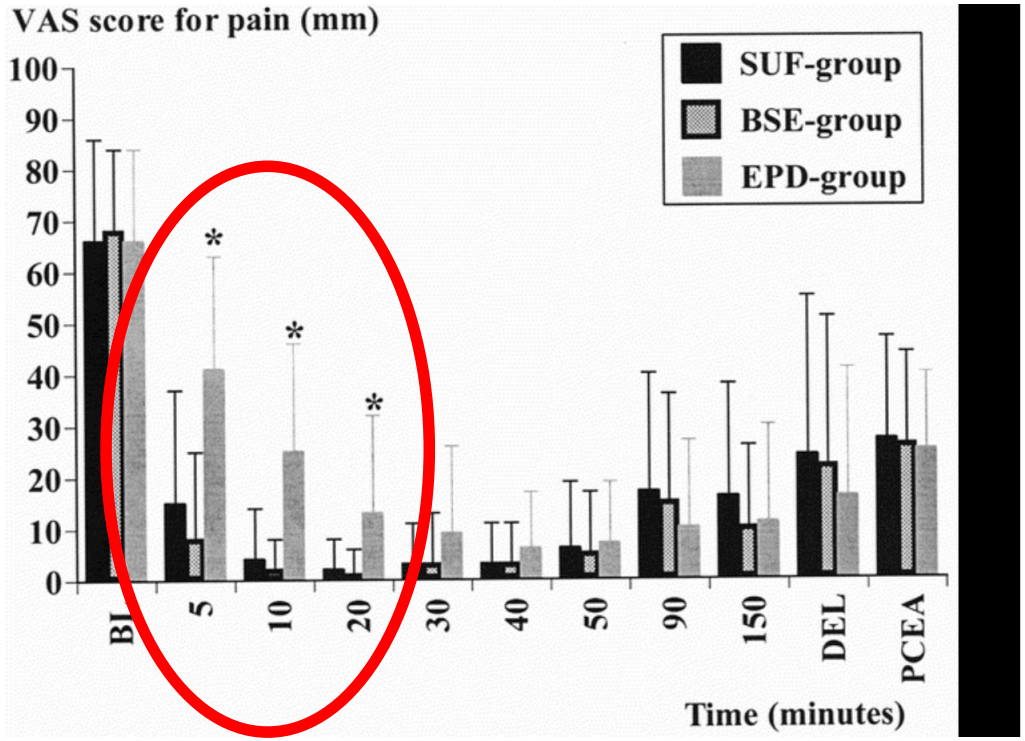


Figure 1.

Visual analog scale (VAS) score for pain. *$P < 0.05$ versus SUF and BSE groups. BL = baseline; DEL = delivery; PCEA = patient-controlled epidural analgesia (first request for additional analgesia).

Source

Intrathecal Sufentanil and Fetal Heart Rate Abnormalities: A Double-Blind, Double Placebo-Controlled Trial Comparing Two Forms of Combined Spinal Epidural Analgesia with Epidural Analgesia...

Anesthesia & Analgesia98(4):1153-1159, April 2004.

Randomised comparison of combined spinal-epidural and standard epidural analgesia in labour

R E Collis, D W L Davies, W Aveling

Lancet 1995; 345: 1413-16

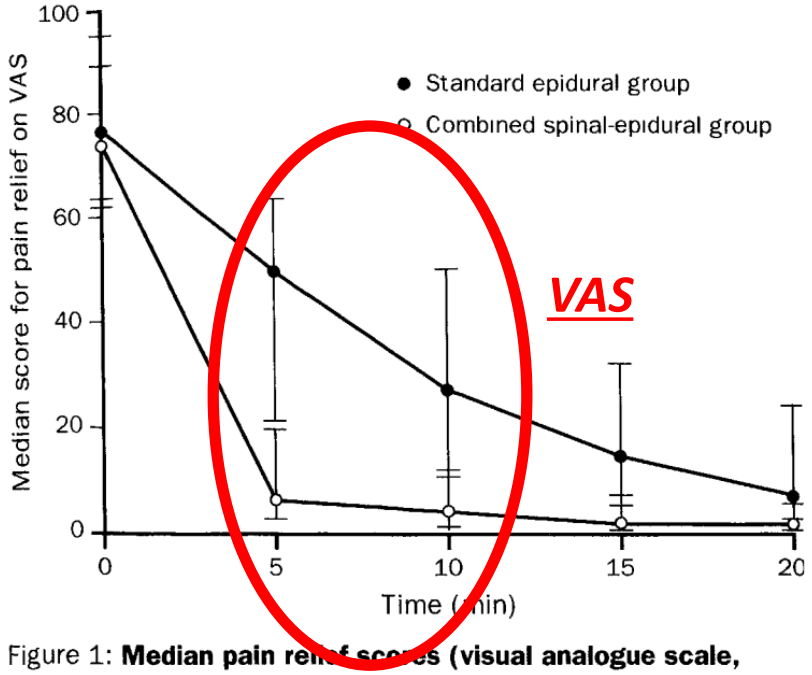


Figure 1: **Median pain relief scores (visual analogue scale, VAS) during first 20 min after establishment of block**
Error bars indicate IQR. 0=best outcome.

Anaesth Intensive Care 2001; **29:** 595-599

Post Dural Puncture Headache Following Combined Spinal Epidural or Epidural Anaesthesia in Obstetric Patients

M. VAN DE VELDE*, A. TEUNKENS†, M. HANSSENS‡, F. A. VAN ASSCHE§, E. VANDERMEERSCH**

Departments of Anaesthesiology, Obstetrics and Gynaecology, Katholieke Universiteit Leuven and University Hospitals Gasthuisberg, Leuven, Belgium

TABLE 2

The incidence of failed spinal anaesthesia/analgesia and of failure of the epidural catheter to produce satisfactory anaesthesia/ analgesia requiring a new epidural puncture (n=2736)

	EA N=661	CSE N=2075	CSE 27 gauge N=349	CSE 29 gauge N=1726
Failed spinal		56 (2.70%)	9 (2.58%)	47 (2.72%)
Failed epidural	21 (3.18%)	31 (1.49%)*	6 (1.72%)*	25 (1.44%)*

EA: data on patients treated with epidural techniques; CSE: data on patients treated with combined spinal-epidural techniques; CSE 27 gauge: data on patients treated with CSE using a 27 gauge spinal needle; CSE 29 gauge: data on patients treated with CSE using a 27 gauge spinal needle. Values are number (% of sub-group). *$P<0.05$ versus EA.

Intrathecal Sufentanil and Fetal Heart Rate Abnormalities: A Double-Blind, Double Placebo-Controlled Trial Comparing Two Forms of Combined Spinal Epidural Analgesia with Epidural Analgesia in Labor

Van de Velde, M. MD, PhD*; Teunkens, A. MD*; Hanssens, M. MD, PhD, FRCOG†; Vandermeersch, E. MD, PhD*; Verhaeghe, J. MD, PhD†

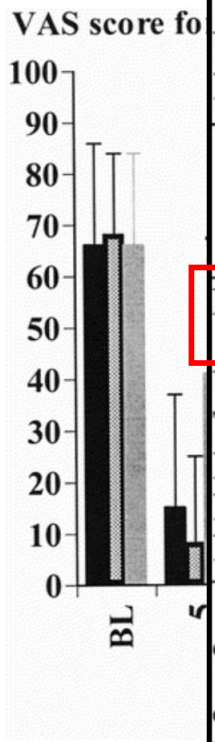


Table 2. Data Related to Nonreassuring Fetal Heart Rate, Uterine Hyperactivity, Maternal Hypotension, and Ephedrine Treatment

	EPD group (n = 100)	BSE group (n = 98)	SUF group (n = 98)
Nonreassuring fetal heart rate (%)	11	12	24*
Uterine hyperactivity (%)	2	2	12†
Tocolysis (%)	0	2	1
Hypotension (%)	31	33	33
Ephedrine treatment (%)	7	29‡	12
Ephedrine (mg)	0 (0–0)	0 (0–5)	0 (0–0)

Results are presented as mean ± SD, median (interquartile range), or as % of group total.

* $P < 0.05$ versus epidural (EPD) groups; † $P < 0.05$ versus bupivacaine + epinephrine + sufentanil (BSE-) and EPD-groups; ‡ $P < 0.05$ versus (SUF-) sufentanil and EPD-group.

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with Epidural

gesia98(4):1153-

The Effect of Combined Spinal–Epidural Versus Epidural Analgesia in Laboring Women on Nonreassuring Fetal Heart Rate Tracings: Systematic Review and Meta-analysis

Hattler, Judith MD*; Klimek, Markus MD, PhD, DEAA, EDIC†; Rossaint, Rolf MD, PhD‡; Heesen, Michael MD, PhD*

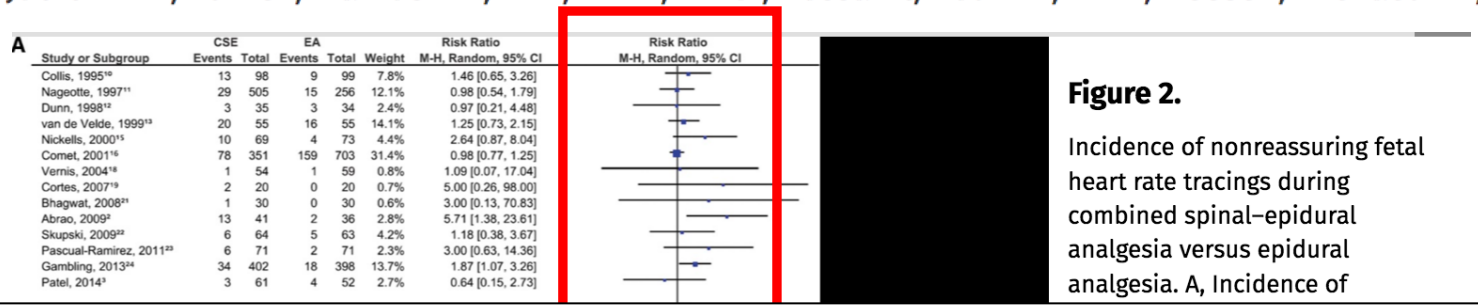
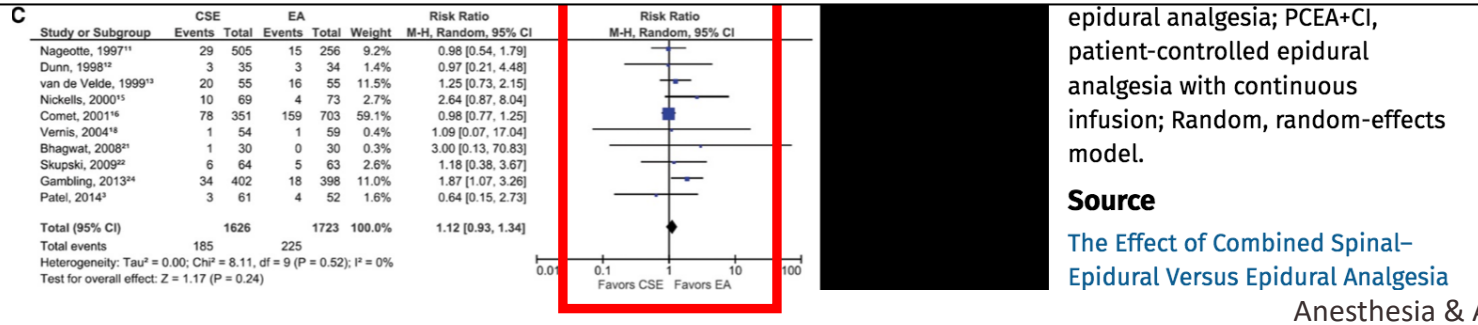


Figure 2.

Incidence of nonreassuring fetal heart rate tracings during combined spinal–epidural analgesia versus epidural analgesia. A, Incidence of

Seventeen trials including 3947 parturients

In summary, CSE analgesia was associated with a higher risk of nonreassuring FHR tracings compared with epidural analgesia. Our analysis does not rule out that CSE compared with low-dose epidural bupivacaine analgesia is associated with a higher rate of nonreassuring FHR abnormalities. It is not clear whether this potentially higher incidence is associated with a greater risk of cesarean delivery.



epidural analgesia; PCEA+CI, patient-controlled epidural analgesia with continuous infusion; Random, random-effects model.

Source

The Effect of Combined Spinal–Epidural Versus Epidural Analgesia

Anesthesia & Analgesia: October 2016 - Volume 123 – Issue 4 – p 955-964

Anaesthesia
Peri-operative medicine, critical care and pain
Association of Anaesthetists

Review Article | Free Access

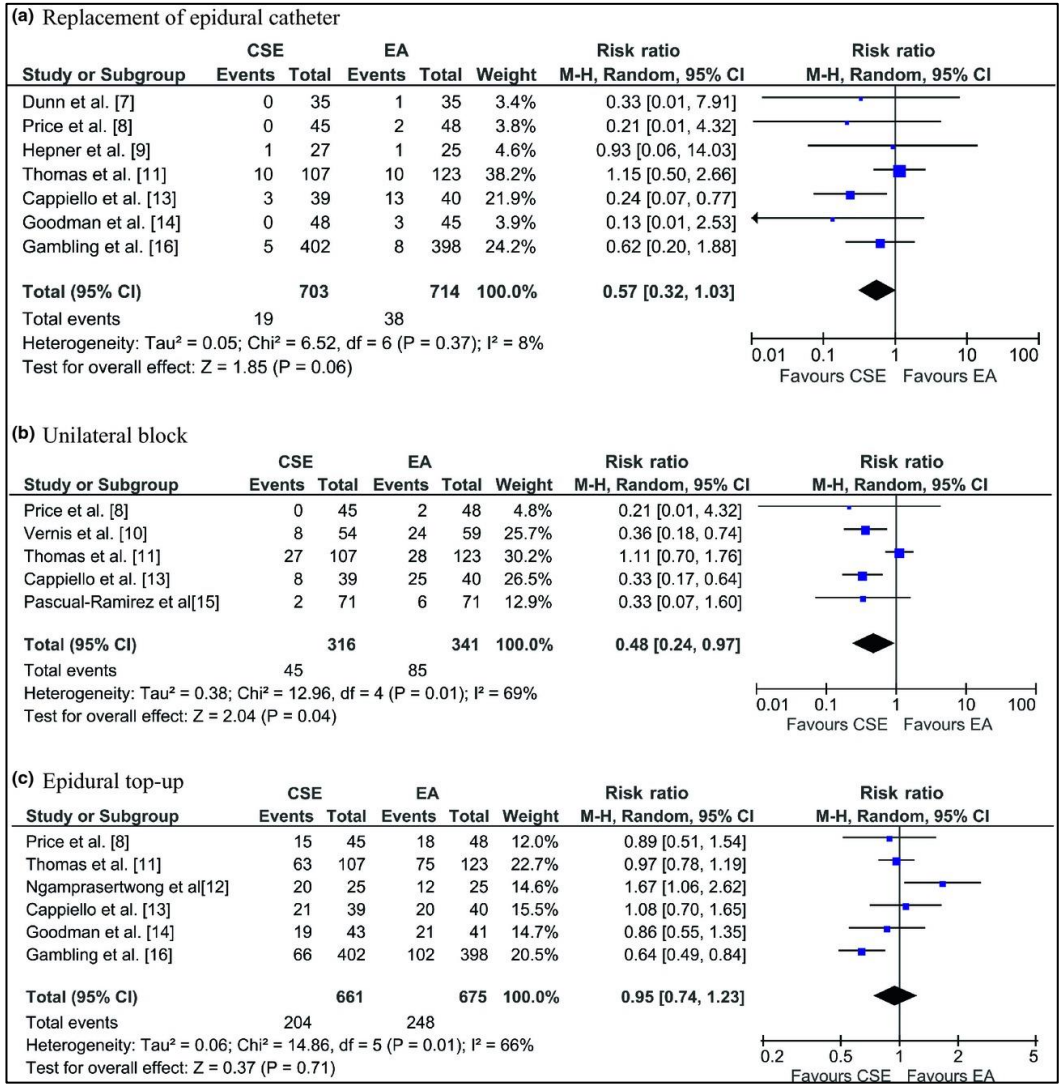
Meta-analysis of the success of block following combined spinal-epidural vs epidural analgesia during labour

M. Heesen, M. Van de Velde, S. Klöhr, J. Lehberger, R. Rossaint, S. Straube

10 randomised controlled trials comparing CSE and epidural analgesia in 1722 labouring women in labour

***No significant differences** were found for rates of epidural catheter replacement, epidural top-up, and epidural vein cannulation.*

On the basis of current best evidence, a consistent benefit of CSE over epidural analgesia cannot be demonstrated for the outcomes assessed in our review.



Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

1,054 nulliparous women in labor:

- ***Traditional****: boluses of 10 ml 0.25% bupivacaine on request (but no more than hourly).*
- ***Combined spinal-epidural (CSE) analgesia****: 1 ml bupivacaine 0.25% and 25 µg fentanyl + bolus of 15 ml 0.1% bupivacaine with 20 µg fentanyl; rescue: boluses of 10 ml 0.1% bupivacaine with 2 microg/ml fentanyl, on request (but no more frequently than half hourly).*
- ***Low-dose infusion (LDI)****: bolus of 15 ml 0.1% bupivacaine with 2 microg/ml fentanyl followed by 10 ml/h; rescue: 10 ml of the mixture (but no more frequently than half hourly).*

-> Visual analog scale pain assessments were collected throughout labor and delivery and 24 h later

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

Table 6. Requirement for Anesthesiologist Reattendance in Preceding Hour

Time (T) after Epidural Insertion	Percentage of Epidura Anesthesiologist Atte: Trad (n = 353)	(n
1 h	10	
2 h	9	
3 h	10	
4 h	8	
5 h	9	
6 h	13	
7 h	7	
8 h	16	

*$P < 0.01$, **$P < 0.001$ chi-squared. N.B. tests of significance conducted or CSE
Trad = traditional; CSE = combined spinal–epidural; LDI = low dose infu

Table 4. Median Visual Analogue Pain Scores (VAS) during Labor and Percentage of Women Reporting VAS < 20/100 (% VAS < 20) by Study Group, after Epidural Insertion

	VAS for Epidural Technique Allocated						
	Traditional (n = 353)		CSE (n = 351)		LDI (n = 350)		
Time after Insertion	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	VAS (median)	% VAS < 20	N (Total) 1,054
5 min	64	8%	20†	50%†	57	13%	939
10 min	44	24%	0†	69%†	38	26%	941
15 min	27	43%	0†	74%†	28	38%	955
20 min	12	57%	0†	80%†	18	52%	945
25 min	7	65%	0†	83%†	10	55%	941
30 min	0	71%	0†	84%†	9*	60%	936
1 h	14	59%	4†	66%	10	63%*	881
2 h	15	55%	12	60%	11	58%	825
3 h	15	56%	21*	44%*	12	59%	730
4 h	10	56%	20	49%	10	61%	589
5 h	18	52%	21	48%	10	60%	477
6 h	20	49%	20	49%	10	62%	363
7 h	20	48%	15	52%	7	64%	257
8 h	28	46%	25	44%	9	60%	185
9 h	22	47%	20	47%	6	66%	111
10 h	20	45%	42	35%	0	69%	72

* $P < 0.01$, † $P < 0.001$, (Mann–Whitney U test). N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

Table 6. Requirement for Anesthesiologist Reattendance in Preceding Hour, as a Percentage of Epidurals at Time Reported by Study Group

Time (T) after Epidural Insertion	Percentage of Epidurals in Each Group Requiring Anesthesiologist Attendance in Preceding Hour: Trad (n = 353)	CSE (n = 351)	LDI (n = 350)	Number of Records at Time (T): N = 1054
1 h	10	39**	15	881
2 h	9	40**	13	825
3 h	10	18*	17*	730
4 h	8	13	15*	589
5 h	9	17*	10	477
6 h	13	11	14	363
7 h	7	11	10	258
8 h	16	13	10	185

*$P < 0.01$, **$P < 0.001$ chi-squared. N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.
Trad = traditional; CSE = combined spinal–epidural; LDI = low dose infusion.

Table 4. Median Visual Analogue Pain Scores (VAS) during Labor and Percentage of Women Reporting VAS < 20/100 (% VAS < 20) by Study Group, after Epidural Insertion

Time after Insertion	VAS for Epidural Technique Allocated: Traditional (n = 353) VAS (median)	Traditional % VAS < 20	CSE (n = 351) VAS (median)	CSE % VAS < 20	LDI (n = 350) VAS (median)	LDI % VAS < 20	N (Total) 1,054
6			20†	50%†	57	13%	939
6			0†	69%†	38	26%	941
6			0†	74%†	28	38%	955
6			0†	80%†	18	52%	945
6			0†	83%†	10	55%	941
6			0†	84%†	9*	60%	936
6			4†	66%	10	63%*	881
6			12	60%	11	58%	825
6			21*	44%*	12	59%	730
6			20	49%	10	61%	589
6			21	48%	10	60%	477
6			20	49%	10	62%	363
6			15	52%	7	64%	257
6			25	44%	9	60%	185
6			20	47%	6	66%	111
6			42	35%	0	69%	72

†). N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

Table 5. Efficacy of Pain Relief at Birth by Study Group in Women with Spontaneous Vaginal Delivery

	Study group		
	Trad n = 124	CSE n = 150	LDI n = 150
Maternal pain report at the time of delivery	—	—	—
Comfortable– no sensation	12 (13%)	18 (16%)	17 (15%)
Comfortable– sensation	50 (55%)	45 (40%)	51 (45%)
Painful	29 (32%)	50 (44%)	46 (40%)
Missing	33	37	36
Median VAS for pain at birth, at delivery	40	55	40
(% VAS < 20)	(20)	(17)	(23)
Missing	43	54	50
Median VAS for pain at birth, at PNI	27	47	32
(% VAS < 20)	(38)	(30)	(43)
Missing	0	0	1

es (%

Conclusions

Relative to traditional epidural analgesia, LDI is at least as effective and CSE provided better pain relief in the early stages after insertion. The proven efficacy of mobile epidurals and their beneficial impact on delivery mode make them the preferred techniques for epidural pain relief in labor.

Anesthesiology December 2002, Vol. 97, 1567–157

Randomized Controlled Trial Comparing Traditional with Two "Mobile" Epidural Techniques: Anesthetic and Analgesic Efficacy

FREE

Comparative Obstetric Mobile Epidural Trial (COMET) Study Group UK

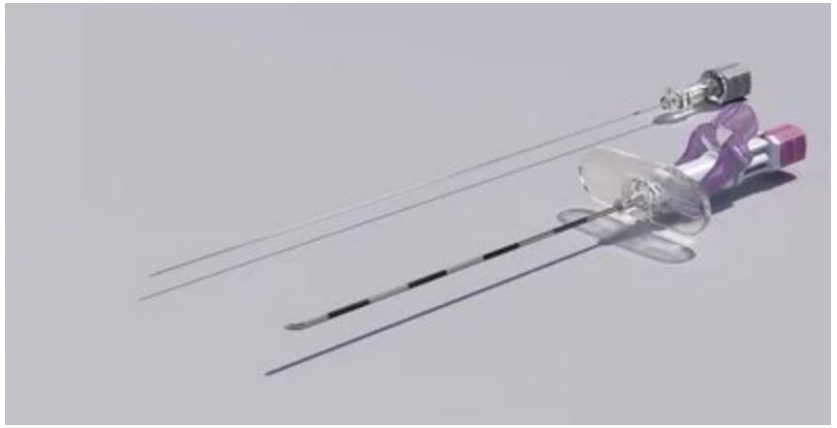
Table 2. Technical Difficulties at Epidural Insertion (Excluding Failed Spinal in CSE) by Study Group

	Study Group		
	Trad (n = 353)	CSE (n = 351)	LDI (n = 350)
Failed epidural	2	5	7
Difficult insertion	48	68*	44
Dural tap	1	0	3
Bloody tap	14	13	17
Resisted (any time after first analgesia)	15	14	24

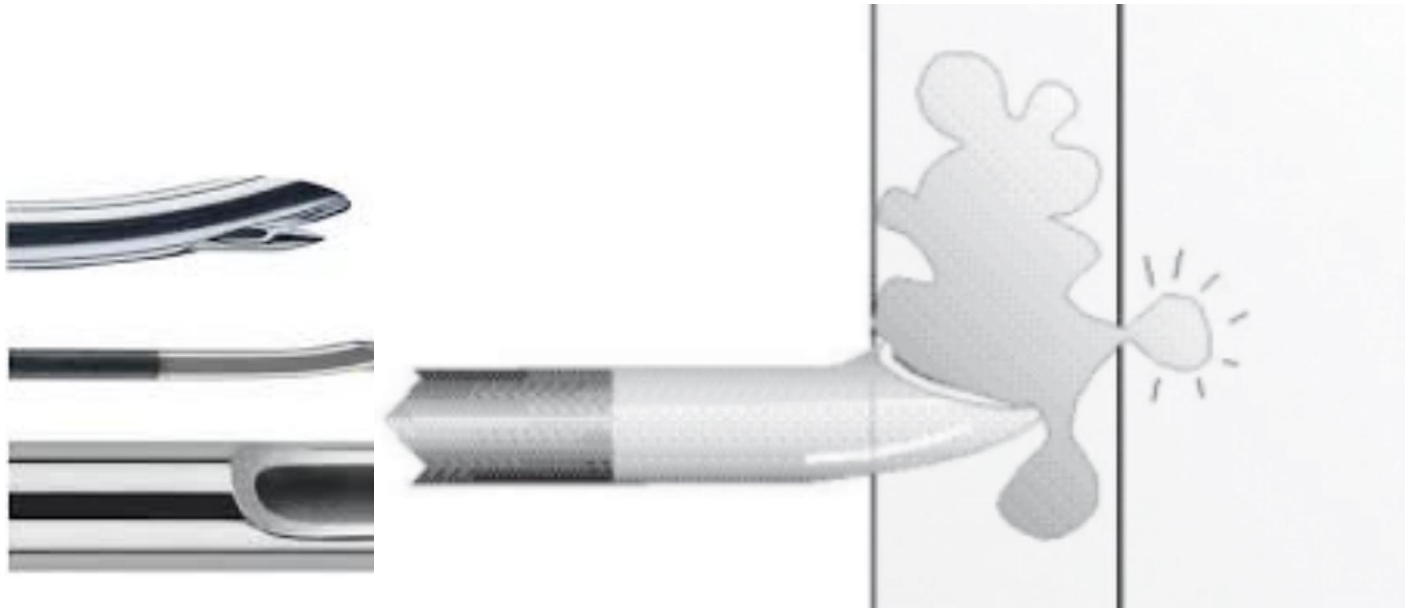
* $P < 0.001$ chi-squared. N.B. tests of significance conducted for CSE *vs.* Trad and LDI *vs.* Trad.

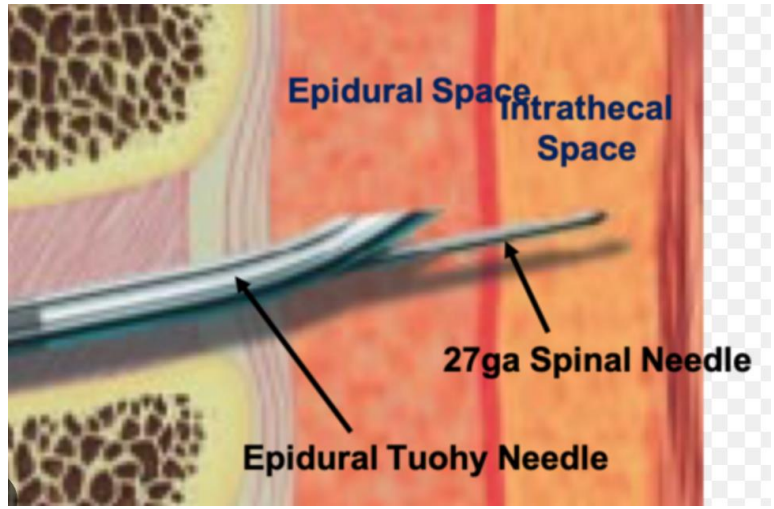
Trad = traditional; CSE = combined spinal–epidural; LDI = low dose infusion.

Anesthesiology December 2002, Vol. 97, 1567–157



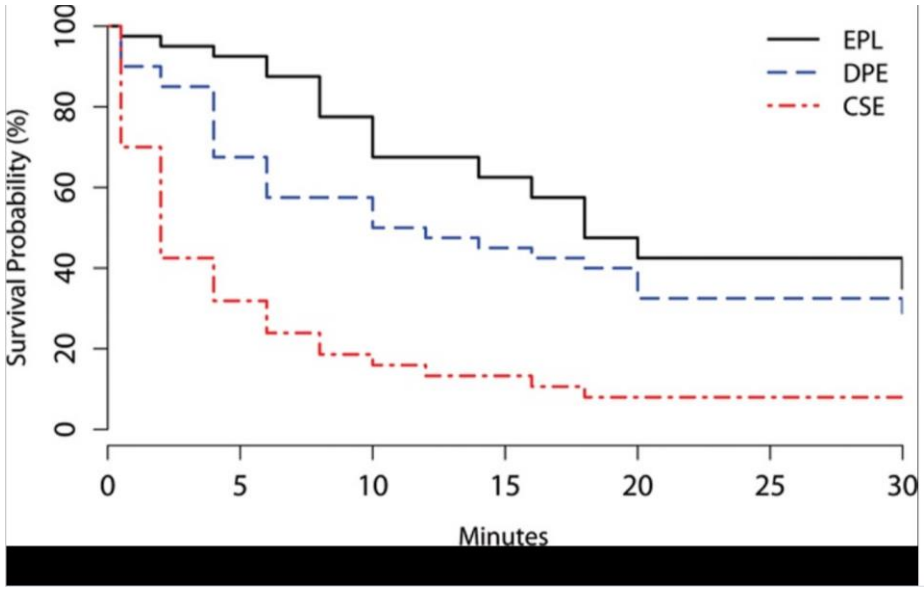
DURAL PUNCTURE EPIDURAL (DPE)





Dural Puncture Epidural Technique Improves Labor Analgesia Quality With Fewer Side Effects Compared With Epidural and Combined Spinal Epidural Techniques: A Randomized Clinical Trial

Initial dosing for EPL and DPE consisted of epidural 20 mL of 0.125% bupivacaine plus fentanyl 2 µg/mL over 5 minutes, and for CSE, intrathecal 0.25% bupivacaine 1.7 mg and fentanyl 17 µg.



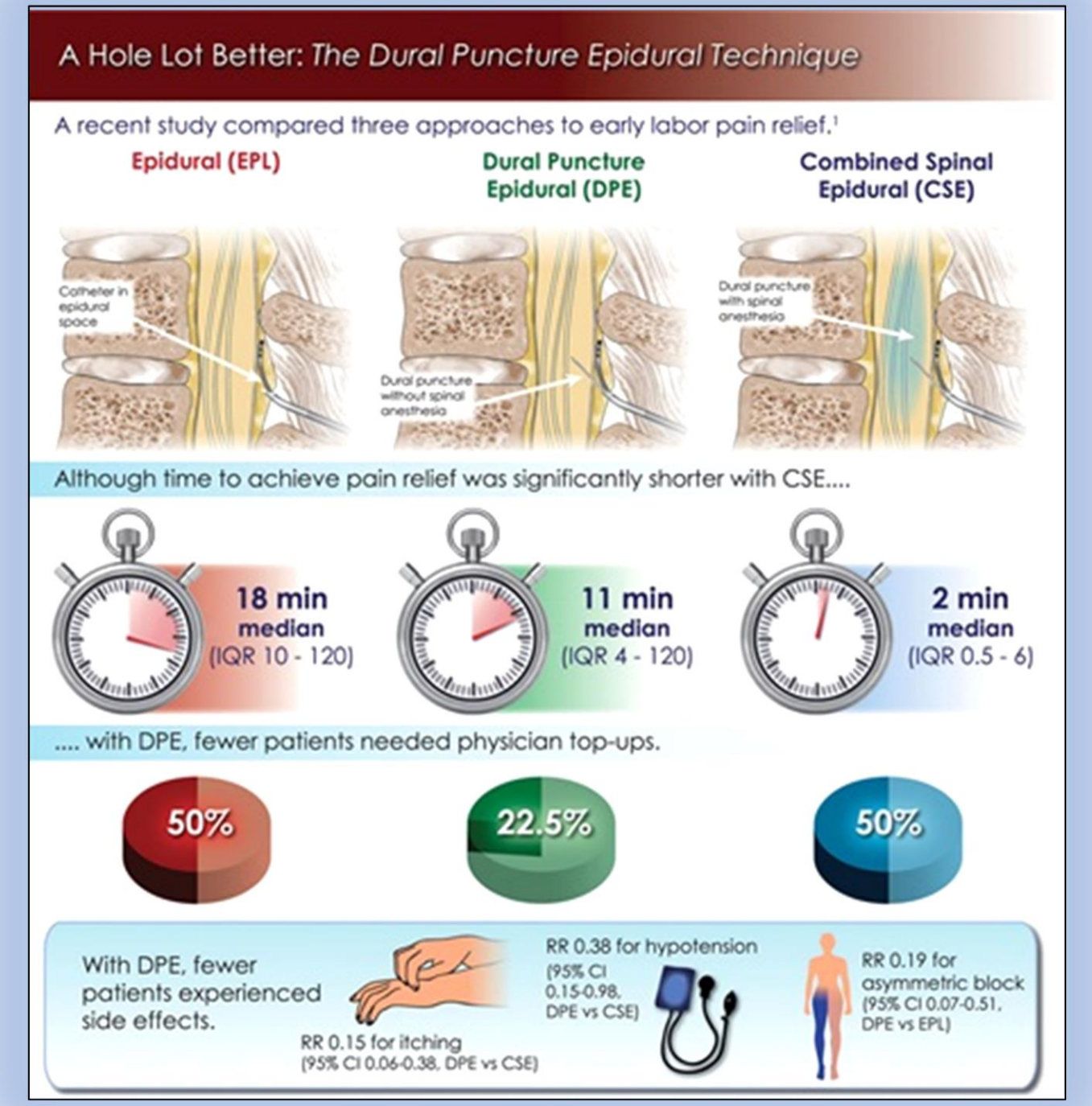
Kaplan-Meier curves for time to achieving NPRS ≤ 1 following initial bolus dosing by CSE, DPE, or EPL analgesia techniques. Survival probability indicates probability of subjects surviving with NPRS > 1 at given time. CSE indicates combined-spinal epidural; DPE, dural-puncture epidural; EPL, standard epidural; NPRS, numeric pain rating scale.

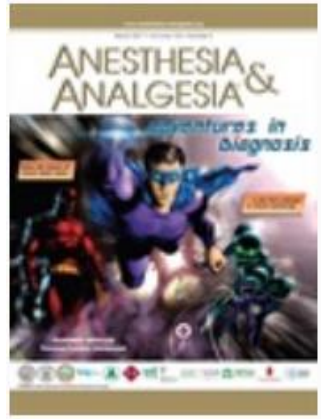
Source

Dural Puncture Epidural Technique Improves Labor Analgesia Quality With Fewer Side Effects Compared With Epidural and Combined Spinal Epidural Techniques: A Randomized Clinical Trial

Anesthesia & Analgesia124(2):560-569, February 2017.

Anesthesia & Analgesia: February 2017 – Volume 124 – Issue 2 – p 560-569



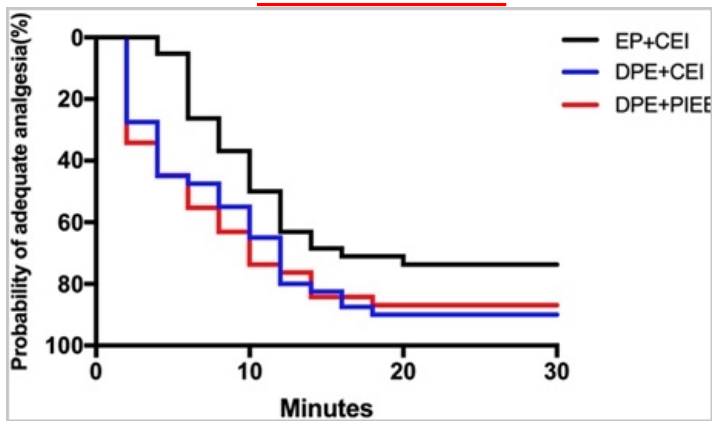


A Hole Lot Better: The Dural Puncture Epidural Technique

Anesthesia & Analgesia: February 2017 – Volume 124 – Issue 2 – p 375

Effect of Dural Puncture Epidural Technique Combined With Programmed Intermittent Epidural Bolus on Labor Analgesia Onset and Maintenance: A Randomized Controlled Trial

VAS ≤30 mm



Time Point	EP + CEI		DPE + CEI		DPE + PIEB	
	n	VAS Score	n	VAS Score	n	VAS Score
Before analgesia	38	80.5 (11.6) (77.5–90)	40	80.5 (12.2) (72.5–90)	38	78.7 (12.1) (70–82.5)
10 min	38	25.5 (23.7) (0–40)	40	17.8 (18.6) (0–37.5)	38	18.0 (18.4) (0–30)
20 min	38	20.0 (20.4) (7.5–40)	40	12.8 (13.2) (0–20)	38	11.7 (12.4) (0–20)
30 min	38	20.9 (18.2) (10–30)	40	14.1 (14.0) (0–20)	38	15.7 (15.0) (9.5–20)

Anesthesia & Analgesia: April 2021 – Volume 132 – Issue 4 - p 971-978

FEATURED ART

Effect … chnique Combined With Progra… Bolus on Labor Analge… A Randomized Contro…

	EP + CEI (n = 38)	DPE + CEI (n = 40)	DPE + PIEB (n = 38)
Thoracic sensory block (not feel cold)			
Highest level (left)	T10 (T9–T10)	T10 (T8–T10)	T10 (T8–T10)
Highest level (right)	T10 (T9–T10)	T10 (T8–T10)	T10 (T8–T10)
Asymmetric blocks	8 (21.1)	3 (7.5)	2 (5.3)
Bromage score >0	1 (2.6)	0	0
Duration of labor analgesia (min)	422 (178)	427 (164)	384 (193)
Time to first PCEA (min)	122 (85)	141 (99)	154 (100)
Time to first provider bolus	193 (130)	165 (64)	172 (88)
Patients requiring PCEATable 2.	28 (73.7)	30 (75)	15 (39.5)
No. of PCEA bolusesTable 2.	2 (0–3)	2 (0.25–3)	0 (0–1)
Provider bolusesTable 2.	17 (44.7)	10 (25)	4 (10.5)
Delivery mode			
Vaginal	31 (81.6)	36 (90)	
Cesarean delivery	7 (18.4)	4 (10)	
Instrumental vaginal delivery			
Yes	4 (12.9)		
No	27 (…		
Duration of first stage of labor (min)			…n = 35)
Duration of second stage of la… (min)			37.0 (23.6) (n = 35)
Adverse effects			
Postpartum headache		0	0
Pruritus	0	1 (2.5)	0
Nausea	2 (5.3)	1 (2.5)	0
Vomiting	1 (2.6)	0	0
Hypotension	0	1 (2.5)	0
Fetal bradycardia within 30 min after EA	0	0	0
Apgar score at 1 min	10 (9–10)	10 (9–10)	10 (9.75–10)
Apgar score at 5 min	10 (10–10)	10 (10–10)	10 (10–10)
Satisfaction score of analgesia (mm)	90 (87.5–100)	92.5 (80–100)	97.5 (90–100)

LETTERS TO THE EDITOR: LETTER TO THE EDITOR

Dural Puncture Epidural Technique: Not So Fast

Richardson, Michael G. MD; Baysinger, Curtis L. MD

EP + PIEB ?

Anesthesia & Analgesia: April 2021 – Volume 132 – Issue 4 - p 971-978

Anaesthesia
Peri-operative medicine, critical care and pain
Association of Anaesthetists

Free Access

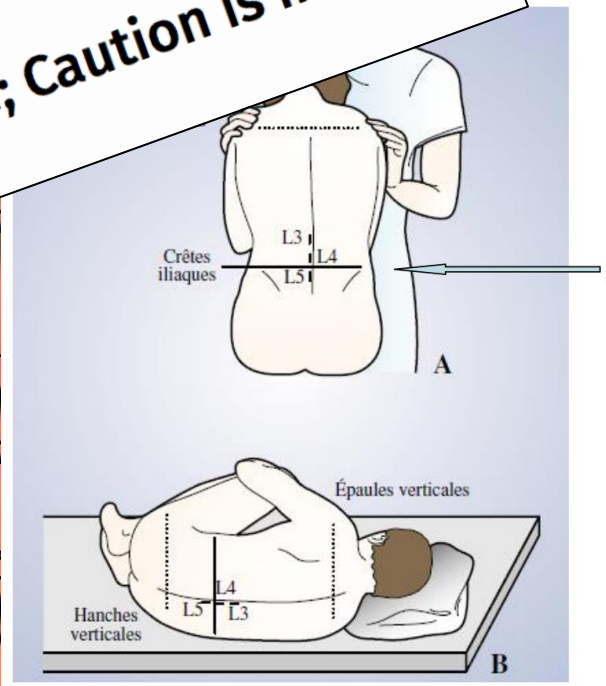
Damage to the conus medullaris following spinal anaesthesia

- *Seven cases with neurological damag*
- *All patients were women, six*
- *All experienced pain d*
- *introduced a*
- *The ti* L_{1-2}, *although it ma*
- *method of identifying the*
- *monly select a space that is one or*
- *Because of these sources of error, anaesthetists need t*
- *needle should not be inserted above* L_3.

BRIEF REPORTS, BOOK & MEDIA REVIEWS, CORRESPONDENCE, ERRATA: LETTER TO THE EDITOR

Routine Dural Puncture Epidural Technique; Caution is in Order

Kodali, Bhavani Shankar MD; Wong, Michael MD



Ligne de Tuffier

The moral of these stories is not to avoid atraumatic needles but to avoid upper lumbar interspace at all times, exercising particular care in women.

COMPARATIVE STUDY JOURNAL ARTICLE RANDOMIZED CONTROLLED TRIAL

Dural puncture with a 27-gauge Whitacre needle as part of a combined spinal-epidural technique does not improve labor epidural catheter function

Anesthesiology 2005, 103 (5): 1046-51

Conference Paper

Dural puncture with a 25-gauge whitacre needle enhances epidural labor analgesia

Anesthesiology. May 2007

LETTERS TO THE EDITOR: LETTER TO THE EDITOR

Nonreassuring Fetal Heart Rate Tracings and the Dural Puncture Epidural Technique

Rupasinghe, Madhumani MBBS, FRCA; Doyle, Peter MD

To the Editor

« In our opinion, (dural puncture epidural technique) may be an interesting technique to avoid or reduce the risk of pruritus, hypotension, delayed recognition of epidural catheter failure, and/or fetal bradycardia following intrathecally administered medication. »

PCA REMIFENTANIL

PAIN

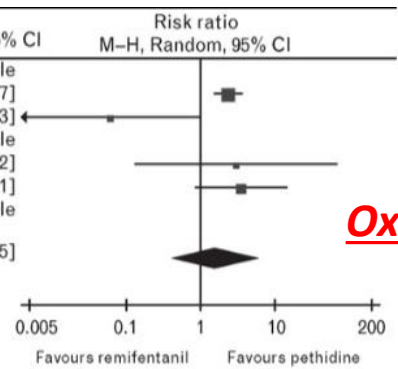
Remifentanil for labour analgesia

a meta-analysis of randomised controlled trials

Study or subgroup	Remifentanil Events	Total	Pethidine Events	Total	Weight	Risk ratio M-H, Random, 95% CI
Calderon 2006 (25)	0	12	0	12		Not estimable
Douma 2010 (15)	37	51	16	52	42.5%	2.36 [1.52, 3.67]
Evron 2005 (18)	0	43	8	45	15.0%	0.06 [0.00, 1.03]
Ng 2011 (24)	0	34	0	34		Not estimable
Shahriari 2007 (19)	1	20	0	20	12.9%	3.00 [0.13, 69.52]
Thurlow 2002 (23)	7	18	2	18	29.6%	3.50 [0.84, 14.61]
Volikas 2001 (22)	0	9	0	8		Not estimable
Total (95% CI)		187		189	100.0%	1.58 [0.41, 6.05]
Total events	45		26			

Heterogeneity: $Tau^2 = 1.05$; $Chi^2 = 8.25$, df = 3 (P = 0.04); $I^2 = 64\%$

Test for overall effect: Z = 0.67 (P = 0.50)



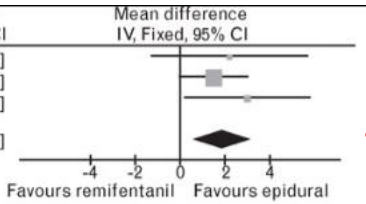
Oxygen desaturation

Number of patients with oxygen desaturation in labouring women treated with remifentanil in comparison with pethidine.

Study or subgroup	Remifentanil Mean	SD	Total	Epidural Mean	SD	Total	Weight	Mean difference IV, Fixed, 95% CI
Douma 2011 (16)	4	4	10	1.8	4	10	13.0%	2.20 [−1.31, 5.71]
Tveit 2011(26)	3.8	1.7	17	2.3	3	20	66.9%	1.50 [-0.04, 3.04]
Volmanen 2008 (21)	7	2	10	4	4.08	10	20.1%	3.00 [0.18, 5.82]
Total (95% CI)			37			40	100.0%	1.89 [0.63, 3.15]

Haterogeneity: $Chi^2 = 0.87$, df = 2 (P = 0.65); $I^2 = 0\%$

Test for overall effect: Z = 2.94 (P = 0.003)



Pain score

Pain scores (visual analogue scale, VAS 0–10 cm) after 1 h in women treated with remifentanil patient-controlled analgesia (PCA) in comparison with continuous epidural analgesia.

European Journal of Anaesthesiology: April 2012 – Volume 9 – Issue 4 – p 177-185

PAIN

Remifentanil for labour analgesia

a meta-analysis of randomised controlled trials

RECOMMANDATIONS

- *Continuous monitoring of oxygen saturation*
- *Close observation by anaesthetists during the initial titration phase*
- *One-to-one nursing of parturient women*
- *Availability of oxygen*

- Continuously increasing background infusion (0.025–0.1 µg kg^{-1} min^{-1}) to match maternal requirement

- In combination with a fixed bolus (0.25 µg kg^{-1}) and a lock-out time of 2 min

European Journal of Anaesthesiology: April 2012 – Volume 9 – Issue 4 – p 177-185

OTHER LABOR PAIN TREATMENT OPTIONS

Gate theory

- *Massage*
- *Bain thérapeutique,*
- *Ballons de naissance*

Contrôle inhibiteur diffus

- *Injections d'eau stérile*
- *Accupression*
- *TENS*

Contrôle supra-spinal

- *Cours pré-nataux*
- *Méditation*
- *Hypnose*
- *Aromathérapie*

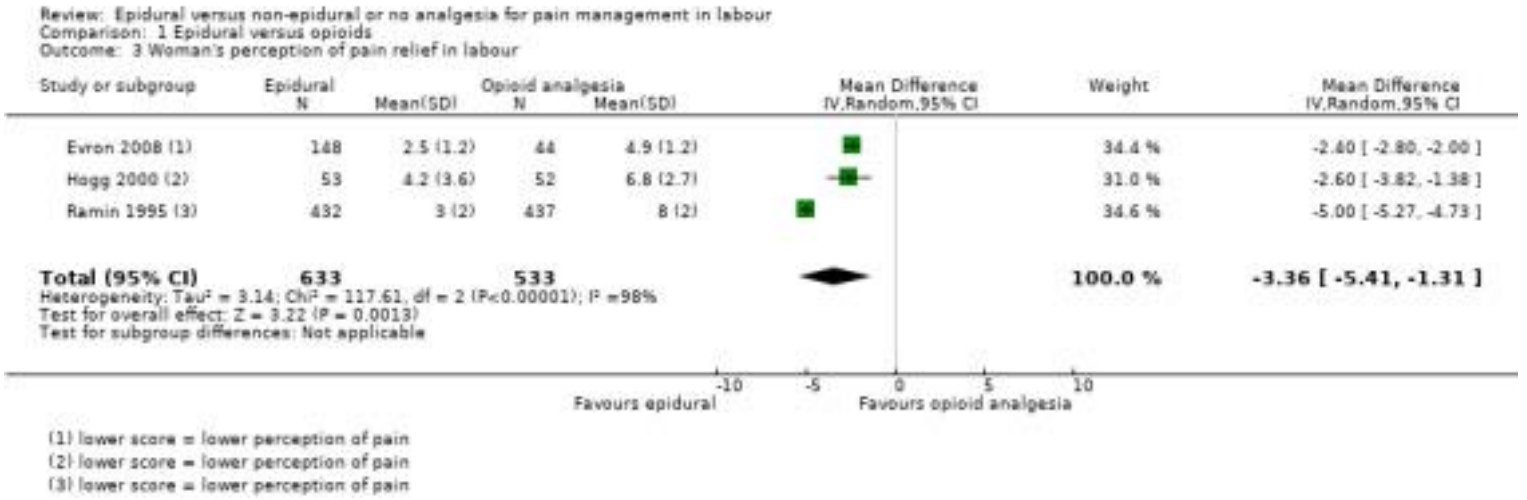
Other Labor Pain Treatment Options

Cochrane Database of Systematic Reviews | Review - Intervention

Epidural versus non-epidural or no analgesia in labour

Millicent Anim-Somuah, Rebecca MD Smyth, Leanne Jones Authors' declarations of interest

Woman's perception of pain relief in labour



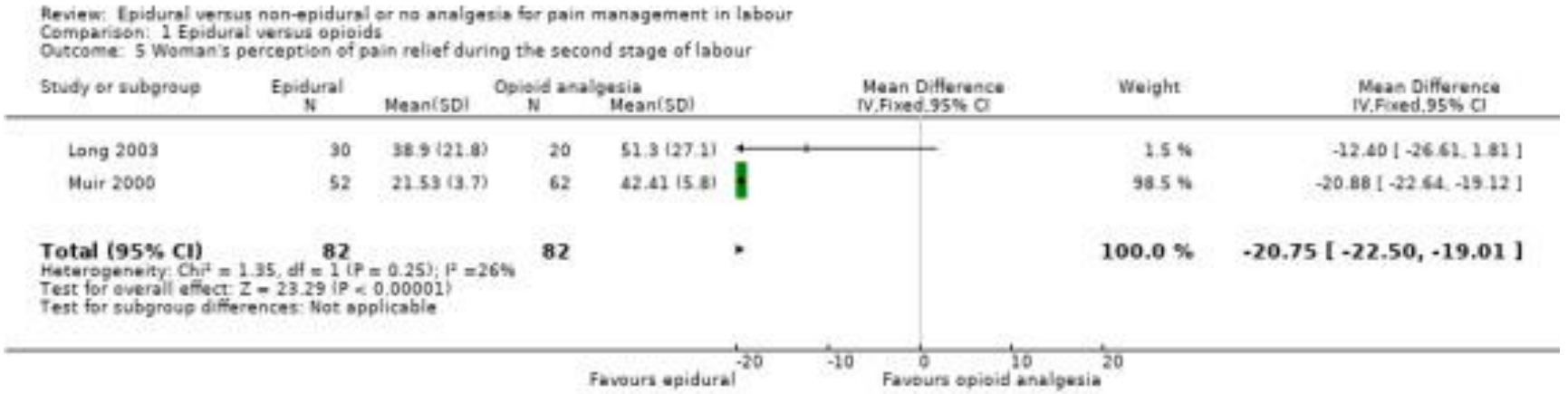
Other Labor Pain Treatment Options

Cochrane Database of Systematic Reviews | Review - Intervention

Epidural versus non-epidural or no analgesia in labour

Millicent Anim-Somuah, Rebecca MD Smyth, Leanne Jones Authors' declarations of interest

Woman's perception of pain relief during the second stage of labour



CONCLUSIONS

Continuous Infusion (CI)

- *Entraîne l'utilisation d'une plus grande quantité d'anesthésiques locaux*
- *Peut causer un bloc moteur significatif*

Patient Controled Epidural Analgesia (PCEA)

- Combinaison d'une perfusion de base à faible débit et de la possibilité de s'autoadminister des doses supplémentaires en bolus
- Programmation de la pompe pour éviter l'administration de doses toxiques
- Diminue la quantité d'anesthésiques locaux utilisés, le bloc moteur et le nombre d'interventions de l'anesthésiologiste auprès des patientes

Programmed Intermittent Bolus (PIB)

- *La perfusion de base est administrée en bolus plutôt qu'en perfusion basale*
- *Ceci permet une meilleure diffusion de la solution en raison de l'injection sous pression*
- *La patiente peut également s'autoadministrer des doses supplémentaires*
- *Par rapport à une perfusion continue, on note*
- *Diminution de la quantité d'anesthésiques locaux utilisés*
- *Moins de pics de douleur*
- *Moins de bloc moteur*
- *Meilleure satisfaction maternelle*

Combined Spinal-Epidural analgesia (CSE)

- *Hybride entre la rachidienne et l'épidurale*
- *Permet d'obtenir la rapidité d'action de la rachidienne: 2- 5 minutes*
- *Avantage lorsque le travail est avancé*
- *Permet d'obtenir un bloc sacré de meilleure qualité grâce à l'injection rachidienne*
- *Analgésie complète avec opioïdes seuls pendant le 1er stade du travail*
- *Offre un meilleur taux de succès du cathéter épidural*
- *Permet de maintenir l'analgésie par la perfusion du cathéter épidural*
- *Peut engendrer du prurit et des bradycardies fœtales par soulagement rapide de la douleur*

Dural Puncture Epidural (DPE)

- *Même approche qu'une technique combinée*
- *Aucune injection par l'aiguille rachidienne*
- *N'est utilisée que pour perforer la dure-mère*
- *Permet aux anesthésiques locaux injectés en épidural de diffuser plus facilement en rachidien*
- *Léger gain en début d'action par rapport à une épidurale conventionnelle*
- *Analgésie sacrée de meilleure qualité et plus rapide qu'avec une épidurale*
- *Moins d'effets secondaires que l'injection rachidienne tels que tachysystole utérine et prurit*

« It seems evident that the adequate dilution of local anaesthetics and the strategies aiming to reduce their consumption are more important than the choice of the local anaesthetic by itself when the goal is to provide optimal neuraxial obstetrical analgesia. »

Practice Guidelines for Obstetric Anesthesia

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