Peut-on éviter toute hypotension artérielle et comment en 2013 ?

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Avec L'AG :
pas de problème !

L' hypotension artérielle maternelle après rachianesthésie pour césarienne existe-elle encore ? Y-a-t-il moyen de la supprimer définitivement ?

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Conflits d'intérêt

- LFB (Clottafact®), TakeDa (Urapidil®) …
- Pour ce « topo » : Fresenius Kabi (Voluven®)

Étude multicentrique CAESAR

sponsorisée par FK (ClinicalTrials.gov: NCT00694343)

Low dose of intrathecal hyperbaric bupivacaine combined with epidural lidocaine...

Fan S-Z et al, Anesth Analg 1994; 78: 474

	Intrathecal Bupi (mg)			
	2.5	5	7.5	10
USL @15 min	T_{11}	T_9	T_5	T_4
Epi lido 2% (mL)	22*	10	1	0
Hypotension (%)	5	**5**	35	50*

(+ décubitus latéral gauche 10°)

Césarienne **programmée**

92% sous rachianesthésie en France en 2005
(*vs.* 2% sous RPC)
et **70%** d'hypotension en l'absence de prévention

Prévention et traitement

- Méthodes non pharmacologiques
  - Réduction de la stase veineuse dans les membres Inf.
  - 5-10° de décubitus latéral gauche
- Méthodes pharmacologiques
  - **Remplissage vasculaire**; soit :

    --> **préremplissage** par cristalloïdes ou par colloïdes (HEA)

    --> *ou* **coremplissage** par cristalloïdes
  - **Vasopresseur(s)** : **éphédrine** & **phényléphrine**

Rachianesthésie & cristalloïdes

Rout et al., Anesthesiology 1993

	RL 20 ml/kg (n = 78)	**pas de RL** (n = 78)
Hypotension (%)	55 *	71
Ephédrine (mg)	**18**	**17**
PAS mini (mmHg)	**85** (±10)	**83** (±13)
pHa	**7,27** (± 0,07)	**7,26** (± 0,06)

The effects of varying volumes of crystalloid administration before cesarean delivery…

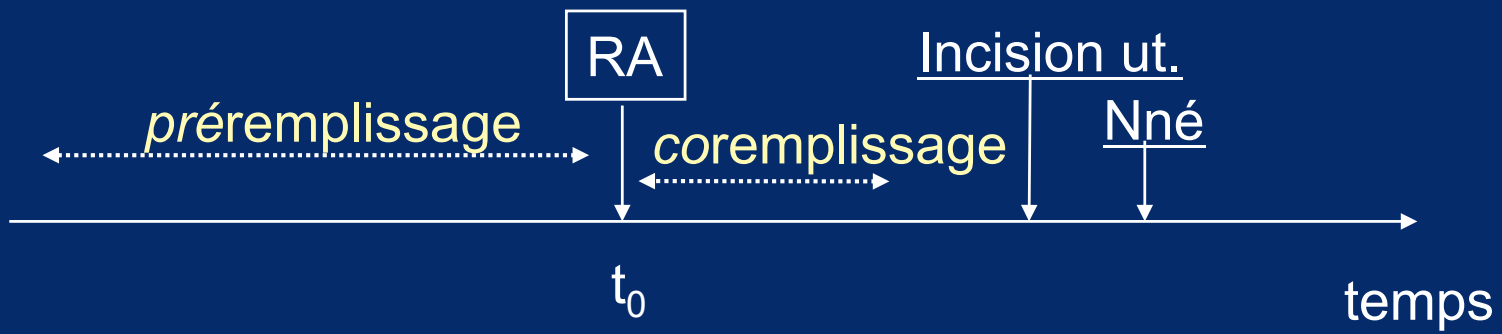
Park GE et al, Anesth Analg 1996; 83: 299-303

- Pré-remplissage par Cristalloïdes : 10, 20, ou même 30 mL/kg

  → pas de différence sur la pression artérielle

  → et pas de différence sur le D.C. non invasif

co-remplissage par cristalloïdes



Crystalloid preload versus rapid crystalloid administration after induction of SA (Co-load) for elective CS

Dyer RA et al., Anaesth Intensive Care 2004; 32: 351-7

	Prérempl.	**Co**rempl.	*P*
Volume perfusé (ml)	**1474**	**1386**	*0,13*
Duration de perfusion (min)	**20**	**9,8**	*0,01*
Délai rachi-naissance (min)	11,6	13,1	*0,58*
Ephédrine avant naissance (mg)	**10 [0-20]**	**0 [0-10]**	*0,03*
Pas d'éphédrine avant naissance	36%	64%	*0,047*

Rachi: B 9mg + F 10µg (n=25x2)

Prevention of hypotension during SA for CD : An effective technique using combination phenylephrine infusion and crystalloid cohydration

Ngan Kee WD et al, Anesthesiology 2005; 103: 744-50

Table 2. Hemodynamic Changes, Fluid, and Vasopressor Requirement

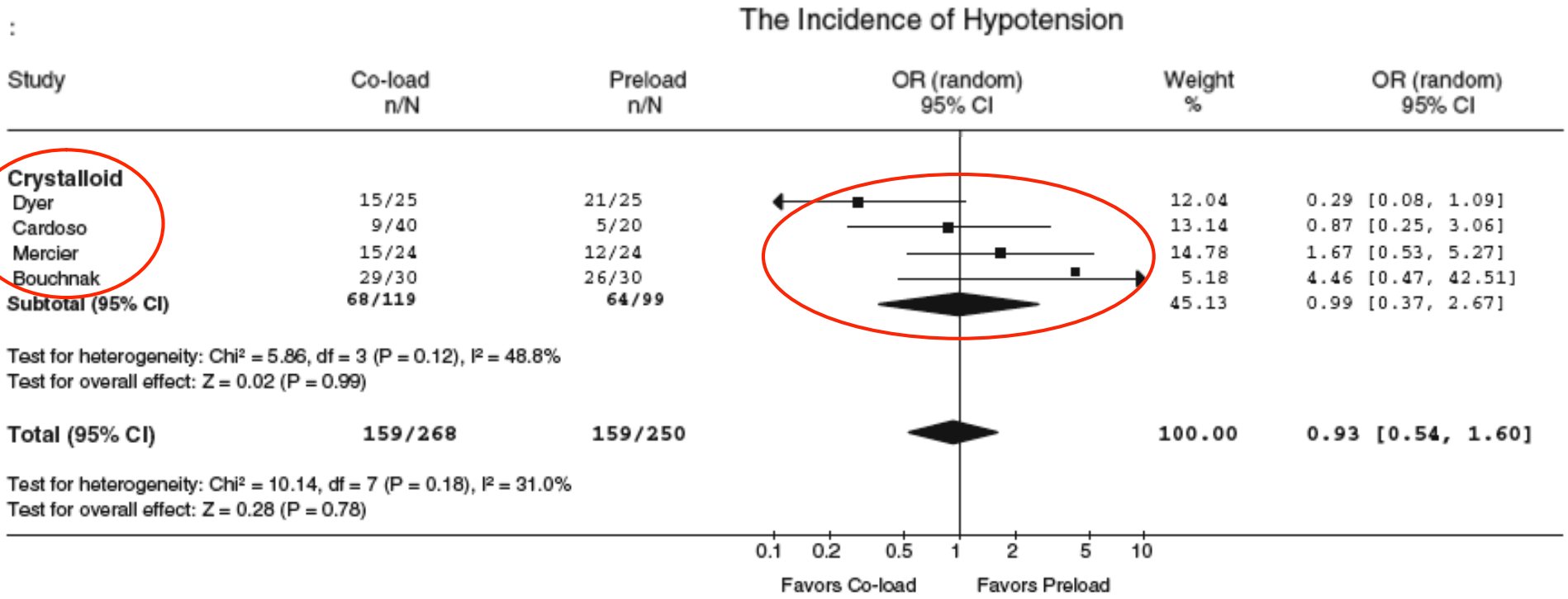
	Group 0	Group 1	*P* Value
Total intravenous fluid, ml	50 [40–60]	1,975 [1,609–2,010]	< 0.0001
Rate of intravenous fluid infusion, ml/min	1.7 [1.5–2.4]	63.5 [53.7–74.4]	< 0.0001
Total phenylephrine dose, μg	1,400 [1,145–1,818]	1,160 [753–1,568]	0.008
Rate of phenylephrine administration, μg/min	55.9 [46.3–63.6]	42.1 [30.4–52.3]	< 0.0001
Incidence of hypotension	15 (28.3%)	1 (1.9%)	0.0001
Minimum recorded SBP, mmHg	95 [89–106]	107 [98–110]	0.0002
Incidence of hypertension	25 (47%)	25 (47%)	1.0
Maximum recorded SBP, mmHg	139 [129–147]	140 [128–149]	0.83
Incidence of bradycardia (HR < 50 beats/min)	13 (24.5%)	9 (1.8%)	0.34
Minimum recorded HR, beats/min	53 [50–58]	58 [52–63]	0.013
Atropine required	0	0	1.0

Values are median [interquartile range] or number (%).

HR = heart rate; SBP = systolic blood pressure.

Preload or coload for spinal anesthesia for elective Cesarean delivery: a meta-analysis

Banerjee et al, Can J Anaesth 2010; 57: 24-31



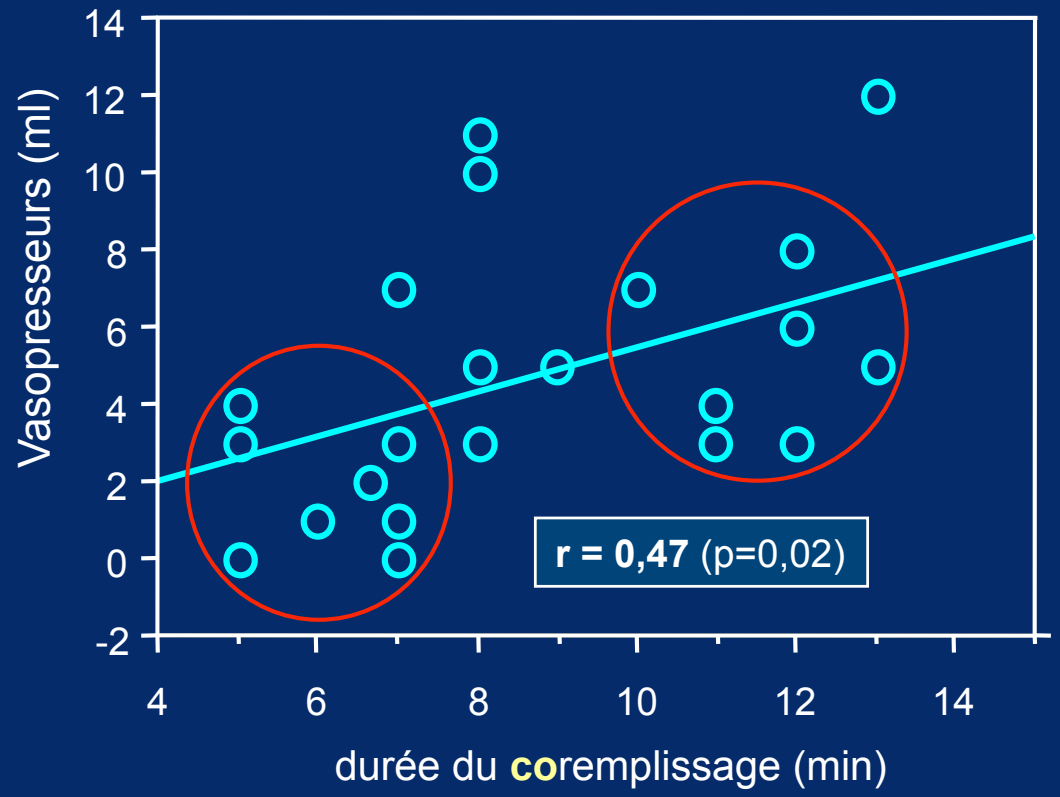
Crystalloid Infusion for the Prevention of Hypotension Following Spinal Anesthesia: Pre-loading *vs*. Co-loading

Mercier FJ et al. (abstract)

- Césarienne élective
  (Bupi 10mg + Sufenta 3µg)
- N = 24 / groupe
- **1 L** de Ringer Lactate
- Pré : -20 à -30 min avant RA

  Co : +5 à +13 min après RA
- Bolus Eph 3mg + PE 15µg :

  6,0 ±5,5 vs **4,8** ±3,2 ml (NS)



(pas de corrélation avec la durée du préremplissage : r = 0,15 ; p=0,50)

➔ Le Coremplissage diminue les besoins en vasopresseurs s'il est perfusé en moins de 7 min

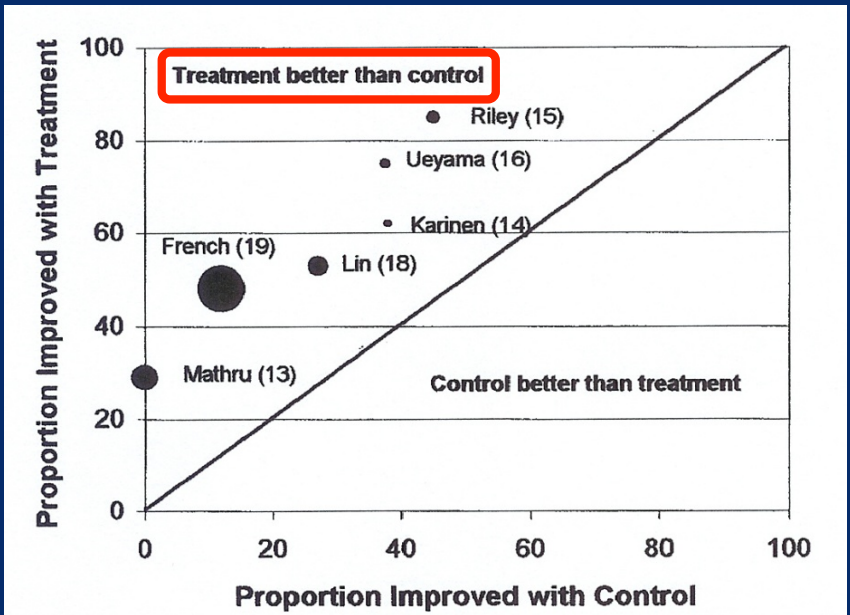


Figure 2. The l'Abbé plot of colloid preload is shown. The treatment

Morgan PJ et al,
Anesth Analg 2001
+
Emmett RS et al,
Cochrane Library 2006

Analysis 7.6. Comparison 7 Colloid versus crystalloid, Outcome 6 Women with hypotension requiring intervention.

Review: Techniques for preventing hypotension during spinal anaesthesia for caesarean section

Comparison: 7 Colloid versus crystalloid

Outcome: 6 Women with hypotension requiring intervention

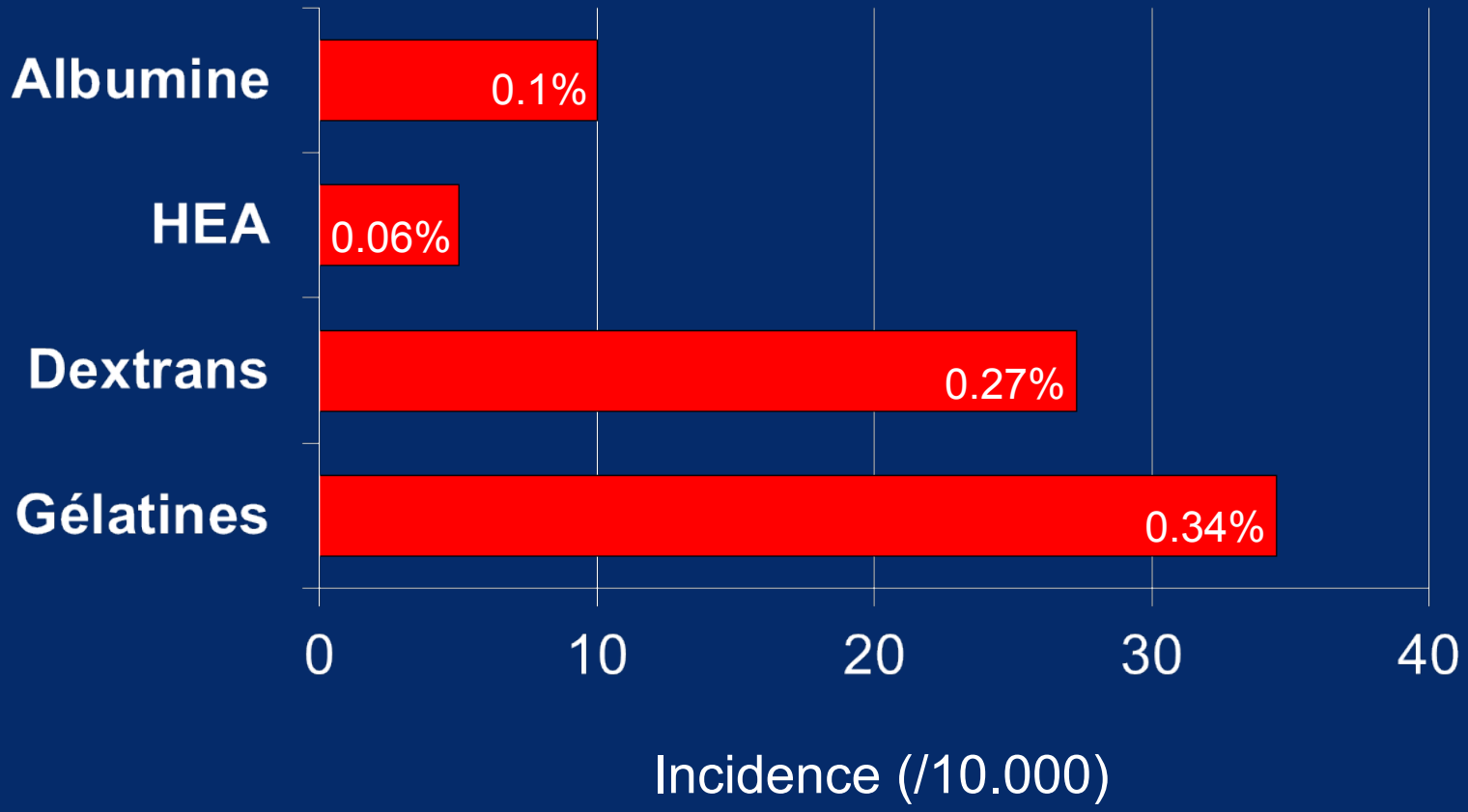
Study or subgroup	Colloid n/N	Crystalloid n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
1 Any hypotension					
Cardoso 2004a	25/25	25/25		12.2 %	1.00 [0.93, 1.08]
French 1999	10/80	38/80		10.8 %	0.26 [0.14, 0.49]
Karinen 1995	5/13	8/13		10.0 %	0.63 [0.28, 1.41]
Lin 1999	8/30	16/30		10.6 %	0.50 [0.25, 0.99]
Ozkan 2004	13/25	14/25		11.3 %	0.93 [0.56, 1.55]
Perumal 2004	13/20	14/20		11.5 %	0.93 [0.60, 1.43]
Selvan 2004	20/40	14/20		11.6 %	0.71 [0.47, 1.09]
Siddik 2000	8/20	16/20		11.0 %	0.50 [0.28, 0.89]
Ueyama 1999	10/24	9/12		11.0 %	0.56 [0.31, 0.99]
Subtotal (95% CI)	**277**	**245**		**100.0 %**	**0.63 [0.35, 1.15]**

Total events: 112 (Colloid), 154 (Crystalloid)
Heterogeneity: $Tau^2 = 0.76$; $Chi^2 = 153.94$, df = 8 ($P<0.00001$); $I^2 = 95\%$
Test for overall effect: $Z = 1.51$ ($P = 0.13$)

0.01 0.1 1 10 100
Favours colloid Favours crystalloid

Anaphylactic reactions to colloidal substitutes...

Laxenaire MC et al, Ann Fr Anesth Reanim 1994; 13: 301



➔ Colloïdes en obstétrique : CI en France depuis conférence de consensus de 1989

➔ CI en partie levée pour les HEA par les RPC-SFAR 2006, puis par l'AFSSAPS 2008

Rachi & préremplissage par HEA

- *Karinen, BJA 1995* : HEA 500 ml *vs.* RL 1000 ml

→ Hypotension : 38% *vs.* 62%

- *Riley, A&A 1995* : RL 1000 ml + HEA 500 ml *vs.* RL 2000 ml

→ Hypotension : 45% *vs.* 85%, et moins d'éphédrine

- *Siddik, CJA 2000* : HEA 500 ml *vs.* RL 1000 ml

→ PAS < 90 mmHg : 40 *vs.* 80% ; éphédrine : 10 *vs.* 35 mg

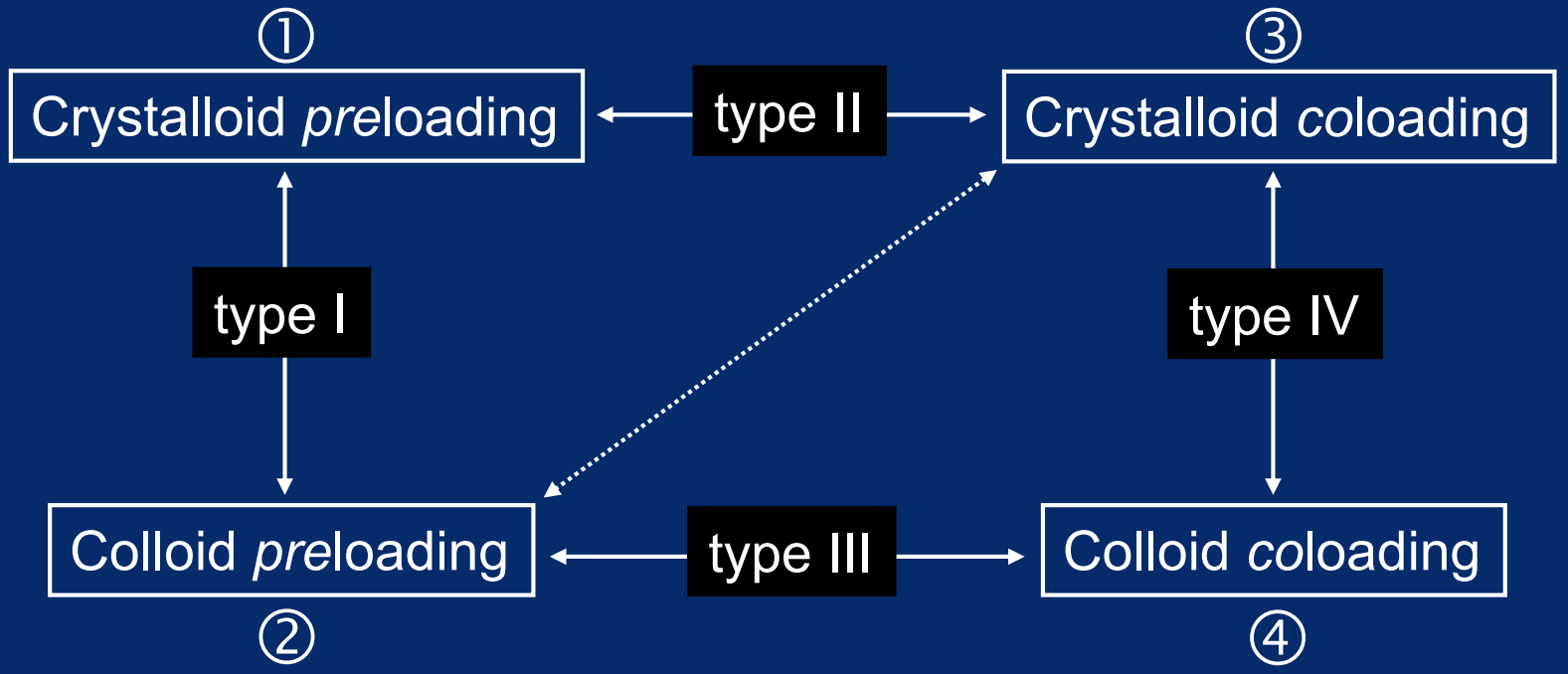
- Ueyama, *Anesthesio* 1999 : HEA 500 or 1000 ml *vs.* RL 1500 ml

→ Hypotension : **58% vs. 17% vs. 75%**

→ Débit cardiaque (DC) maternel n'est augmenté qu'avec les HEA

Fluid loading for cesarean delivery under spinal anesthesia : toward a better understanding and optimal management

Mercier FJ, Anesth Analg 2011; 113: 677-80



REVIEW

CURRENT OPINION

(2012)

Cesarean delivery fluid management

Frédéric J. Mercier

KEY POINTS

- Crystalloid preloading for cesarean de… spinal anesthesia is clinically ine… should be abandoned.
- Hydroxyethyl starch … …ifiably decreases the … …y of hypotension, and may … …pressor requirements.
- H… …urs equally effective as preloading …used after initiation of anesthesia.
- …loid coloading is a cheaper alternative to colloid … its efficacy appears less reliable, at least when a substantial volume cannot be infused rapidly during onset of spinal sympathetic blockade.
- Fluid loading should be used cautiously in preeclampsia and multiple gestations.

Mais absence d'AMM en France + alerte EMEA-FDA relayée par ANSM pour les HEA …

Prévention et traitement

- Méthodes non pharmacologiques
  - Réduction de la stase veineuse dans les membres Inf.
  - 5-10° de décubitus latéral gauche
- Méthodes pharmacologiques
  - Remplissage vasculaire; soit :

    --> préremplissage par cristalloïdes ou par colloïdes (HEA)

    --> coremplissage par cristalloïdes
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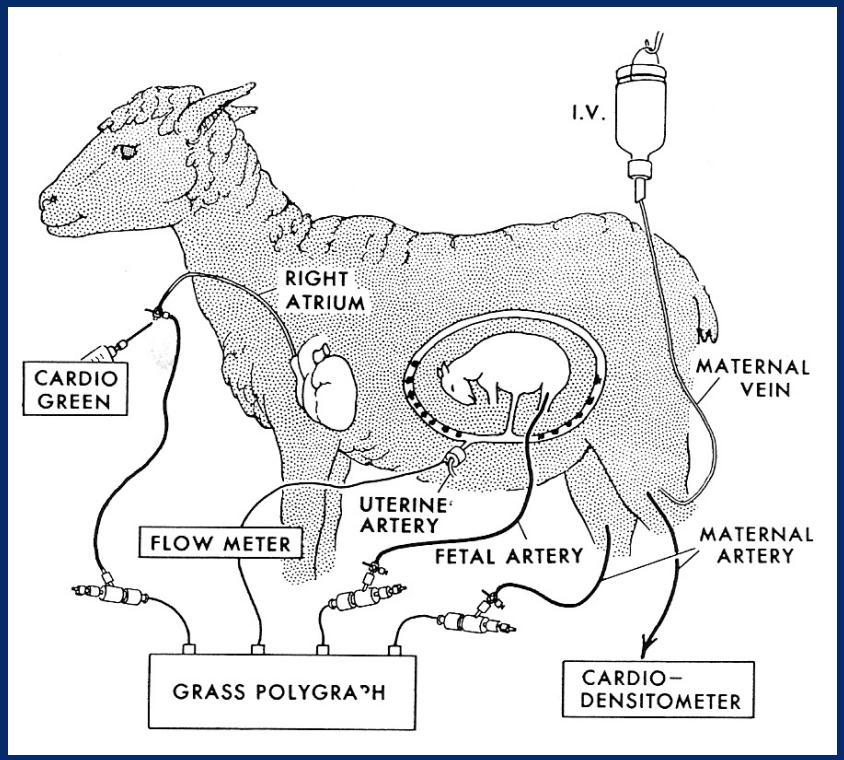
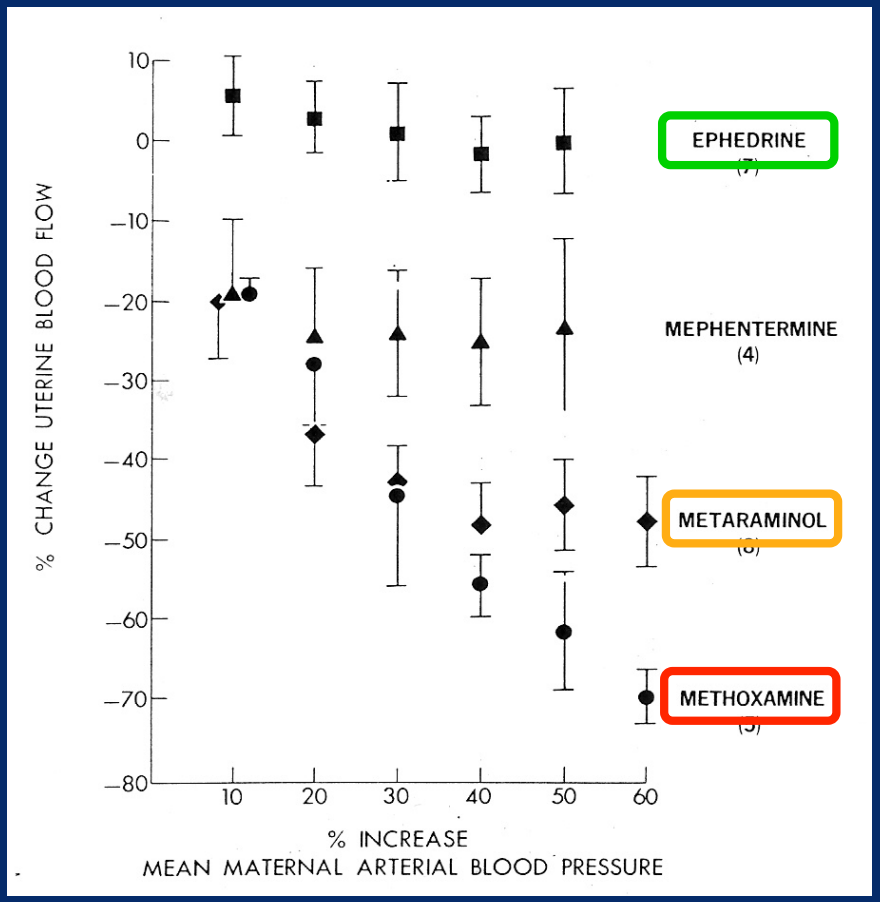
Values are median [interquartile range] or number (%).

HR = heart rate; SBP = systolic blood pressure.

Effects of equipotent ephedrine, metaraminol, mephentermine, and *methoxamine on UBF in the pregnant ewe*

Ralston DH et al, Anesthesiology 1974; 40: 354-70

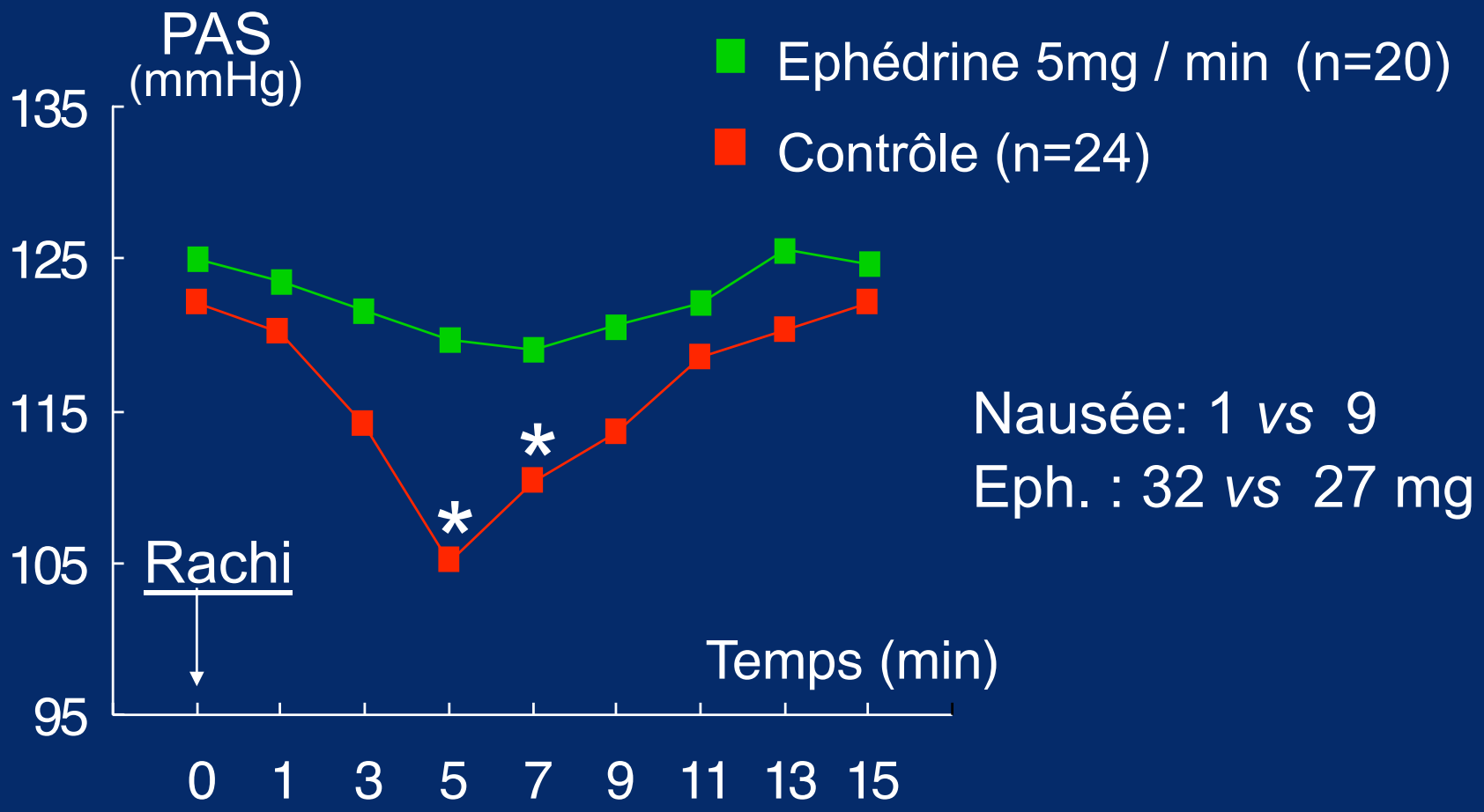




Ephedrine has minimal effects on UBF,
Metaraminol is potentially hazardous,
Methoxamine should be avoided

Spinal anesthesia and prophylactic ephedrine

Kang et al, Anesth Analg 1982



Nausée: 1 *vs* 9

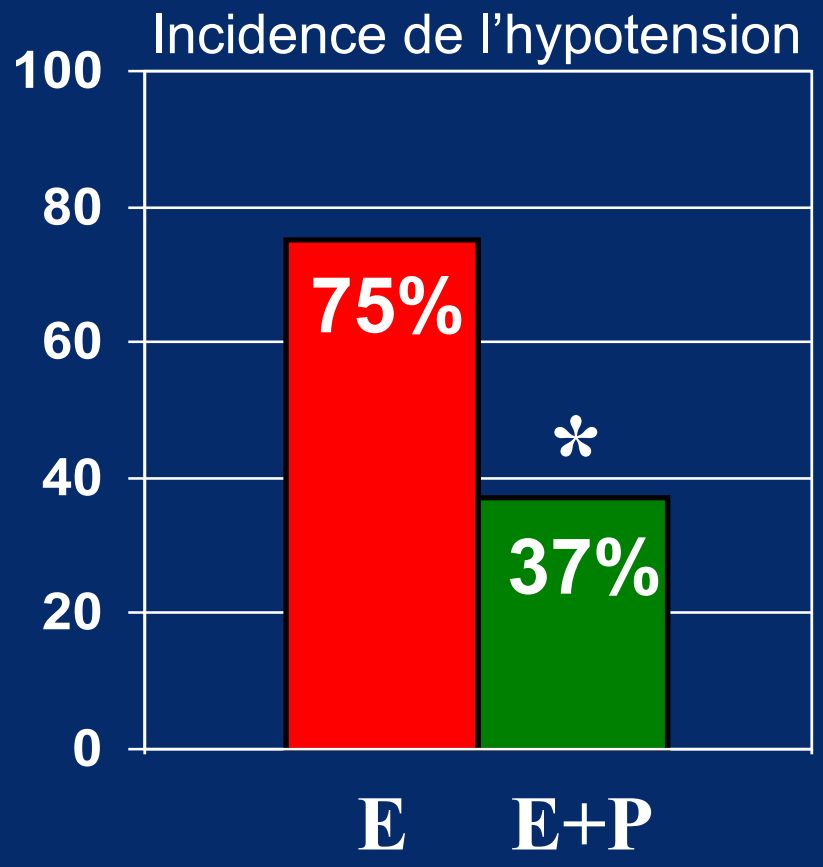
Eph. : 32 *vs* 27 mg

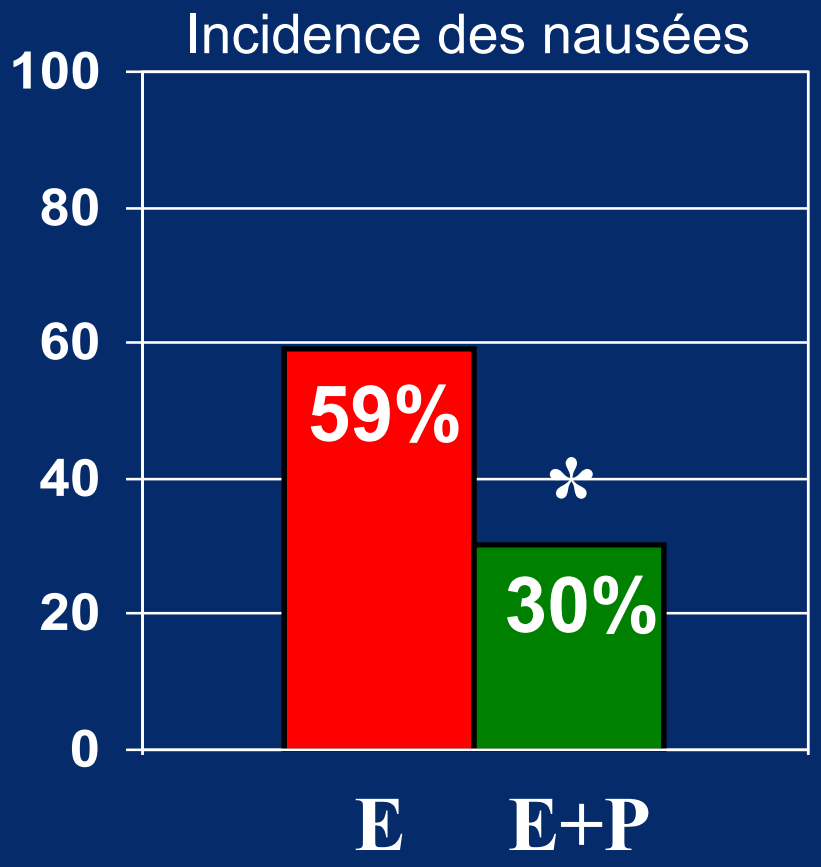
L'éphédrine prophylactique *diminue* le pHa et augmente le Base Deficit :

- Rolbin 1982 : surtout si doses ≥ 50 mg
- Hughes 1985
- Rout 1992
- Ramin 1994
- Shearer 1996
- Chan 1997
- Morgan 2000
- Ngan Kee 2001

Phenylephrine added to prophylactic ephedrine infusion during SA for elective CS

Mercier FJ et al, Anesthesiology 2001; 95: 668-74





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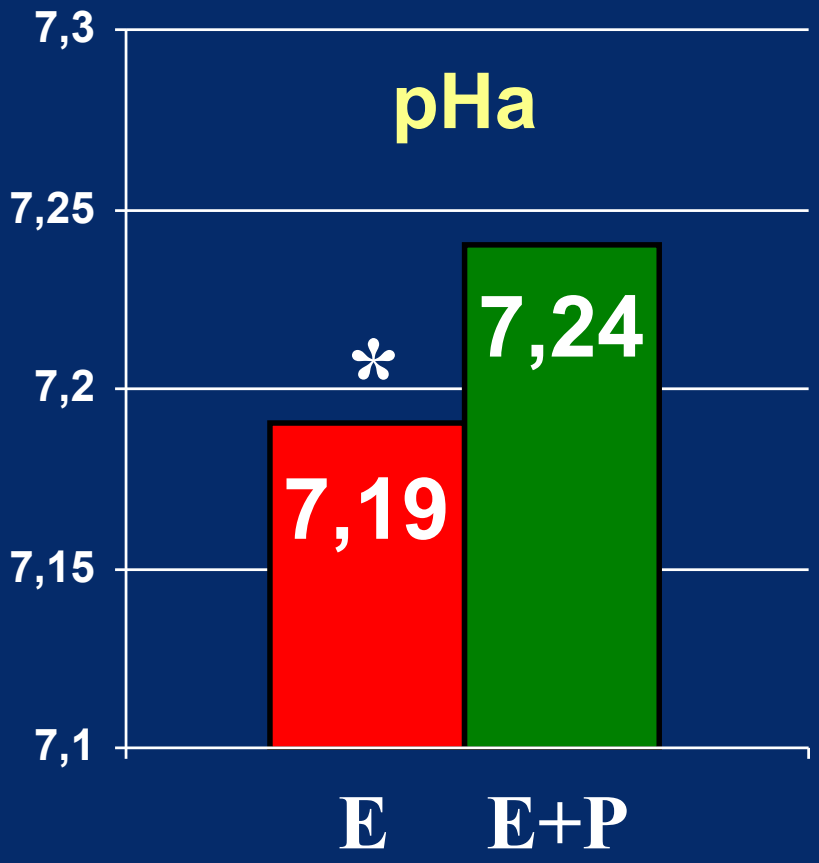

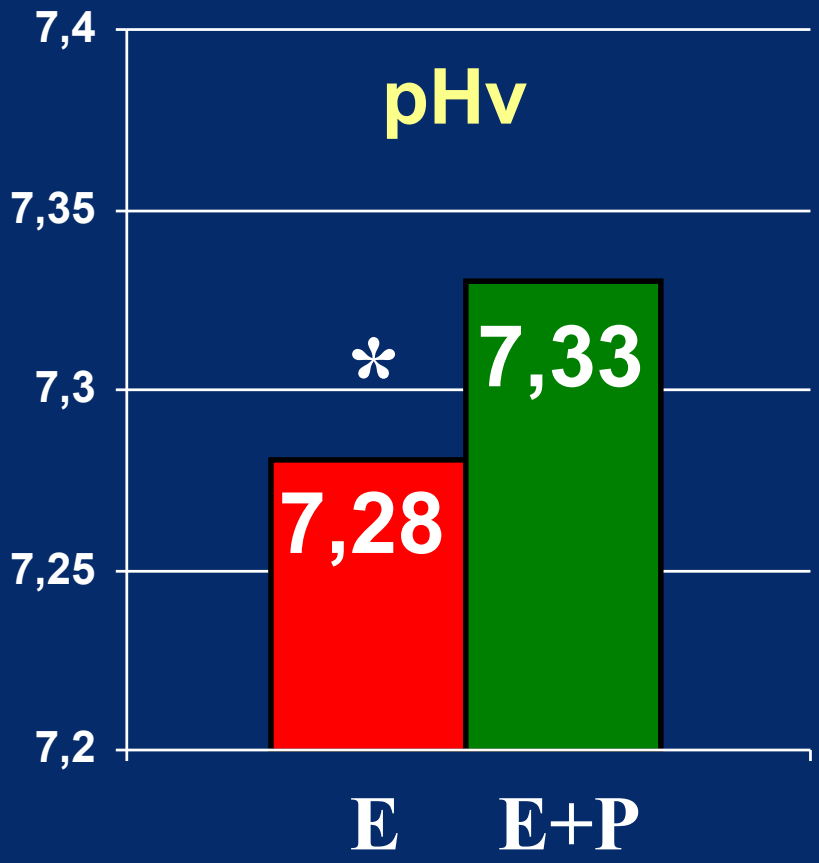

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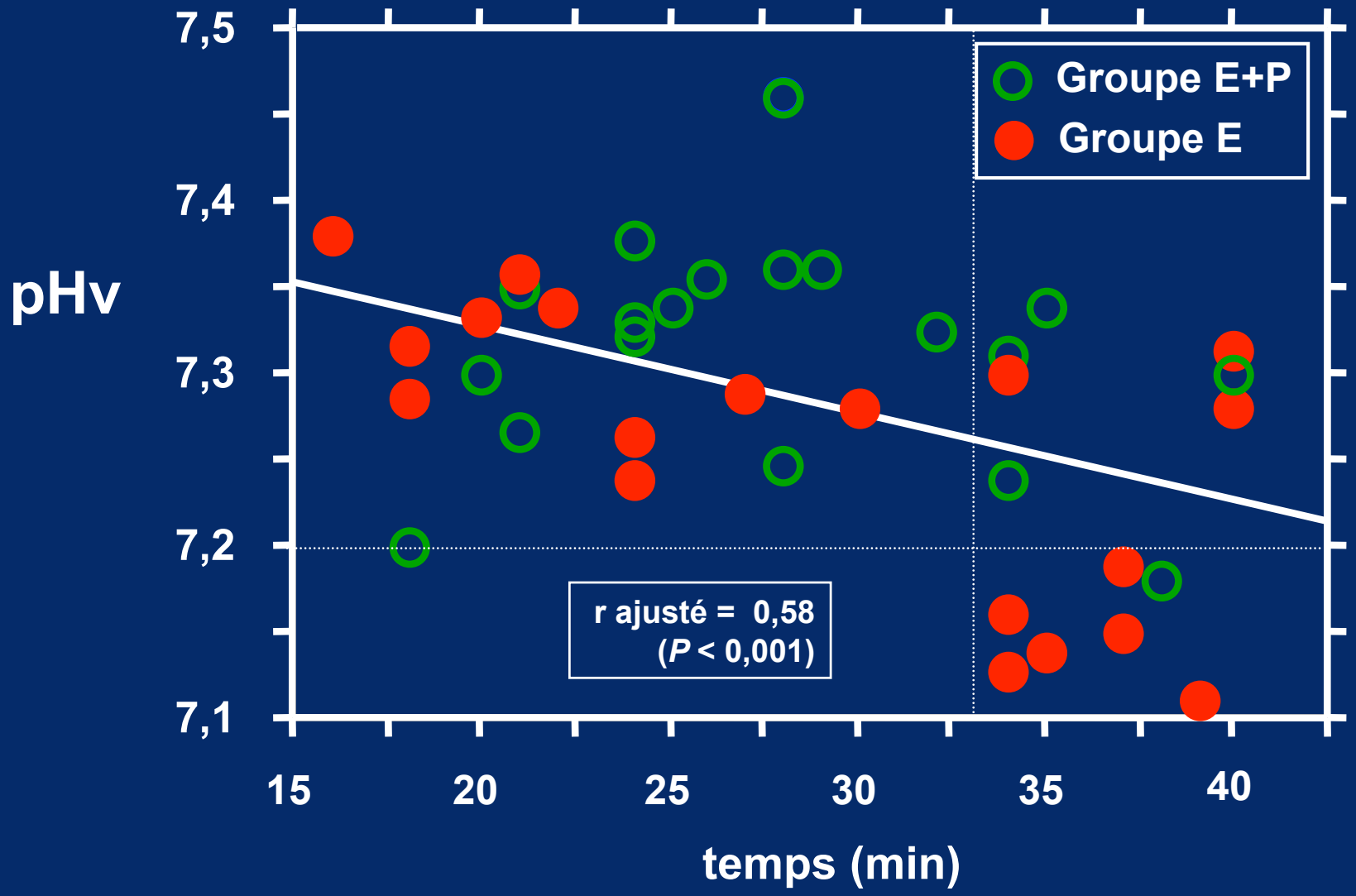
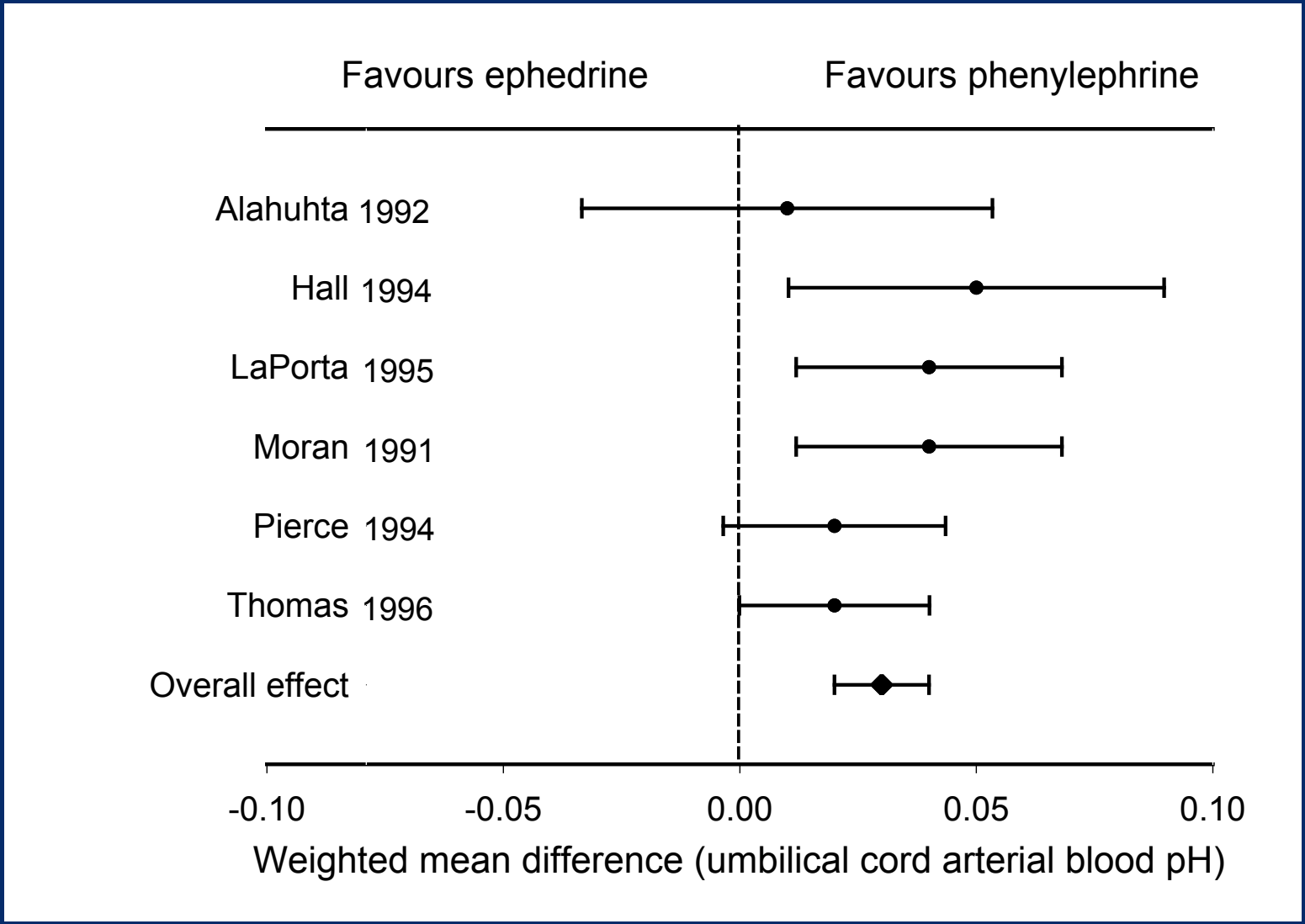


A quantitative, systematic review of randomized trials of E vs P

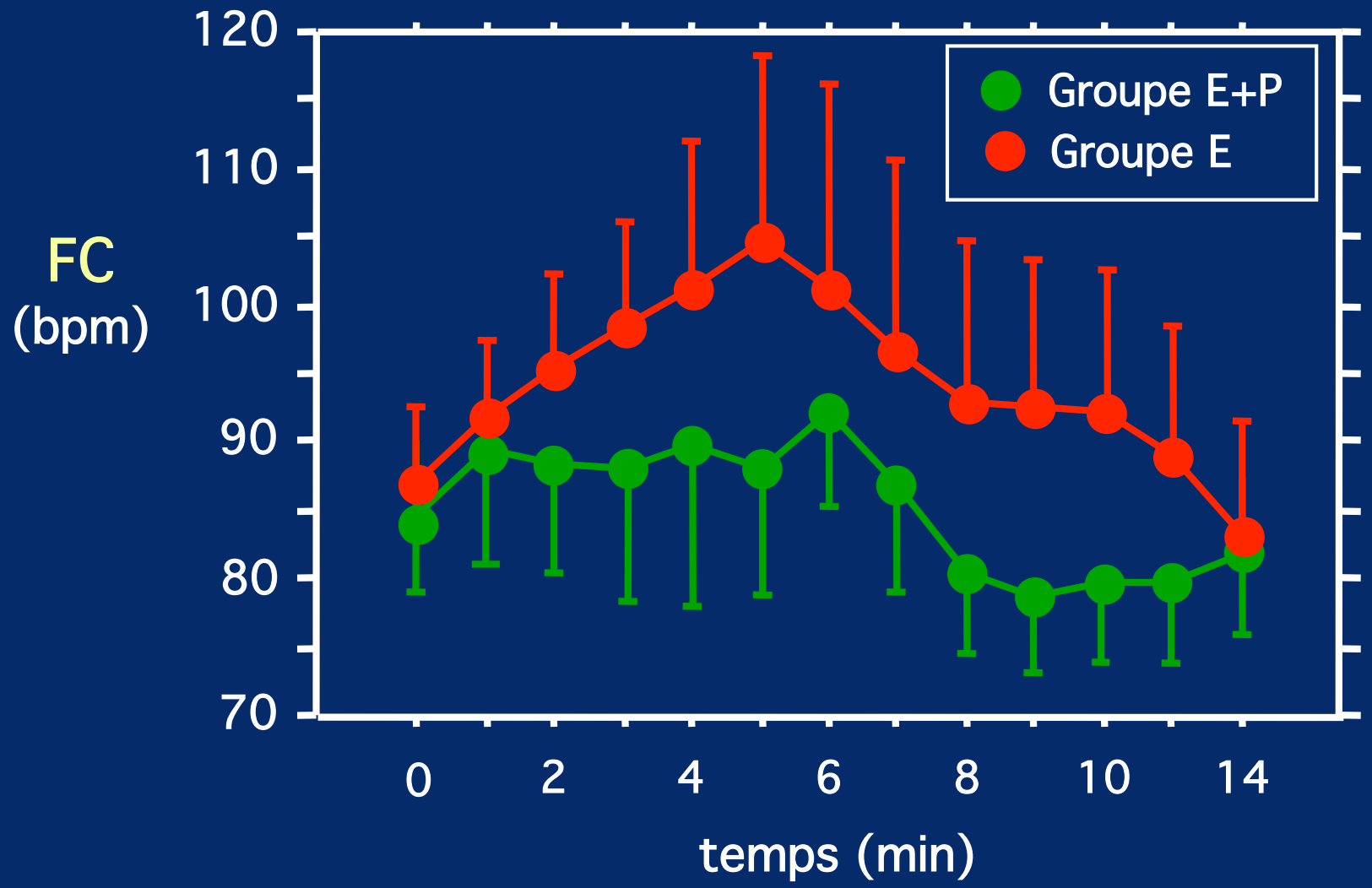
Lee A et al, Anesth Analg 2002; 94: 920-6



(mais RR = 4,8 de bradycardie maternelle avec la Phényléphrine)

Phenylephrine added to prophylactic ephedrine infusion during SA for elective CS

Mercier FJ et al, Anesthesiology 2001; 95: 668-74



Ngan Kee et al, Anesth Analg 2008; 107: 1295-1302

equipotency ratio 1:80 (Saravanan et al, 2006)	Group 1 (1:0)	Group 2 (3:1)	Group 3 (1:1)	Group 4 (1:3)	Group 5 (0:1)	*P*
PhenylEph (µg/ml)	**100**	**75**	**50**	**25**	**0**	
Ephedrine (mg/ml)	**0**	**2**	**4**	**6**	**8**	
Hypotension	4%	13%	12%	8%	32%	0.01*
Hypertension	**50%**	**54%**	**36%**	**33%**	**60%**	**ns**
Bradycardia	**13%**	**4%**	**4%**	**0%**	**4%**	**ns**
Max HR (bpm)	100	106	108	116	130	<0.01
Nausea/vomiting	0%	17%	0%	21%	40%	0.01*
UA pH	7.29	7.27	7.25	7.21	7.14	<0.01
UA BE (mmol/L)	-2.0	-3.0	-3.9	-4.7	-6.2	<0.01
UA pH < 7.2	0%	2.5%	24%	29%	48%	0.02

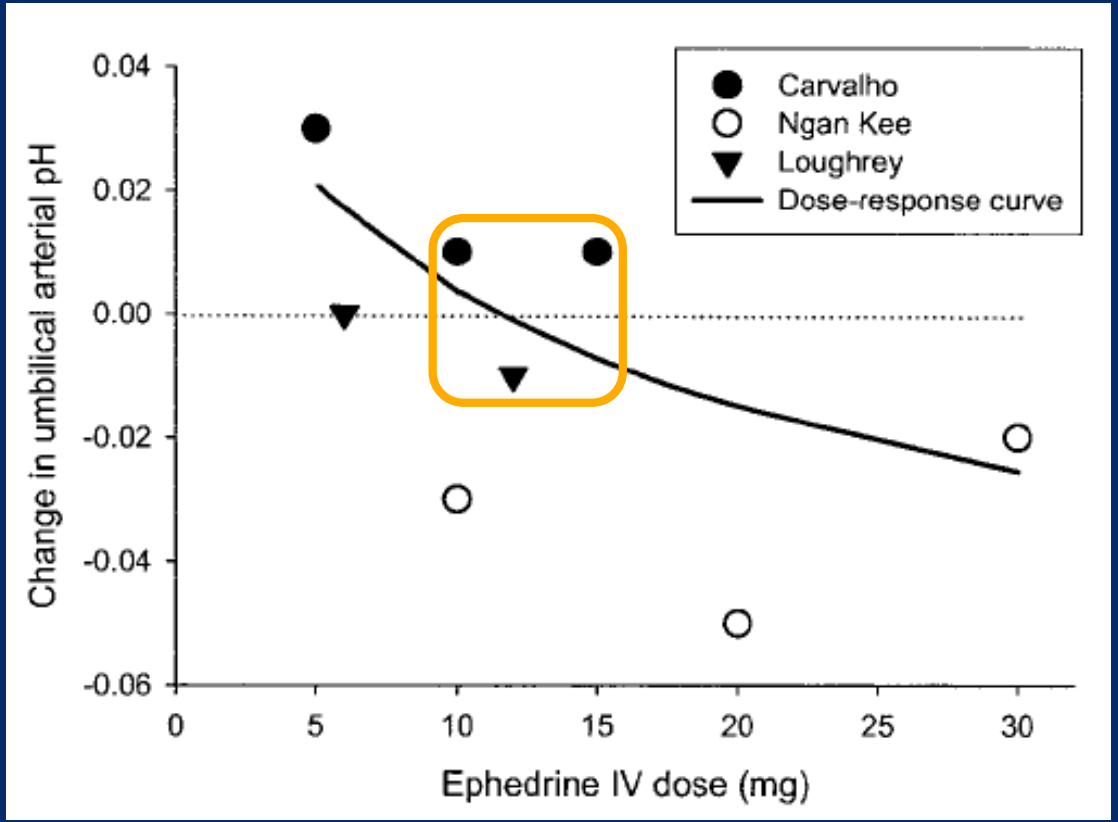
(N=25/Gp, mean or %)

Vasopressor(s) 1 ml/min: SBP ~100%

* vs other groups

A dose-response meta-analysis of prophylactic ephedrine…

Lee et al, Anesth Analg 2004; 98:483-90



Eph 10-15 mg : no change in UA pH

Anesthesiology 2009; 111:506–12

Placental Transfer and Fetal Metabolic Effects of Phenylephrine and Ephedrine during Spinal Anesthesia for Cesarean Delivery

Warwick D. Ngan Kee, M.B.Ch.B., M.D., F.A.N.Z.C.A., F.H.K.A.M., Kim S. Khaw, M.B.B.S., F.R.C.A., F.H.K.A.M.,† Perpetua E. Tan, B.Sc., M.Phil.,‡ Floria F. Ng, R.N., B.A.Sc.,§ Manoj K. Karmakar, M.B.B.S., F.R.C.A., F.H.K.A.M.†*

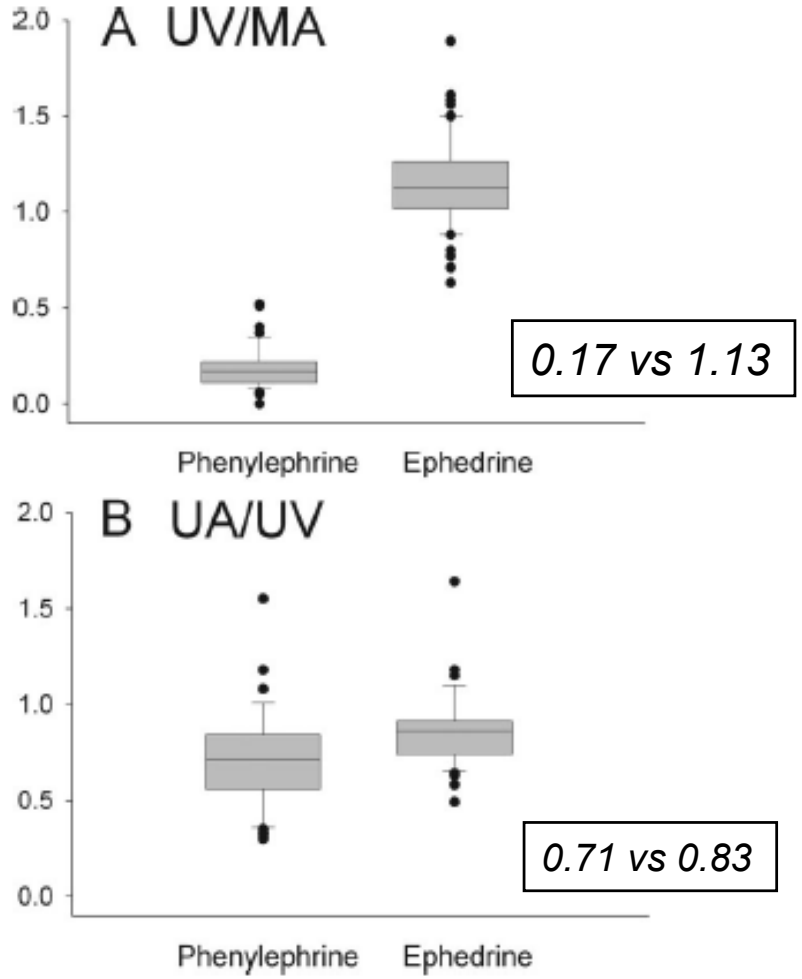


Fig. 1. Plasma concentration ratios for phenylephrine and ephedrine. Data are shown for (*A*) umbilical venous to maternal arterial (UV/MA) and (*B*) umbilical arterial to umbilical venous (UA/UV) ratios. *Box plots* display the 25th, 50th, and 75th percentiles as *horizontal lines* on a bar, *whiskers* above and below

Comparison of phenylephrine infusion regimens for mainting maternal blood pressure during SA for CS

Ngan Kee WD et al, Br J Anaesth 2004; 92: 469-74

Phényléphrine 100 µg/min. i.v. perfusé dès que la PAS est inférieure à ….

	Gr 100%	Gr 90%	Gr 80%
Hypotension	29%*	72%	96%
dose Phe (µg)	1520*	1070	790
N - V	1/24*	4/25	10/25

pHa ≥ 7,20 dans tous les cas & même meilleur dans le Gr 100% !
FC maternelle < 50 bpm transitoirement chez 1/5 des patients

A Double-Blind, Placebo-Controlled Trial of Four Fixed Rate Infusion Regimens of Phenylephrine for Hemodynamic Support During Spinal Anesthesia for Cesarean Delivery

Terrence K. Allen, MBBS, FRCA,* Ronald B. George, MD, FRCPC,† William D. White, MPH,* Holly A. Muir, MD, FRCPC,* and Ashraf S. Habib, MBBCh, MSc, FRCA*

Anesth Analg 2010; 111: 1221-9

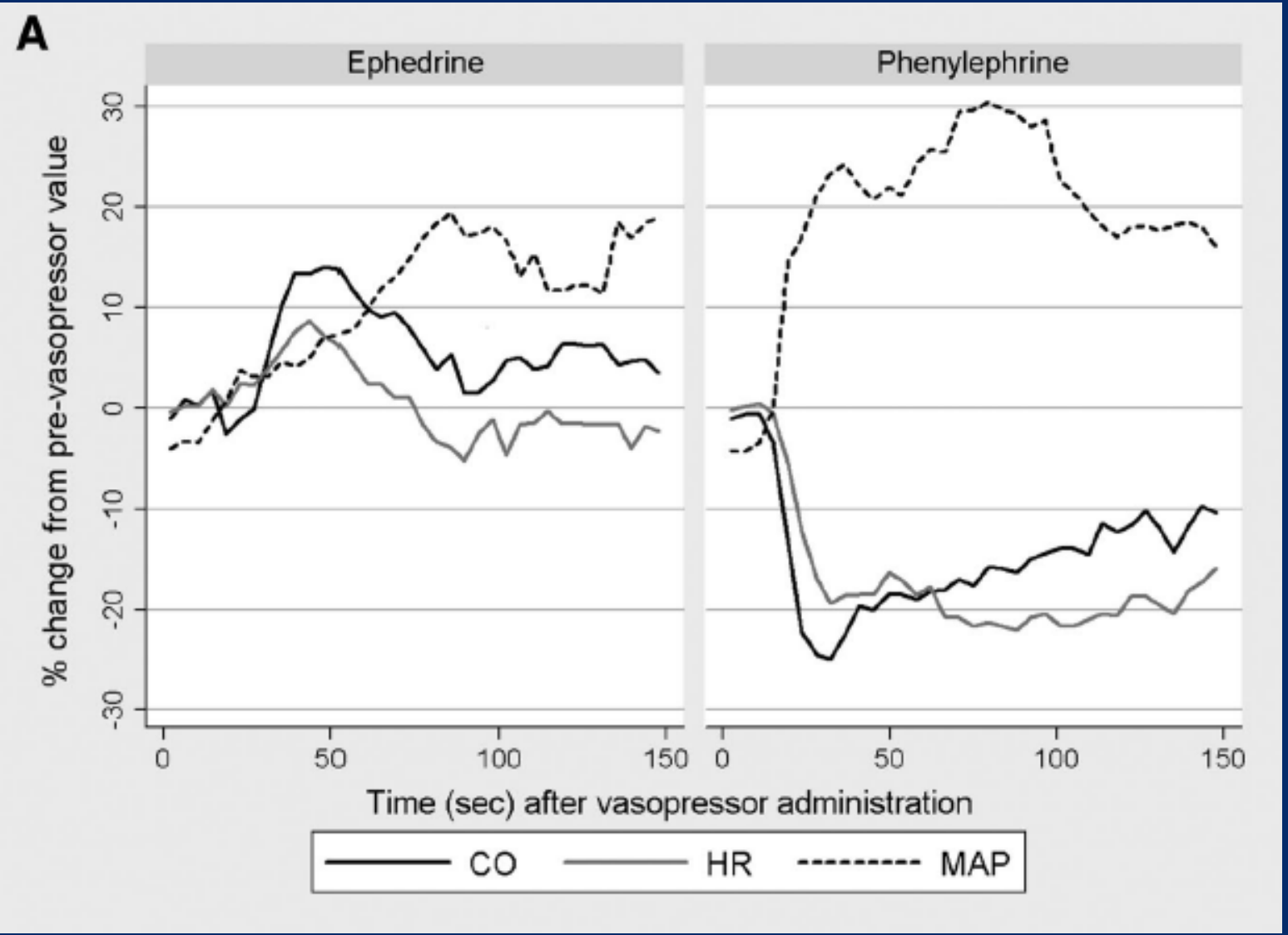
Table 2. Hemodynamic Variables

	PE 0 (n = 20)	PE 25 (n = 20)	PE 50 (n = 20)	PE 75 (n = 19)	PE 100 (n = 22)
No. of interventions	2 (1–3.5)	0.5 (0–4.5)	1.5 (0–3.5)	4 (1–6)	5 (4–6)*
Infusion permanently stopped	1 (5%)	5 (25%)	3 (15%)	9 (47%)	15 (68%)†
Predelivery hypotension	16 (80%)†	6 (30%)	3 (15%)	2 (11%)	0 (0%)
Predelivery hypertension	2 (10%)§	5 (25%)	8 (40%)	14 (74%)	18 (82%)‖
Postdelivery hypotension	9 (45%)	5 (25%)	1 (5%)	4 (21%)	2 (22%)
Postdelivery hypertension	0 (0%)	0 (0%)	5 (25%)	2 (11%)	8 (36%)
No. of hypotensive episodes	2 (1–3)¶	0 (0–2)	0 (0–0)	0 (0–1)	0 (0–0)
No. of hypertensive episodes	0 (0–0)#	0 (0–0)**	0.5 (0–2)††	2 (0–5)	3 (2–6)
Maximum percent change in SBP	8.3 (4.7–15.5)‡‡	12.7 (5.0–19.8)§§	22 (14.4–27.1)	29.3 (19.9–37.2)	33.2 (23.9–46.5)
Minimum percent change in SBP	−26.9 (−30.5, −19.1)‖‖	−19.2 (−22.5, −13.1)	−9.8 (−15.1, −5.5)	−8.3 (−19.7, −0.4)	−11.8 (−17.6, −6.2)
Bradycardia	1 (5%)	3 (15%)	0 (0%)	6 (32%)	7 (32%)

PE = phenylephrine; SBP = systolic blood pressure.
Data are median (interquartile range) or number (%).

Hemodynamic effects of Ephedrine, Phenylephrine and coadministration of Phenylephrine and Oxytocin during SA for elective CD

Dyer RA et al., Anesthesiology 2009; 111: 753-65



Phenylephrine Infusion Versus Bolus Regimens During Cesarean Delivery Under Spinal Anesthesia: A Double-Blind Randomized Clinical Trial to Assess Hemodynamic Changes

Anne Doherty, MD,* Yayoi Ohashi, MD, PhD,* Kristi Downey, MSc,* and Jose C. A. Carvalho, MD, PhD*

INTRODUCTION: Phenylephrine is used to prevent and treat hypotension during spinal anesthesia for cesarean delivery. The optimal administration regimen is undetermined. We used a noninvasive cardiac output monitor to test the hypothesis that a fixed-rate phenylephrine infusion regimen would cause a smaller reduction in maternal cardiac output, and result in less maternal hypotension, as compared to a phenylephrine bolus regimen.

METHODS: This was a double-blind, randomized clinical trial of women undergoing elective cesarean delivery under spinal anesthesia. Patients were randomized to an intermittent bolus (120 μg) or a fixed-rate infusion (120 μg/min) regimen of phenylephrine. Any decrease in systolic blood pressure from baseline was treated. The primary outcome was the maximum change in cardiac output in the predelivery period, assessed using bioreactance technology. Secondary outcomes included the maximum change in heart rate, incidence of hypo- and hypertension, nausea/vomiting and bradycardia, total dose of phenylephrine, umbilical blood gases, and Apgar scores. The hemodynamic profiles over time in each treatment arm were compared.

RESULTS: Sixty patients were studied. There was no significant difference in the maximum change in cardiac output between the 2 treatment arms: mean (SD) maximum change in cardiac output in the bolus group was 1.87 (1.68) L/min versus 1.9 (1.46) L/min in the infusion group ($P = 0.94$) (95% confidence intervals of difference in means: −0.84 to 0.78 L/min). The infusion group received significantly more phenylephrine (1740 (613) versus 964 (454) μg) ($P < 0.001$). In the initial 6 min after intrathecal injection, there was a significant decrease in blood pressure in the infusion group compared to the bolus group ($P = 0.007$). There was no significant difference in the other secondary outcomes.

CONCLUSION: There were no clinical benefits to administering phenylephrine as an infusion versus a bolus regimen. The bolus regimen maintained maternal arterial blood pressure closer to baseline in the initial minutes after spinal injection but this had no clinical benefits. The infusion regimen required a higher total dose of phenylephrine to maintain maternal arterial blood pressure at baseline during the predelivery period. (Anesth Analg 2012;115:1343–50)

Spinal Hypotension During Elective Cesarean Delivery: Closer to a Solution

Robert A. Dyer, FCA (SA), PhD, and Anthony R. Reed, FRCA

Hypotension during spinal anesthesia for cesarean delivery should be minimized, both for maternal safety and comfort, and fetal wellbeing. Traditional teaching is that aortocaval compression predisposes the parturient to decreased venous return and hence cardiac output and blood pressure during spinal anesthesia for cesarean delivery. However, a variety of measures to improve venous return, including lateral tilt and numerous fluid administration regimens, have failed to eliminate hypotension.[1] Recent studies focusing on the arterial circulation as a source for hypotension suggest that in the fluid-replete parturient undergoing elective cesarean delivery, moderate spinal hypotension (20% decrease from baseline) primarily reflects decreased systemic vascular resistance.[2–4] In most cases, venous return is initially maintained and consequently there is a partial compensatory *increase* in cardiac output, mediated by an increase in stroke volume and heart rate. In this situation, the rapidly acting α-agonist phenylephrine seems to be the best option to restore baseline hemodynamics rapidly. Although ephedrine has traditionally been used to treat spinal anesthesia–induced hypotension, recent evidence suggests that ephedrine causes neonatal acidosis, and large doses may be harmful in a compromised fetus, by increasing oxygen demand and anaerobic metabolism.[5,6] Ephedrine is also associated with a higher incidence of nausea and vomiting than phenylephrine.

The dose and method of administration of phenylephrine have been the subject of extensive investigation.[7–12] In this issue of *Anesthesia & Analgesia*, 2 articles address this subject. First, Allen et al.[13] compared placebo with the use of 4 different infusion rates of phenylephrine, in combination with a crystalloid coload, and assessed "hemodynamic stability" by heart rate and blood pressure. The aim was to maintain blood pressure within 20% of baseline values. They demonstrated that infusing phenylephrine at a fixed rate of 75 or 100 μg/min is associated with more episodes of hypertension than placebo, or the lower infusion rates of 25 or 50 μg/min, respectively. Seven patients in the group receiving 100 μg/min developed sinus bradycardia and were given glycopyrrolate. It may be more appropriate to treat baroreceptor-mediated bradycardia associated with a well-maintained blood pressure by discontinuing the infusion than by the administration of an anticholinergic. This would avert the reactive hypertension reported by the authors. This work suggests that to reduce hypotension and avoid hypertension and bradycardia, slower infusion rates of phenylephrine are a better starting point, with supplementary boluses as necessary, in keeping with the pharmacokinetic principle of the use of a bolus followed by an infusion to increase steady-state concentrations. Alternatively, the authors speculate, varying infusion rates could be used. The fact that some patients experienced bradycardia and hypertension even at the slower infusion rates suggests that bolus administration of phenylephrine, titrated as required in the individual case, may be a better option than prophylactic infusions.

In the second important contribution, Stewart et al.,[14] using a suprasternal Doppler flow technique, described cardiac output changes associated with infusions of 25, 50, and 100 μg/min phenylephrine, respectively, after the administration of a rapid crystalloid preload, during spinal anesthesia for elective cesarean delivery. The aim was to maintain baseline blood pressure. The infusion of phenylephrine at 100 μg/min for 20 minutes was associated with a reduction in heart rate from 80 to 58 bpm and a reduction in cardiac output from 5.1 to 4.0 L/min. Neonatal outcomes were similar among groups. This is in agreement with a recent investigation of the hemodynamic effects of boluses of ephedrine and phenylephrine using pulse power analysis. Bolus administration of phenylephrine in response to hypotension (20% decrease from baseline blood pressure) was shown to reduce maternal cardiac output to close to baseline values (an effect strongly correlated with maternal heart rate) and restore blood pressure.[2]

In the non-obstetric population, phenylephrine (1:20,000) added to epidural lidocaine,[15] and IV methoxamine administered during spinal anesthesia,[16] have been shown to reduce cardiac output. The studies published in this issue examining the effects of phenylephrine infusions during spinal anesthesia for cesarean delivery suggest that the use of phenylephrine in doses that cause hypertension and sinus bradycardia is inappropriate.

How does phenylephrine influence cardiac output? The effect of α-agonists on venous return is controversial.[17] It is

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likely that low doses of phenylephrine increase venous return, and thus cardiac output, by causing some degree of increase in splanchnic venous tone,[18] particularly in the parturient at term, with her expanded blood volume. By contrast, high doses of phenylephrine cause a baroreceptor-mediated reduction in heart rate and dilation of splanchnic veins and a shift of blood into the splanchnic vasculature with a decrease in venous return.[19] Although the indirect baroreceptor reflex-mediated sympathetic effects on the splanchnic circulation are blocked under spinal anesthesia, the heart rate- and direct receptor-mediated effects of high-dose phenylephrine persist. The latter may cause a significant increase in splanchnic arterial resistance, resulting in a decrease in splanchnic blood flow.[20] Hepatic vein resistance may also be increased. Both effects would reduce venous return. It was interesting that Stewart et al. noted that larger doses of phenylephrine were required to maintain equivalent control of the blood pressure when the infusion rate was 100 μg/min. This would be in keeping with a dose-related decrease in venous return. Because the

In the absence of cardiac output monitoring in everyday practice, heart rate is a good surrogate marker of cardiac output. Usually, the initial response to spinal anesthesia for elective cesarean delivery is an increase in heart rate and a well-maintained or increased cardiac output.[2,4] In this situation, restoring the heart rate to the baseline value using phenylephrine in conjunction with a rapid fluid coload should be the primary goal. Because a small proportion of patients respond to spinal anesthesia with hypotension and bradycardia,[24] which usually reflects a decrease in cardiac output, anticholinergics and ephedrine (and occasionally epinephrine) do have a role to play, together with increasing lateral tilt and fluid administration.

6% HES (130/0.4) *vs.* Ringer's Lactate to prevent hypotension during spinal anesthesia for C -section : the CAESAR multicenter trial

FJ Mercier *et al.*

and le groupe de travail CAESAR

(résumés à la SFAR & l'ASA 2011 + article soumis)

ClinicalTrials.gov: NCT00694343

Méthodes :

- Césarienne programmée sous rachianesthésie

  ASA_{1-2}, 60-95 Kg, grossesse monofœtale non compliquée et à terme

- Étude randomisée, *double-aveugle*, multicentrique (12 sites) comparant deux solutions de préremplissage perfusées en 20-30 min avant la rachianesthésie :

  - Gr. HEA : 500 ml HEA 130/0,4 (6%) + 500 ml RL
  - Gr. RL : 500 ml RL + 500 ml de RL

- Rachianesthésie standard :

  bupivacaine 11 mg + sufenta 3 µg + morphine 100 µg

Critère de jugement principal :

Incidence de l'hypotension

(< 80% de la PAS de base)

Pression Artérielle (PA) relevée / 1 min pendant les 10 premières minutes
après l'induction de la rachianesthésie et toutes les 2 min ensuite

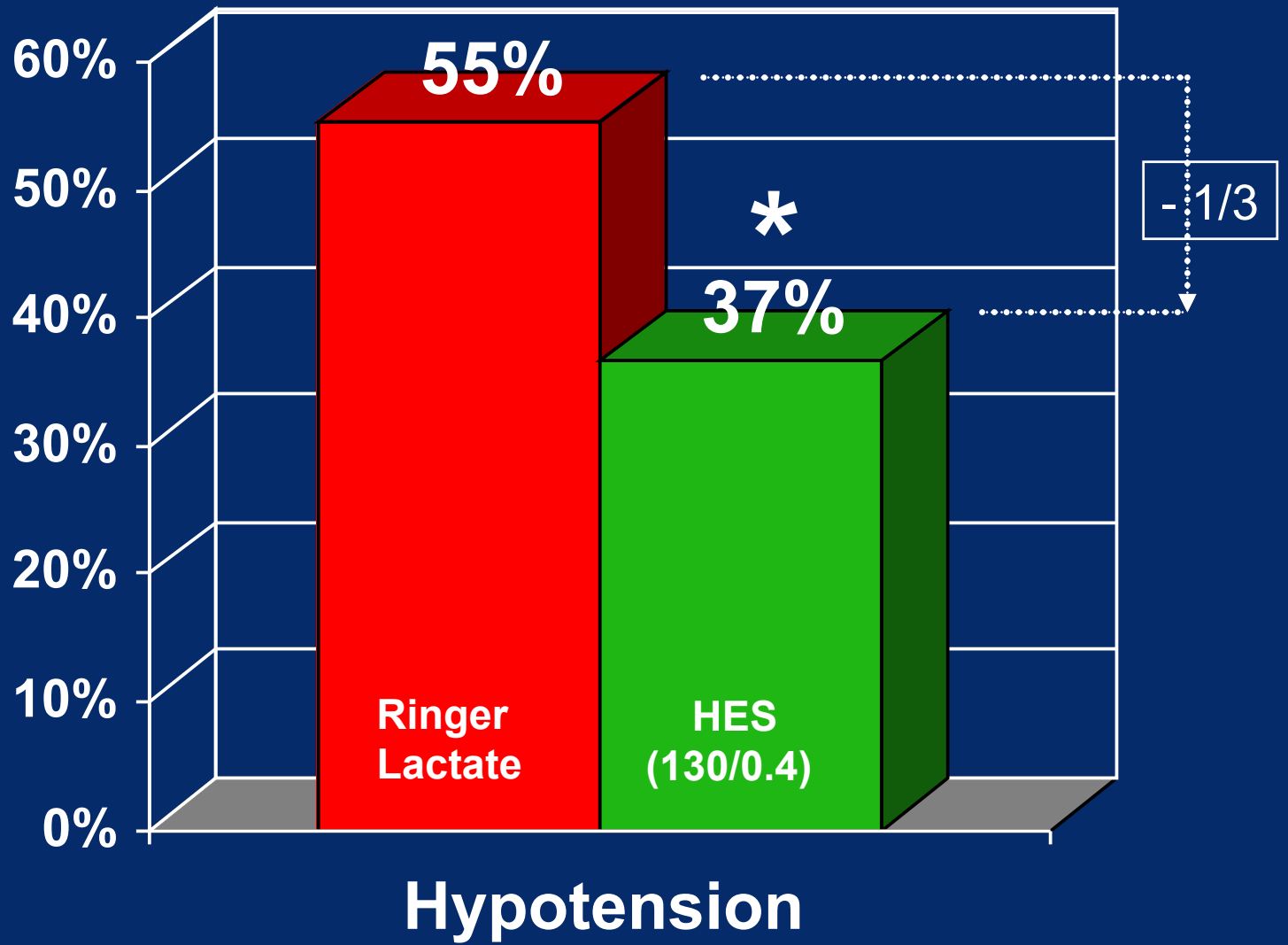
Algorithme prédéfini pour la prophylaxie de l'hypotension par phényléphrine :

PAS ≥ 95%	0
80% ≤ PAS < 95%	50 µg
70% ≤ PAS < 80%	100 µg
PAS < 70%	150 µg

Phényléphrine i.v. : 50 µg/mL

(+ atropine 0,5 to 1 mg i.v., si FC maternelle < 50 bpm)

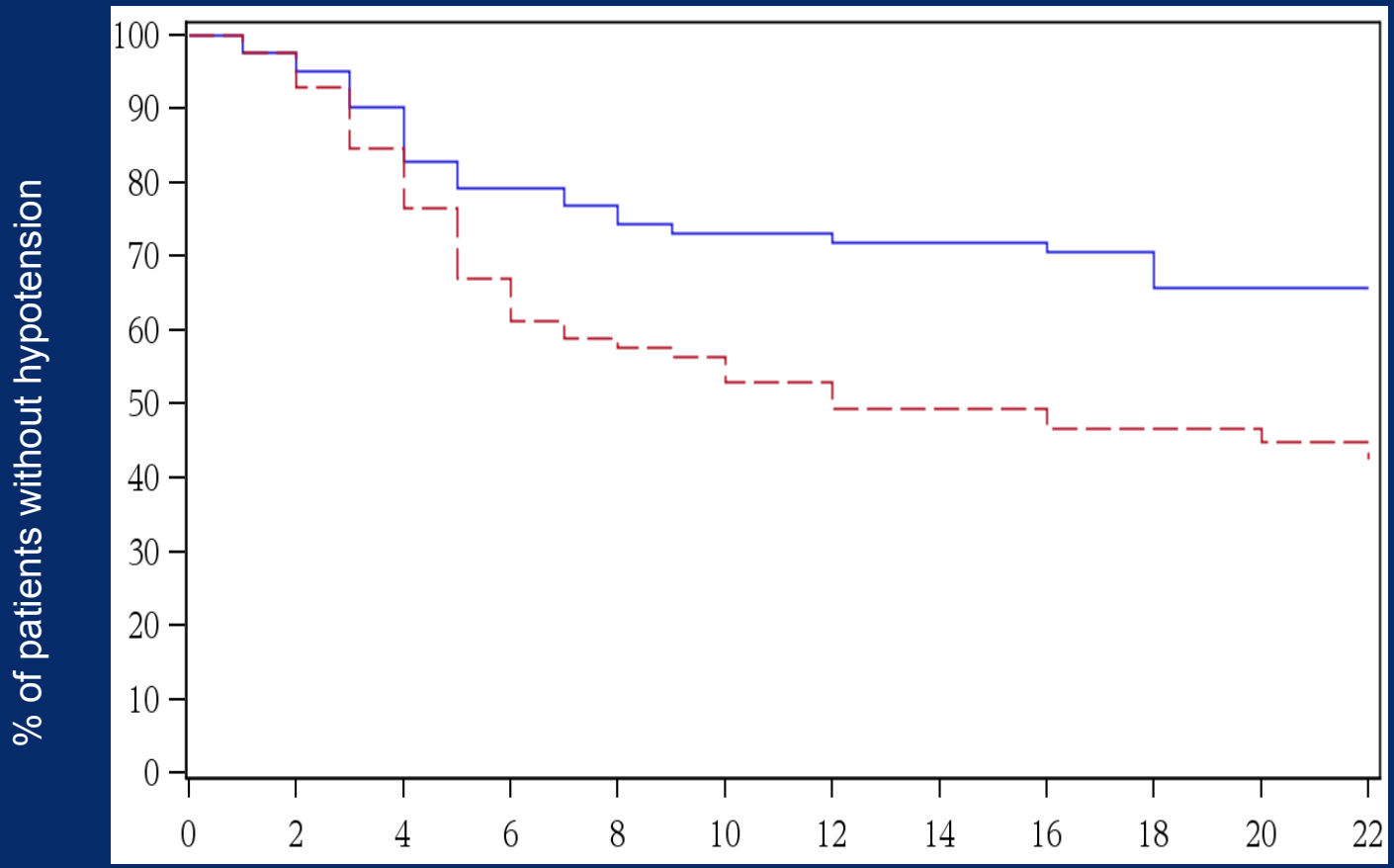
Résultat principal : % d'hypotension



*: *p = 0,02*

Ringer Lactate (n = 82) HES (n = 85)

56% *vs.* 34% en analysis "per-protocole"


% of patients without hypotension
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
22
Time after SA (min)
HES group
RL group

Autres résultats

	HEA (n = 82)	RL (n = 85)	*P*
HypoTA symptomatique	4%	14%	*0,03*
PAS < 70%	10%	18%	*NS*
PhénylE (µg)	413 (±306)	447 (±271)	*NS*
N-V	12%	22%	*0.09*
ΔHb J_0-J_1	1,2 (±1,0)	1,0 (±0,9)	*NS*

PAS < 70% : de la valeur de base / N-V: Nausées-Vomissement / ΔHb J_0-J_1: variation d'Hb en 24h (g/dL)
Hypotension symptomatique : hypotension avec nausées, vomissements et/ou vertiges

Césarienne

« urgente »

Les 3 Degrés d'Urgence

Lucas DN, JR Soc Med 2000

Extrême urgence **Délai < 5 min** **LUCAS 1**	**Urgence non différable** **Délai < 30min** **LUCAS 2**	**Urgence différable** **Délai > 30 min** **LUCAS 3**
HRP	Échec d'extraction instrumentale	Disproportion foeto -pelvienne
Procidence du cordon avec ARCF	Présentation dystocique	Présentation du siège Herpes génital
Rupture utérine	SFA-ARCF récupérant entre les contractions	Placenta praevia sans saignement
Hémorragies sévères		Stagnation dilatation Échec déclenchement
SFA-ARCF anoxique ne récupérant pas		Pré-éclampsie stable

Anaesthesia
Journal of the Association of Anaesthetists of Great Britain and Ireland

Anaesthesia, 2008, **63**, pages 1319–1326 doi:10.1111/j.1365-2044.2008.05635.x

Randomised double-blinded comparison of phenylephrine vs ephedrine for maintaining blood pressure during spinal anaesthesia for non-elective Caesarean section*

W. D. Ngan Kee,[1] K. S. Khaw,[2] T. K. Lau,[3] F. F. Ng,[4] K. Chui[5] and K. L. Ng[6]

- Randomisée & DA, n = 102 x 2, césar NON programmée
- Phényléphrine 100 µg *vs.* Ephédrine 10 mg IV si PAS < 100 mmHg

➞ Même pHa et pHv

➞ Lactates artériels néonatals plus élevés (2,6 vs. 2,4 mmol/l) et plus de nausées/vomissements (13 vs. 4 %) dans gr. Ephédrine

➞ PO2 néonatale plus basse (2,0 vs. 2,4 kPa) dans gr. Phényléphrine mais seulement pour les Césariennes pour « SFA » (n=48) et sans conséquence sur scores d'Apgar, lactactes & admission en Réa

- ≤ 500 µg pour 90% du gr. PE et ≤ 40 mg pour 93% du gr. E

ORIGINAL ARTICLE

Retrospective study of association between choice of vasopressor given during spinal anaesthesia for high-risk caesarean delivery and fetal pH

D.W. Cooper, S. Sharma, P. Orakkan, S. Gurung
Department of Anaesthesia, James Cook University Hospital, Middlesbrough, UK

International Journal of Obstetric Anesthesia (2010) 19, 44–49

- Rétrospective, 385 césar pour situation à risque fœtal : anomalie RCF, dystocie, HTAG, RCIU, hémorragie prépartum, RPDM, procidence
- pas de VasoPresseur (115), Ephédrine (122), Phényléphrine (148)

→ Même pHa (7,26 vs 7,27 vs 7,28), même taux d'acidose (23 / 20 / 15 %)

→ Anomalie du RCF = seule variable indépendante prédictive d'altération du pHa néonatal (analyse multivariée)

- Mais dose médiane d'Ephédrine = 12 mg (*vs.* 52 mg & pHa à 7,20 pour césar programmée dans cette même maternité)

Patients with severe preeclampsia experience less hypotension during SA for CS than healthy parturients

Aya AG et al, Anesth & Analg 2003; 97: 867-72

	Normale (n = 30)	Prééeéclamsie (n = 30)
Age gestationel (wk)	38	32
Preremplissage (ml)	1895	1653
Hypotension (%)	53	16
Ephédrine (mg)	12,5	5,0
PAS minimale (mmHg)	100	133

Risque d'hypotension bien moindre (1/6) chez les prééclamptiques sévères

Risque d'hypotension moindre confirmé (1/2), même à un terme gestationel prématuré équivalent de 32 SA *(Aya et al, Anesth Analg 2005)*

Anesthesia mode for C-section and **mortality** in very preterm infant : an epidemiologic study in the EPIPAGE cohort

Laudenbach V, Mercier FJ et al., IJOA 2009; 18: 142-9

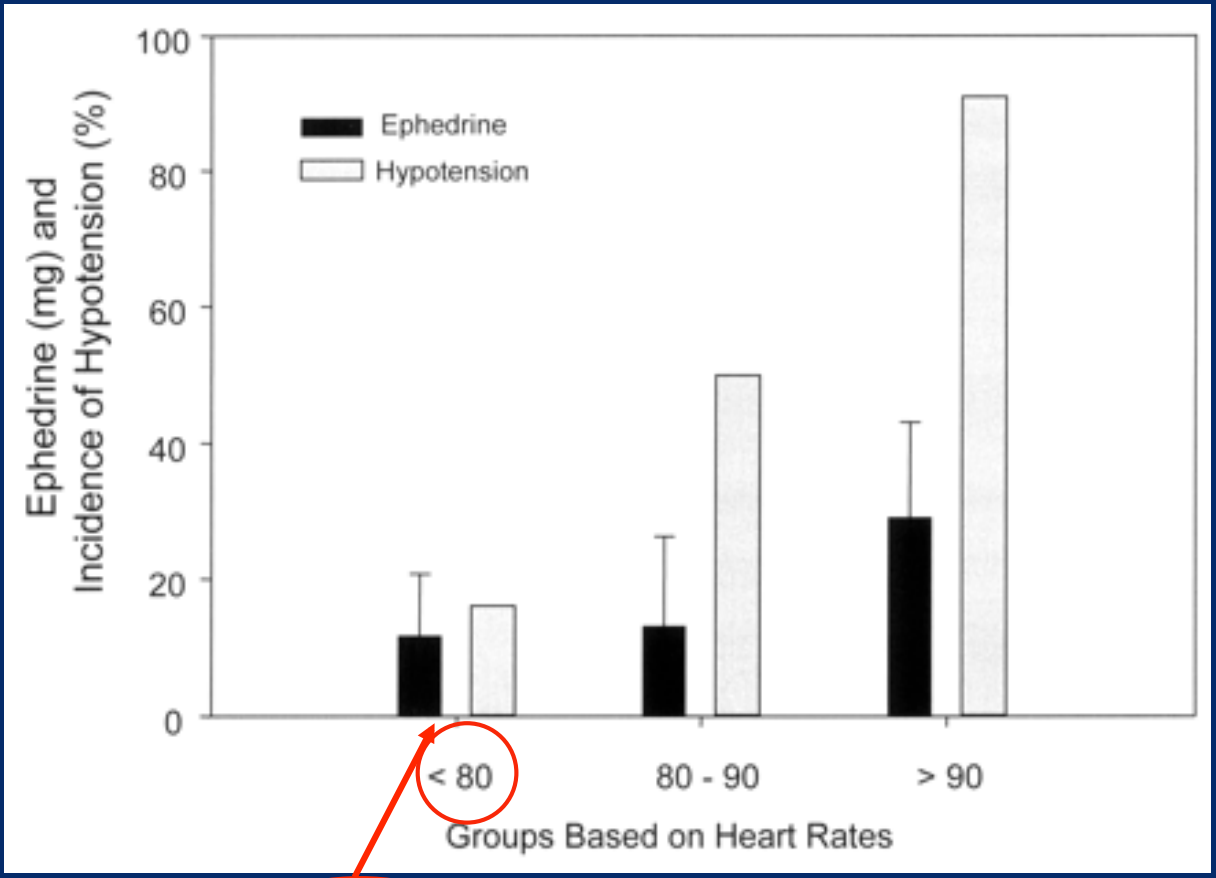
	Rachi (n = 419)	**Péri** (n = 208)	**AG** (n = 711)
Décès néonatal à l'hôpital	**12,2%**	**7,7%**	**10,1%**
OR ajusté [IC 95%]	**1,7** [1,1 – 2,6]	0,7 [0,4 – 1,4]	1

Cohorte française EPIPAGE : 1338 grands **prématurés** (27 - 32 SA) nés par Césarienne

Baseline heart rate may predict hypotension after spinal anesthesia in prehydrated obstetrical patients

Frolich & Caton, Can J Anaesth 2002; 49: 185-9

(40 césar programmées, étude prospective)



P + E

(E ≤ 15 mg)

Vasopresseur(s) :

→ Phényléphrine prophylactique (± éphédrine)

- Sharwood-Smith G, Drummond GB. *Br J Anaesth* 2009; 102: 291–4
- Ngan Kee WD. *Curr Opin Anaesthesiol* 2010; 23: 304–9
- Dyer RA, Reed AR. *Anesth Analg* 2010; 111: 1093-5
- Mercier FJ *et al*., *Minerva Anestesiologica* 2013; 79: 62-73

Conclusions : remplissage et mesures générales

- Préremplisaage par cristalloïdes : inefficace et à abandonner
- Préremplissage par HEA (130/0.6) : efficace, n'est plus CI mais pas d'AMM en France + récente alerte EMEA-FDA-ANSM
- Co-remplissage rapide par Ringer Lactate : efficacité, mais variable
- BAT & DLG & dépistage précoce de l'hypotension : TA / 1 min
- Incision débutée dès que le NSS est adéquat
- RPC seulement pour situations délicates : ↘ bupi ≤ 5 mg

Conclusions : vasopresseurs

* Césarienne **PROGRAMMÉE** :

- Phényléphrine en bolus IV de 50-150 µg ou en perfusion continue i.v. entre 25 et 50 µg/min

➞ pour maintenir la PAS ≈ 90-100% de la valeur de base

➞ pour ↘ le risque d'hypotension & de N/V + optimiser le pH néonatal

- *Éphédrine : en 2ème intention*

➞ pour empêcher une ↘ trop importante de la FC maternelle

➞ dose d'éphédrine limitée à 15 mg maxi

* Césarienne **NON programmée** :

➞ éphédrine *ou* phényléphrine *ou* les 2 combinées

BECAR 2013

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(ou me demander un formulaire d'inscription)