Critères de choix AL et adjuvants
Blocs périmédullaires

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Blocs périmédullaires

- **Rachianesthésie**
  - Diffusion de proche en proche dans le LCR
    - Propre à un anesthésique local
    - Selon la dose injectée
  - Blocage de la conduction nerveuse = blocs S et M
    - Insensiblité du corps sous le niveau d'anesthésie
- **Anesthésie péridurale**
  - Résorption systémiques des anesthésiques (80 à 95% de la dose injectée)
  - Diffusion vers les structures médullaires sous arachnoïdiennes entourées de méninges: les nerfs rachidiens
    - Niveaux supérieur et inférieur de l'anesthésie : "anesthésie suspendue"

Les médicaments

Utiliser des **agents**

non neurotoxiques agissant

par un **bloc de la conduction nerveuse**

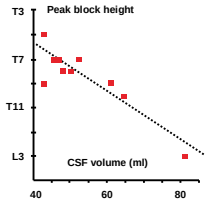
sur des **récepteurs**

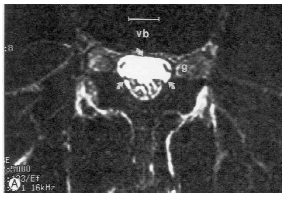
- **Les anesthésiques locaux**
- **Les adjuvants**
  - **Les morphiniques**
  - **La clonidine**
  - **L'adrénaline**

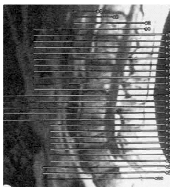
Critères de choix pour les AL

- Bloc induit
  - sensitif
  - moteur
  - sympathique
    - Hypotension artérielle
    - *ACR*
- Toxicité
  - locale
  - systémique
- Autres effets plus rares

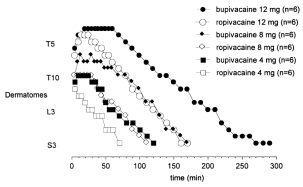
Carpenter RL et al. Anesthesiology 1998;89:24-9



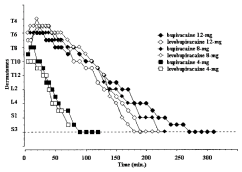




Relations doses-effets en IT



McDonald S.
Anesthesiology 1999; 90(4): 971-7

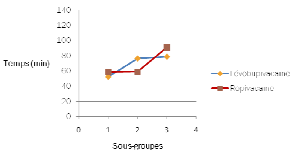


Hyperbaric Spinal Levobupivacaine: A Comparison to Racemic Bupivacaine in Volunteers

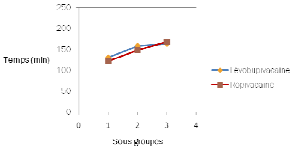
La dose reste l'élément prépondérant dans l'extension de la rachianesthésie

Bloc sensitif

Durée du bloc à D10

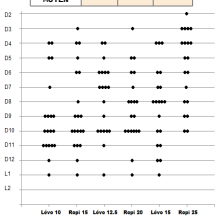


Temps de levée du bloc sensitif



Extension céphalique

LEVO	10 mg	12,5 mg	15 mg
MEDIANE	D10	D7	D8
NIVEAU MOYEN	D9-D10	D7-D8	D8-D9
ROPI	15 mg	20 mg	25 mg
MEDIANE	D9	D8	D5
NIVEAU MOYEN	D8-D9	D8-D9	D5-D6

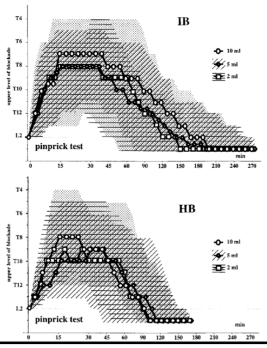


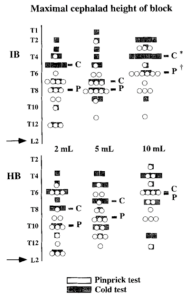
Anesthesiology
1999; 91:1260–6

Intrathecal Bupivacaine in Humans

Influence of Volume and Baricity of Solutions

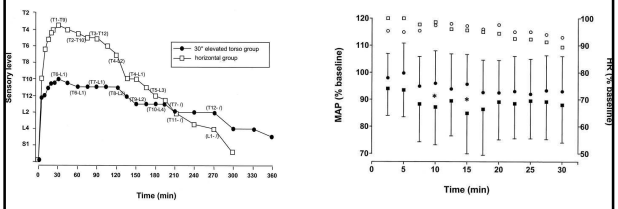
Jean-Marc Malinovsky, M.D., Géraldine Renaud, M.D.,† Pascal Le Corre, Pharm.D., Ph.D.,‡ Florence Charles, M.D.,† Jean-Yves Lepage, M.D.,* Myriam Malinge, M.D., Ph.D.,* Antoine Cozian, M.D.,* Olivier Bouchot, M.D.,§ Michel Pinaud, M.D.‖*





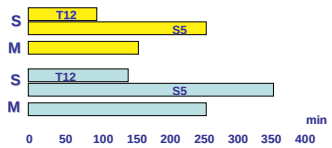
Anesthesiology
May 2003 - Volume 02 - Issue 5 - pp 1319-1323
Clinical Investigations

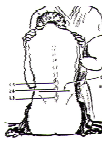
Extent of Hyperbaric Spinal Anesthesia Influences the Duration of Spinal Block

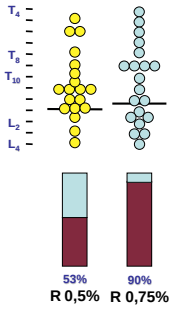


Rachianesthésie

40 patients, assis
15 et 22,5 ropivacaïne mg, isobare





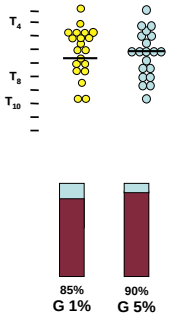


Van Kleef et al. Anesth Analg 1994

Rachianesthésie

40 patients, DL
15 mg ropivacaïne hyperbare
(Glucose 1% -5%)

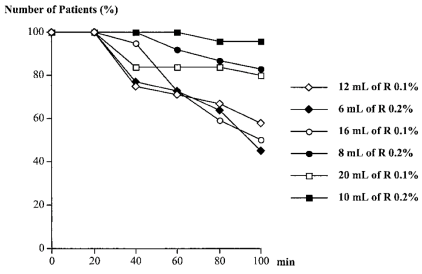
	G 1%	G 5%	*p*
instal. T10	10 (2-25)	5 (2-20)	0,03
durée T10	108 (35-175)	115 (70-178)	NS
durée totale	210 (150-330)	210 (150-300)	NS
instal.max	10 (2-30)	10 (2-30)	NS
durée totale	120 (90-210)	120 (90-210)	NS



Whiteside et al. Br J Anaesth 2001

Ropivacaine and Fentanyl Concentrations in Patient-Controlled Epidural Analgesia During Labor: A Volume-Range Study (Anesth Analg 2003;97:1800–7)

Jean-Marc Bernard, MD, PhD, Daniel Le Roux, MD, and Jacques Frouin, MD
From the Département d'Anesthésie-Réanimation, Polyclinique Jean-Villar, Bruges-Bordeaux, France



En péridurale : dose et concentration

A Comparison of Epidural Levobupivacaine 0.75% with Racemic Bupivacaine for Lower Abdominal Surgery

esth Analg 2000;90:642-8)

Dan J. Kopacz, MD, Hugh W. Allen, MD, and Gale E. Thompson, MD

- Chirurgie abdominale
- B 0,75% ou L 0,75% (20 ml, 150 mg)
- Onset time T10 et T5 (bloc max)
  - B 14,0 ± 9,9 et 26,5 ± 13,2 min
  - L 13,6 ± 5,6 et 24,3 ± 9,4 min
- Durée L2
  - B 506 ± 71 min
  - L 551 ± 88 min
- Bloc moteur suffisant pour la chirurgie

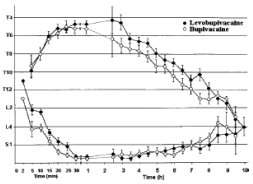


Figure 1. Segmental spread of pin-prick anesthesia (mean ± sd) for 0.75% levobupivacaine (-●-) and 0.75% racemic bupivacaine (-○-). Assessments could not be consistently made between 60 and 150 min while patients were having surgery.

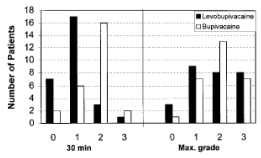


Figure 2. Lower extremity motor block (Bromage score) after 30 min ($P < 0.001$), and maximal level attained ($P = 0.47$).

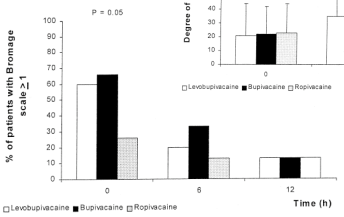
Levobupivacaine = Bupivacaine

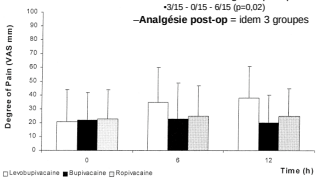
Intraoperative Epidural Anesthesia and Postoperative Analgesia with Levobupivacaine for Major Orthopedic Surgery: A Double-Blind, Randomized Comparison of Racemic Bupivacaine and Ropivacaine

Andrea Casati, MD,* Roberta Santorsola, MD,* Giorgio Aldegheri, MD,* Flavio Ravasi, MD,† Guido Fanelli, MD,‡ Marco Berti, MD,* Gianfranco Fraschini, MD,§ Giorgio Torri, MD‖

Journal of Clinical Anesthesia 15:126–131, 2003

- PTH - 3 groupes de 15 patients - APD L_2-L_3
  - 10 ml **L, B ou R 0,5%** ± 5 ml
  - puis **L 0,125%, B 0,125%, R 0,2%**
- **Volume total** pour induire anesthésie T_{10}
  - 15 - 14 - 15 (10-18) ml - NS
- **Onset time**
  - 31±16 - 25 ± 19 - 30 ± 24 min - NS
- **Bloc moteur** Bromage < 2 per-op
  - 3/15 - 0/15 - 6/15 (p=0,02)
- **Analgésie post-op** = idem 3 groupes





Bupivacaine = Levobupivacaine > Ropivacaine

A prospective, randomized, double-blind comparison of epidural levobupivacaine 0.5% with epidural ropivacaine 0.75% for lower limb procedures

- **Chirurgie des membres inférieurs**
  - L 15 ml 0,5% (n=30) *vs* R 15 ml 0,75% (n=35)
  - Installation T_{10} = 29/24 *vs* 25/22 min
  - Durée T_{12} = 185/77 *vs* 201/75 min
  - Durée Bloc moteur = 105/63 *vs* 95/48 min

Levobupivacaine > Ropivacaine

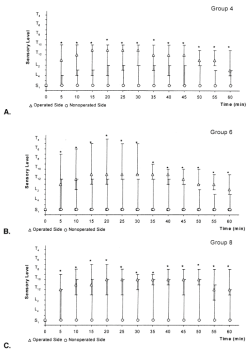
Peduto et al. Eur J Anaesthesiol 2003;20(12):979-83

MLAC sensitive

	Lyons 1998	Robinson 2001	Polley 2003	Benhamou 2003
Levobupi	0,083 % (0,065-0,101)	0,091 % (0,052-0,103)	0,087 % (0,081-0,094)	0,077 % (0,058-0,096)
Bupi	0,081 % (0,055-0,108)			
Ropi			0,089% (0,075-0,103)	0,092 % (0,082-0,102)
Levobupi + Fenta 2 µg.ml^{-1} 3 µg.ml^{-1}		0,047 % (0,023-0,072) 0,050 % (0,035-0,065)		

Effets hémodynamiques

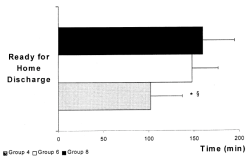
- Obligatoires
- Marque d'efficacité
- Effet du blocage sympathique
  - Bradycardie
  - Hypotension artérielle, surtout en rachianesthésie
  - Vitesse d'installation du bloc sympathique
  - **Selon l'étendue du bloc**
- Incidence : variable selon les patients
  - Vieillard : très fréquents
  - Adulte jeunes : selon l'état basal (tonus parasympathique)
  - Femmes enceintes : compression cave et bloc sympathique
  - Enfants : peu important



Unilateral Spinal Block for Outpatient Knee Arthroscopy: A Dose-Finding Study

Battista Borghi, MD,* Francesca Stagni, MD,† Stefano Bugamelli, MD,† Matteo Bonfatti Paini, MD,† Maria Lia Nepoti, MD,‡ Milena Montebugnoli, MD,§ and Andrea Casati, MD‖

Arthroscopies
4, 6 ou 8 mg bupivacaïne HB



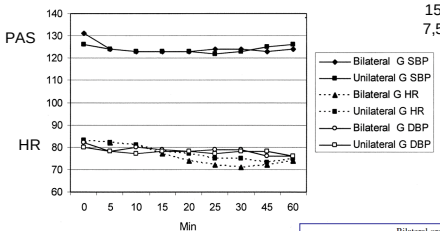
Knee Surg Sports Traumatol Arthrosc (2004) 12: 155–158
DOI 10.1007/s00167-003-0350-2

KNEE

Aliye Esmaoglu
Sinan Karaoglu
Ayse Mizrak
Adem Boyaci

Bilateral vs. unilateral spinal anesthesia for outpatient knee arthroscopies

70 patients
15 mg bupivacaïne
7,5 mg bupivacaïne



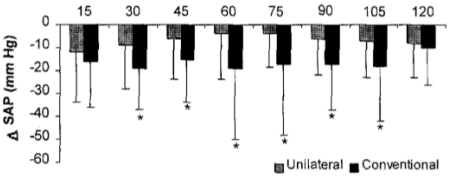
	Bilateral group (*n*=35)	Unilateral group (*n*=35)	*P*
The duration of motor block (min)	153.25±73.13	102.48±42.72	<0.05
The duration of sensory block (min)	193.42±73.95	137.68±46.85	<0.05
Time to discharge (min)	252.87±72.20	195.71±45.97	<0.05

	Bilateral group (*n*=35)	Unilateral group (*n*=35)	*P*
Hypotension	3	0	>0.05
Bradycardia	2	0	>0.05
Urinary retention	3	0	>0.05
Nausea, vomiting	3	0	>0.05
Headache	9	6	>0.05
Backache	5	6	>0.05

Frequency of Hypotension During Conventional or Asymmetric Hyperbaric Spinal Block

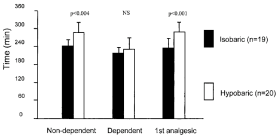
Reg Anesth Pain Med 1999: 24: 214–219.

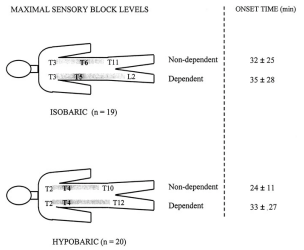
Andrea Casati, M.D., Guido Fanelli, M.D., Giorgio Aldegheri, M.D., Eleonora Colnaghi, M.D., Elisabetta Casaletti, M.D., Valeria Cedrati, M.D., and Giorgio Torri, M.D.



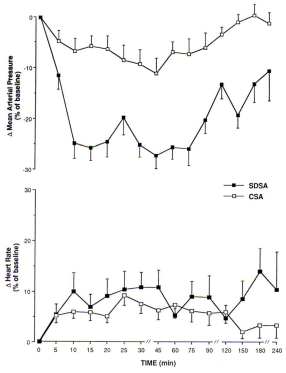
Isobaric Versus Hypobaric Spinal Bupivacaine for Total Hip Arthroplasty in the Lateral Position

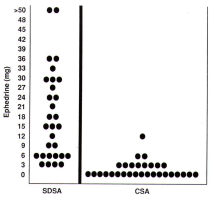
Alexandre Faust, MD*, Roxane Fournier, MD*, Elisabeth Van Gessel, MD*, Anne Weber, MD*, Pierre Hoffmeyer, MD†, and Zdravko Gamulin, MD*
*Division of Anesthesiology, †Clinic of Orthopedic Surgery, University Hospital Geneva, Geneva, Switzerland





RAC





60 patients > 70 ans

15 mg bupivacaïne SDSA
5-7,5 mg bupivacaïne CSA

Favarel-Garrigues et al. AA 1996

	CSE (n = 40)	Epidural (n = 40)	P
Ephedrine	10	13	0.1
Atropine	12	11	0.80
Fentanyl	6	20	0.03
MAP < 70 mmHg	2	2	1.00
Heart rate < 50 beat·min^{-1}	12	7	0.2

CSE = combined spinal-epidural anesthesia; MAP = mean arterial pressure. Results are presented as numbers of patients.

Similar incidence of hypotension with combined spinal-epidural or epidural alone for knee arthroplasty

[L'incidence rachidienne et péridurale combinée, et péridurale seule, ont une incidence similaire d'hypotension lors de l'arthroplastie du genou]

Table 2. Characteristics of Block

	Group S (n = 20)	Group CS (n = 20)	P-value
Maximal sensory block reached	T3 (T1-T6)	T3 (C7-T4)	0.547
Time to maximal sensory block (min)	8.5 ± 5.6	7.4 ± 2.1	0.408
Time for block to recede two segments (min)	92.3 ± 20.8	92.5 ± 26.0	0.984
Time for block to recede to T10 (min)	143.5 ± 28.3	144.4 ± 25.8	0.919
Time to maximal motor block (min)	6.0 ± 4.1	6.5 ± 4.1	0.716
Time for motor block to recede to Bromage score of two (min)	137.3 ± 35.0	128.2 ± 34.8	0.424
Max decrease in systolic blood pressure (mm Hg)	36.1 ± 16.9	40.0 ± 16.8	0.468
Max decrease in heart rate (min^{-1})	17.8 ± 14.0	12.8 ± 10.5	0.209
Phenyleprine (μg/patient)	35.0 ± 56.4	57.5 ± 89.3	0.347
Hypotension (before delivery of fetus)	9 (45)	7 (35)	0.519
Nausea (before delivery of fetus)	2 (10)	1 (5)	0.548
Vomiting (before delivery of fetus)	1 (5)	2 (10)	0.548
Shivering (before delivery of fetus)	1 (5)	3 (15)	0.079

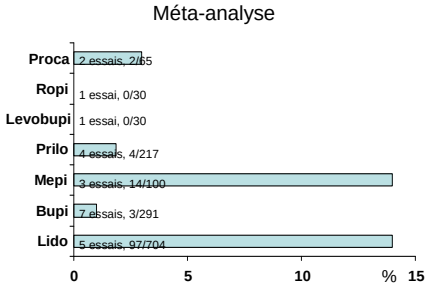
Group S = spinal block provided via a single shot spinal (SSS) technique. Group CS = spinal block provided via a combined spinal epidural (CSE) technique.
Values are median (min–max) or mean ± SD or n (%).

Combined Spinal Epidural Does Not Cause a Higher Sensory Block than Single Shot Spinal Technique for Cesarean Delivery In Laboring Women

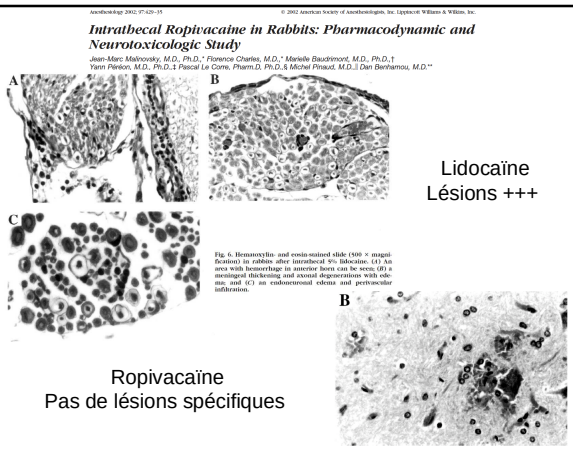
Lidocaïne

	n	2%	3%	5%		Doses
Hampl 95	120			37%		1 mg/kg
Hampl 96	50	32%				1 mg/kg
Pollock 96	102	16% *		16% *		60-75 mg
Morisaki 98	1045		0,4%			45 mg
Hampl 98	30	30%				50 mg
Hiller 99	30			27%		85-100 mg
Liguori 98	30	22%				60 mg
Freedman 98	873				11 - 13%	< 50 mg 51-74 mg > 75 mg

Transient neurologic symptoms (TNS) following spinal anaesthesia with lidocaine versus other local anaesthetics



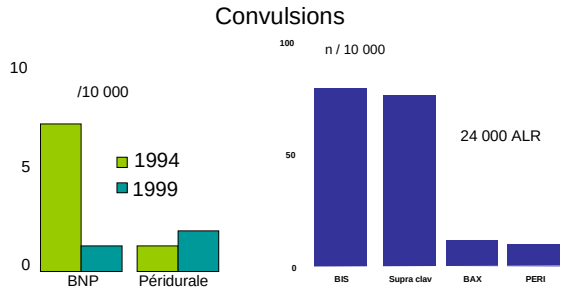
Zaric et al. Cochrane Database Syst Rev 2005 Oct 19;(4):CD003006



Rachianesthésie

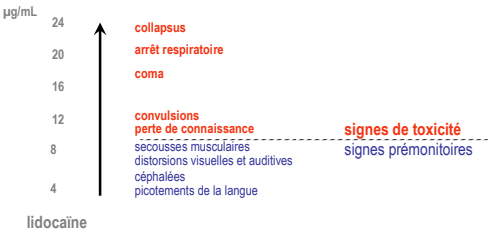
- Longue durée d'action : bupivacaïne ou équivalents
- Courte durée d'action : le standard était la lidocaïne, MAIS retirée car neurotoxique
  - Alternatives
    - Un anesthésique local
      - non neurotoxique
      - de durée d'action similaire
    - Un adjuvant
    - Modifications des techniques
      - Rachianesthésie unilatérale
      - Rachianesthésie continue

Toxicité systémique



Brown et al. Anesth Analg 1996.

Effets neurologiques



Troubles ECG

Effets majeurs

- Conduction (bloc du canal Na^+ cardiaque)
  - Ralentissement de la conduction ventriculaire
  - Phénomènes de ré-entrées
  - Le bloc augmente quand la fréquence augmente
    - (use dependence).
- Contractilité
  - Effet à des concentrations 5-10 fois supérieures
- Effets différents entre lidocaïne et les autres ALx

S F A R

Éditorial

Toxicité systémique des anesthésiques locaux et solutions lipidiques : une alternative supplémentaire intéressante

Systemic toxicity of local anesthetics and lipid emulsions: An interesting supplementary alternative

Dans un premier temps,
- perméabilité des voies aériennes et ventilation en oxygène pur
- intubation dès que possible
- massage cardiaque externe
- injection de vasopresseurs mais limiter les doses d'adrénaline
- cardioversion en cas de fibrillation ventriculaire
- ne pas injecter d'amiodarone

Utilisation des solutions lipidiques
- disponible rapidement et **logique d'en disposer dans les salles où sont réalisées les anesthésies locorégionales**.
- ne doit en aucun cas retarder la réanimation cardiorespiratoire.
- 3 ml/kg d'une solution lipidique à 20 %, en bolus
- Intralipide > Médialipide
- La nécessité d'une perfusion d'entretien ne paraît pas indispensable, la surveillance clinique et électrocardiographique attentive dans les suites devrait permettre sa mise en route si nécessaire.

Anesthésiques Locaux

	Lidocaïne	Bupivacaïne	Ropivacaïne	L-Bupivacaïne
IT anesthésie		+++ BM ++	+++ BM ++	++ BM +
Équivalence		10 mg	10 mg	15 mg
Iso- ou hyperbare		Durée Isobare > Hyperbare Restriction étendue bloc HB > IB		
APD anesthésie	1% et 2% Action courte	0,5% Action longue	0,5% Action longue	0,75% Action ± longue
APD analgésie	±	Bloc différentiel	Bloc différentiel	Bloc différentiel

Cas particuliers de la rachianesthésie
- •unilatérale : HB > IB (hypobare), ⇓ doses
- •RAC : HB, ⇓ doses

Spinal Bupivacaine in Ambulatory Surgery: The Effect of Saline Dilution

Bruce Ben-David, MD*, Hilton Levin, MBBCh*, Eric Solomon, MBChB*, Hillel Admoni, MD†, and Sonya Vaida, MD‡

15-10-7,5-5 mg de bupivacaïne
N = 15 / groupe

Table 1. Study Results

	Group I	Group II	Group III	Group IV
Highest level of block, median (range)	T-5 (T4-7)*	T-8 (T6-10)	T-8 (T4-11)	T-8 (T4-12)
Time to highest level	15 ± 1	14 ± 1	15 ± 1	12 ± 1
Time to two-segment regress	151 ± 15*	89 ± 6*	60 ± 5	47 ± 3
Time to S-2 regress	343 ± 29*	194 ± 13*	144 ± 14	123 ± 7
Time until out of bed	395 ± 28*	223 ± 12*	161 ± 12	140 ± 6
Time to urination	428 ± 34*	241 ± 14*	186 ± 14	163 ± 8
Time to discharge	471 ± 35*	260 ± 15*	202 ± 14	181 ± 8
Motor block: Bromage scale: 0-1-2-3	0-0-0-15*	0-1-7-7*	0-7-8-0*	0-13-2-0
Sensory block: requested/required pain treatment	0/15	0/15	0/15	4/15

* $P \leq 0.05$ versus adjacent groups in the table: all times are presented in minutes (mean ± SEM) rounded off to the nearest whole minute.

Table 1. Study Results

	Group I (bupivacaine only)	Group II (bupivacaine + fentanyl)
Highest level of block, median (range)	T7(T4-12)	T8(T3-12)
Time to highest level	11 ± 3	10 ± 3
Time to two-segment regression	53 ± 14†	67 ± 19
Time to S2 regression	120 ± 25*	146 ± 54
Time out of bed	146 ± 39	163 ± 55
Time to urination	169 ± 52	177 ± 53
Time to discharge	187 ± 51	195 ± 49
Motor block[a] Bromage scale: 0-1-2-3	2-16-7-0	2-11-9-3
Sensory block scale[b] a-b-c-d	11-5-3-6†	20-4-1-0
Failed blocks	6/25*	0/25

5 mg de bupi
N = 25 / groupe

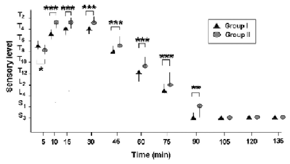
Intrathecal Fentanyl With Small-Dose Dilute Bupivacaine: Better Anesthesia Without Prolonging Recovery

Bruce Ben-David, MD*, Eric Solomon, MBChB*, Hilton Levin, MBBCh*, Hillel Admoni, MD†, and Zeev Goldik, MD‡

Low-Dose 3 mg Levobupivacaine Plus 10 μg Fentanyl Selective Spinal Anesthesia for Gynecological Outpatient Laparoscopy

(Anesth Analg 2009;109:1456-61)

Jesus de Santiago, DESA, MD*
Javier Santos-Yglesias, MD*
Jorge Giron, MD*
Francisco Montes de Oca, MD†
Alejandro Jimenez, PhD‡
Pilar Diaz, PhD§



	Group I (n = 26)	Group II (n = 26)	P
Onset time (min)	8.1 ± 1	7.7 ± 1	0.25
Surgical conditions (poor/fair/good/excellent)	0/0/2/24	0/0/1/25	0.55
GA conversion	0	0	
OAA/S (5/4/3/2/1)	19/7/0/0/0	21/5/0/0	0.51
Propofol (mg)	120	60	0.27
Fentanyl (μg)	0	0	
Ephedrine/atropine	0	0	
Duration of surgery (min)	7.9 ± 1	7.5 ± 1	0.20

Values are mean ± SD, median (range) or count.
GA = general anesthesia; OAA/S = Observer's Assessment of Alertness/Sedation.

Groupe I : 10 mg lidocaine + fentanyl
Groupe II : 3 mg de lévobupi + fentanyl

Anesthesiology
2000; 92:6–10

Minidose Bupivacaine–Fentanyl Spinal Anesthesia for Surgical Repair of Hip Fracture in the Aged

Bruce Ben-David, M.D., Roman Frankel, M.D.,* Tatianna Arzumonov, M.D.,* Yuri Marchevsky, M.D.,* Gershon Volpin, M.D.†*

	Group A: Bupivacaine 4 mg + Fentanyl 20 μg (n = 10)	P	Group B: Bupivacaine 10 mg (n = 10)
Peak level of block (to pinprick)	T8 (T6–T10)	< 0.01	T6 (T4–T8)
Patients having pain during surgery	0		0
Lowest systolic pressure	128 ± 22		110 ± 26
Lowest/baseline systolic pressure	0.81 ± 0.10	0.001	0.64 ± 0.12
Median	0.85		0.70
Range	0.68–0.97		0.48–0.77
Lowest diastolic pressure	69 ± 14		59 ± 14
Lowest/baseline diastolic pressure	0.84 ± 0.13	0.025	0.69 ± 0.14
Median	0.79		0.67
Range	0.67–0.99		0.52–0.97
Lowest mean pressure	88 ± 13		75 ± 16
Lowest/baseline mean pressure	0.85 ± 0.09	< 0.0001	0.64 ± 0.09
Median	0.84		0.66
Range	0.70–0.98		0.51–0.81
Number of patients treated for hypotension	1/10	0.001	9/10
Number of measurements of hypotension	0.1 ± 0.3	< 0.001	6.4 ± 3.4
Median	0		7
Range	0–1		0–11
Total ephedrine (mg)	0.5 ± 1.6	< 0.001	32.0 ± 17.0
Median	0		35
Range	0–5		0–50
Number of patients requiring phenylephrine after 50 mg ephedrine	0/10		2/10
Fluids	955 ± 240		1,150 ± 337

Data are mean ± SD unless otherwise indicated.

Journal of Clinical Anesthesia (2008) 20, 180–185

Intrathecal morphine in anesthesia for cesarean delivery: dose-response relationship for combinations of low-dose intrathecal morphine and spinal bupivacaine

Nermin K. Girgin MD (Assistant Professor)*, Alp Gurbet MD (Assistant Professor), Gurkan Turker MD (Associate Professor), Hale Aksu (Fellow), Nevra Gulhan (Fellow)

Table 3 Results for patient-controlled analgesia (PCA) with morphine use and for pain (VAS) scores at four and 24 hours

	Group 1, 0 mg of ITM (n = 19)	Group 2, 0.1 mg of ITM (n = 18)	Group 3, 0.2 mg of ITM (n = 19)	Group 4, 0.3 mg of ITM (n = 20)	Group 5, 0.4 mg of ITM (n = 19)
Time to first PCA demand (hrs)	5.6 ± 3.4	16.3 ± 7 *	17.5 ± 8.3 *	17.4 ± 9 *	18.2 ± 8.1 †
PCA-morphine use at 24 hrs (mg)	60 ± 20	28 ± 18 ‡	25 ± 16 ‡	21 ± 13 ‡	20 ± 14 ‡
VAS 4 hrs	1.7 ± 1.4	1.5 ± 1.4	1.4 ± 1.1	1.1 ± 0.8	1 ± 0.8
VAS 24 hrs	0.1 ± 0.7	0.2 ± 0.7	0.1 ± 0.3	0.2 ± 0.3	0.1 ± 0.4

Data are given as means ± SD. VAS = visual analog scale, ITM = intrathecal morphine.
* $P < 0.05$ versus control group (group 1).
† $P < 0.01$ versus control group (group 1).
‡ $P < 0.001$ versus control group (group 1).

-50% morphine

Table 4 Results for side effects related to intrathecal morphine (ITM) use

	Group 1, 0 mg of ITM (n = 19)	Group 2, 0.1 mg of ITM (n = 18)	Group 3, 0.2 mg of ITM (n = 19)	Group 4, 0.3 mg of ITM (n = 20)	Group 5, 0.4 mg of ITM (n = 19)	P ANOVA	P Trend
Nausea	1.2 ± 1.3	2.1 ± 1.5	2.4 ± 2.4	2 ± 2.4	2.2 ± 2.2	0.731	0.358
Vomiting	0.7 ± 0.9	0.8 ± 0.9	1 ± 0.8	1.5 ± 0.9	1.2 ± 1.2	0.388	0.091
Pruritus	1.6 ± 1.5	2.8 ± 2.7	5.5 ± 2.7	5.3 ± 3.1	7.5 ± 3.1	0.0001	<0.0001

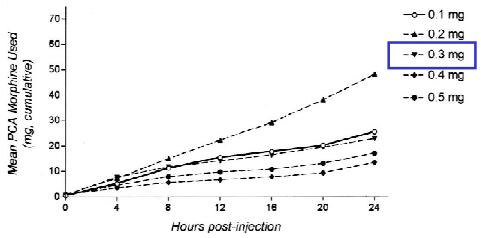
Data are given as means ± SD. ANOVA = analysis of variance.

Prurit dose-dépendant

Anesthesiology:
February 1999 - Volume 90 - Issue 2 - pp 437-444
Clinical Investigations

Dose-Response Relationship of Intrathecal Morphine for Postcesarean Analgesia

Palmer, Craig M. MD; Emerson, Scott MD, PhD; Volgoropolous, Dimitri MD; Alves, Diane RN

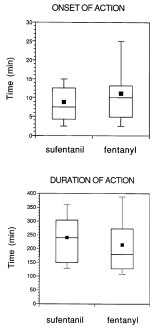


Pas de relation dose - survenue de nausées
Prurit dose-dépendant

A Comparison of Intrathecal Analgesia with Fentanyl or Sufentanil After Total Hip Replacement

Roxane Gourmier, MD, Elizabeth Van Gessel, MD, Anne Wehrer, MD, and Zdravko Gouvalias, MD

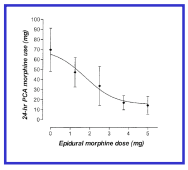
(Anesth Analg 2001;93:958–22)



Postcesarean Epidural Morphine: A Dose-Response Study

Craig M. Palmer, MD, Wallace M. Nogami, MD, Gretchen Van Maren, MD, and Diane M. Alves, RN
Department of Anesthesiology, University of Arizona Health Sciences Center, Tucson, Arizona

Anesth Analg 2000;90:887–91



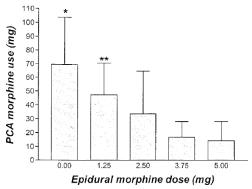


Figure 1. Total 24-h patient-controlled analgesia (PCA) morphine use. Data are mean (±95% confidence interval). Groups were significantly different (analysis of variance, $P < 0.001$); *Group 0.0 mg was significantly different from Groups 2.5, 3.75, and 5.0 mg; **Group 1.25 was significantly different from Groups 3.75 and 5.0 mg (a posteriori, $P < 0.05$).

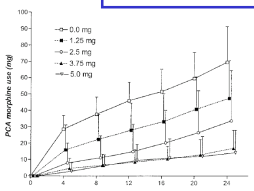
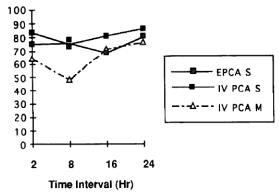


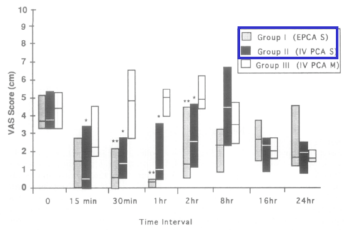
Figure 2. Cumulative patient-controlled analgesia (PCA) morphine use over time. Data are mean (95% confidence interval), and are slightly offset for clarity. Groups were significantly different (two-way analysis of variance, $P < 0.001$). (*A posteriori* comparisons among groups at each time interval were not performed.)

Patient-Controlled Analgesia with Sufentanil: A Comparison of Two Different Methods of Administration

Journal of Clinical Anesthesia 8:123–129, 1996

Raymond S. Sinatra, MD, PhD,*
Ferne B. Severino, MD,† Darcy Paige, RN, MS‡





Anesthesiology
2001; 95:133–41
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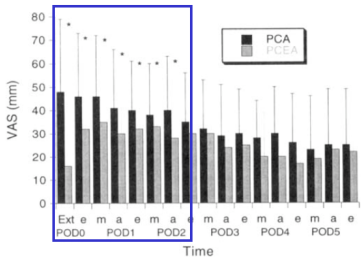
Lippincott Williams & Wilkins, Inc.

Comparison of Intravenous or Epidural Patient-controlled Analgesia in the Elderly after Major Abdominal Surgery

Claude Mann, M.D., Ph.D., Yvan Pouzeratte, M.D.,† Gilles Boccara, M.D.,† Christophe Peccoux,‡ Christine Vergne, M.D.,§ Georges Brunat, M.D.,† Jacques Domergue, M.D.,‖ Bertrand Millet, M.D.,‖ Pascal Colson, M.D., Ph.D.#*



Mélange de bupivacaine 0,125% et sufentanil (PCEA group, n=35),
AG puis PCA iv de morphine (PCA group, n=35)

Dépression respiratoire

- La dépression est différée dans le temps selon la liposolubilité
  - très retardée avec la morphine (de 6 à 18 heures)
  - précoce avec les mrophiniques très liposolubles (jusqu'à 4 heures)
- Décrite pour de faibles doses : 0,2 mg de morphine IT ou 5 µg de sufentanil IT
- Il existe des facteurs de risques
  - âge
  - BPCO
  - obésité avec apnée du sommeil
  - compléments par voie générale
    - morphiniques
    - sédatifs

Rachianesthésie

10 mg de bupivacaine
0,2 mg de morphine

4 mg de dexamethasone
0,625 mg de droleptan

International Journal of Obstetric Anesthesia (2007) 16, 122–127
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doi:10.1016/j.ijoa.2006.11.004

ORIGINAL ARTICLE

Prevention of postoperative nausea and vomiting after intrathecal morphine for cesarean section: a randomized comparison of dexamethasone, droperidol, and a combination☆

J. I. Wu, Y. Lo, Y. Y. Chia, K. Liu, W. P. Fong, L. C. Yang, P. H. Tan

Table 2. Incidence of nausea and vomiting in each study period

	Group D (*n* = 30)	Group Dr (*n* = 30)	Group D+Dr (*n* = 30)	Group P (*n* = 30)
0-3 h				
Nausea only	0 (0)	1 (3)	0 (0)	0 (0)
Nausea and vomiting	13 (43)	3 (10)*†	4 (13)*†	15 (50)
Total	13 (43)	4 (13)*†	4 (13)*†	15 (50)
3-6 h				
Nausea only	0 (0)	1 (3)	1 (3)	2 (6)
Nausea and vomiting	10 (33)	2 (6)*†	2 (6)*†	10 (33)
Total	10 (33)	3 (10)*†	3 (10)*†	12 (40)
6-24 h				
Nausea only	1 (3)	2 (6)	0 (0)	1 (3)
Nausea and vomiting	3 (10)	2 (6)	1 (3)	6 (20)
Total	4 (13)	4 (12)	1 (3)	7 (23)
Rescue antiemetics	4 (13)	3 (10)	2 (6)	6 (20)
Complete responses	17 (56)	21 (70)	24 (80)*†	15 (50)

Data are number of patients (%). Group key: as in Table 1. Complete response: no PONV 24-h postoperatively.
*$P < 0.05$ versus group P.
†$P < 0.05$ versus group D.

International Journal of Obstetric Anesthesia (2005) 14, 279–283
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doi:10.1016/j.ijoa.2005.02.004

Hypothermia after cesarean delivery and its reversal with lorazepam

P. E. Hess, C. E. Snowman, J. Wang

Table 1. Comparison of demographic and intraoperative factors with postoperative temperature and symptomatology

Factor	Normothermic	Hypothermic without symptoms	Hypothermic with symptoms
n	68	26	6
Age (years)	34.5 ± 4.4	34.2 ± 4.9	35.2 ± 4.4
Height (cm)	164 ± 7	164 ± 6	162 ± 6
Weight (kg)	85 ± 17	81 ± 19	79 ± 16
BMI (kg/m^2)	31.9 ± 6.0	30.2 ± 5.9	29.8 ± 5.1
Duration of surgery (min)	104 ± 25	108 ± 25	118 ± 20
EBL (mL)	885 ± 810	805 ± 220	910 ± 245
i.v. fluid (mL)	2900 ± 750	2950 ± 550	3250 ± 700

EBL = estimated blood loss, BMI = body mass index.
No significant difference in any group comparison ($P > 0.05$).

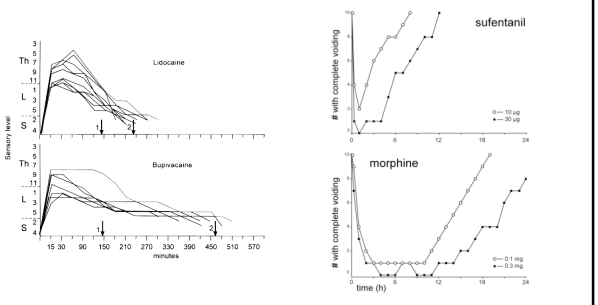
100 césariennes programmées consécutives sous rachianesthésie.
Température pré-op 36.7 ± 0.4 °C et post-op 36.1±0.6 °C.
Le changement moyen de température était ↓ 0.5° ↓ C (+0.6° à ↓ 2.4 ↓ °C).
32% d'hypothermies, 80% asymptomatiques.
6% d'hypothermies symptomatique [35.2 ↓ C (34.0–35.7 ↓ C)].

Kamphuis, Anesthesiology 1998;88:310-6

Intrathecal Opioids and Lower Urinary Tract Function

A Urodynamic Evaluation

Peter W. Kuipers, M.D.,* Ed T. Kamphuis, M.D., Ph.D.,† Ger E. van Venrooij, Ph.D.,‡ John P. van Roy, M.D.,§ Traian I. Ionescu, M.D., Ph.D.,‖ Johannes T. Knape, M.D., Ph.D.,# Cor J. Kalkman, M.D., Ph.D.#



Pas de rétention d'urines avec la clonidine

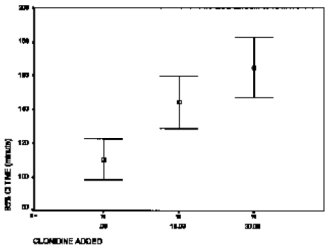
Optimal dose of intrathecal clonidine added to sufentanil plus bupivacaine for labour analgesia

Alex Tiong-Heng Sia MB BS MMED

48 femmes, 3 groupes

1,25 mg de bupi
5 mcg de sufenta

+ clonidine :
0-15-30 mcg

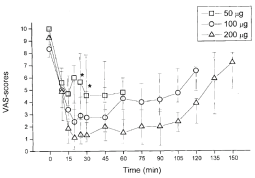


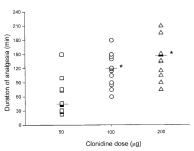
CAN J ANESTH 2000 / 47: 9 / pp 875–880

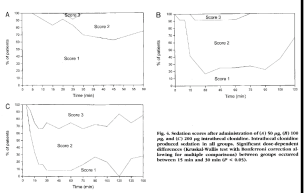
Analgesic and Hemodynamic Effects of Intrathecal Clonidine as the Sole Analgesic Agent during First Stage of Labor

A Dose-Response Study

Astrid Chiari, M.D.,* Christine Lorber, M.D.,* James C. Eisenach, M.D.,† Eckart Wilding, M.D.,* Claus Krenn, M.D.,* Ana Zavrsky, M.D.,* Christian Kainz, M.D.,‡ Peter Germann, M.D.,§ Walter Klimscha, M.D.‖





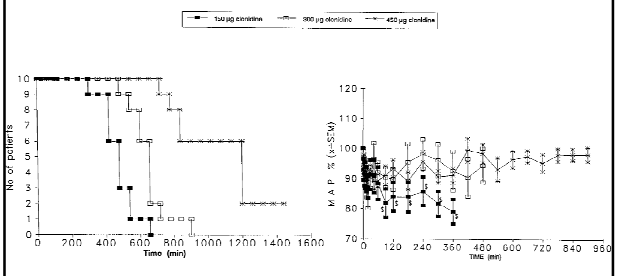


CHIARI ET AL.

Hemodynamic and Analgesic Profile after Intrathecal Clonidine in Humans

A Dose-Response Study

Kriton S. Filos, M.D.,* Leonidas C. Goudas, M.D.,† Ourania Patroni, M.D.,‡ Vassiliki Polyzou, M.D.§



Anesthesiology
79:525–531, 1993
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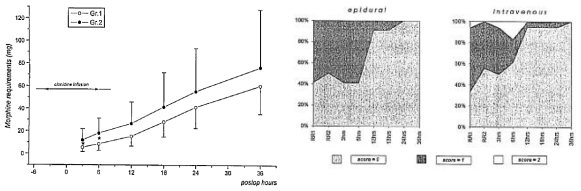
J. B. Lippincott Company, Philadelphia

Intravenous or Epidural Clonidine for Intra- and Postoperative Analgesia

M. De Kock, M.D., B. Crochet, M.D.,† C. Morinont, M.D.,† J-L. Scholtes, M.D.‡*



Clonidine 4 µg.kg^{-1} à l'induction puis 2 µg.kg^{-1}.h^{-1} EPI ou IV

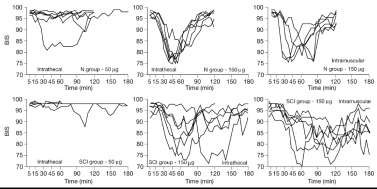
British Journal of Anaesthesia **90** (6): 742–5 (2003)
DOI: 10.1093/bja/aeg134

BJA

Sedation caused by clonidine in patients with spinal cord injury

J.-M. Malinovsky*, M. Malinge, J.-Y. Lepage and M. Pinaud

	Spinal injury			Normal		
	i.t.	i.t.	i.m.	i.t.	i.t.	i.m.
Dose of clonidine	50 µg	150 µg	150 µg	50 µg	150 µg	150 µg
Number of patients	6	6	6	6	6	6
Level of lesion	T_3 (C_5–T_8)	T_2 (C_5–T_8)	C_6 (C_7–C_7)	–	–	–
Onset time of sensory block (min)	–	–	–	12 (6–15)	9 (3–12)	12 (6–15)
Duration of L_2–L_5 anaesthesia (min)	–	–	–	138 (125–170)	155 (140–195)	133 (110–145) ††
Number of dermatomes blocked	–	–	–	6 (5–7)	6 (5–7)	6 (5–8)
Onset time of complete motor block paralysis of knee (min)	-	-	-	15 (12–21)	15 (9–21)	15 (12–18)
Duration of motor block (min)	–	–	–	130 (120–155)	145 (140–190)	93 (85–120)†
Onset time of sedation (min)	–	50 (35–120)	100 (45–150)	–	25 (15–30)*	31 (20–45)*
Duration of sedation (min)	–	75 (50–185)	70 (35–120)	–	58 (60–130)	60 (55–75)



Intrathecal epinephrine in combined spinal-epidural analgesia for labor: dose-response relationship for epinephrine added to a local anesthetic-opioid combination

A. Curbet, G. Tarker, D. D. Rose, N. Uckunkaya

Table 3. Highest level of sensory blockade, maximum motor blockade score, and duration of intrathecal analgesia

	E0 ($n = 20$)	E12.5 ($n = 20$)	E25 ($n = 20$)	E50 ($n = 20$)	E100 ($n = 20$)
Highest level of sensory blockade	T8 (T4-T10)	T7 (T3-T10)	T8 (T4-T9)	T8 (T3-T10)	T7 (T2-T10)
Maximum motor blockade score	0 (0-2)	0 (0-2)	0 (0-2)	0 (0-1)	0 (0-2)
Duration of intrathecal analgesia (min)	81 ± 31	106 ± 32*	109 ± 33*	113 ± 27**	114 ± 32**

Data are median (range) or mean ± SD.
For details of intrathecal agents given to the different treatment groups, see the Method section of the text.
* $P < 0.05$, compared to group E0.
** $P < 0.01$, compared to group E0.

Niveau de bloc identique
Durée de bloc sensitif ⇑ dès la première dose d'adrénaline

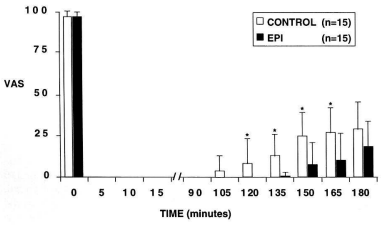
Anesthesiology:
March 1997 - Volume 86 - Issue 3 - pp 525-531
Clinical Investigation

Addition of Epinephrine to Intrathecal Bupivacaine and Sufentanil for Ambulatory Labor Analgesia

Campbell, David C. MD, MSc, FRCPC; Banner, Robert MD; Crone, Lesley-Ann MD, FRCPC; Gore-Hickman, Wendy MD, FRCPC; Yip, Ray W. MD, FRCPC

	Control (n = 19)	Epinephrine (n = 20)
Hypotension	1 (5.2%)	0
Nausea	1 (5.2%)	6 (30%)
Vomiting	1 (5.2%)	4 (20%)
Pruritus	17 (90%)	20 (100%)
Treatment requested for pruritus	1 (5.2%)	1 (5%)
Oxygen saturation <95%	0	1 (5%)†
Upper level of sensory loss to pinprick and cold at 15 min (median + range)	T4 (T2–T9)	T4 (T2–T9)

There are no significant differences between groups.
*By definition; transient, not associated with maternal/fetal distress.
†Patient was wide awake; transient, not associated with maternal/fetal distress.



Anesthesiology
78:870–874, 1993

Intrathecal Sufentanil for Labor Analgesia

Effects of Added Epinephrine

William R. Camann, M.D., Beth H. Minzter, M.D.,† Roger A. Denney, M.D.,‡ Sanjay Datta, M.D.§*

Table 3. Side Effects

	Sufentanil	Sufentanil–Epinephrine
Pruritus (incidence)	16*	9
Scores = 0, 1, 2, 3, respectively	4, 7, 5, 4*	11, 7, 2, 0
Nausea (incidence)	0*	7
Scores = 0, 1, 2, 3, respectively	20, 0, 0, 0	13, 3, 3, 1

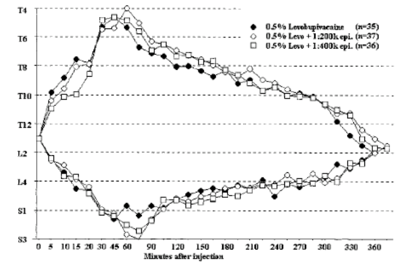
* $P \leq 0.05$ compared to other group.

Analgésie équivalente, mais effets secondaires

A Comparison of Epidural Levobupivacaine 0.5% With or Without Epinephrine for Lumbar Spine Surgery

ıalg 2001;93:755–60)

Dan J. Kopacz, MD*, James D. Helman, MD*, Charles E. Nussbaum, MD†,
John N. K. Hsiang, MD, PhD†, Peter C. Nora, MD†, and Hugh W. Allen, MD*



Peu de prolongation par l'adrénaline

Levobupivacaine-Sufentanil With or Without Epinephrine During Epidural Labor Analgesia

Filiep M. Soetens, MD*
Maurits A. Soetens, MD*
Marcel P. Vercauteren, MD, PhD†

(Anesth Analg 2006;103:182–6)

Table 2. Analgesic Data

	LSE group	LS group	*P* value
Consumption during total labor (mL)	43 ± 18	51 ± 19	0.1
Consumption (mL/h)	9 ± 3	11 ± 4	0.03
Rescue volume administered (mL)	5 ± 7	9 ± 9	0.02

LSE = levobupivacaine, sufentanil, epinephrine; LS = levobupivacaine, sufentanil. Data are mean ± SD.

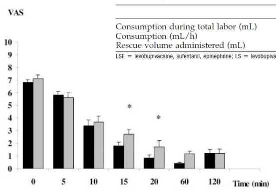


Figure 1. Pain scores measured using a visual analog scale (0–10). The black and gray bars represent the LSE group and LS group respectively. LSE, levobupivacaine, sufentanil, epinephrine; LS, levobupivacaine, sufentanil. **P* < 0.05.

Table 4. Side Effects

	LSE group (n = 34)	LS group (n = 33)
Motor block	50%	27%
Hypotension (requiring ephedrine)	6%	9%
Pruritus	79%	74%
Nausea	38%	36%
Vomiting	21%	21%
Shivering	41%	45%

LSE, levobupivacaine, sufentanil, epinephrine; LS, levobupivacaine, sufentanil. There were no statistically significant differences.

Anesthesiology 2004; 100:381–5

Epidural Neostigmine Produces Analgesia but Also Sedation in Women after Cesarean Delivery

F. Nur Kaya, M.D., Sukran Sahin, M.D.,† Medge D. Owen, M.D.,‡ James C. Eisenach, M.D.§*

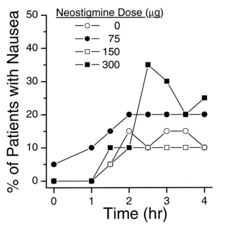
Table 3. Side Effects

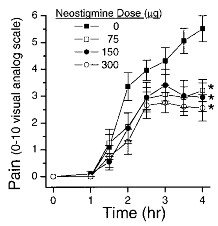
	Saline	Neostigmine 75 μg	Neostigmine 150 μg	Neostigmine 300 μg
Intraoperative				
Shivering	1	3	0	8*
Sedation†	0/0/0	5/0/1	5/1/0	9/3/0*
Nausea	6	10	6	10
Postoperative				
Sweating	2	4	2	9*
Sedation†	1/0/0	6/1/0*	5/0/1*	8/0/0*
Dizziness	2	3	2	6
Nausea	7	9	5	10
Metoclopramide treatment	5	6	3	8
24-h global nausea	0.85 ± 0.34	0.95 ± 0.34	0.55 ± 0.20	1.00 ± 0.29

Analgésique

Sédation

Nausées +++





Adjuvants

	Morphiniques	Clonidine	Adrénaline
Anesthésie	+++ liposol	++	+
Analgésie	++ liposol +++ morphine	+++	+
Effets moteurs	0	++	++
Dépression respiratoire	++	0	0
Sédation	++	++	0
Prurit	+++	0	++
NVPO	++	0	++
Hypotension artérielle	0	++ / doses	+
RAU	+++	0	+