Pinzamiento del cordón umbilical

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150 años de vida

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Temas que voy a comentar acerca del tiempo de clampeo del cordón umbilical

- **Conceptos generales**
- **Estudio en RN de término**
- **Estudios en prematuros**
- **Efectos a los seis meses**
- **Reflexiones**

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CLAMPEO Y CORTE DEL CORDÓN

- La intervención más antigua y prevalente en el género humano
- Genera controversia desde hace décadas
- La mayoría de los médicos de occidente clampean y cortan el cordón inmediatamente

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Evolución histórica

- 1811. Erasmus Darwin. Promueve clampeo demorado
- 1875. P.Budin: ¿cual es el momento oportuno para el clampeo del cordón umbilical?
- 1879. A.Schucking: mide el VS en cinco RN:
  - ⇒ clampeo precoz: 6,5% del peso
  - ⇒ clampeo tardío: 11% del peso
- 1937. Gibson y Evans:colorante T1824.
- 1941.Brines y col: miden VS en RNT:8,6% del peso.
- 1943. De Marsh y col: miden VS en 35 RN
  - ⇒ 18 con clampeo precoz: 9,4% (Hto.53%)
  - ⇒ 17 con clampeo demorado:11,2% (Hto.61%)

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Volumen sanguíneo en el RN de término

- Clampeo inmediato: TP normal o cesárea
  ⇒ VS=66 ml/kg (VE:31 ml y VP: 35 ml/kg)
- Clampeo cinco segundos: valores similares
- Clampeo inmediato con asfixia IU
  ⇒ VS=90 ml/kg (VE:44 ml/kg y VP:46 ml/kg)

(Yao A et al. *Acta Paediatr* 1967;55:585)

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Volumen sanguíneo del RN y volumen sanguíneo residual placentario

- **VS + VSRP = 110-115 ml/kg**
- **Clampeo demorado: > VS y < VSRP**

  ⇒ si el VS es 65-70 ml/kg, el VSRP es 35-40 ml/kg

  ⇒ si el VS es 80-85 ml/kg, el VSRP es 20-25 ml/kg

(Yao A et al. *Lancet* 1969;2:871)

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Influencia de la gravedad sobre el VS del RN y el VSRP

- **La ubicación del RN con relación a la placenta modifica su VS en el clampeo tardío (Gunther M. Lancet 1957;1:1277).**
- **En clampeo a los tres minutos, el VSRP es:**
  - ⇒ **10 cm arriba o abajo: 50 ml/kg**
  - ⇒ **20 cm arriba: 60 ml/kg**
  - ⇒ **60 cm arriba: > 100/ ml/kg**
  - ⇒ **40 cm abajo: 40 ml/kg**

(YaoA, Lind J. *Lancet* 1969;2:505)

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Adaptación y morbilidad en el RN

(Saigal S et al .*Pediatrics* 1972;49:406)

Clampeo precoz	Clampeo demorado
■ CV:,vasoconstricción periférica,< TA, R_2 más suave.	■ PAP y TA más alta, plétora.
■ Resp.:< FR, < quejido.	■ <PaO_2 ,< compliance, < CRF, > quejido.
■ Riñón: < diuresis	■ > diuresis, >FG, >reabsorción de Na
■ Bilirrubina: < valores a las 72 hs. (media 9,8 vs 12,1 mg/dL)	■ Más RN con Bi>15 mg/dL

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Efecto del clampeo precoz y tardío sobre parámetros hematológicos del RN

Neonatal blood volumen, calculated as the difference between an assumed total feto-placental blood volumen of 115 ml/kg and the measure fetal blood volume of the placenta, was 50% higher in the late cord-clamped infants (3m.) than in the early cord-clamped infants (<10 s).

(Liderkamp O, et al.*Acta Paediatr* 1992;81:745-50)

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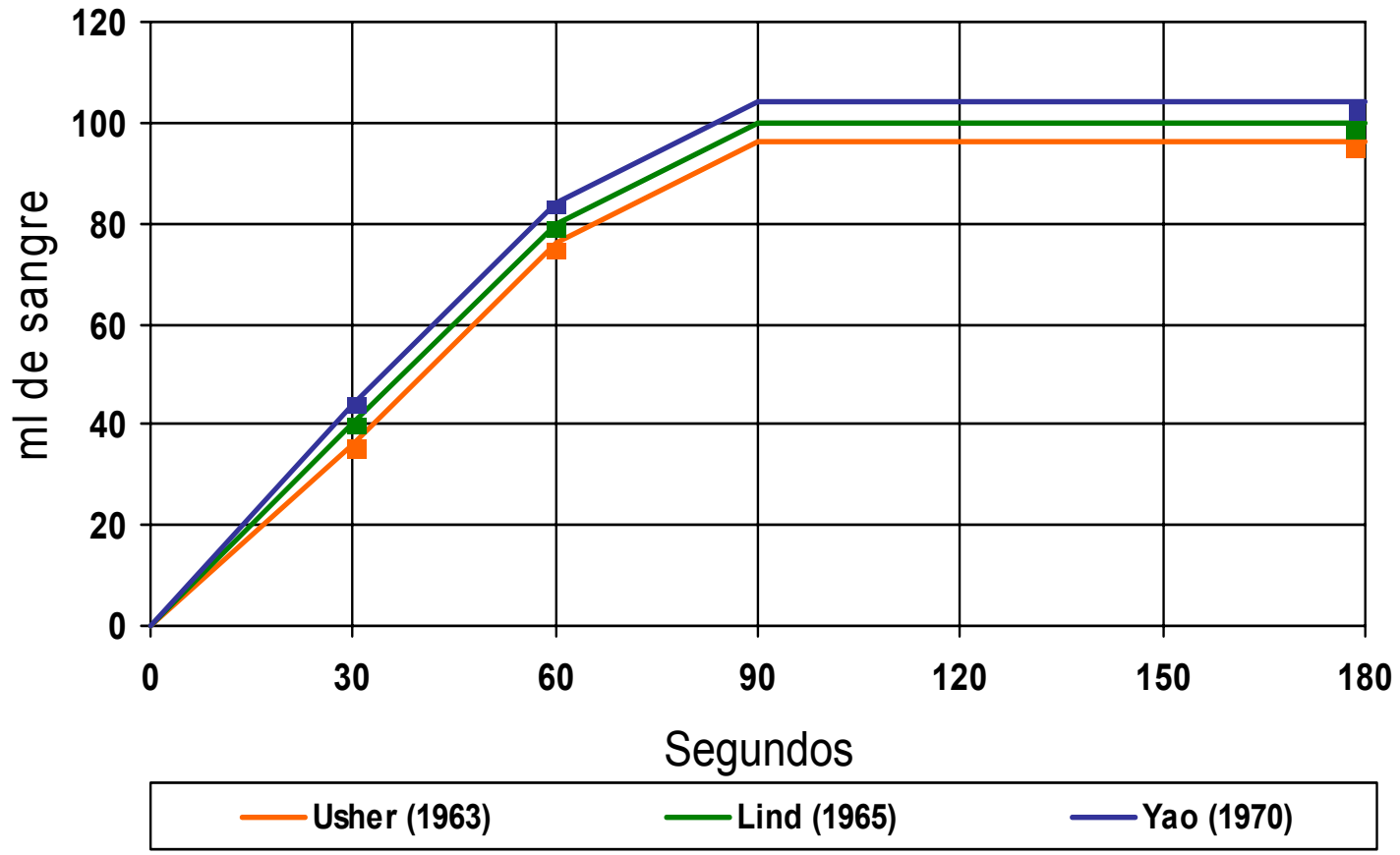
Volumen de sangre que pasa al RN según el momento de clampeo del cordón



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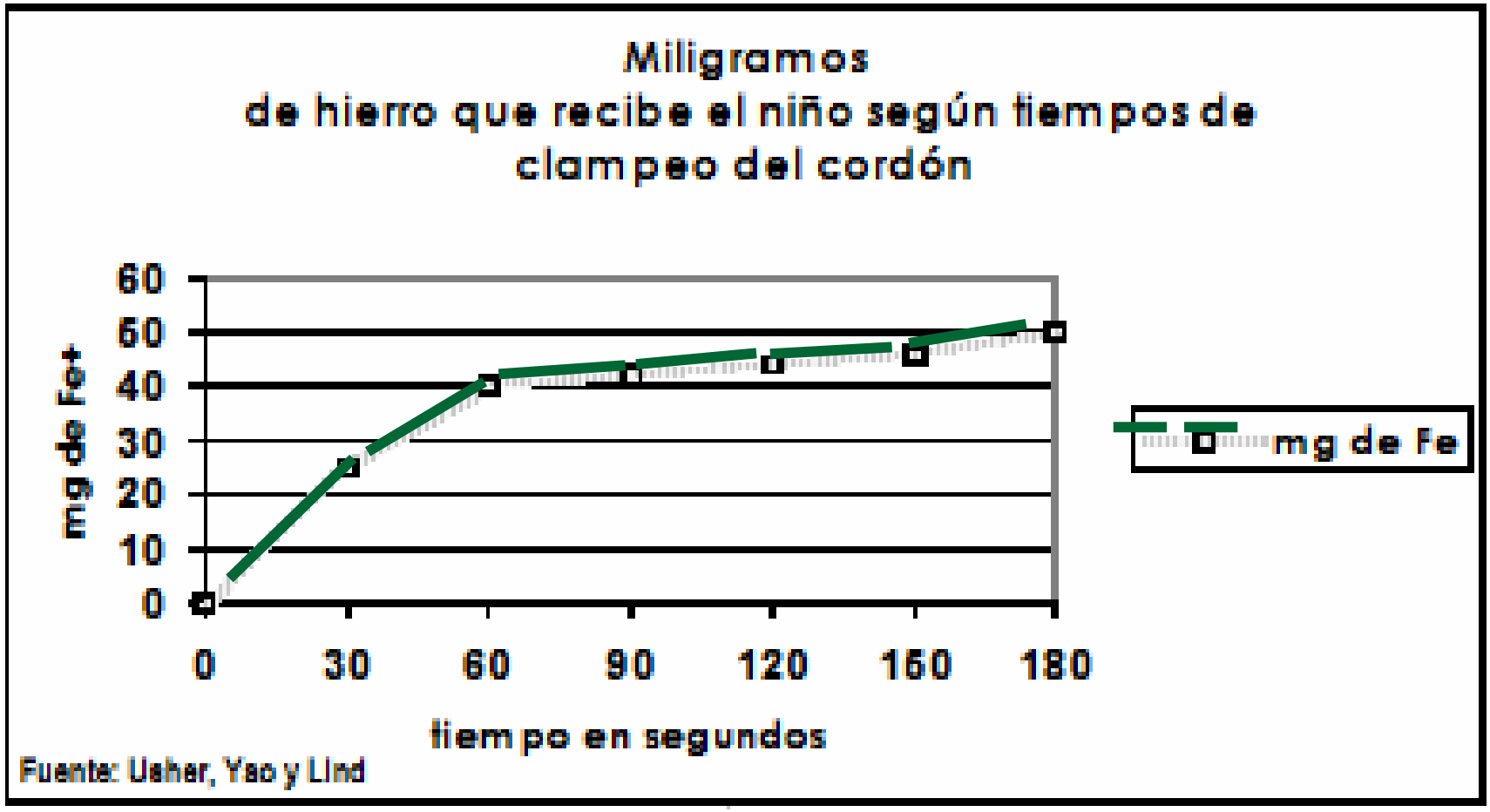
Transfusión placentaria y depósitos de hierro



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The dangers of early clamping of the umbilical cord (Http://www.cordclamping.com)

- Here is a collection of papers, dating back more 35 years, dealing with cord clamping by Peter Dunn,MD……..
- The medical approach to pregnancy and birth has forgotten the way of birth of our ancestors…….
- A new study showing that iron stores and hemoglobin in infancy can be improved by delaying cord clamping at birth.

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Tiempo de clampeo de cordón

- Hasta los años 80’ no había sido evaluada su efectividad
- Desde los 80’hasta la actualidad la evaluación ha sido fragmentada e incorrecta (en su gran mayoría)

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Evaluación de la efectividad del tiempo de clampeo del cordón umbilical

- **Investigación Clínica Aleatorizada (ICA)**
- **Revisión Sistemática de Investigaciones Clínicas Aleatorizadas (RS)**

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"En realidad existen 2 hechos, ciencia y opinión, el primero propicia conocimiento, el segundo ignorancia."

Hipócrates

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Estudios clínicos aleatorizados en RN de término

Autor	Año	N
Nelson	1980	55
Oxford Midwives	1991	554
Geethanath	1997	107
Gupta	2002	102
Emhamed	2004	104
Ceriani Cernadas	2006	276
Chaparro	2006	476
Ceriani Cernadas	2010	252

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The Effect of Timing of Cord Clamping on Neonatal Venous Hematocrit Values and Clinical Outcome at Term: A Randomized, Controlled Trial

José M. Ceriani Cernadas, Guillermo Carroli, Liliana Pellegrini, Lucas Otaño, Marina Ferreira, Carolina Ricci, Ofelia Casas, Daniel Giordano, and Jaime Lardizábal

Pediatrics, Apr 2006; 117: e779 - e786.

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Característica basales de los Grupos en Estudio

Variable	Clampeo Inmediato			Clampeo al 1º Minuto			Clampeo al 3º Minuto		
	Mediana	P_{25} – P_{75}		Mediana	P_{25} – P_{75}		Mediana	P_{25} – P_{75}	
Edad de la Madre	29	24	32	28.5	25	33	27.5	23	32
Paridad	1	1	3	1	0	3	1	1	2
Edad Gestacional al Parto	39	39	40	39	38	40	39	39	40
Controles Prenatales	9	7	10	9	7	10	9	7	10
Hematrocrito Previo al Parto	34	32	36	35	33	36	34	32	36
Edad Gestacional del RN	40	39	40	39	38	40	39	39	40
Peso del Bebe al Nacer	3370	3105	3620	3365	3150	3725	3460	3177.5	3650

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Tiempo de clampeo según tratamiento asignado

Variable	Estadístico	Clampeo Inmediato	Clampeo al 1º Minuto	Clampeo al 3º Minuto
Tiempo de Clampeo	N	93	91	92
	Faltante	0	0	0
	Min-Max	0-60	0-123	3-378
	Media	12.75	59.86	169.47
	Dev Est.	9.47	14.70	48.42
	Mediana	14	60	180
	$P_{25} – P_{75}$	7-15	60-61	180-181

Cumplimiento y tiempo de medición de la variable principal

Tratamiento	Tiempo a la Medición del Hematocrito a las 6 horas								
	N	**Faltante**	**Min**	**Max**	**Media**	**Dev Est**	**Mediana**	**Q25**	**Q75**
Clampeo Inmediato	90	3	6	13	6.27	0.83	6	6	6
Clampeo al 1º minuto	91	0	6	12	6.35	0.81	6	6	7
Clampeo al 3º minuto	92	0	2	12	6.47	1.23	6	6	7

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Hematocrito Neonatal a las seis horas del nacimiento

Tratamiento	Hematocrito Neonatal a las 6 horas								
	N	**Faltante**	**Min**	**Max**	**Media**	**Dev Est**	**Mediana**	**Q25**	**Q75**
Clampeo Inmediato	90	3	39.7	68	53.50	6.99	53.75	49	58
Clampeo al 1º minuto	90	1	43.5	71	57.02	5.80	57.00	53	61
Clampeo al 3º minuto	92	0	45.0	75	59.41	6.09	60.00	55	64

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Hematocrito del recién nacido a las seis horas mayor a 65 %

Variable	Clampeo Inmediato n/N (%)	Clampeo al 1º Minuto n/N (%)	Clampeo al 3º Minuto n/N (%)
Hematocrito > 65 % a las seis horas de vida	4/90 (4.44)	5/90 (5.56)	13/92 (14.13)

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Bilirrubinemia a las 36-48 horas

Tratamiento	Bilirrubinemia a las 36-48 horas								
	N	**Faltante**	**Min**	**Max**	**Media**	**Dev Est**	**Mediana**	**Q25**	**Q75**
Clampeo Inmediato	91	2	1	17.4	7.39	3.08	7.3	5.6	9
Clampeo al 1º minuto	85	6	1	18.9	7.58	3.04	7.7	6.1	9
Clampeo al 3º minuto	90	2	1	14.6	6.99	2.98	7.2	5.0	9

Variable	Clampeo Inmediato n/N(%)	Clampeo al 1º Minuto n/N(%)	Clampeo al 3º Minuto n/N(%)
Bilirrubina a las 36-48 horas mayor a 16 mg/dL	2/91(2.20)	1/85(1.18)	0/90(0.0)

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Ingreso a neonatología

Variable	Clampeo Inmediato n/N (%)	Clampeo al 1º Minuto n/N (%)	Clampeo al 3º Minuto n/N (%)
Ingreso a neonatología	4/93 (4.3)	5/91(5.49)	8/92 (8.7)

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Días de internación en Neonatología

Tratamiento	Días de internación en Neonatología								
	N	**Faltante**	**Min**	**Max**	**Media**	**Dev Est**	**Mediana**	**Q25**	**Q75**
Clampeo Inmediato	4	0	1	8	5.0	2.94	5.5	3.0	7.0
Clampeo al 1º minuto	5	0	2	13	7.4	4.28	7.0	5.0	10.0
Clampeo al 3º minuto	8	0	1	4	2.5	1.20	2.5	1.5	3.5

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Otros Resultados Neonatales

Variable	Clampeo Inmediato	Clampeo al 1º Minuto	Clampeo al 3º Minuto
Enteritis necrotizante	0/93(0%)	0/91(0%)	0/92(0%)
Sepsis neonatal	0/93(0%)	1/91(1.1%)	0/92(0%)
Convulsiones	0/93(0%)	0/91(0%)	0/92(0%)
Taquipnea	2/93(2.15%)	6/91(6.59%)	6/92(6.52%)
Distress respiratorio	1/93(1.08%)	5/91(5.49%)	3/92(3.26%)
Quejido respiratorio	0/93(0%)	4/91(4.4%)	3/92(3.26%)
Problema respiratorio (taquipnea + distress + quejido)	2/93(2.15%)	6/91(6.59%)	6/92(6.52%)
Muerte Neonatal	0/93(0%)	0/91(0%)	0/92(0%)
Alimentación al mes			
Pecho exclusivo	82/90(91.1%)	70/87(80.46%)	78/91(85.71%)
Mixta	6/90(6.67%)	16/87(18.39%)	13/91(14.29%)
Fórmula	2/90(2.22%)	1/87(1.15%)	0/91(0.00%)
Evolución neonatal anormal	4/90(4.44%)	2/89(2.25%)	2/91(2.20%)

Efectos del clampeo demorado del cordón umbilical en prematuros de muy bajo peso al nacer

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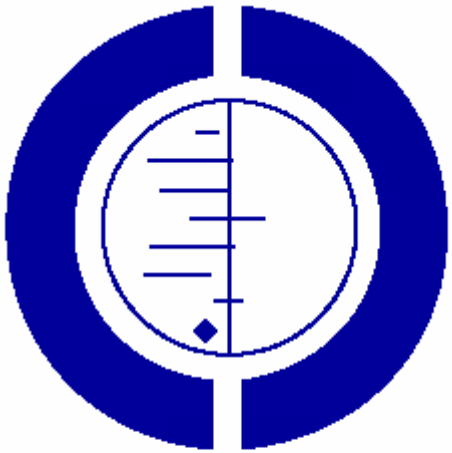
Antecedentes

- En una revisión Cochrane y en posteriores estudios publicados los prematuros con clampeo demorado presentaron una significativa reducción de transfusiones, expansores, HIC y sepsis tardía.
- No se observó en ninguno de los estudios evaluados (tanto incluidos como excluidos) efectos adversos atribuibles al clampeo demorado. Observaciones similares se publicaron en otras revisiones.
- Una demora de 30 a 45”en el clampeo resulta en un 8 a 24% de aumento en el volumen sanguíneo:2–16 mL/kg en cesárea y 10–28 mL/kg en parto vaginal

(Narenda et al *Pediatr Res* 1998;44:453)

Early versus delayed umbilical cord clamping in preterm infants (Review)

Rabe H, Reynolds G, Diaz-Rossello J



THE COCHRANE COLLABORATION®

ABSTRACT

- **Background:** Optimal timing for clamping of the umbilical cord at birth is unclear. Early clamping allows for immediate resuscitation of the newborn. Delaying clamping may facilitate transfusion of blood between the placenta and the baby.
- **Objectives:**To delineate the short- and long-term effects for infants born at less than 37 completed weeks' gestation, and their mothers, of early compared to delayed clamping of the umbilical cord at birth.
- **Search strategy: .....** PubMed (1966 to 2 February 2004) and EMBASE (1974 to 2 February 2004).
- **Selection criteria:** Randomized controlled trials comparing early with delayed (30 seconds or more) clamping of the umbilical cord for infants born before 37 completed weeks' gestation

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ABSTRACT

- **Data collection and analysis:** Three reviewers assessed eligibility and trial quality.
- **Main results:**Seven studies (297 infants) were eligible for inclusion. Delayed cord clamping was associated with **fewer transfusions for anaemia (three trials, 111 infants; relative risk (RR) 2.01, 95% CI 1.24 to 3.27) or low blood pressure (two trials, 58 infants; RR 2.58, 95% CI 1.17 to 5.67) and less IVH (five trials, 225 infants; RR 1.74, 95% CI 1.08 to 2.81)** than early clamping.
- **Authors' conclusions:**Delaying cord clamping by 30 to 120 seconds, rather than early clamping, was associated with less need for transfusion and less intraventricular haemorrhage.There were no differences in other outcomes.

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Early versus delayed umbilical cord clamping in preterm infants

In preterm infants, delaying cord clamping by 30-120 seconds seems to be associated with less need for blood transfusion and less IVH. The beneficial effects of delayed cord clamping may yield the greatest benefits in settings where access to health care is limited.

RHL Commentary by Ceriani Cernadas JM

1. EVIDENCE SUMMARY

Related documents
:: Cochrane Review
:: RHL Practical Aspects

About the author
:: Ceriani Cernadas JM

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Los beneficios hallados con el clampeo demorado son producidos por hechos fisiológicos por lo cual no debe considerarse como un tratamiento, sino como una práctica que respeta aspectos naturales. Sus beneficios son producto de permitir que el recién nacido reciba un volumen de sangre que le corresponde. Es decir que la transfusión placentaria es una inevitable consecuencia fisiológica, en los primeros minutos de vida, de la redistribución de sangre entre la placenta y el neonato. La naturaleza ha determinado que ese volumen de sangre le pertenece en su mayoría al recién nacido, entonces *¿Por qué privarlo de que lo reciba?*

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Delayed Cord Clamping in Very Preterm Infants Reduces the Incidence of Intraventricular Hemorrhage and Late-Onset Sepsis: A Randomized, Controlled Trial

Judith S. Mercer, DNSc, CNM[a], Betty R. Vohr, MD[b], Margaret M. McGrath, DNSc[a], James F. Padbury, MD[b], Michael Wallach, MD[b] and William Oh, MD[b]

PEDIATRICS Vol. 117 No. 4 April 2006

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ABSTRACT

Objective. To compare the effects of immediate (ICC) and delayed (DCC) cord clamping on VLBW infants on 2 primary variables: bronchopulmonary dysplasia (BPD) and suspected necrotizing enterocolitis (SNEC). Other outcome variables were late-onset sepsis and intraventricular hemorrhage (IVH).

Study design. Randomized, controlled unmasked trial in which women in labor with singleton fetuses 32 weeks' gestation **were randomly assigned to ICC (cord clamped at 5–10 seconds) or DCC (30–45 seconds) groups.** Exclusion criteria: obstetrician refused to participate, major congenital anomalies, multiple gestations, intent to withhold care, severe maternal illnesses, placenta abruption or previa, or rapid delivery after admission.

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Results. Seventy-two mother/infant pairs were randomized. Analyses revealed no difference in maternal and infant demographic, clinical, and safety variables. **There were no differences in the incidence of our primary outcomes (BPD and suspected NEC). However, significant differences were found between the ICC and DCC groups in the rates of IVH and LOS.** Two of the 23 male infants in the DCC group had IVH versus 8 of the 19 in the ICC group. **No cases of sepsis occurred in the 23 boys in the DCC group, whereas 6 of the 19 boys in the ICC group had confirmed sepsis.** There was a trend toward higher initial hematocrit in the infants in the DCC group.

Conclusion. Delayed cord clamping seems to protect VLBW infants from IVH and LOS, especially for male infants.

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TABLE 4. IVH and LOS in Study Infants

	ICC (*n* = 36), n (%)	DCC (*n* = 36), n (%)	*P*	OR	95% CI
IVH					
All IVH	13 (36)	5 (14)	.03	3.5	(1.1–11)
Grade1	4 (11)	3 (8)			
Grade 2	8 (22)	2 (6)			
Grade 4	1 (3)	0 (0)			
Sepsis	8 (22)	1 (3)	.03	.01	(.01–.84)

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TABLE 5. Gender Differences in IVH, LOS, and NEC Among Infants With ICC and DCC

	ICC		DCC	
	Boys (*n*=19) *n* (%)	**Girls (*n*17)** *n* (%)	**Boys (*n*23)** *n* (%)	**Girls (*n*13),** *n* (%)
IVH	8 (42)[a]	5 (29)	2 (9)	3 (23)
Sepsis	6 (32)[a]	2 (12)	0 (0)	1 (8)
NEC	3 (16)[a]	1 (6)	0 (0)	2 (15)

a Differences for boys between groups; *P*<.05, Fisher's exact test.

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The Influence of the Timing of Cord Clamping on Postnatal Cerebral Oxygenation in Preterm Neonates: A Randomized, Controlled Trial (*Pediatrics* 2007;119,455)

Subjets. A total of 39 preterm infants with a median GA of 30.4 weeks were randomly assigned to an experiment group (*n*=15) and a control group(*n*= 24).

Interventions. ... the infant was placed 15 cm below the placenta, and cord clamping was delayed by **60 to 90 seconds**.. **At the ages of 4 and 24 h, cerebral hemoglobin concentrations, cerebral blood volume, and regional tissue oxygenation were measured by near-infrared spectroscopy**.

Results. Cerebral blood volume was not different between the 2 groups at the age of 4 hours nor at the age of 24 hours. **Mean regional tissue oxygenation of the experiment group was higher at the ages of 4 hours** (69.9% vs 65.5%) **and of 24** hours (71.3% vs 68.1%).

Conclusion. Delayed clamping of the umbilical cord improves cerebral oxygenation in preterm infants in the first 24 hours

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Seven-month developmental outcomes of very low birth weight infants enrolled in a randomized controlled trial of delayed versus immediate cord clamping

JS Mercer, BR Vohr, DA Erickson-Owens, JF Padbury and W Oh

Journal of Perinatology 2010; 30:11–16

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Objective: our previous trial revealed **.....** **We hypothesized that infants with DCC would have better motor function by 7 months corrected age.**

Study Design:... and follow-up evaluation at 7 months corrected age.

Result: We found no differences in the Bayley Scales of Infant Development scores between the DCC and ICC groups. However, a regression model of effects of DCC on motor scores controlling for gestational age, IVH, BPD, sepsis and male gender **suggested higher motor scores of male infants with DCC.**

Conclusion: DCC at birth seems to be **protective of very low birth weight male infants** against motor disability at 7 months corrected age.

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Table 2 Perinatal characteristics of study subjects

Variables	ICC (n=29)	DCC (n=29)	P-value
Apgar at 5 min, median	8	8	0.88
IVH, all grades	10 (34%)	5 (17%)	0.13
Late-onset sepsis	6 (21%)	1 (3%)	0.10
Suspected NEC	16 (55%)	11 (38%)	0.19
NEC	1 (3%)	1 (3%)	1.0
BPD	6 (21%)	6 (21%)	1.0
Percent of BW <10th percentile	1	1	0.98

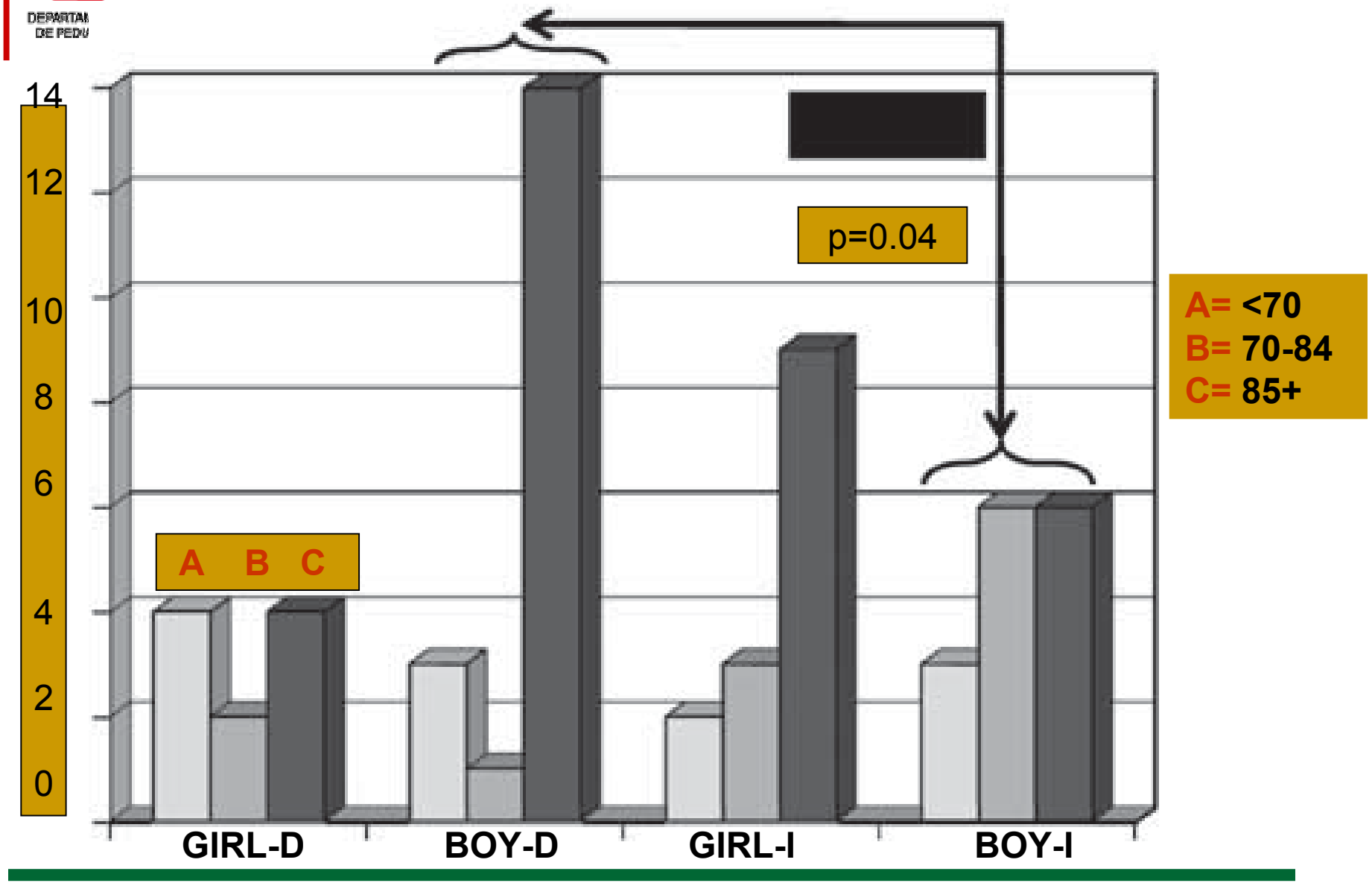
14
12
10
8
6
4
2
0
p=0.04
A B C
A= <70
B= 70-84
C= 85+
GIRL-D
BOY-D
GIRL-I
BOY-I

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Figure 2
Number of girls and boys in each Psychomotor Developmental Index Score Range with delayed (D) or immediate (I) cord clamping at 7 months corrected age. The difference between the boys with immediate cord clamping and delayed cord clamping is significant (p=0.04). No difference was noted between the girls (p=0.33).

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Owing to the strength of the variable male in our Main Effects Model and our previous finding that DCC appeared to be more protective for males with lower rates of IVH and LOS, an interaction term was created between male gender and DCC (Table 4). In this model, the regression coefficient for the product term, male late clamped, indicating that if an infant was male and had late clamping, his score on the PDI would be 18 points higher than if he had early clamping when controlling for the other variables The coefficient of multiple determination, R^2, is 35% for the Interaction Model ($P \leq 0.005$).

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Efecto del clampeo demorado del cordón umbilical en la ferritina sérica a los seis meses de vida. Estudio clínico controlado aleatorizado

*Dr. José M Ceriani Cernadas, Dr. Guillermo Carroli, Dra. Liliana Pellegrini, Dra. Marina Ferreira, Dra. Carolina Ricci, Dra. Ofelia Casas,Dr. Jaime Lardizabal*b *y Dra. María del Carmen Morasso*

***Arch Argent Pediatr* 2010;108(3):201-208**

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Ferritina (ug/L) 6 meses

Clampeo temprano 20,9 (26,3)

Clampeo 1 minuto 25,5 (26,0)

diferencia: 1,2 (0,9-1,6)

Clampeo 3 minutos 33,2 (36,8)

Diferencia: 1,6 (1,2-2,1)

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Anemia ferropénica

Definición: hemoglobina < 10,5 g/dl y ferritina < 9 µg/L

Clampeo temprano: 6/86 (7,0%)

Clampeo 1 minuto: 3/84 (3,6%)

Clampeo 3 minutos: 2/84 (2,4%)