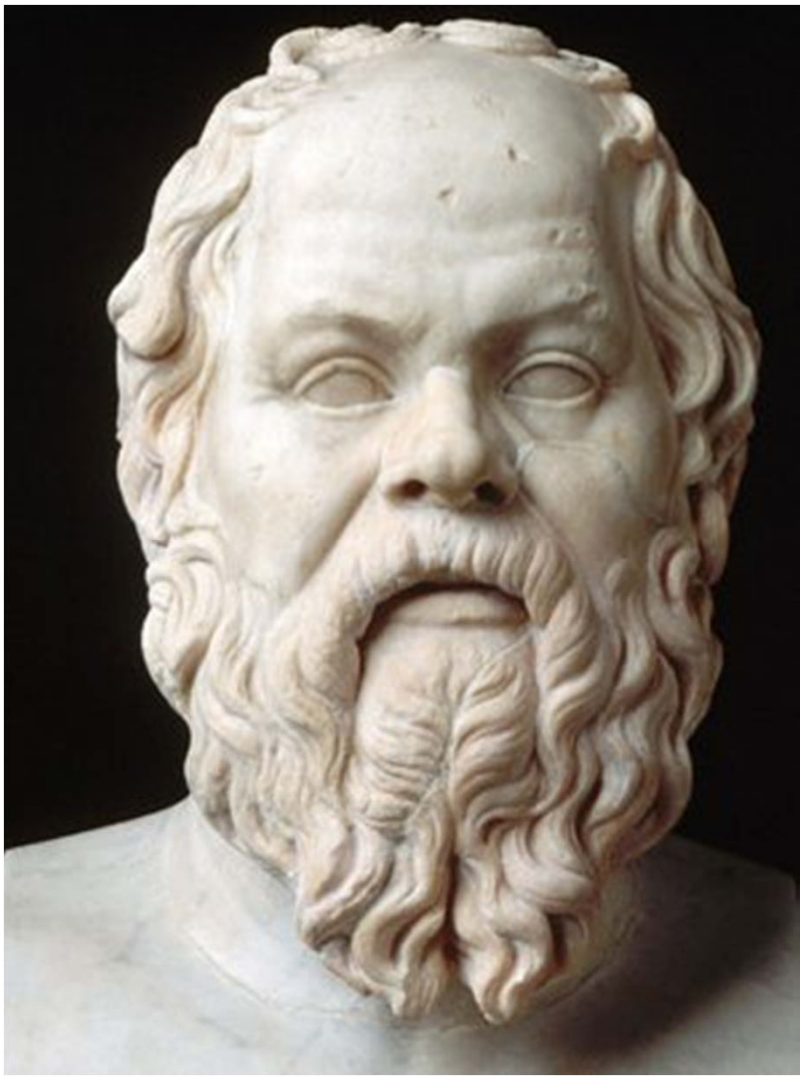
MANEJO DE DROGAS VASOACTIVAS EN NEONATOLOGÍA



Yo sólo sé que no sé nada.

CARACTERÍSTICAS DE LA UNIDAD NEONATAL

- 750 ingresos anuales
- 125 CC -----16%
- Actividad hemodinámica 28 casos (25 terapéuticos)
- Actividad quirúrgica CC de 41 casos.
- ECMO Neonatal 6-10 casos anuales.
- Mortalidad hospitalaria de CC 7% (55% limitación terapéutica)
- Mortalidad quirúrgica 1,5%

EXPERIENCIA DEL EQUIPO NEONATAL EN CC

- 25 años de cirugía cardiovascular

- Diferentes etapas
  - Aprendizaje del equipo- Diferentes cirujanos

- Relación y comparación con otros equipos

- Nivel de conocimientos

- Asistencia quirófano y transfer

- Incorporación de ECMO

CONTENIDO

1. ASPECTOS FISIOLÓGICOS FETO-NEONATALES

1. VALORACIÓN CARDIOVASCULAR EN EL NEONATO

1. SITUACIONES CLÍNICAS

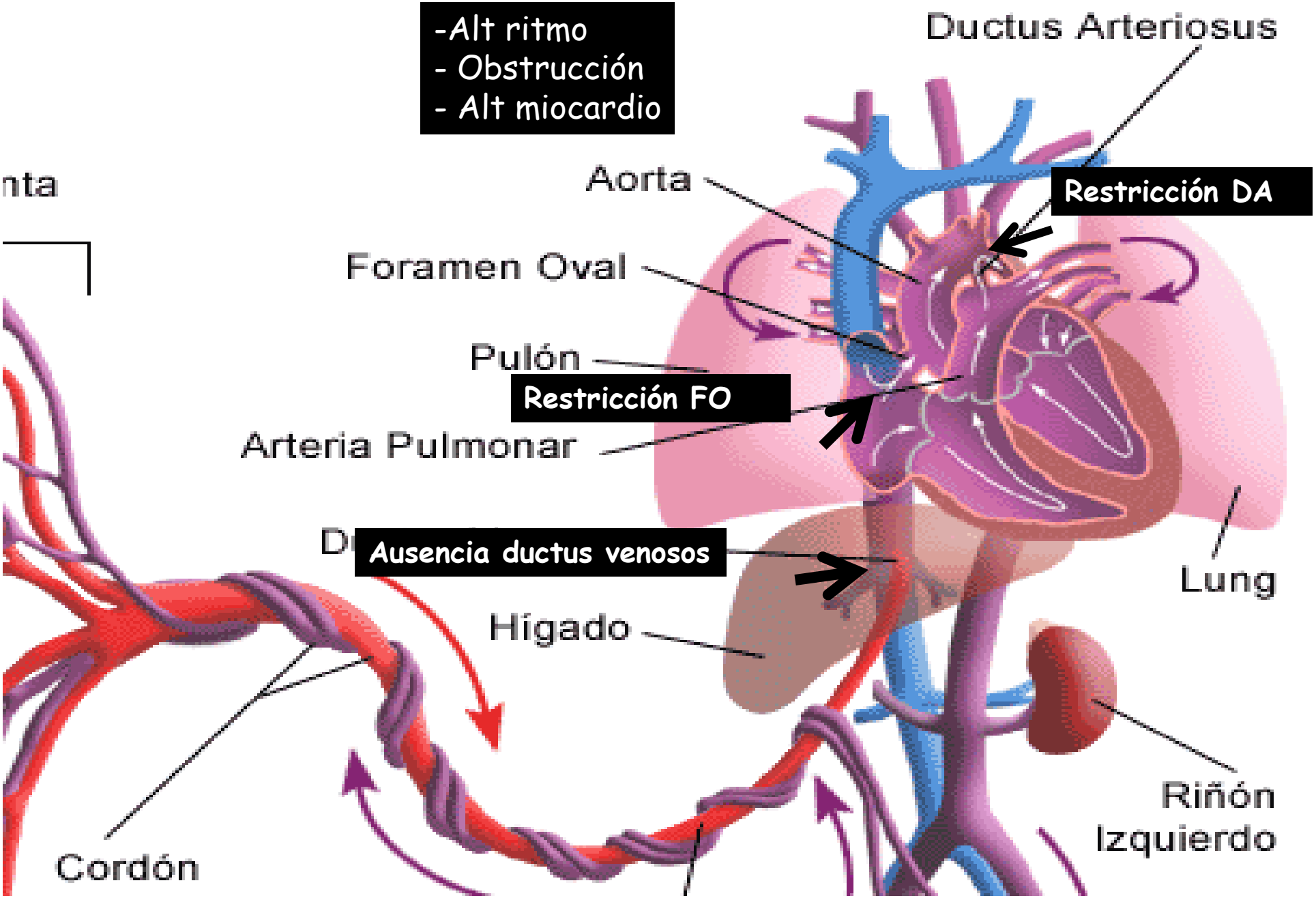
1. DROGAS VASOACTIVAS- ADRENÉRGICOS

1- ASPECTOS FISIOLÓGICOS FETO-NEONATALES

- CORAZÓN FETAL
- CORAZÓN TRANSICIONAL
- CORAZÓN NEONATAL

Circulación en el Feto

-Alt ritmo
- Obstrucción
- Alt miocardio



CORAZÓN TRANSICIONAL

- La mayoría de CC nacen sin problemas transicionales feto-neonatales.
- Sistema vascular fetal de baja resistencia (placenta)
- Etapa neonatal aumenta RVS por aumento catecolaminas.
- Descenso drástica de la Presión pulmonar.
- SINTOMÁTICOS :

  Hipoxémia por patología pulmonar
  Hipoxémia por patología vascular pulmonar

- Los orificios fetales con shunt persisten en la primera etapa transicional (horas)

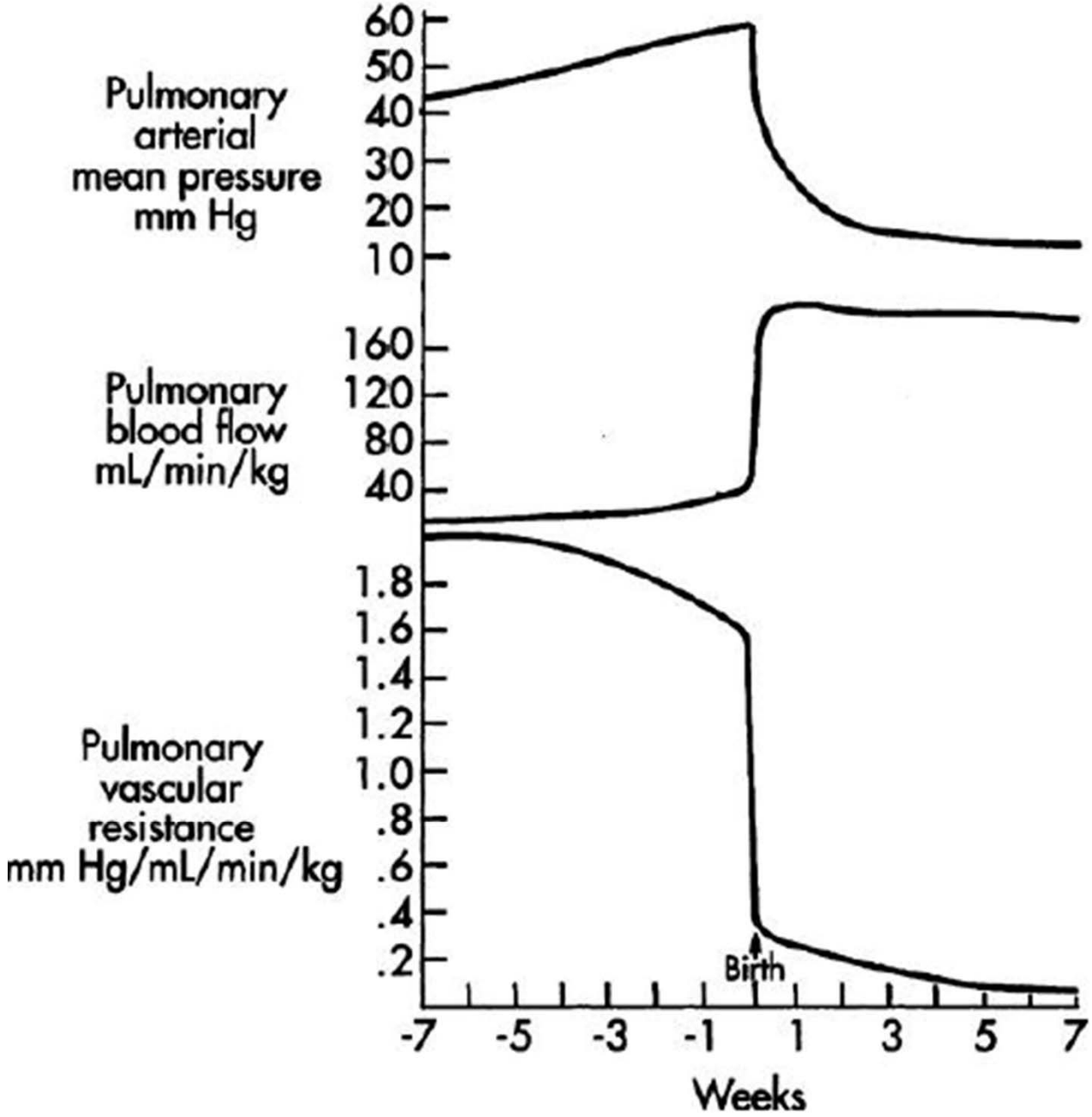


Figure 8-2 *Changes in pulmonary artery pressure, pulmonary blood flow, and pulmonary vascular resistance, during the 7 weeks preceding birth, at birth, and in the 7 weeks after birth. The prenatal data were derived from lambs and the postnatal data from other species. (From Rudolph AM: Congenital Diseases of the Heart. Chicago, Mosby, 1974.)*

CORAZÓN NEONATAL

- Mayor contenido de agua
- Menos elementos contráctiles
- Menor desarrollo del retículo sarcoplásmico
- Mayor desorganización de las células miocárdicas
- Menor compactación y mayor tejido no contráctil
- Inmadurez SN Autónomo (altera tono vascular y función cardíaca)
- Vulnerabilidad suprarrenal
- Metabolismo energético

RESULTADO:

MENOR CONTRACTILDAD
MENOR DISTENSIBILIDAD (mejora durante 1º mes)

TABLE 1 ■ Etiology of Hypotension

Pathophysiologic Mechanism	Pathogenesis	Underlying Pathophysiology	Etiology
Hypovolemic	Insufficient circulating blood volume; reduced preload	Impaired cardiac output and reduced oxygen-carrying capacity from anemia	• Maternal hemorrhage • Twin-to-twin transfusion • Newborn hemorrhage
Distributive	Decreased systemic vascular resistance leading to distribution of vascular volume into extravascular space; altered afterload	Reduced systemic vascular resistance leading to venous or third spacing of fluid from intravascular to extravascular space	• Sepsis release of vasoactive mediators, altering vascular tone and endothelial permeability • Streptococcal or staphylococcal toxic shock • Hydrops fetalis • Adrenal insufficiency
Cardiogenic	Cardiac dysfunction with a decrease in cardiac output; reduction in myocardial function	Myocardial dysfunction	• Myocarditis • Hypoxic ischemic conditions • Congenital heart block • Congenital heart defects with impaired flow and obstructive lesions

From Adcock LM. Etiology, clinical manifestations, and evaluation of neonatal shock. UpToDate Web site. http://www.uptodate.com/contents/etiology-clinical-manifestations-and-evaluation-of-neonatal-shock. Updated July 18, 2014. Accessed May 30, 2014.

CONTENIDO

1. ASPECTOS FISIOLÓGICOS FETO-NEONATALES

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EVOLUCIÓN

REDUCCIÓN PERFUSIÓN TISULAR

< ENTREGA DE OXÍGENO

METABOLISMO ANAEROBIO

ACIDOSIS METABÓLICA

MUERTE CELULAR

NEONATO

MONITORIZACIÓN

CÉLULA

CLÍNICA

Aspecto ???

Alt. SNC: letargo / irritabilidad

Trastornos de perfusión

Relleno capilar enlentecido

Extremidades frias

Taquicardia

Hipotensión

Cianosis

Oliguria

Pálido externo (arterial)
Congestivo interno (venoso)

CLÍNICA

Fase Compensada

Perfusión a SNC, corazón y Suprarrenales conservada

- sistema simpático + sist. angiotensina
- signos vitales normales
- signos clínicos: palidez, ↑ FC, Tª diferencial.
- ↓ relleno capilar

CARDIOPATÍAS CON FALLO CARDIACO
CLÍNICA

Fase Descompensada

Metabolismo anaeróbico
Ácido láctico ↑ acidosis

•<contractilidad + < efecto de las calecolaminas

• Liberación de mediadores + Falla de la bomba ATP NaK

• Disrupción de endotelio capilar

• Activación de la cascada de coagulación

Clínica: anterior + ↓ TA, taquipnea, oliguria, edemas, sangrado

Los signos físicos, fallan en detectar la persistencia de hipoxia global tisular :

Exploración física

TA – PVC

Diuresis

Measuring Cardiac Output

The Fick Principle

Dilution methods

Pulmonary Artery Thermodilution (Trans-right-heart Thermodilution)

Doppler Ultrasound Method

Echocardiography

Transcutaneous Doppler: USCOM

Transoesophageal Doppler: TOD

Pulse Pressure Methods

Non-invasive PP – Sphygmomanometry and Tonometry

Invasive PP

Calibrated PP – PiCCO, LiDCO

Uncalibrated PP - FloTrac

Uncalibrated, pre-estimed demographic data-free - PRAM

Impedance cardiography

Electrical Cardiometry

Magnetic Resonance Imaging

Flow SVC

Detectar hipòxia celular precoz

- **Normalizar valores de:**
  - **SvO2**
  - **Lactato arterial**
  - **Déficit de base**
  - **pH**

CONTENIDO

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FORMAS CLÍNICAS NEONATAL

Uso drogas vasoactivas

- **HIPOTENSIÓN DEL VLBW (< 28 S) 1º DÍA**
  - Disfunción miocárdica- Alt vasorregulación (< SVR o > (Corioamnionitis)

- **HIPOTENSIÓN EN PRETÉRMINOS CON PDA**
  - >QP/QS . Hipoperfusión sistémica . +- Disfunción miocárdica.

- **HIPOTENSIÓN EN NEONATO CON DEPRESIÓN PERINATAL con PPHN**
  - Disfunción miocárdica +- Alt vasorregulación

- **HIPOTENSIÓN DEL VLBW o LBW CON INSF SUPRARRENAL**
  - Alt vasorregulación (<SVR) - +- Disfunción miocárdica

- **HIPOTENSIÓN NEONATAL CON RESPUESTA INFLAMATORIA SISTÉMICA (SÉPSIS-NEC)**
  - Alt vasorregulación (<>SVR) – Función miocárdica >o <

- **CARDIOPATIAS CONGÉNITAS**
  - Pre y - postoperatorio

Treating hypotension in the preterm infant: when and with what: a critical and systematic review

EM Dempsey[1,2] and KJ Barrington[1,2]

Journal of Perinatology (2007) 27, 469–478

[1]Departments of Pediatrics and OB/GYN, McGill University, Montréal, QC, Canada and [2]NICU, Royal Victoria Hospital, Montréal, QC, Canada

Conclusions: There is a distinct lack of prospective research of this issue, which prevents good clinical care. It is possible that a simple BP threshold that indicates the need for therapy does not exist, and other factors, such as the clinical status or systemic blood flow measurements, may be much more informative. Such a paradigm shift will also require careful prospective study.

HIPOTENSIÓN EN EL PRETÉRMINO

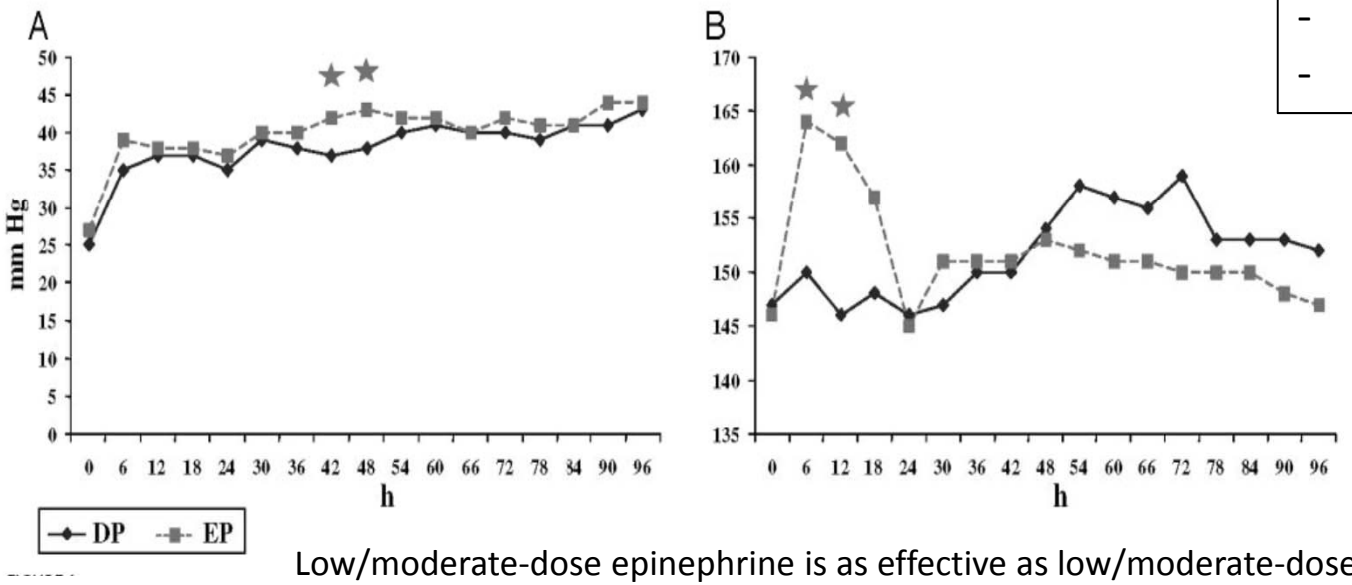
DOPAMINA VERSUS EPINEFRINA

Dopamine Versus Epinephrine for Cardiovascular Support in Low Birth Weight Infants: Analysis of Systemic Effects and Neonatal Clinical Outcomes

Eva Valverde, Adelina Pellicer, Rosario Madero, Dolores Elorza, José Quero and Fernando Cabañas

Pediatrics 2006;117;e1213-e1222; originally published online May 22, 2006;
DOI: 10.1542/peds.2005-2108

- Clampaje cordón
- Inmadurez miocardica
- Insuficiencia suprarrenal
- PDA



Low/moderate-dose epinephrine is as effective as low/moderate-dose dopamine for the treatment of hypotension in low birth weight infants, although it is associated with more transitory adverse effects

NO RESPONDEDORES 36-37%

Randomized, Placebo-Controlled Trial of Dobutamine for Low Superior Vena Cava Flow in Infants

María Carmen Bravo, MD, PhD[1], Paloma López-Ortego, MD[1], Laura Sánchez, MD[1], Joan Riera, MBE[1,2], Rosario Madero, MD[3], Fernando Cabañas, MD, PhD[1], and Adelina Pellicer, MD, PhD[1]

J Pediatr. 2015 Sep;167(3):572-8

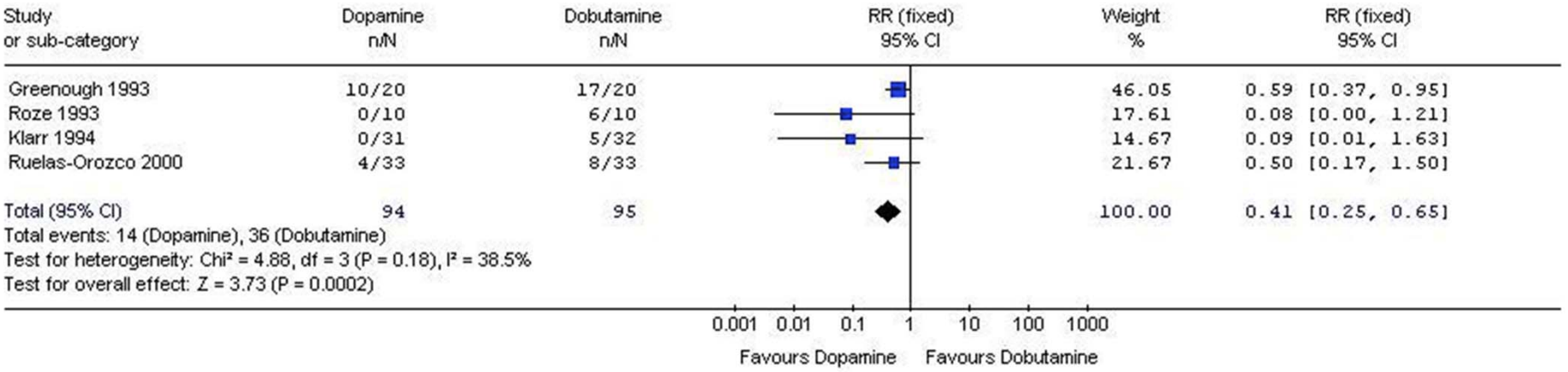
Conclusion This exploratory trial demonstrates a tendency toward improved short-term clinical and biochemical perfusion variable outcomes in infants with low SVC flow treated with DB. *(J Pediatr 2015;167:572-8).*

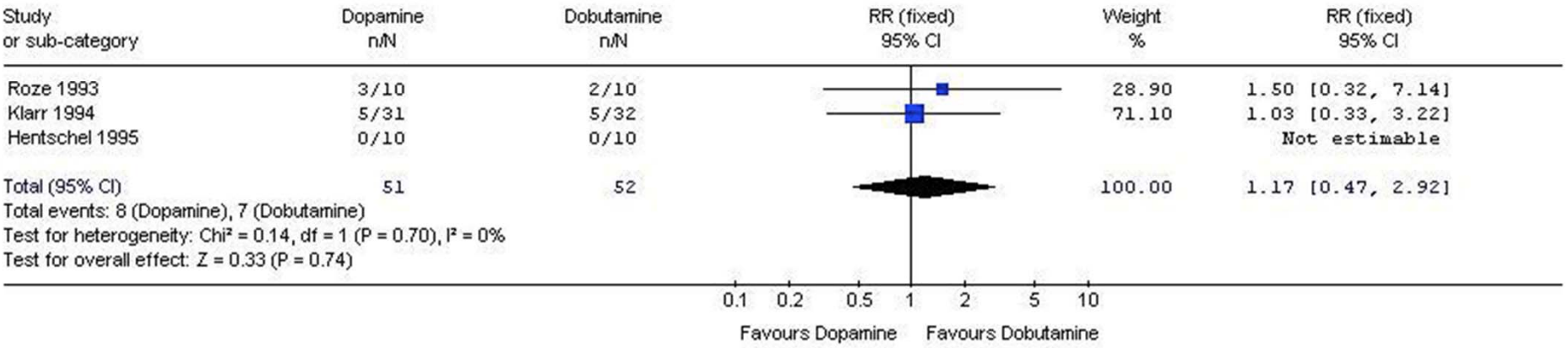
low SVC flow (<41 mL/kg/min).

Dopamine versus dobutamine for hypotensive preterm infants
2003

Cochrane Neonatal Reviews

Review: Dopamine versus dobutamine for hypotensive preterm infants
Comparison: 01 Dopamine versus dobutamine
Outcome: 04 Treatment failure





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DROGAS VASOACTIVAS – INOTRÓPICOS

ADRENÉRGICOS

USO EN NEONATOLOGÍA

- **DOPAMINA**
- DOBUTAMINA
- **ADRENALINA**
- NORADRENALINA
- **MILRINONA**

El manejo del fallo cardíaco del postoperado CC se basa en guías derivadas de experiencias de la etapa pediátrica y adulta.
Hay poca información sobre farmacocinética en este tipo de fármacos en el postoperatorio de CC neonatal.

SOPORTE CARDIOVASCULAR NO INOTRÓPICO

USO EN NEONATOLOGÍA

- VOLUMEN
- VASODILATADORES
- CORTICOIDES
- SHUNTS – Qp/Qs
- VPPI- VNI - Presión intratorácica
- Noi - PG
- FIO2 < 21%
- Tratamientos anatómicos CC: CoA-Rasking- Tórax abierto
- Drenajes : NTX-Taponamiento-Paracentesis
- Soporte vital extracorpóreo.

Table 1
Cardiovascular actions mediated by adrenergic, dopaminergic, and vascular vasopressin receptors

	Adrenergic, Dopaminergic, and Vasopressin Receptors					
	α_1/α_2[a]	β_2	α_1	β_1/β_2	DA_1/DA_2	V_{1a}
	Vascular	Vascular	Cardiac	Cardiac	Vascular/Cardiac	Vascular
Vasoconstriction	++++	0	0	0	0	++++
Vasodilation	0	++++	0	0	++++[b]	0
+Inotropy	0	0	++	++++	+/++	0
+Chronotropy	0	0	0	++++	0	0
Cond. velocity	0	0	0	++++	0	0

Table 2
Estimated relative cardiovascular receptor stimulatory effects of inotropes, lusitropes, and vasopressors

	Adrenergic, Dopaminergic, and Vasopressin Receptors					
	α_1/α_2	β_2	α_1	β_1/β_2	DA_1/DA_2	V_{1a}
	Vascular	Vascular	Cardiac	Cardiac	Vascular/Cardiac	Vascular
Phenylephrine	++++	0	+	0	0	0
Norepinephrine	++++	0/+	++	++++	0	0
Epinephrine	++++	++++	++	++++	0	0
Dopamine[a]	++++	++	++	+++	++++	0
Dobutamine[b]	+/0	++	++	++++	0	0
Isoprenaline	0	+++	0	++++	0	0
Vasopressin	0	0	0	0	0	++++
PDE-III inhibitors	0	0	0	0	0	0
PDE-V inhibitors	0	0	0	0	0	0

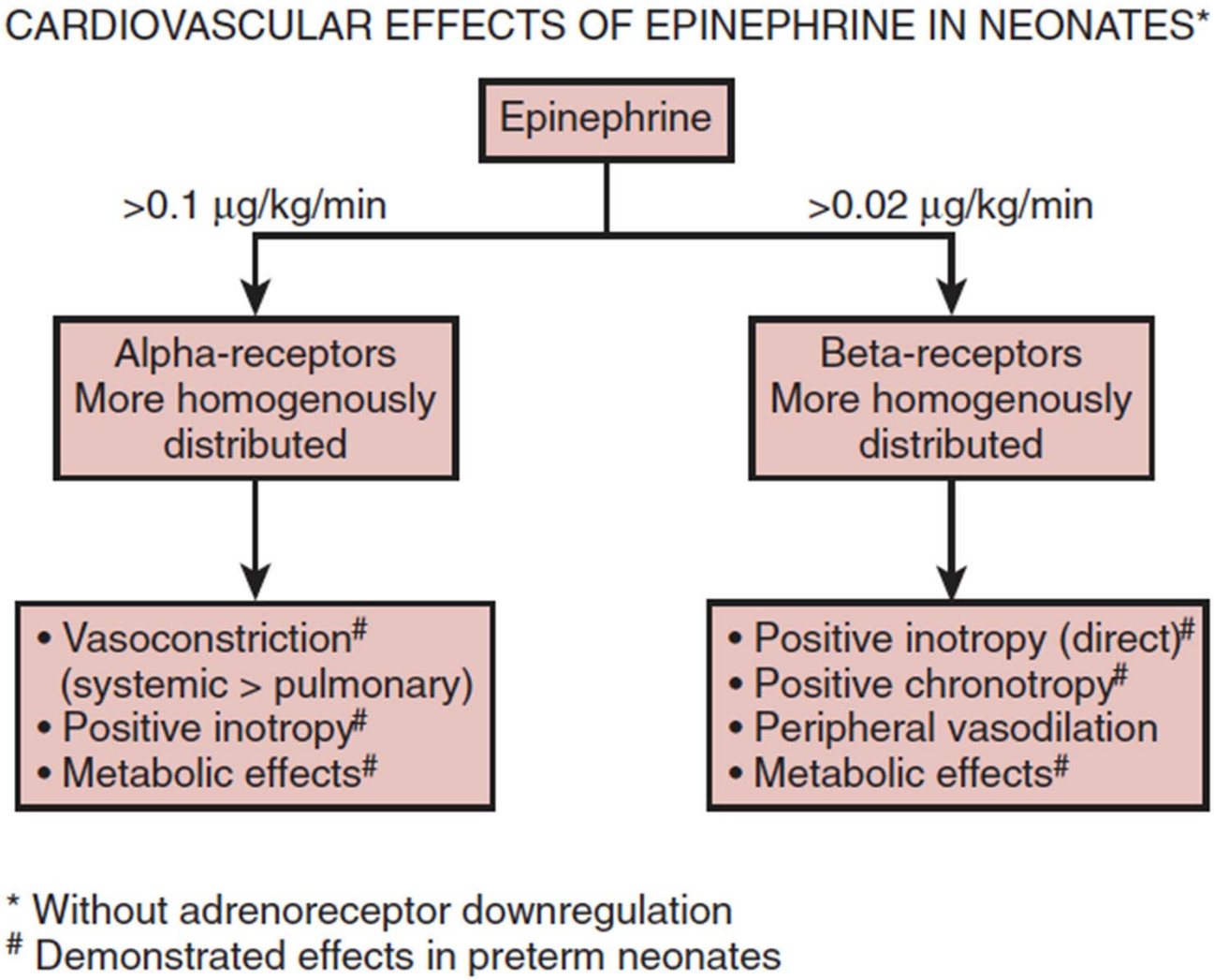

Figure 12-8 In the preterm neonate, at low to medium doses of epinephrine administration, effects of beta- and then alpha-adrenergic receptor stimulation become apparent. The cardiovascular response is influenced by several factors (e.g., state of cardiovascular adrenergic receptor expression, etc) regulated by the level of maturity and disease severity. See text for details. (Modified from Seri I. Management of hypotension and low systemic blood flow in the very low birth weight neonate during the first postnatal week. J Perinatol. 2006;26:S8-S13.)

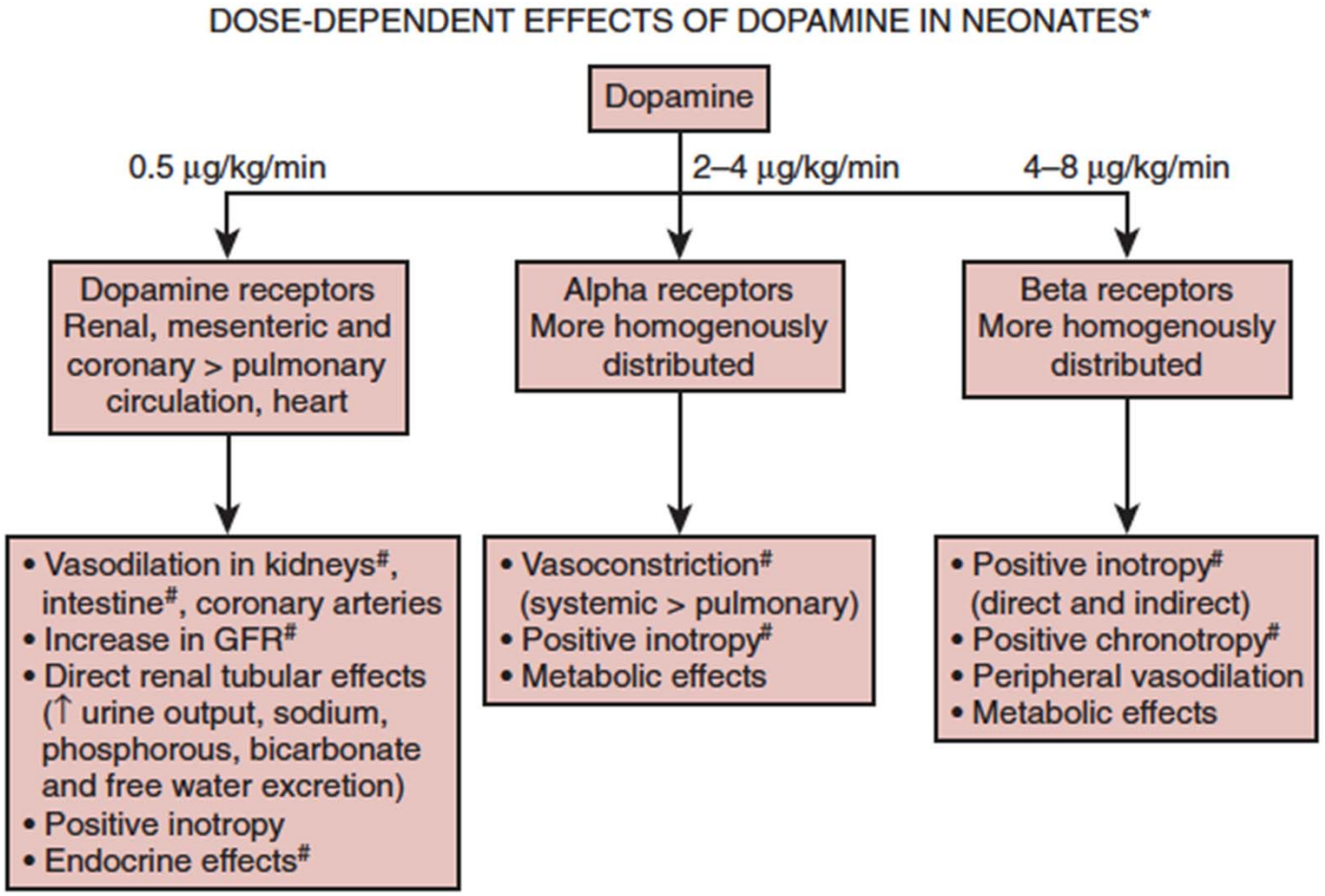

Figure 12-6 In the preterm neonate, low doses of dopamine stimulate the dopaminergic receptors. At low-to-medium doses, effects of alpha-adrenergic receptor stimulation also appear. At medium-to-high doses (>8-10 mcg/kg/min), effects of both beta- and alpha-receptor stimulation dominate the hemodynamic response to the drug. However, this response is influenced by several factors (e.g., state of cardiovascular adrenergic receptor expression) regulated by the level of maturity and disease severity. See text for details. (Modified from Seri I. Management of hypotension and low systemic blood flow in the very low birth weight neonate during the first postnatal week. J Perinatol. 2006;26:S8-S13.)

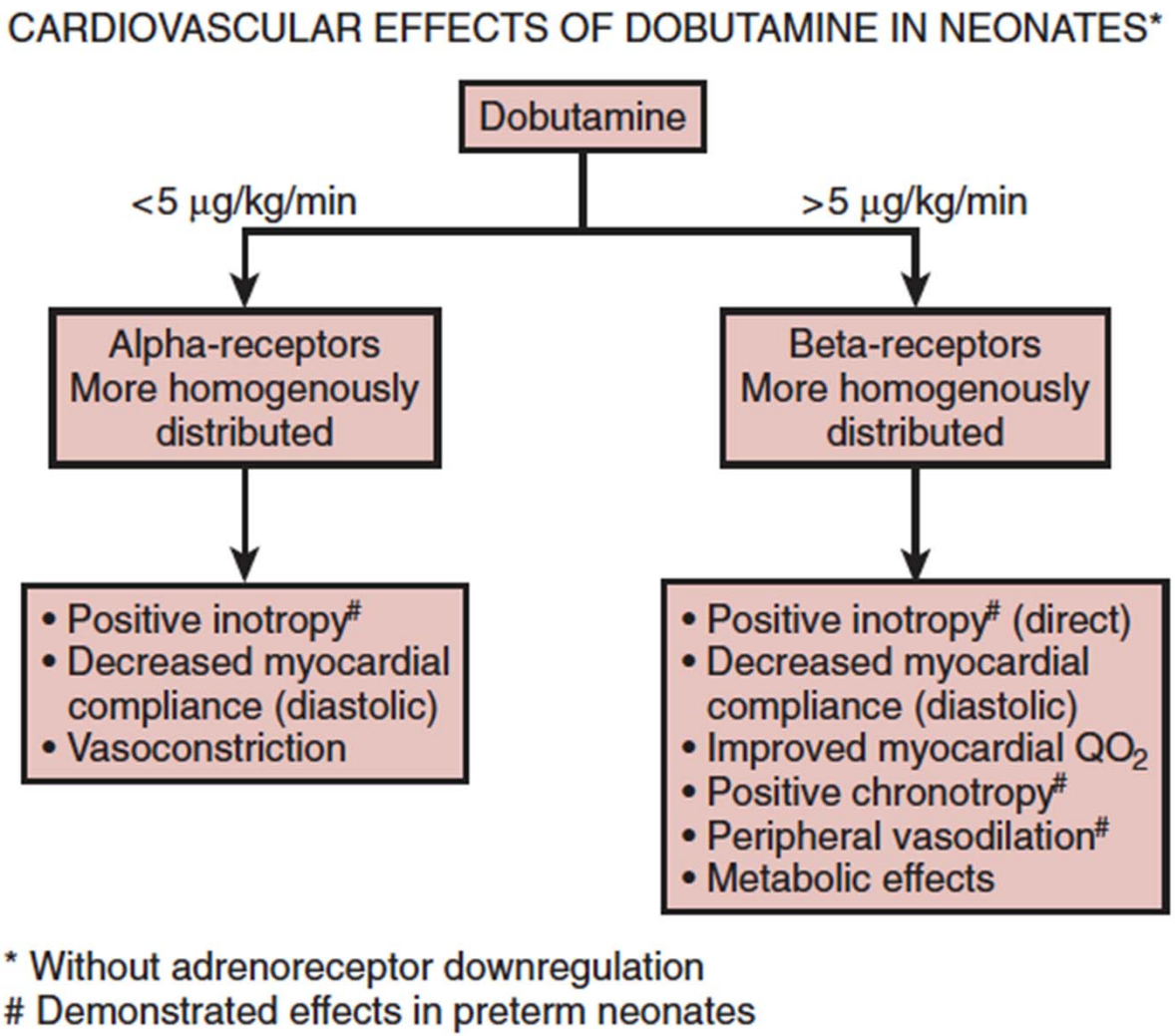

Figure 12-7 In the preterm neonate, dobutamine increases cardiac output and exerts a variable degree of a peripheral vasodilatory effect. The cardiovascular response is influenced by several factors (e.g., state of cardiovascular adrenergic receptor expression) regulated by the level of maturity and disease severity. See text for details. (Modified from Seri I. Management of hypotension and low systemic blood flow in the very low birth weight neonate during the first postnatal week. J Perinatol. 2006;26:S8-S13.)

ADRENALINA ENDÓGENA EN EL NEONATO VARIACIÓN FISIOLÓGICA

- Respiratorio:
  Aumenta en pacientes con patología respiratoria SDR

- Intervenciones
  Masaje y cuidados básicos no alteran
  Punciones y aspiraciones traqueales aumentan niveles
  VMC – Modalidades sincronizadas reducen

- Clearance rápido

- Aumenta con la hipoglucemia

- Fármacos que reducen:
  Morfina- Fenobarbital- Pancuronio-Naloxona-Dopamina-Coticoides prenatales

ADRENALINA ENDÓGENA EN EL NEONATO VARIACIÓN FISIOLÓGICA

La excreción urinaria

- No depende de edad gestacional.
- Depende del estado clínico

Niveles plasmáticos

- < EG mayor niveles y menos receptores.
- No diferencias entre vía de parto vaginal y cesárea
- Aumentan con la Asfixia
- En el sistema cardiovascular :
  - En la transición feto-neonatal reduce la presión pulmonar
  - Aumenta la circulación cerebral y coronaria.
  - Reduce flujo intestinal y renal.

ADRENALINA EN EL NEONATO
Terapéutica

- Hipotensión- Reanimación
  - Modelos animales mejora perfusión cerebral y coronaria
  - Dosis elevadas relacionadas con > HIV
  - Adrenalina-Dopamina igual efecto sobre la TAM y Flujo cerebral (Pellicer 2009)

Heart Rate Independence of Catecholamine-Induced Myocardial Damage in the Newborn Pig

JOSEPH CASPI, JOHN G. COLES, LEE N. BENSON, STANLEY L. HERMAN, JANET AUGUSTINE ACT, AND GREGORY J. WILSON

Division of Cardiovascular Surgery [J.C., J.G.C., S.L.H.], Pediatric Cardiology [L.N.B.], Department of Pathology [G.J.W.], and The Research Institute [J.A.A.], The Hospital For Sick Children, Toronto, Ontario, Canada

PEDIATRIC RESEARCH Vol. 36, No. 1, 1994

Table 1. *Comparison of mean hemodynamic variables and contractile indices between pacing and high-dose E groups**

	Epinephrine			Pacing		
	Before	30 min	After	Before	30 min	After
ESP (mm Hg)	60 ± 8.6	110 ± 19†	56 ± 9.6	68 ± 9.6	72 ± 12	67 ± 12
SV (mL)	5 ± 2.4	4.5 ± 2.8	4 ± 1.2	5.4 ± 1.2	4.8 ± 1.4	5 ± 2.4
SW (erg · 10^3)‡	200 ± 25	310 ± 35†	160 ± 18†	210 ± 18	240 ± 20	185 ± 20
CO (mL/min)	800 ± 130	1150 ± 240†	640 ± 140†	700 ± 120	1000 ± 320†	680 ± 160
Ees (mm Hg/mL)	9.8 ± 3.5	16 ± 6†§	5 ± 2.4†	8.2 ± 2	9.6 ± 3.3	7.4 ± 2.4
V_{100} (mL)	4 ± 3	3 ± 2.2	8 ± 2.4†§	4.3 ± 2.4	4 ± 1.4	5 ± 1.9

* All data are expressed as mean ± SD. ESP, end-systolic pressure; SV, stroke volume; SW, stroke work; CO, cardiac output.

† $p < 0.05$ compared with baseline.

‡ 1 erg= 10^{-7} J.

§ $p < 0.05$ compared with pacing.

Heart Rate Independence of Catecholamine-Induced Myocardial Damage in the Newborn Pig

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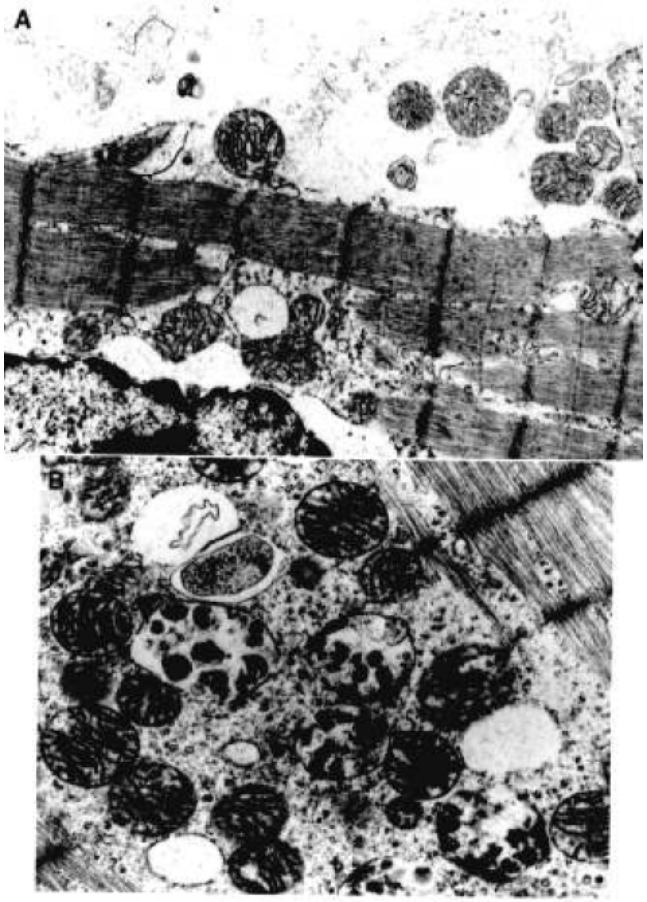
PEDIATRIC RESEARCH Vol. 36, No. 1, 1994



A.- Epinefrina (lesiones irreversibles diseminadas)
* ruptura sarcolema
* Pérdida arquitectura mitocondrial

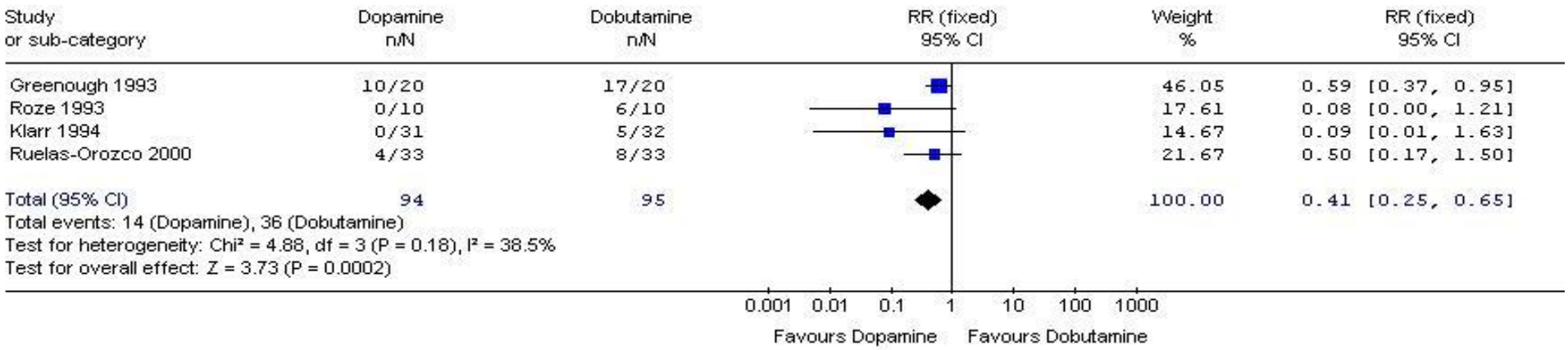
B.- Marcapasos (lesiones reversibles)
* Acúmulo lipídico microvesicular
* Edema mitocondrial

HIPOTENSIÓN EN EL PRETÉRMINO

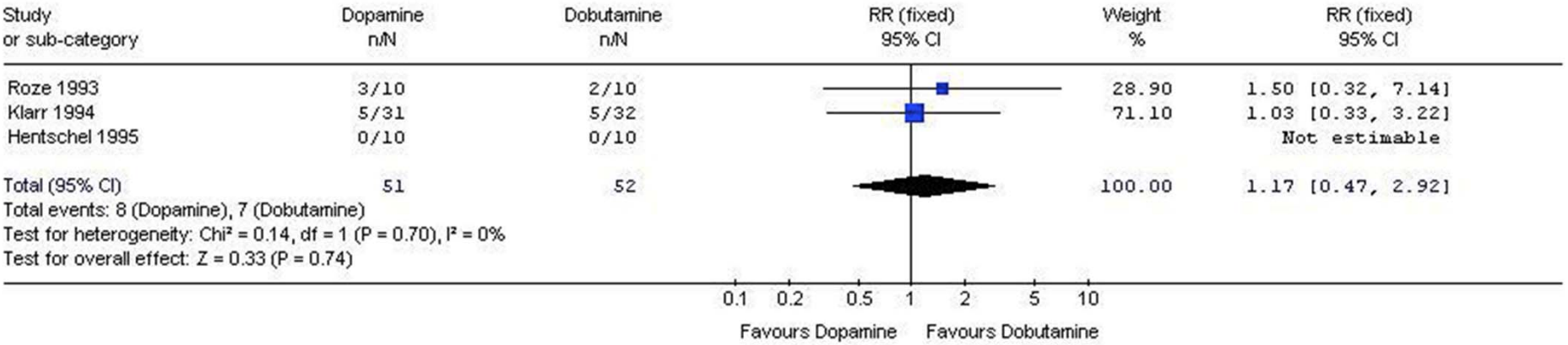
Review is published as a Cochrane review in The Cochrane Library 2003, Issue 3, 2003

DOPAMINA VERSUS DOBUTAMINA

Review: Dopamine versus dobutamine for hypotensive preterm infants
Comparison: 01 Dopamine versus dobutamine
Outcome: 04 Treatment failure

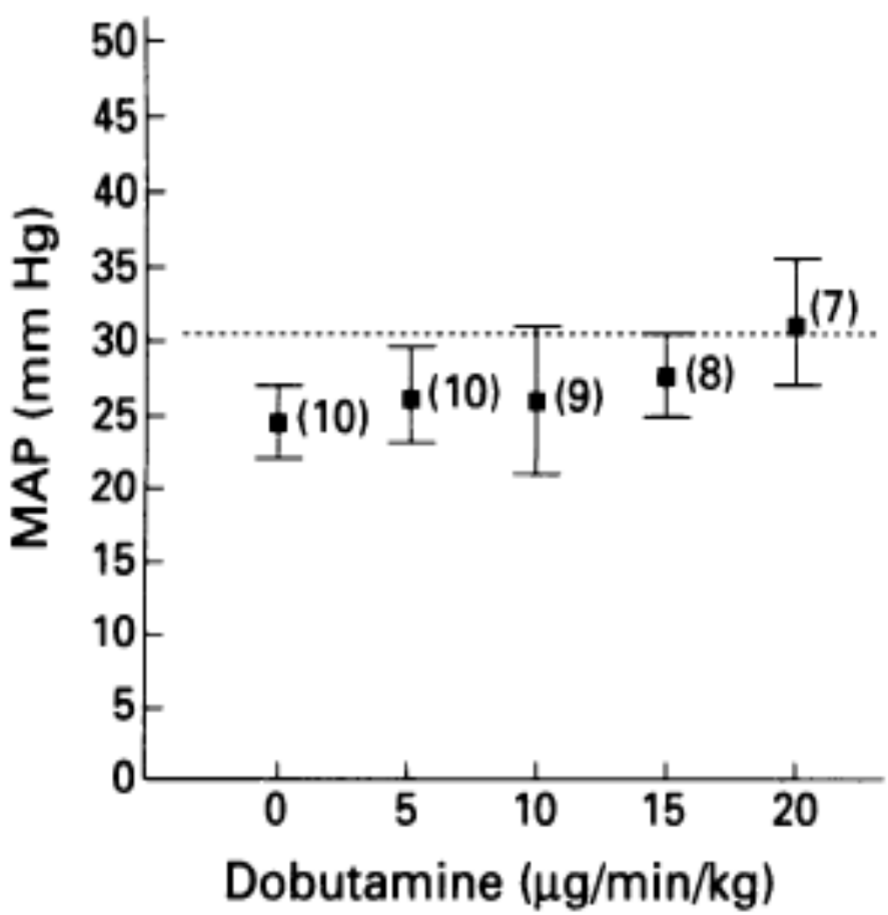


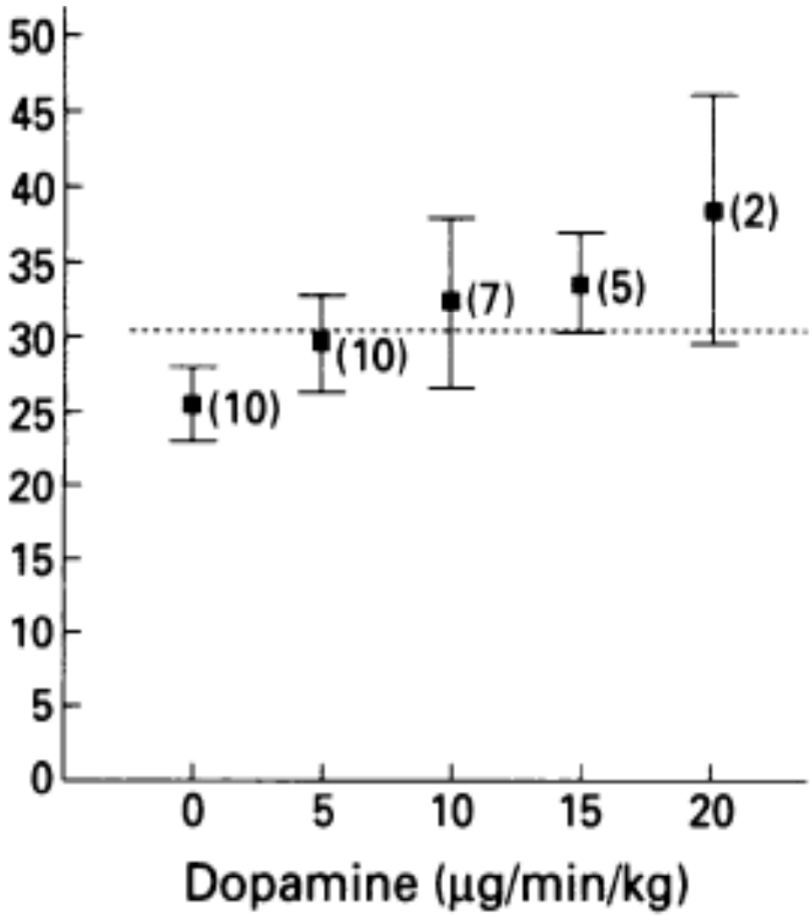
Review: Dopamine versus dobutamine for hypotensive preterm infants
Comparison: 01 Dopamine versus dobutamine
Outcome: 01 Mortality < 28 days



DOPAMINA –DOBUTAMINA

MAP





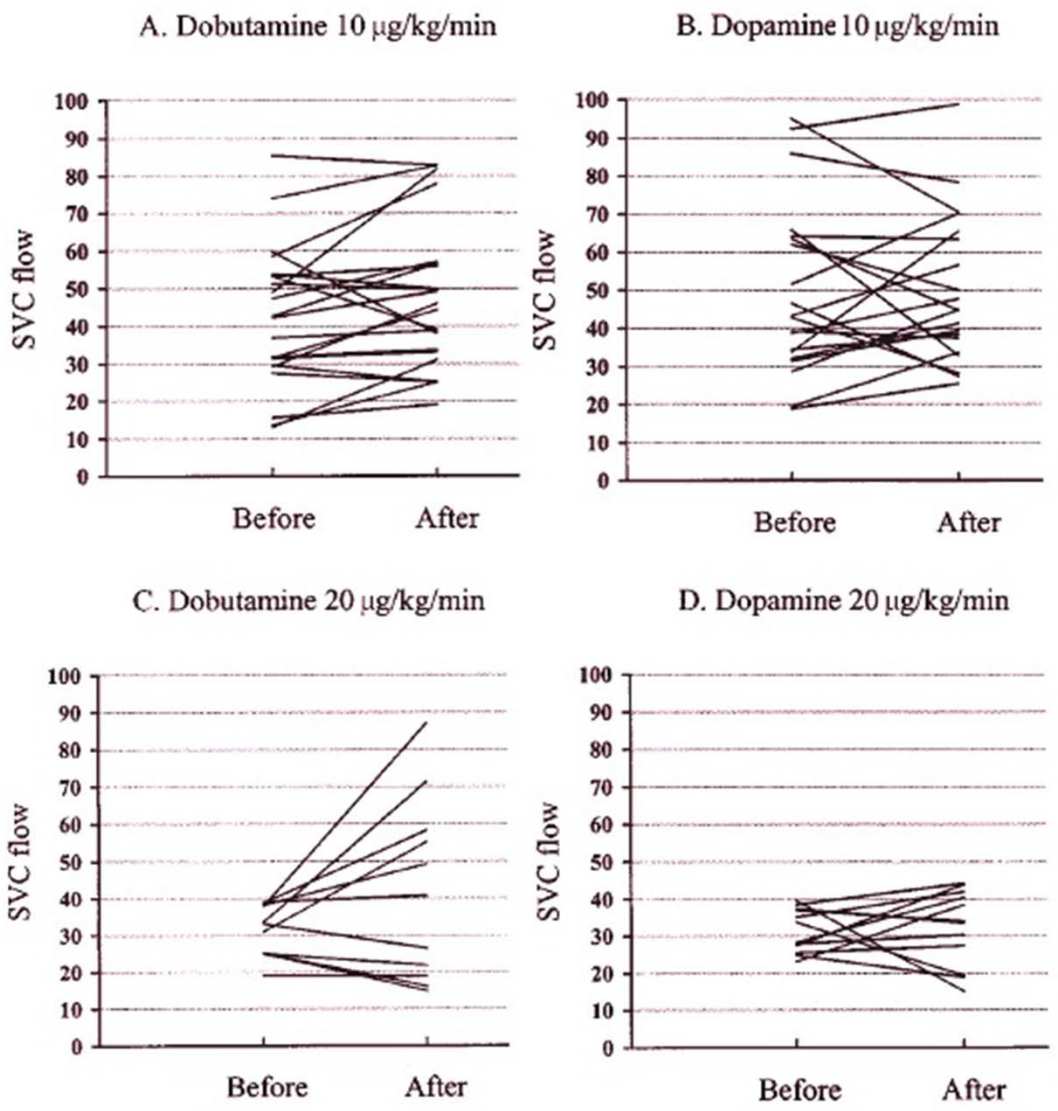
Archives of Disease in Childhood 1993; **69:** 59–63

DOPAMINA –DOBUTAMINA
GASTO CARDÍACO

	Dobutamine (n=10)		*Dopamine (n=10)*	
	Before treatment	*Highest infusion rate*	*Before treatment*	*Highest infusion rate*
Dosage (μg/kg/min)		17·0 (1·7)		12·0 (1·8)
MAP (mm Hg)	24·4 (1·0)*	32·0 (1·4)†	25·6 (1·2)*	37·7(1·5)†
LVO (ml/min/kg)	269 (36)	313 (37)†	245 (23)	206 (21)†
SVR (dynes/sec/cm^5/m^2)	1035 (188)	1171 (237)†	1124 (186)*	1952 (300)†

Archives of Disease in Childhood 1993; **69:** 59–63

DOPAMINA –DOBUTAMINA
SVC Flow



OSBORN, EVANS, AND KLUCKOW

THE JOURNAL OF PEDIATRICS
FEBRUARY 2002

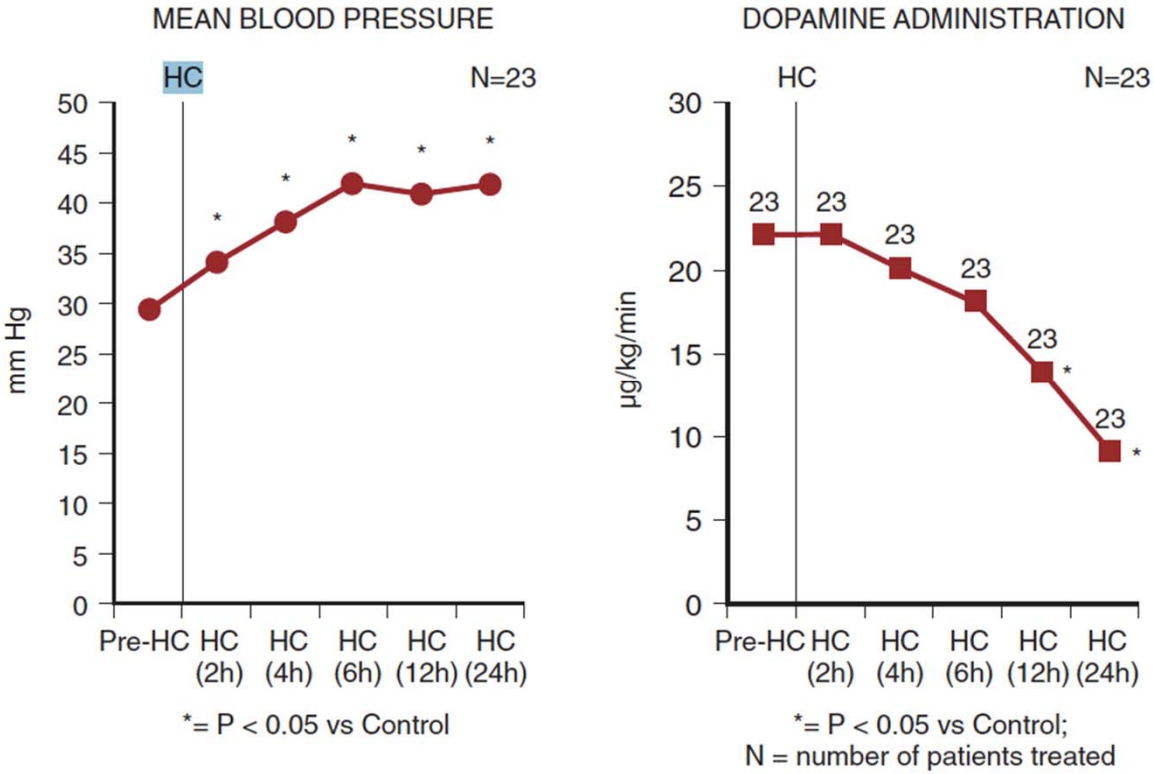
ADRENÉRGICOS

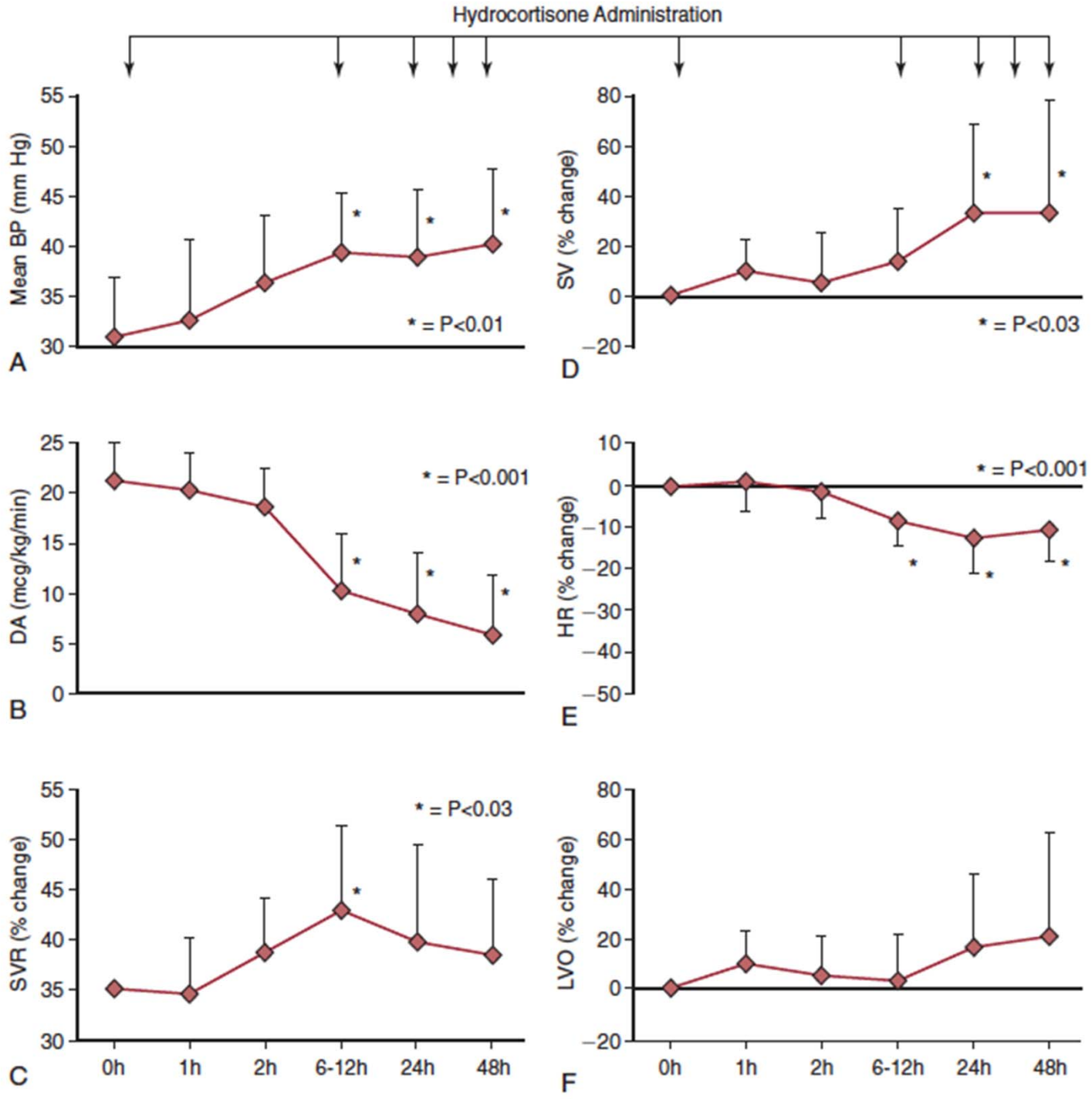
- Aspectos sobre los receptores adrenérgicos.

Pobre regulación de los receptores adrenérgicos en el efecto vasopresor
en la hipotensión refractaria los corticoides mejoran la función de los receptores.

Pediatrics 2001;107;1070-1074

Cardiovascular Effects of Hydrocortisone in Preterm Infants With Pressor-Resistant Hypotension

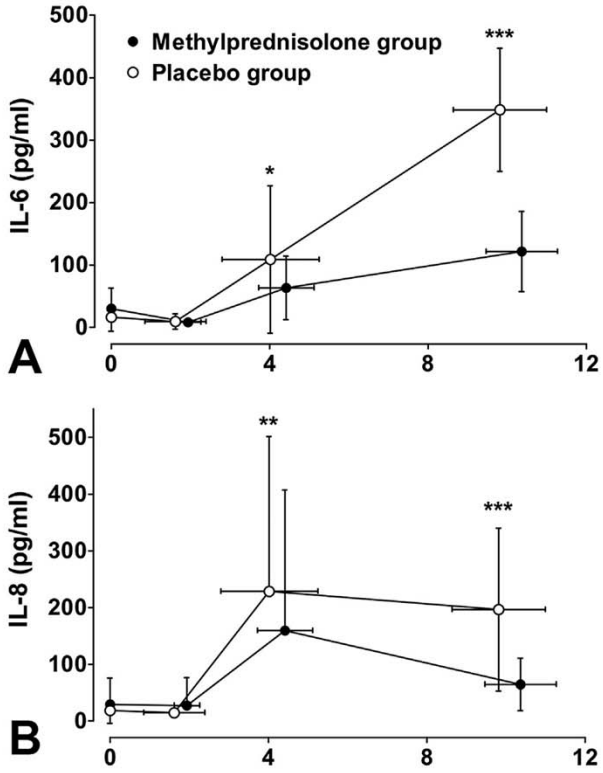


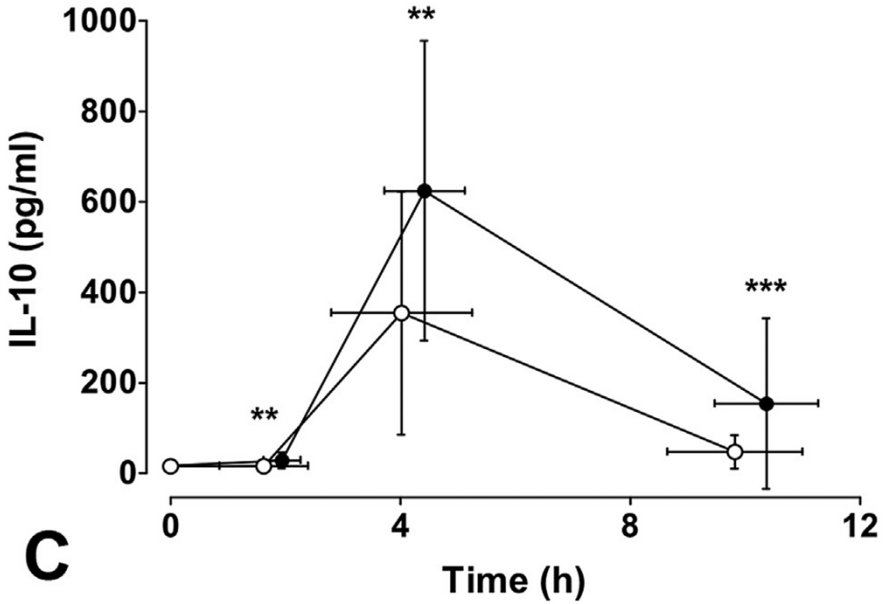

Hydrocortisone Administration
Mean BP (mm Hg)
55
50
45
40
35
30
* = P<0.01
A
SV (% change)
80
60
40
20
0
−20
* = P<0.03
D
DA (mcg/kg/min)
25
20
15
10
5
0
* = P<0.001
B
HR (% change)
10
0
−10
−20
−30
−40
−50
* = P<0.001
E
SVR (% change)
55
50
45
40
35
30
* = P<0.03
C
LVO (% change)
80
60
40
20
0
−20
F
0h
1h
2h
6-12h
24h
48h

Methylprednisolone in Neonatal Cardiac Surgery: Reduced Inflammation Without Improved Clinical Outcome

Ann Thorac Surg 2013;95:2126–32

Juho Keski-Nisula, MD, Eero Pesonen, MD, PhD, Klaus T. Olkkola, MD, PhD, Kaija Peltola, MD, PhD, Pertti J. Neuvonen, MD, PhD, Netta Tuominen, MD, Heikki Sairanen, MD, PhD, Sture Andersson, MD, PhD, and Pertti K. Suominen, MD, PhD





Methylprednisolone in Neonatal Cardiac Surgery: Reduced Inflammation Without Improved Clinical Outcome

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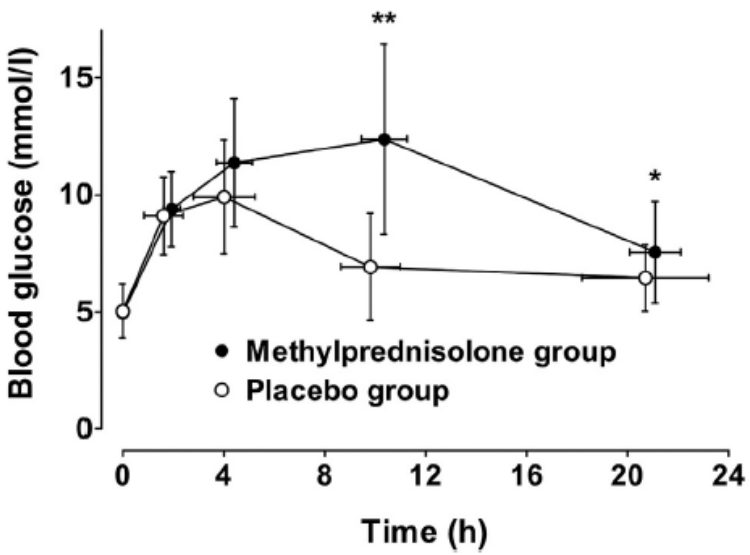

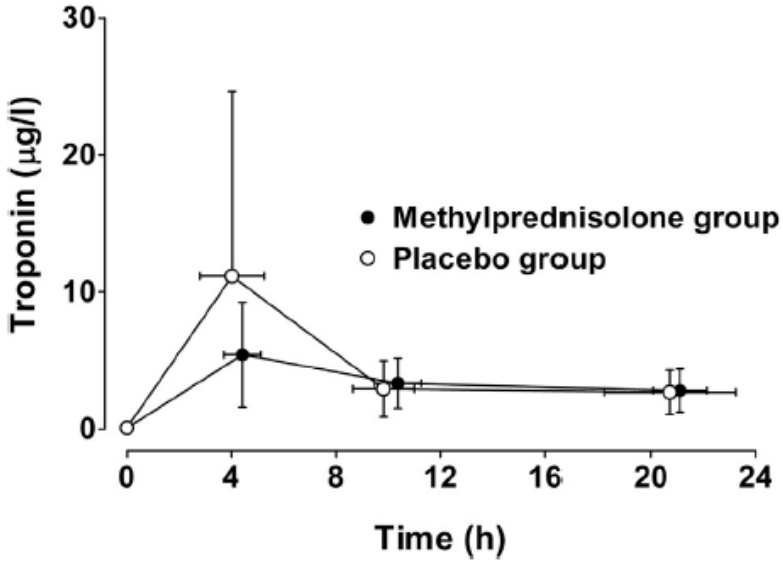

Early initiation of arginine vasopressin infusion in neonates after complex cardiac surgery*

Pediatr Crit Care Med 2012 Vol. 13, No. 3

Jeffrey A. Alten, MD; Santiago Borasino, MD, MPH; Rune Toms, MD; Mark A. Law, MD; Ashley Moellinger, PNP; Robert J. Dabal, MD

Table 2. Hemodynamic and fluid balance variables first 24 hrs after cardiac intensive care unit admission

Variable	Arginine Vasopressin– (n = 18)	Arginine Vasopressin+ (n = 19)	*p*
Median (interquartile range) maximum inotrope score	16.5 (10.3, 22.1)	9 (5, 12.5)	.02
Heart rate	169 ± 12 beats/min	161 ± 16 beats/min	.09
Mean arterial blood pressure	53 ± 7 mm Hg	53 ± 8 mm Hg	.86
Central venous pressure	12 ± 2 cm H_2O	11 ± 2 cm H_2O	.16
Maximum lactate	12.2 ± 4.5 mmol/L	11.9 ± 5.1 mmol/L	.78
Maximum Sao_2–$S\bar{v}o_2$	34 ± 10%	32 ± 12%	.71
Fluid intake	223 ± 53 cc/kg	182 ± 61 cc/kg	.03
Urine output	28.7 ± 15.1 cc/kg	32.3 ± 19 cc/kg	.09
Peritoneal drain output	40.8 ± 16 cc/kg	44 ± 12.7 cc/kg	.49
Chest tube output	59.5 ± 19.7 cc/kg	50.7 ± 23.5 cc/kg	.22
Mean lowest serum sodium first 48 hrs	137 ± 4 mmol/L	132 ± 5 mmol/L	.01

CONSIDERACIONES

1.- El uso de inotrópicos en neonatología es frecuente.

2.- Es difícil de valorar la situación hemodinámica en el neonato (principalmente el pretérmino) y dar el soporte adecuado necesario.

3.- Los parámetros que valoran la función celular pueden ser de gran ayuda.

4.- No hay evidencia de efectividad entre las diferentes pautas de administración de inotrópicos.

Hidrocortisona

Dosing recommendations for hydrocortisone treatment of hypotension secondary to RAI refractory to dopamine at >10 mcg/kg/minute vary in the literature. Common recommendations are to dose at 15 mg/m^2, or 1–2 mg/kg every 6–12 hours, by intravenous infusion.[11,34,35] Dosing interval for term newborns or infants 35 weeks gestation or more is every 6–8 hours, and dosing interval for infants <35 weeks is every 8–12 hours.

Prospective validation of the vasoactive-inotropic score and correlation to short-term outcomes in neonates and infants after cardiothoracic surgery

Jesse Davidson
Suhong Tong
Hayley Hancock
Amanda Hauck
Eduardo da Cruz
Jon Kaufman

Intensive Care Med (2012) 38:1184–1190

Table 1 Calculation of IS and VIS

IS[a] = dopamine dose (μg/kg/min) + dobutamine dose (μg/kg/min) + 100 × epinephrine dose (μg/kg/min)
VIS[b] = IS + 10 × milrinone dose (μg/kg/min) + 10,000 × vasopressin dose (U/kg/min) + 100 × norepinephrine dose (μg/kg/min)

IS inotrope score, *VIS* vasoactive-inotropic score

[a] Wernovsky et al. [2]

[b] Gaies et al. [10]

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Table 6 Association with outcomes based on multiple logistic regression controlling for CPB/DSC group and the presence of single ventricle physiology

	OR	95 % CI	*P* value
VIS48			
Prolonged intubation time	22.3	(3.1, 157.7)	0.002
Prolonged time to negative fluid balance	0.5	(0.1, 4.3)	0.557
Prolonged ICU stay	8.1	(1.4, 45.4)	0.017
Prolonged hospital stay	11.3	(1.7, 73.7)	0.011
Peak creatinine change	0.6	(0.1, 3.3)	0.574
Peak lactate	0.9	(0.2, 5.2)	0.919
Poor outcome	n/a		
VIS48max			
Prolonged intubation time	14.9	(2.4, 94.1)	0.004
Prolonged time to negative fluid balance	0.5	(0.1, 3.1)	0.476
Prolonged ICU stay	2.5	(0.6, 11.5)	0.225
Prolonged hospital stay	2.4	(0.5, 11.1)	0.259
Peak creatinine change	1.9	(0.4, 7.8)	0.399
Peak lactate	2.5	(0.5, 11.5)	0.245
Poor outcome	4.6	(0.5, 35.6)	0.165
IS48			
Prolonged intubation time	18.1	(2.4, 138.1)	0.005
Prolonged time to negative fluid balance	0.4	(0.04, 2.8)	0.322
Prolonged ICU stay	2.8	(0.6, 14.4)	0.212
Prolonged hospital stay	2.5	(0.5, 12.4)	0.275
Peak creatinine change	1	(0.2, 5.1)	0.964
Peak lactate	1.8	(0.3, 9.4)	0.502
Poor outcome	n/a		
IS48max			
Prolonged intubation time	7.1	(1.3, 37.6)	0.021
Prolonged time to negative fluid balance	0.8	(0.2, 3.8)	0.802
Prolonged ICU stay	2.4	(0.6, 9.8)	0.222
Prolonged hospital stay	1.4	(0.3, 6.0)	0.690
Peak creatinine change	2.2	(0.6, 8.0)	0.255
Peak lactate	2.4	(0.6, 9.8)	0.224
Poor outcome	4.4	(0.6, 30.7)	0.136

Conclusion

Vasoactive-inotropic score at 48 h after cardiac surgery is a simple clinical tool that can provide valuable information regarding likely length of intubation, intensive care unit stay, and hospital stay. VIS at 48 h performs better than maximum VIS in the first 48 h after surgery in predicting poor short-term outcomes. Within the first 72 h after surgery, VIS is a stronger predictor of poor short-term outcome than inotrope score. Given these findings, we believe that VIS, particularly at 48 h, should replace the previous inotrope score as the best available measure of cardiovascular support after cardiac surgery in infants.

Phase 1 study of two inodilators in neonates undergoing cardiovascular surgery

Pediatric RESEARCH Volume 73 | Number 1 | January 2013

Adelina Pellicer[1], Joan Riera[1,2], Paloma Lopez-Ortego[1], María Carmen Bravo[1], Rosario Madero[3], Jesús Perez-Rodriguez[1], Carlos Labrandero[4], Jose Quero[1], Ar d Fernando Cabañas[1]

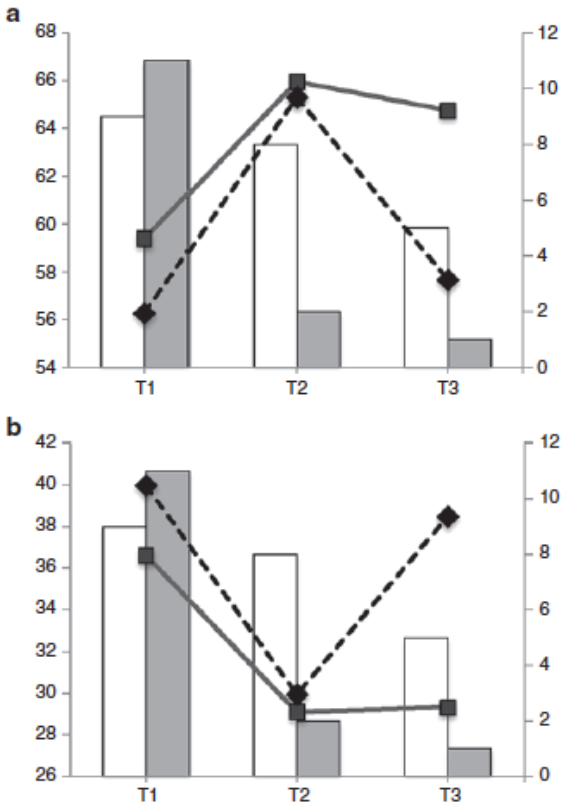

Figure 2. The lines represent the average mean value (left *y*-axis) of (**a**) the cerebral tissue oxygenation index (%) and (**b**) the fractional oxygen extraction (%) in the milrinone (dashed line) and levosimendan (gray line) study groups. Bars (right *y*-axis) show the number of patients still receiving INDs at the various time points (T1, first 24 h; T2, at 48 h; T3, at 96 h after surgery) in the milrinone (white bar) and levosimendan (gray bar) study groups. IND, inodilator.