Neuroimágenes en Asfixia del RNT

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Neurorradióloga HPM

Agosto 2016

Generalidades

- Daño cerebral selectivo en EHI
- Evolución temporal del daño cerebral
- Biomarcadores en RM y su valor pronóstico
- Hipotermia y RM
- Características RM en la fase crónica

The NEW ENGLAND JOURNAL of MEDICINE

N Engl J Med 2005;353:1574-84.

ORIGINAL ARTICLE

Whole-Body Hypothermia for Neonates with Hypoxic–Ischemic Encephalopathy

Seetha Shankaran, M.D., Abbot R. Laptook, M.D., Richard A. Ehrenkranz, M.D., Jon E. Tyson, M.D., M.P.H., Scott A. McDonald, B.S., Edward F. Donovan, M.D., Avroy A. Fanaroff, M.D., W. Kenneth Poole, Ph.D., Linda L. Wright, M.D., Rosemary D. Higgins, M.D., Neil N. Finer, M.D., Waldemar A. Carlo, M.D., Shahnaz Duara, M.D., William Oh, M.D., C. Michael Cotten, M.D., David K. Stevenson, M.D., Barbara J. Stoll, M.D., James A. Lemons, M.D., Ronnie Guillet, M.D., Ph.D., and Alan H. Jobe, M.D., Ph.D., for the National Institute of Child Health and Human Development Neonatal Research Network*

Daño cerebral selectivo

Asfixia aguda profunda

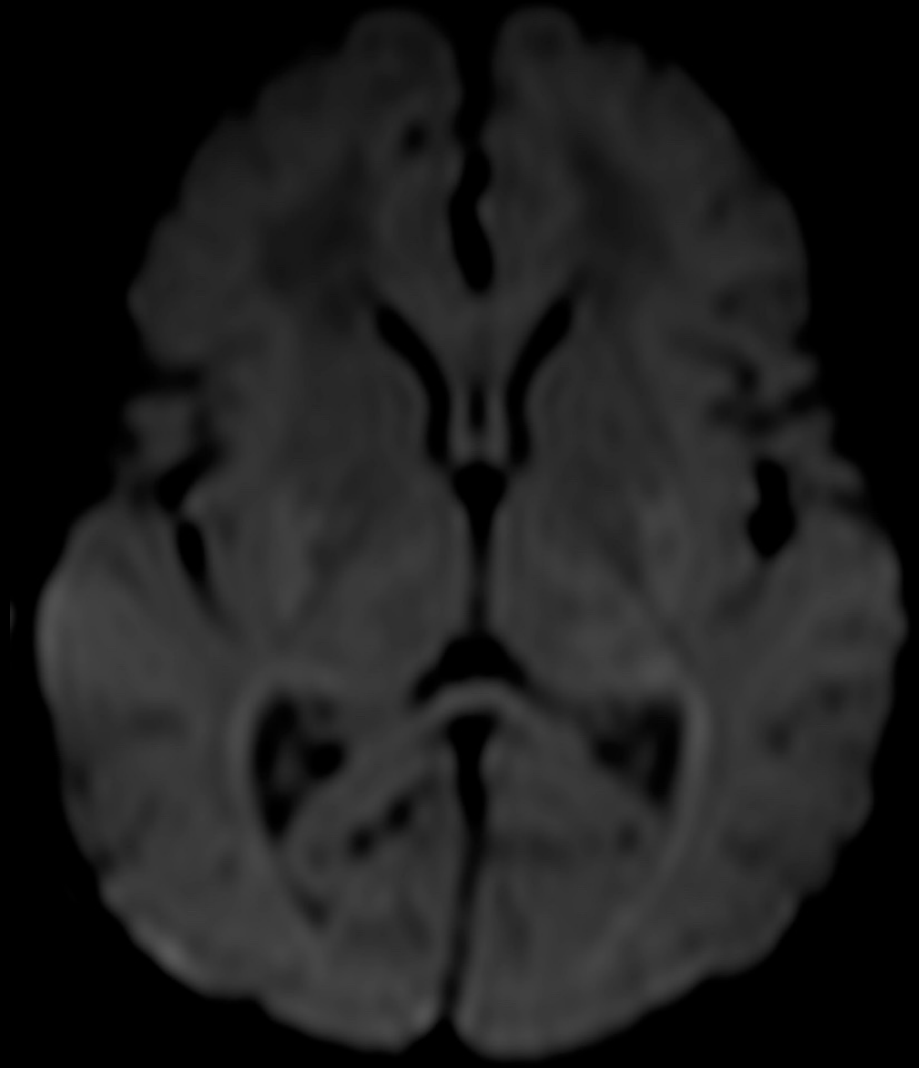
- GB
- Tálamo
- Corteza perirolándica
- ± Hipocampos

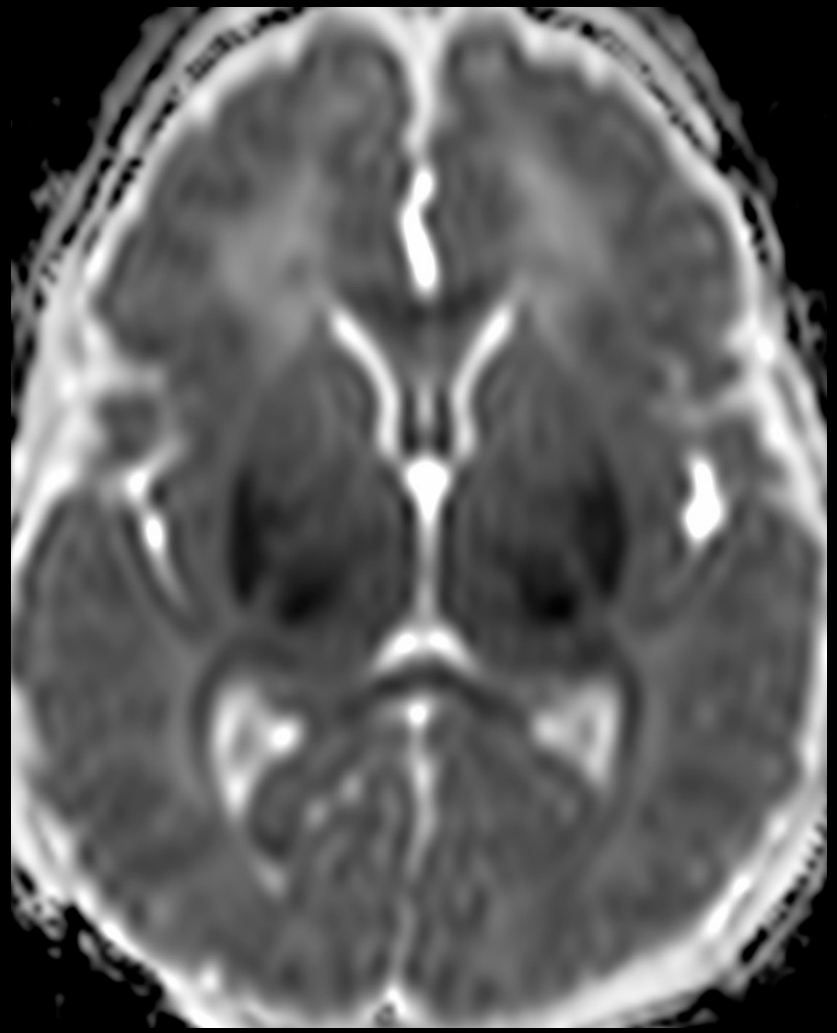
Asfixia parcial prolongada

- Territorio limítrofe

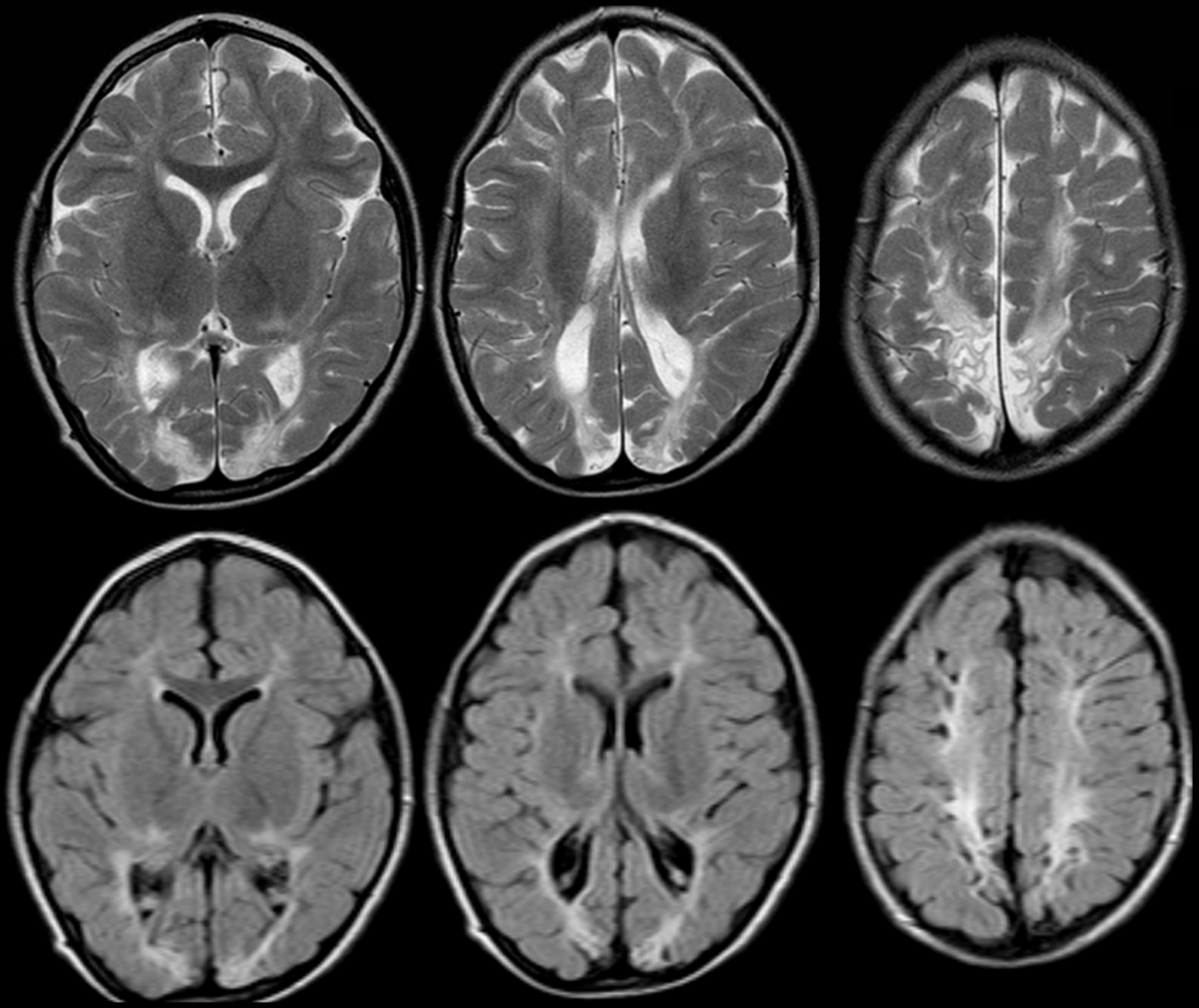
Hipotensión
Infección
Hipoglicemia

Asfixia aguda profunda





Asfixia parcial prolongada



Protocolo MR

- 2-4 días (4 día hipotermia): MR standard (con difusión) + espectroscopia
- > 7-10 días: MR standard

Protocolo MR

- T2 trans
- T1 IR trans
- SWI trans
- DW/DTI trans
- T2 cor
- T1 sag
- (espectroscopía TE 144)

Evolución temporal del daño cerebral: secuencias MR

Extensión final del daño

Días	1	2-4	>7
Difusión	++	+++	-
T1	-	+	++
Espectroscopía	+++	+++	+

Evolución temporal

- DWI más sensible que T1 y T2 en la fase aguda
- DWI es más sensible entre los **2-4** días
- ADC < 0,7 en el cerebro y < 0,6 en el **BPCI**: marcador de mal pronóstico
- DWI subestima la extensión final del daño

THE JOURNAL OF PEDIATRICS • www.jpeds.com

ORIGINAL ARTICLES

Neonatal Magnetic Resonance Imaging Pattern of Brain Injury as a Biomarker of Childhood Outcomes following a Trial of Hypothermia for Neonatal Hypoxic-Ischemic Encephalopathy

Patrón de MR NN es un marcador de resultado del neurodesarrollo a los 6-7 años de edad

J Pediatr 2015; 167:987-93

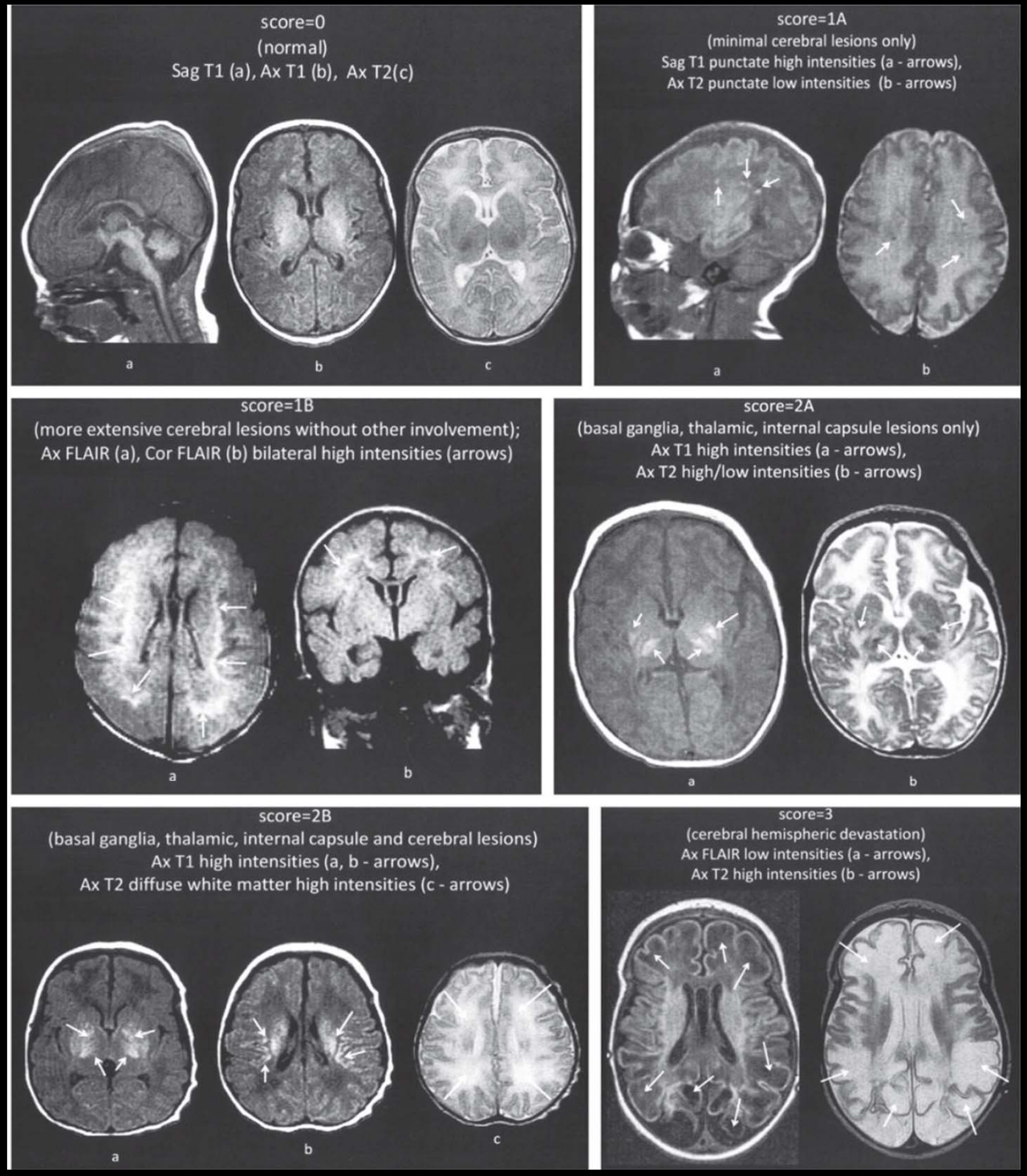
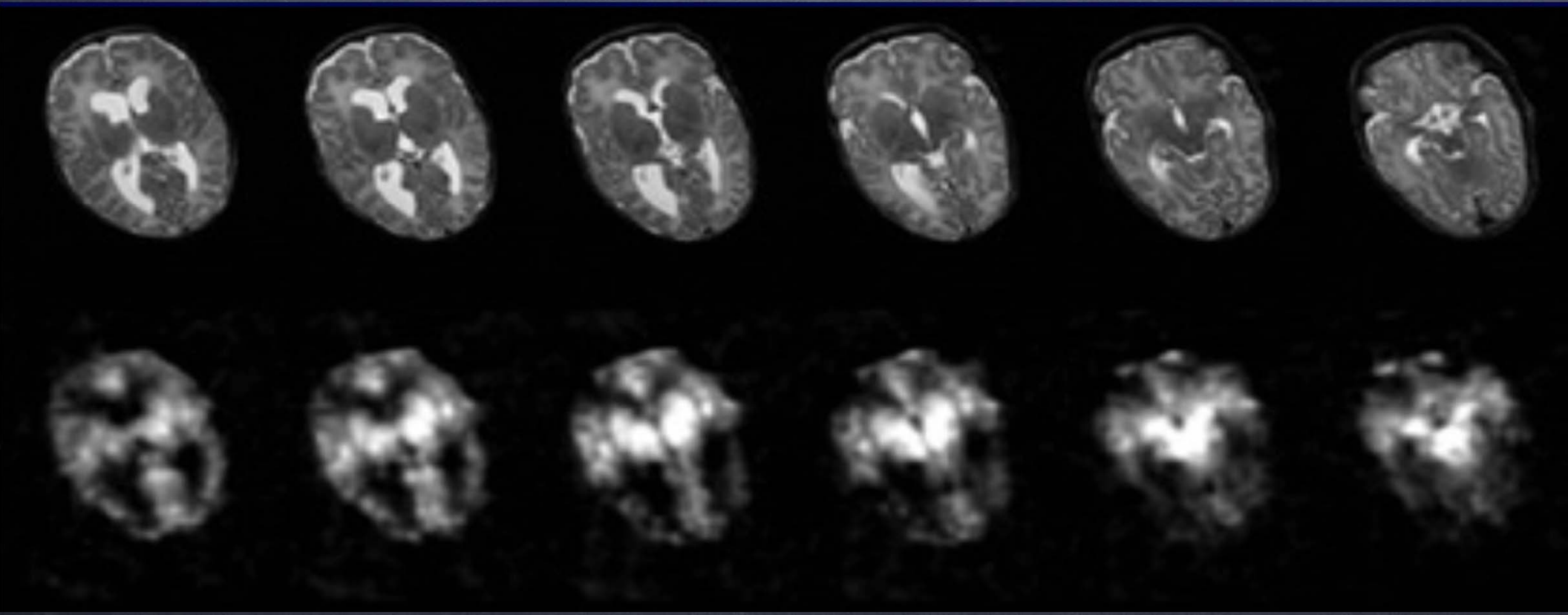

score=0
(normal)
Sag T1 (a), Ax T1 (b), Ax T2(c)
a
b
c
score=1A
(minimal cerebral lesions only)
Sag T1 punctate high intensities (a - arrows),
Ax T2 punctate low intensities (b - arrows)
a
b
score=1B
(more extensive cerebral lesions without other involvement);
Ax FLAIR (a), Cor FLAIR (b) bilateral high intensities (arrows)
a
b
score=2A
(basal ganglia, thalamic, internal capsule lesions only)
Ax T1 high intensities (a - arrows),
Ax T2 high/low intensities (b - arrows)
a
b
score=2B
(basal ganglia, thalamic, internal capsule and cerebral lesions)
Ax T1 high intensities (a, b - arrows),
Ax T2 diffuse white matter high intensities (c - arrows)
a
b
c
score=3
(cerebral hemispheric devastation)
Ax FLAIR low intensities (a - arrows),
Ax T2 high intensities (b - arrows)

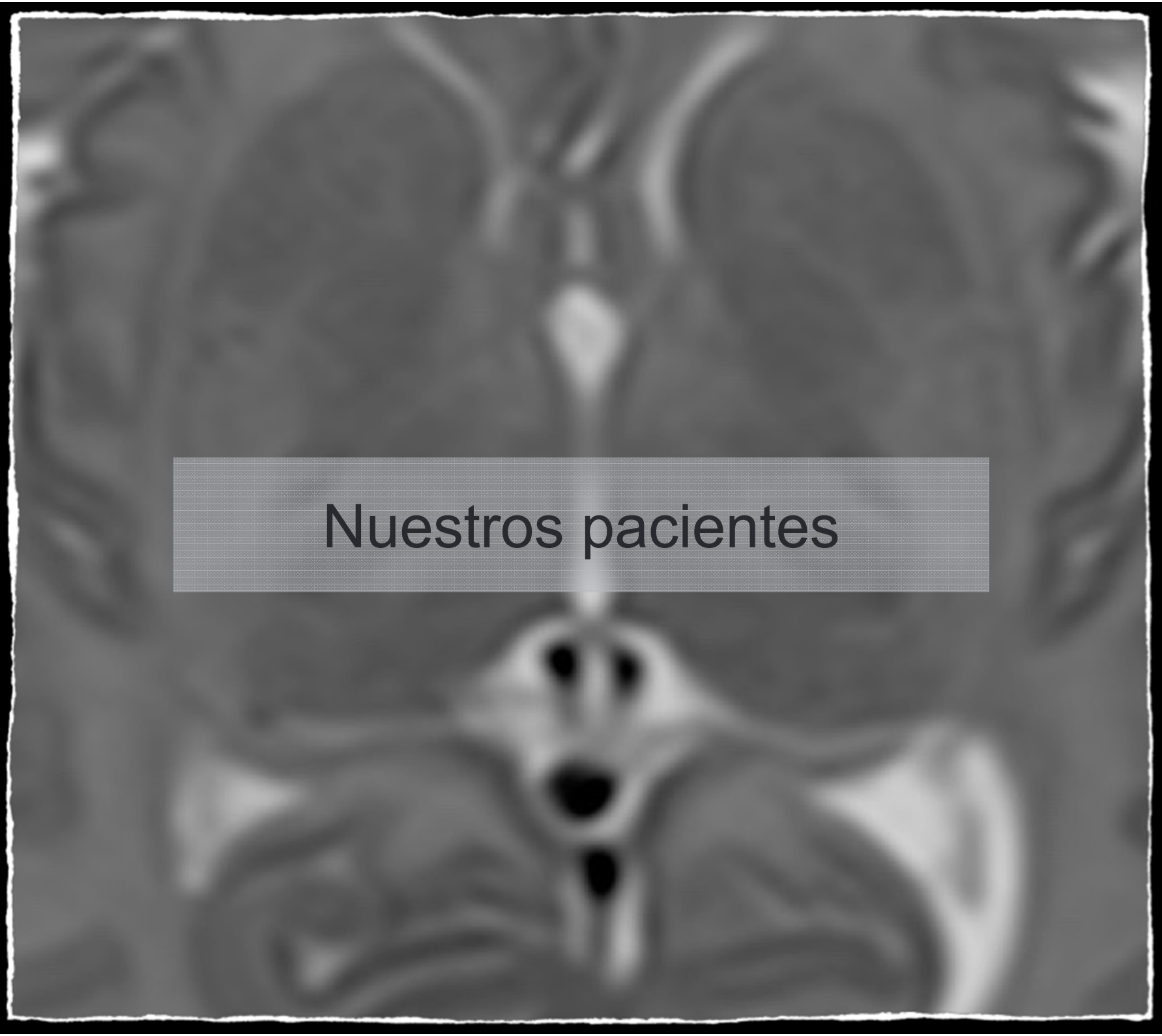
Table III. Relationship of neonatal MRI and 6- to 7-year outcome

MRI NICHD score	Death or IQ <70	Among survivors*			
		Normal	Mild disability	Moderate disability	Severe disability
Entire cohort					
0 n = 50	4 (8%)	26 (57%)	14 (30%)	6 (13%)	0 (0%)
1A n = 6	1 (17%)	2 (40%)	3 (60%)	0 (0%)	0 (0%)
1B n = 4	1 (25%)	2 (50%)	0 (0%)	1 (25%)	1 (25%)
2A n = 8	3 (38%)	4 (67%)	0 (0%)	2 (33%)	0 (0%)
2B n = 49	32 (65%)	7 (21%)	8 (24%)	3 (9%)	16 (47%)
3 n = 7	7 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Total n = 124	48 (39%)	41 (43%)	25 (26%)	12 (13%)	18 (19%)
P value <.0001†			<.0001		
Among cooled infants					
0 n = 35	3 (9%)	16 (50%)	11 (34%)	5 (16%)	0 (0%)
1A n = 4	0 (0%)	2 (50%)	2 (50%)	0 (0%)	0 (0%)
1B n = 1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
2A n = 5	1 (20%)	3 (75%)	0 (0%)	1 (25%)	0 (0%)
2B n = 22	15 (68%)	4 (29%)	3 (21%)	1 (7%)	6 (43%)
3 n = 2	2 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total n = 69	22 (32%)	25 (45%)	16 (29%)	7 (13%)	7 (13%)
P value <.0001†			.02		
Among control infants					
0 n = 15	1 (7%)	10 (71%)	3 (21%)	1 (7%)	0 (0%)
1A n = 2	1 (50%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
1B n = 3	0 (0%)	2 (67%)	0 (0%)	1 (33%)	0 (0%)
2A n = 3	1 (50%)	1 (50%)	0 (0%)	1 (50%)	0 (0%)
2B n = 27	17 (63%)	3 (15%)	5 (25%)	2 (10%)	10 (50%)
3 n = 5	5 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Total n = 55	26 (47%)	16 (39%)	9 (22%)	5 (12%)	11 (27%)
P value <.0001†			.004		

Otras modalidades: ASL



Mayor requerimiento energético-mayor CBF


Nuestros pacientes

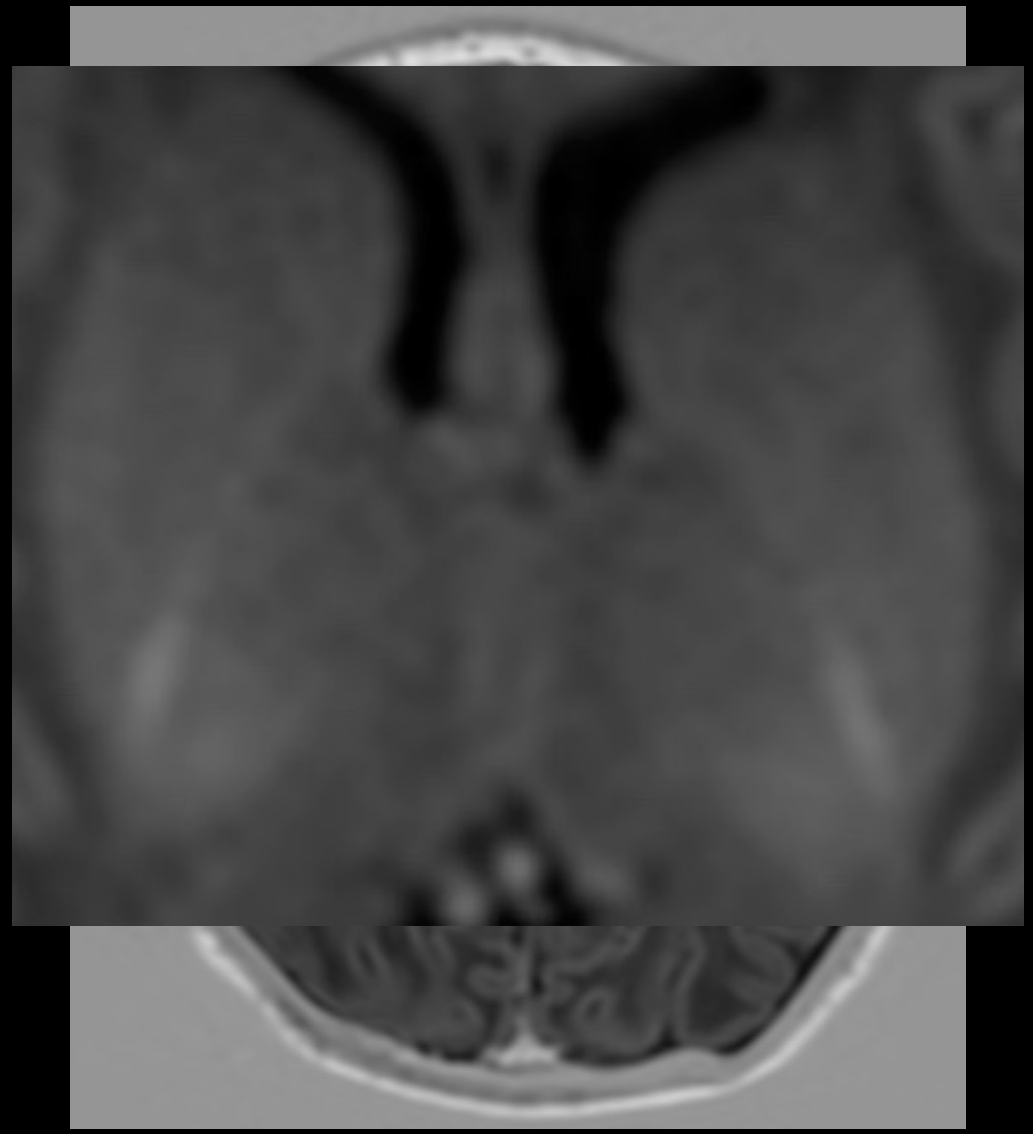
Nuestros pacientes

- RM Octubre 2014-Julio 2016
  - 7 pacientes con EHI+hipotermia
  - 5 pacientes derivados con diagnóstico de asfixia/EHI -hipotermia

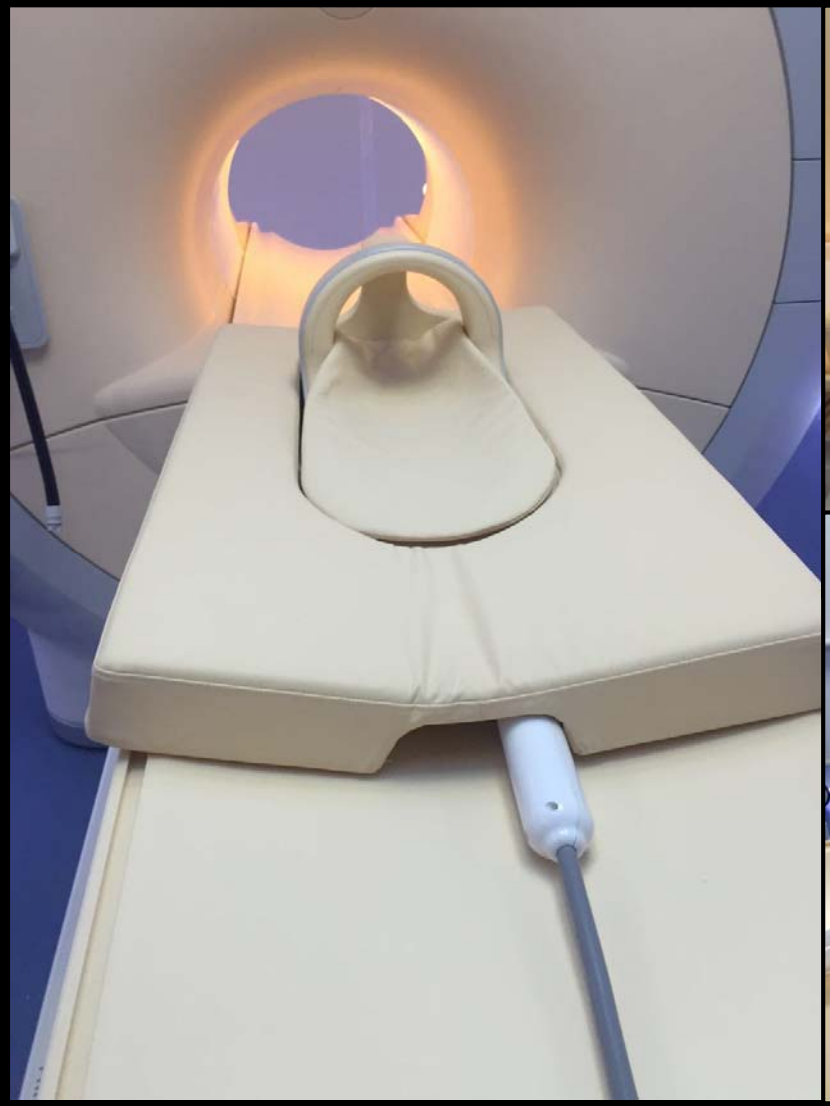
Nota

- **No se autorizó la colocación de las imágenes de los casos por no existir Consentimiento Informado para publicación en Página Web.**

BPCI (PLIC)



BOVINA NEUROVASCULAR PEDIÁTRICA (2016)



Es importante recordar…

- MR es altamente sensible en la fase aguda, aunque no puede predecir con exactitud la extensión del daño final

Los antecedentes clínicos son fundamentales para la evaluación de la imagen

- La MR en etapa de EHI crónica es bastante “típica”, pero no PATOGNOMÓNICA

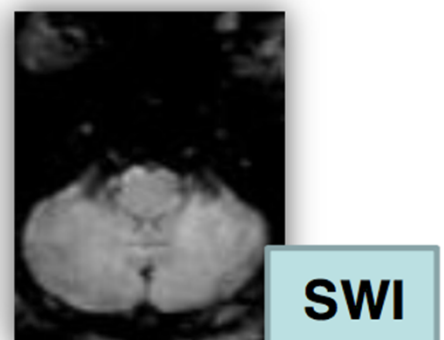

BONUS
TRACK

Vulnerabilidad cerebelosa en el RNPT

Accuracy of ultrasound in assessing cerebellar haemorrhages in very low birthweight babies

Alessandro Parodi,[1] Andrea Rossi,[2] Mariasavina Severino,[2] Giovanni Morana,[2] Andrea Sannia,[1] Maria Grazia Calevo,[3] Mariya Malova,[1] Luca A Ramenghi[1]

Parodi A, et al. Arch Dis Child Fetal Neonatal Ed 2015;100:F289–F292



Cerebellar hemorrhage size	AF	MF	SWI
Massive cerebellar hemorrhages (>1/3 of cerebellum)	2/128 (1.6%)	2/128 (1.6%)	**2/128 (1.6%)**
Limited cerebellar hemorrhages (size ≥5 mm and <1/3 of cerebellum)	2/128 (1.6%)	5/128 (3.9%)	**5/128 (3.9%)**
Cerebellar microhemorrhages (microCBH) (size <5 mm)	0/128 (0%)	0/128 (0%)	**20/128 (15.6%)**
All cerebellar hemorrhages	**4/128 (3.1%)**	**6/128 (4.7%)**	**26/128 (20.3%)**

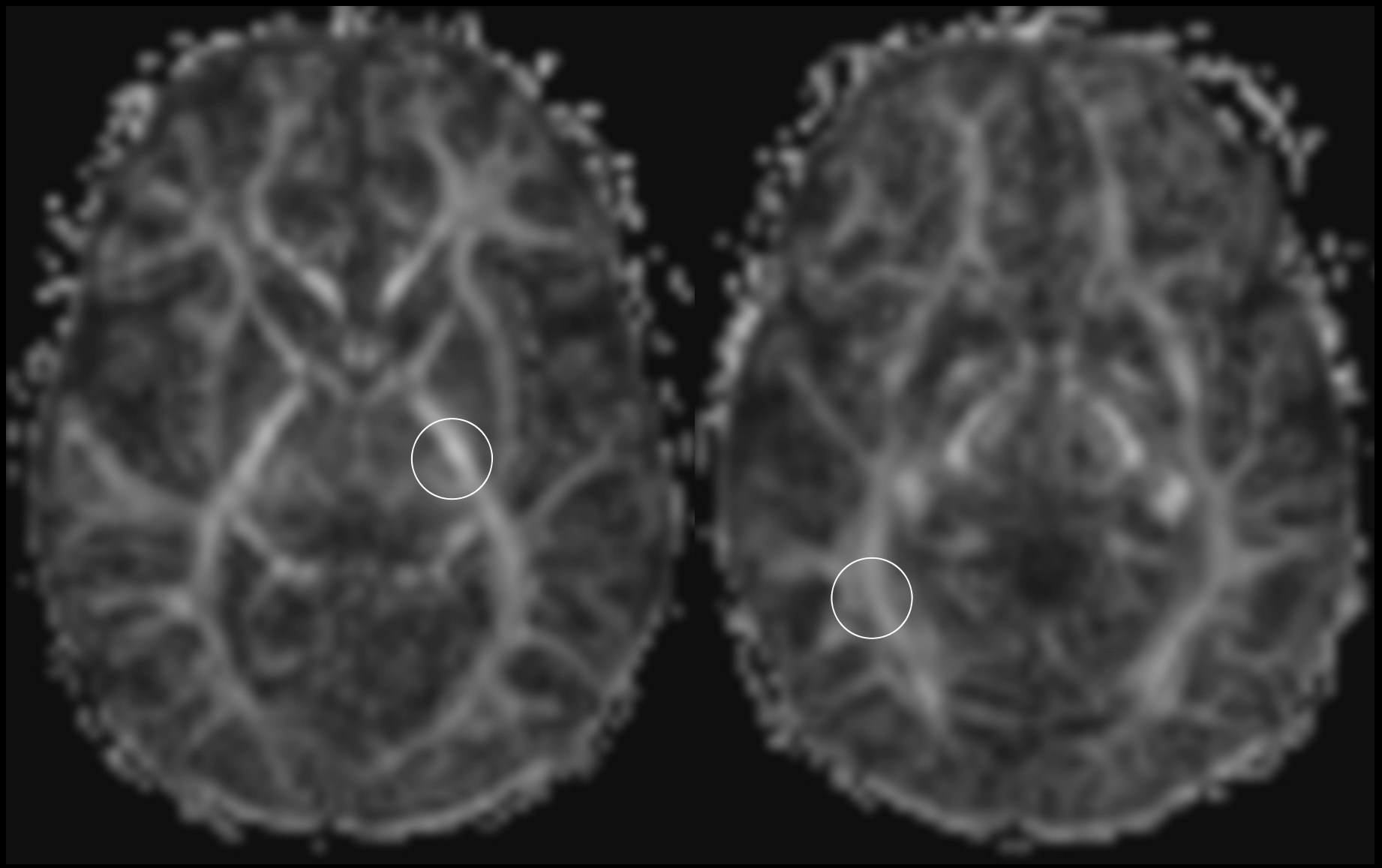
Optimal Timing of Cerebral MRI in Preterm Infants to Predict Long-Term Neurodevelopmental Outcome: A Systematic Review

A. Plaisier, P. Govaert, M.H. Lequin, and J. Dudink

AJNR Am J Neuroradiol 35:841– 47 May 2014

Table 1: Details of included serial MRI studies

MRI Modality		Population	Timing of MRI (wk)	Main Findings
Structural conventional	Dyet et al[8]	119 Infants <30 wks	Serial	Abnormal outcome[a] at 18 mos was related to major destructive lesions, DEHSI, cerebellar hemorrhage, and
DTI				PDI[b] at 24 mos correlated to FA of the PLIC at 30 wks ($r = 0.55$), faster increase of FA/wk in internal capsule ($r = -0.63$), and occipital WM ($r = -0.59$) FA of the optic radiation was correlated with visual-evoked-potential amplitude ($r = 0.7$) at 10.5 mos
	Glass et al[71]	9 Infants <34 wks	33 + 38	FA of the optic radiation was correlated with visual-evoked-potential amplitude ($r = 0.7$) at 10.5 mos
Volumetric	Dubois et al[81]	45 Infants <36 wks	32 + 41	Functional assessment at term was associated with inner cortical surface and sulcation index
	Kapellou et al[82] Rathbone et al[83]	119 Infants <30 wks	Serial	Growth of the cortical surface area was related to neurodevelopmental outcome[a] at 24 mos and full-scale IQ at 6 yrs



RM a las 40 sem EGC en RNPT $\leq$ 32 sem

Muchas gracias por su atención