



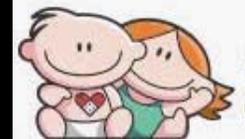
SAP

SOCIEDAD ARGENTINA DE PEDIATRÍA

4° Congreso Argentino de Neonatología

Neuroimágenes en neonatología “Selección de pacientes y Tiempo apropiado de estudio”

Juan Pablo PRINCICH, Neuroimágenes – Htl . De Pediatría Garrahan
Hospital El Cruce, Fcio. Varela.



Hospital de Pediatría
Garrahan

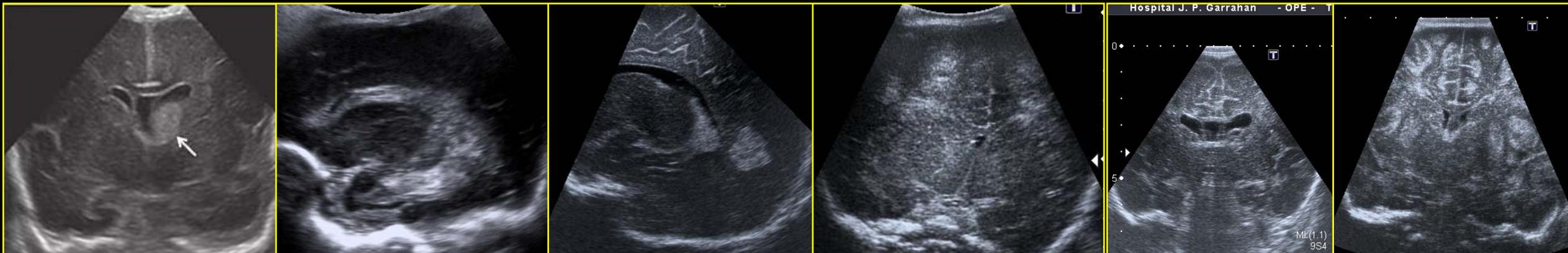
US

- Ampla Disponibilidad
- No requiere sedacion ni utiliza radiaciones ionizantes
- Portatil, rapida realizacion facil repeticion.
- Baja reproducibilidad entre observadores
- Cuestionable sensibilidad para detectar lesiones corticales
- Limitaciones en ventana acustica y diagnosticos diferenciales



Utilidad US

- EHI Pretermino y a termino
- Hemorragias de matriz germinal (Papile I-IV)
(seguimiento: Presencia de hidrocefalia y progreción conversión G3-4)
- Hidrocefalia
- Infecciones peri-neonatales.



RNPT-PAPILE I

RNPT-PAPILE II

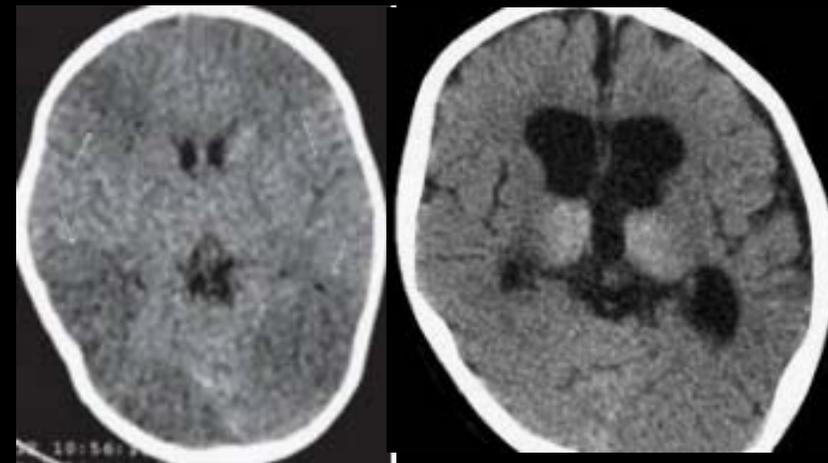
RN-Hemorragia IP

RNPT-LMP aguda

RNPT-LMP secular

RN- isquemia

TC



- Amplia Disponibilidad
- Requerimiento de sedación en pocos casos
- Pacientes inestables: mejor compatibilidad con equipo de soporte y monitoreo que RM
- Alta definición vascular en AngioTC arterial y Venosa c/ Contraste.
- Alta sensibilidad: TORCH , HIDROCEFALIA, EHI.

- Utiliza radiaciones ionizantes
- Baja sensibilidad para detectar lesiones isquémicas recientes o patología de sustancia blanca no isquémica (Enf Metabólicas)

RM

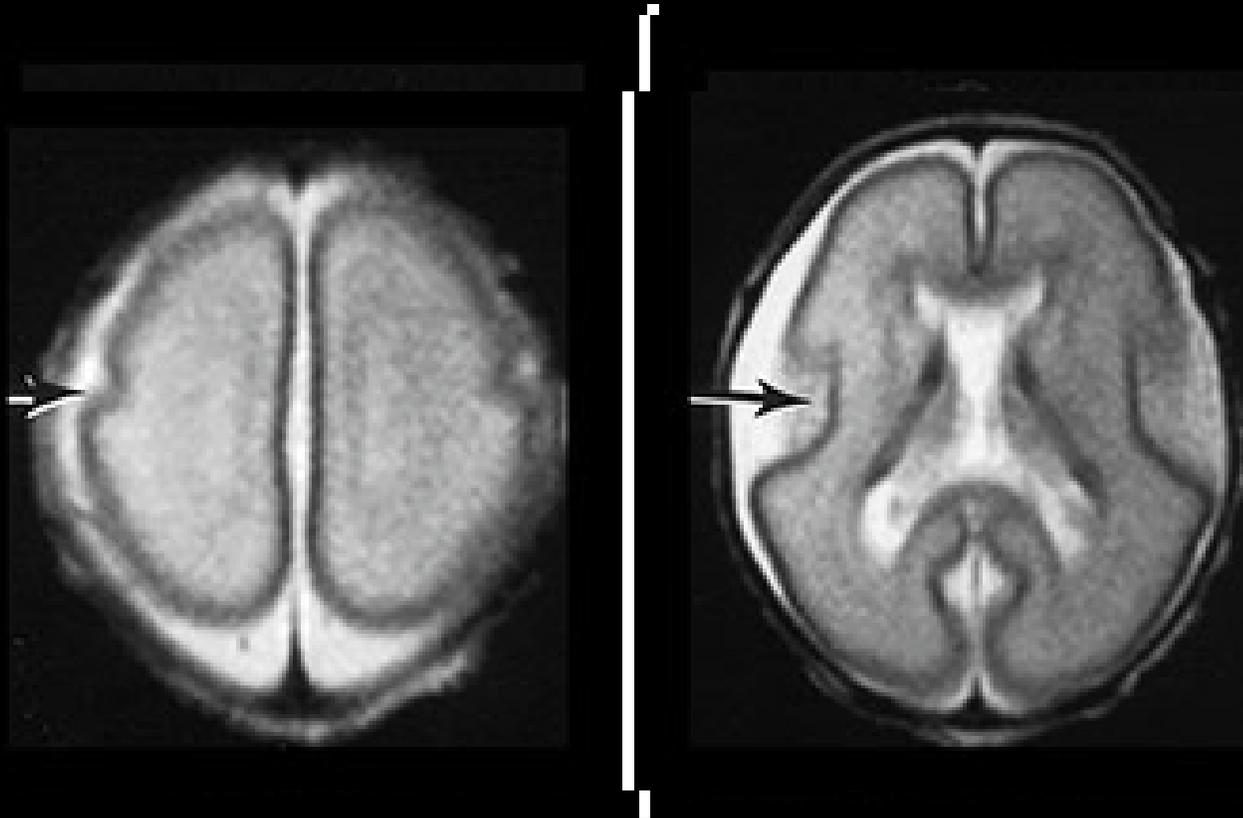


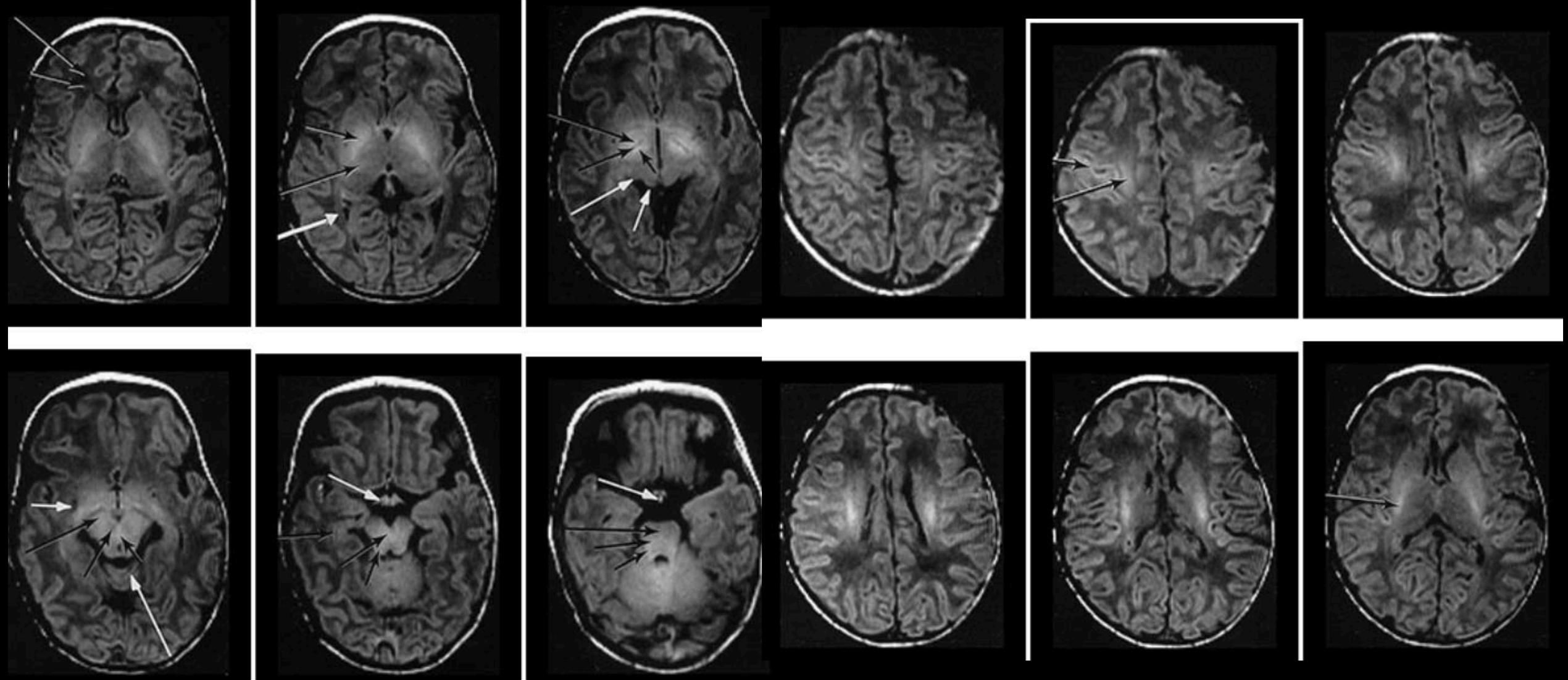
- No utiliza radiaciones ionizantes
- Alta sensibilidad: Lesiones isquémicas recientes (patrones) y gran especificidad en patología de sustancia blanca no isquémica (Enf Metabólicas)
- Técnicas Adicionales AngioRM, Espectroscopia, Imágenes funcionales como Difusión, dinámicas de LCR.
- Menor Disponibilidad
- Requerimiento de sedación Vs. Niño envuelto
- Pacientes inestables: Baja compatibilidad con equipo de soporte y monitoreo.
- Sensible a movimientos y artificios por valvulas, protesis etc.

ETAPA DE MAYOR SENSIBILIDAD Y HALLAZGOS PRINCIPALES en EHI

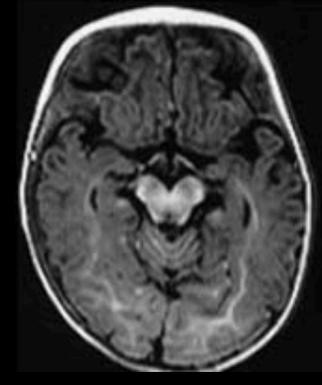
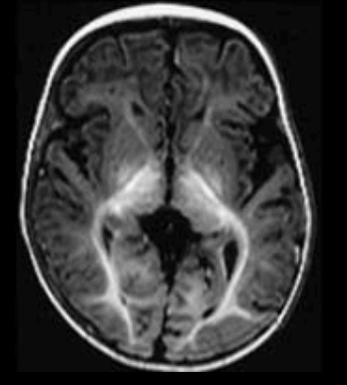
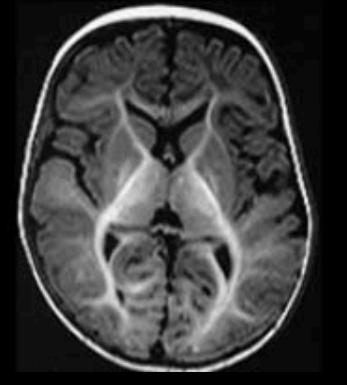
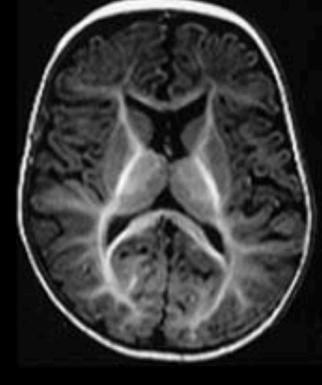
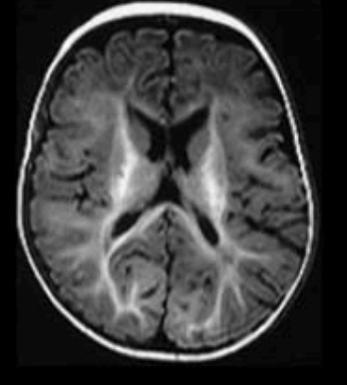
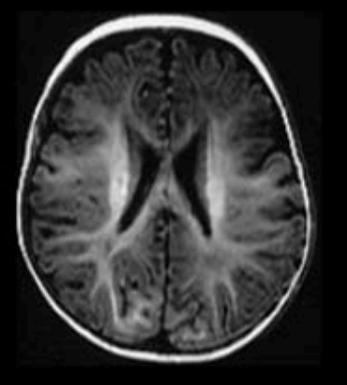
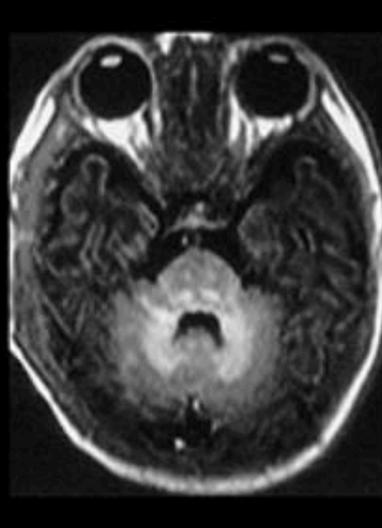
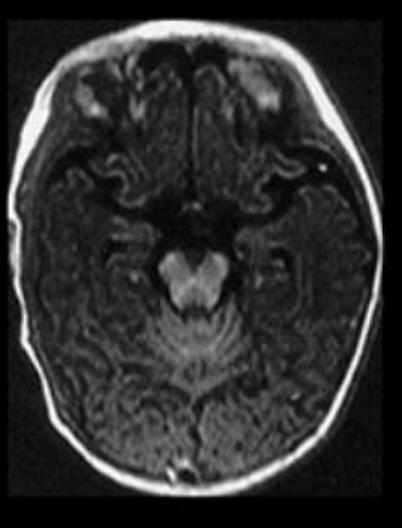
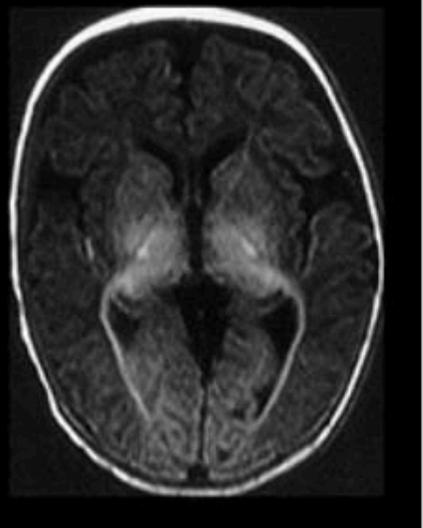
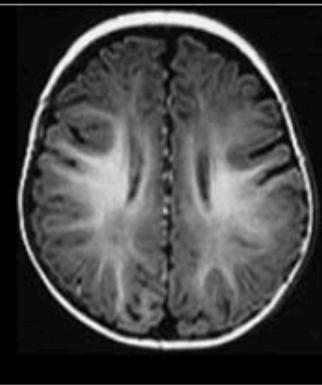
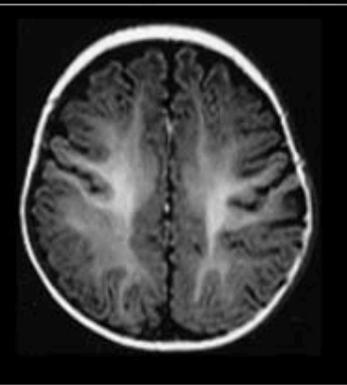
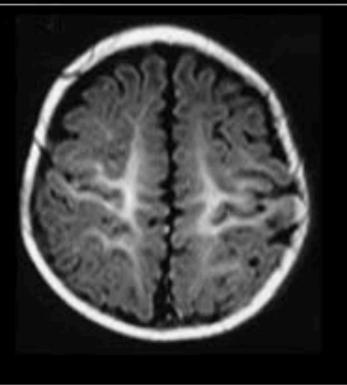
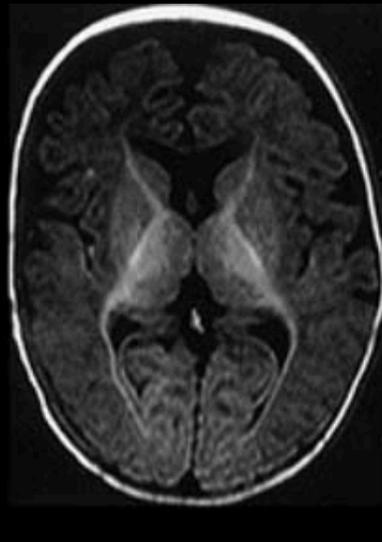
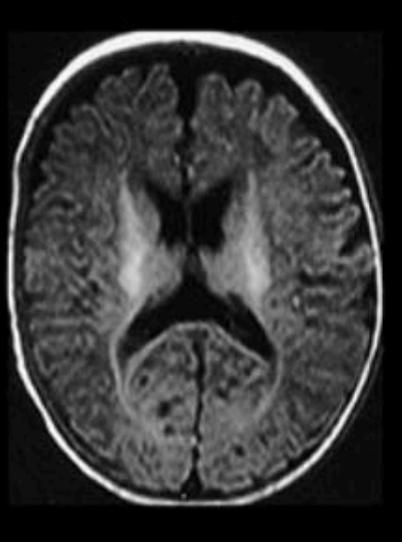
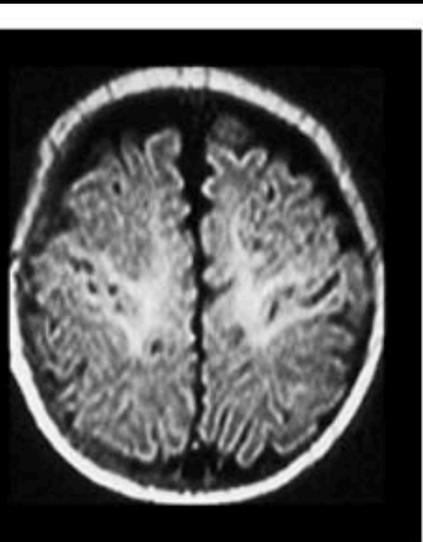
MODALIDAD	HALLAZGOS	TIEMPO
US	Aumento de la ecogenicidad	2-10 días
TC	Disminución de la densidad	1-7 días
RM •DWI •T1 •T2 •MRS	Restricción (hiperintenso) Hiperintenso Hipointenso-hiperintenso Rel Ac. Lac/Naa (mayor 0.25)	2-7 días 2-3 días a meses. 2-3 días a meses. 1er día

Evolución del cerebro en RM T2 desde 25 semanas a termino

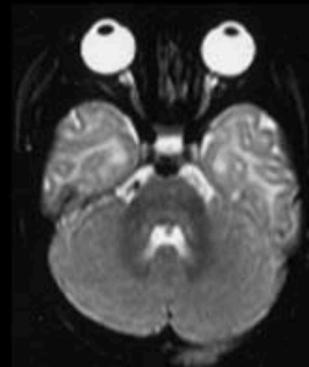
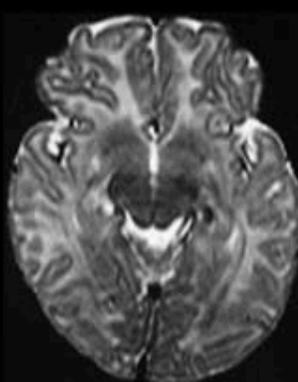
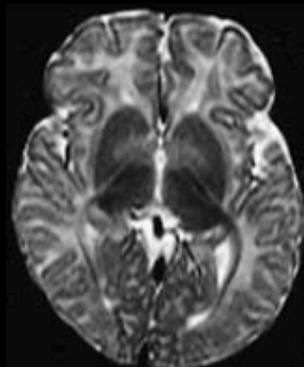
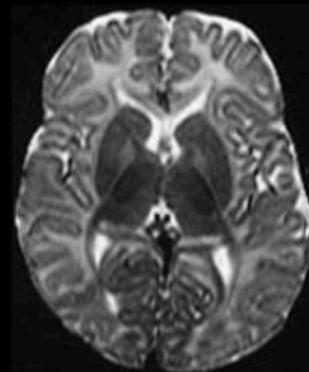
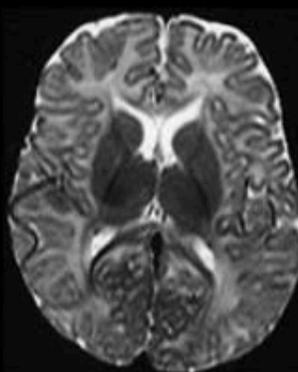
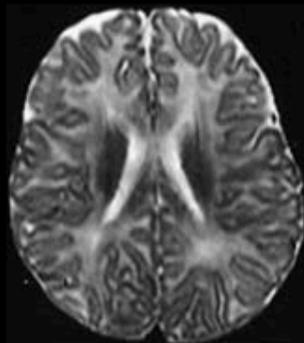
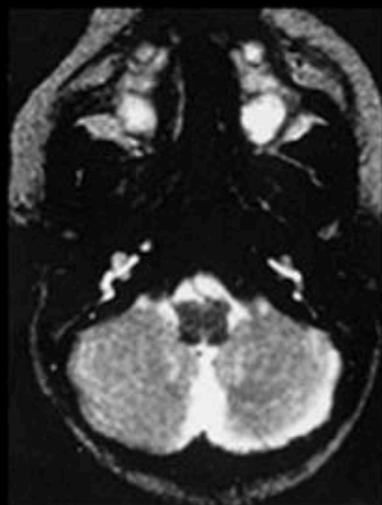
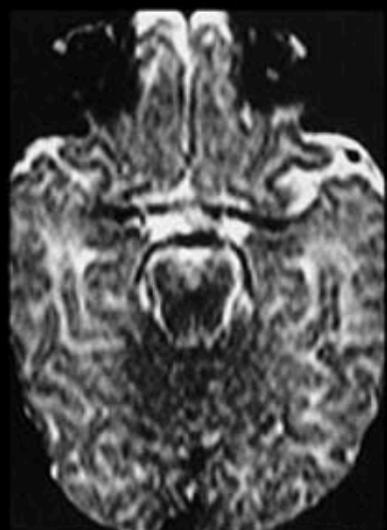
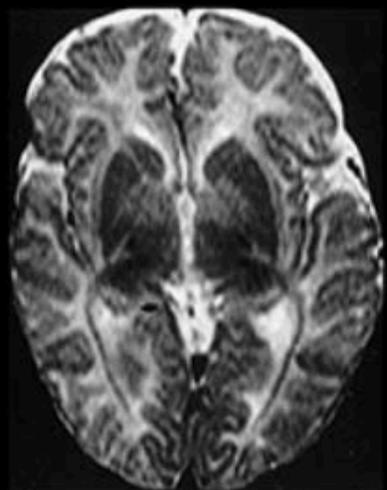
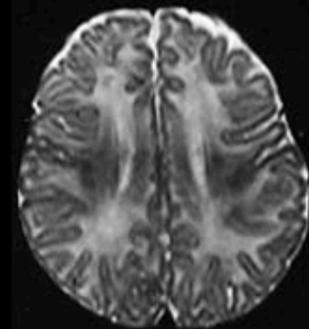
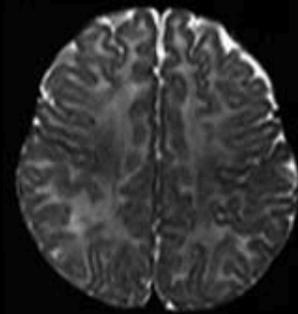
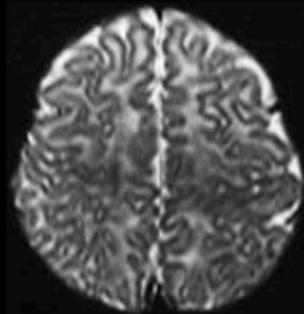
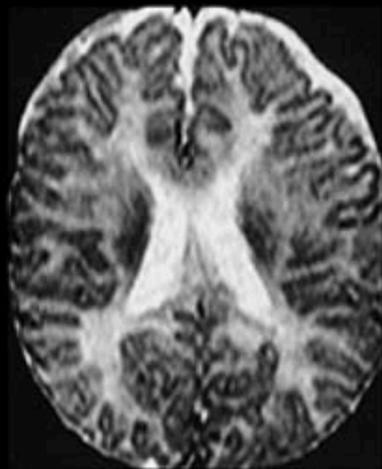
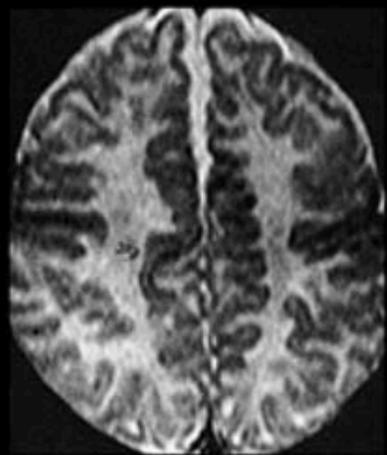
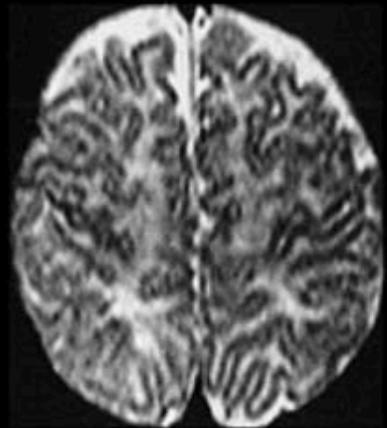




Recién Nacido a Termino – T1

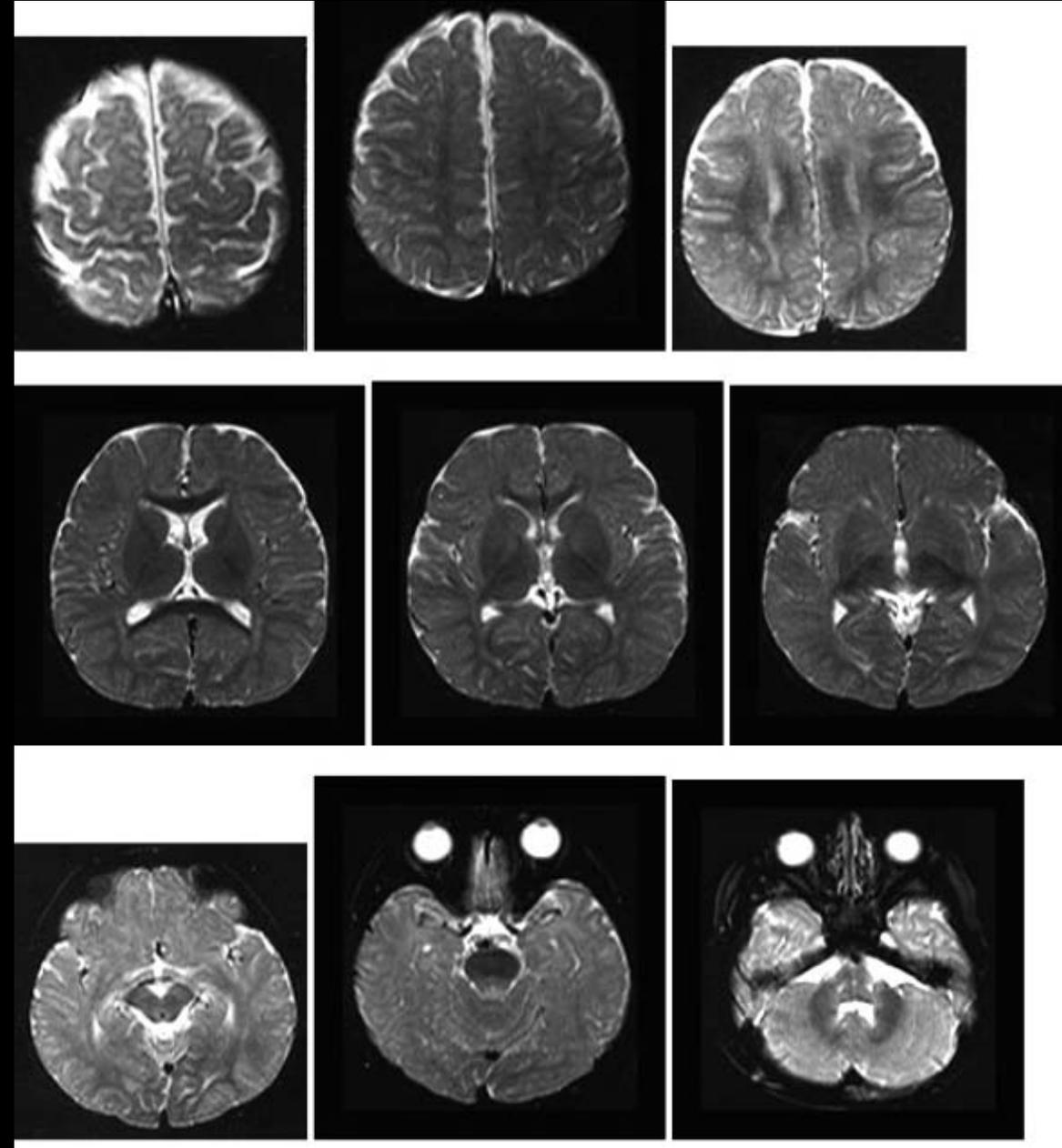
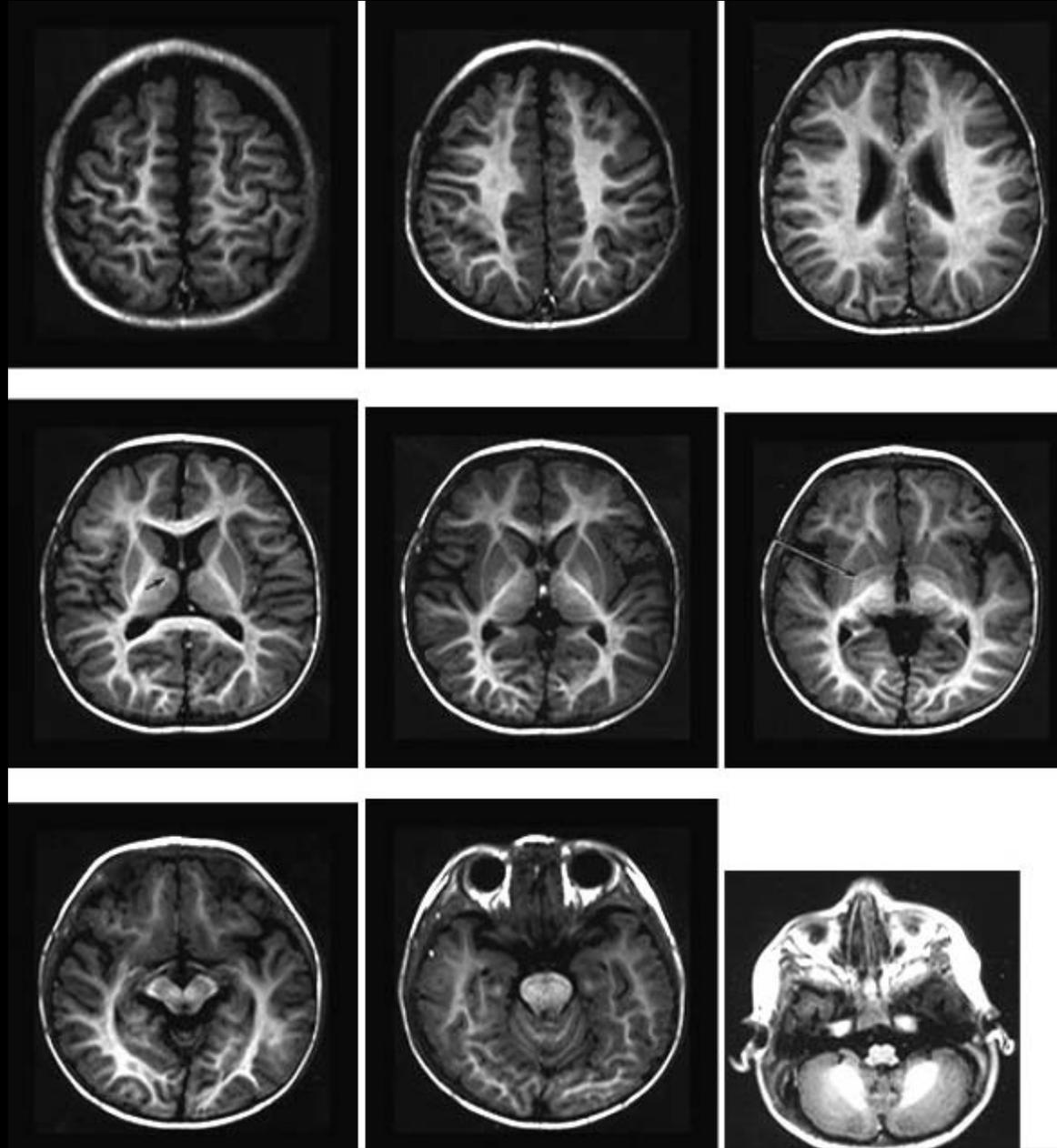


3 Meses – T1

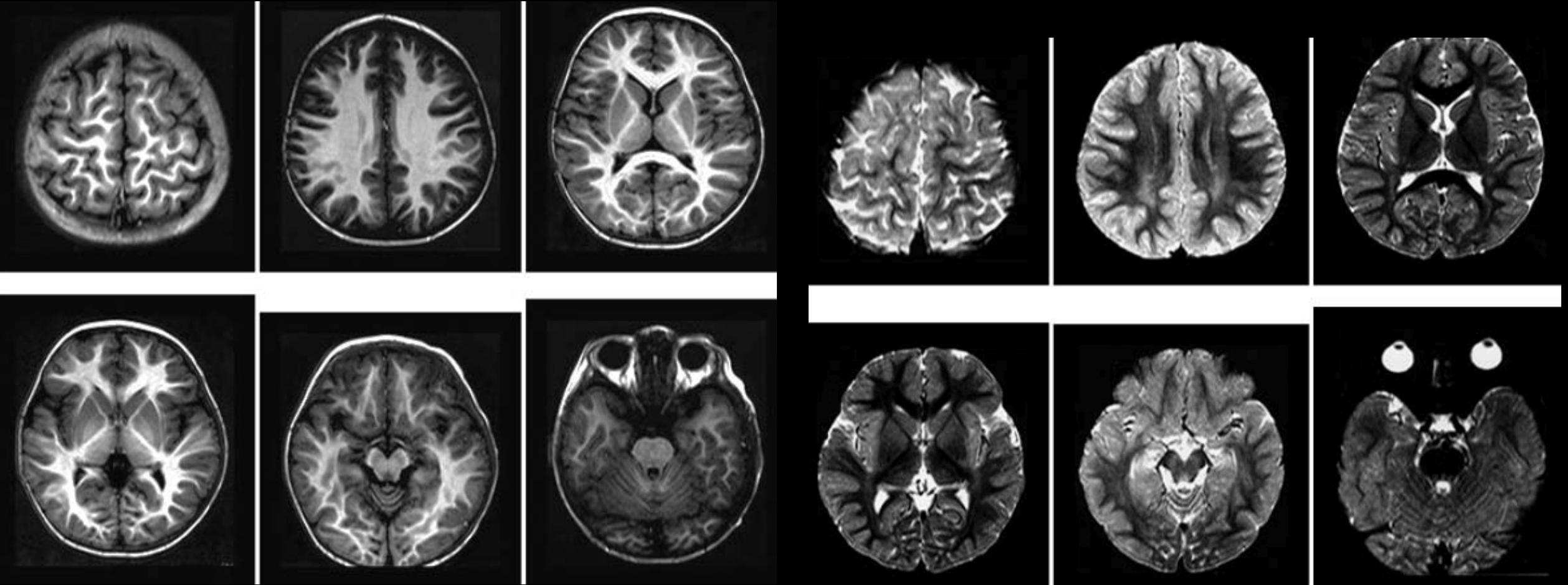


3 Meses - T2

1 año



2 años

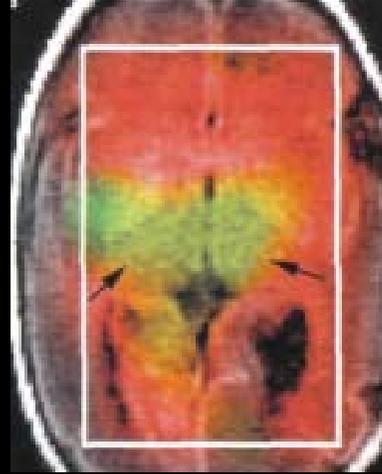
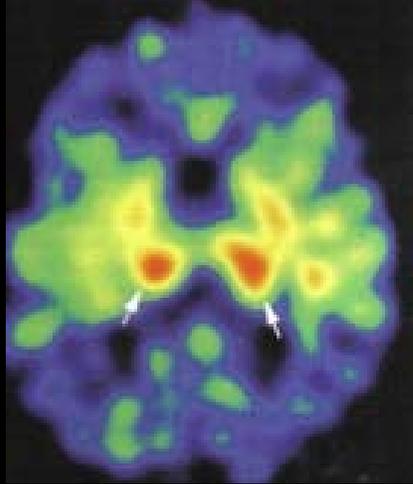


Aplicaciones de la RM

- Patrones en imágenes de injuria H-I
 - ✓ RN pretérmino
 - ✓ Hemorragia de la matriz germinal/intraventricular
 - ✓ Leucomalacia periventricular
 - ✓ Asfixia Severa (tronco-GB Difusa)
 - ✓ RN de término
 - ✓ Asfixia parcial prolongada (T.Limitrofes)
 - ✓ Asfixia severa (tronco-GB, Difusa)
- Diagnósticos diferenciales en RM

Vulnerabilidad selectiva: Demanda metabólica y Territorios vasculares limitrofes

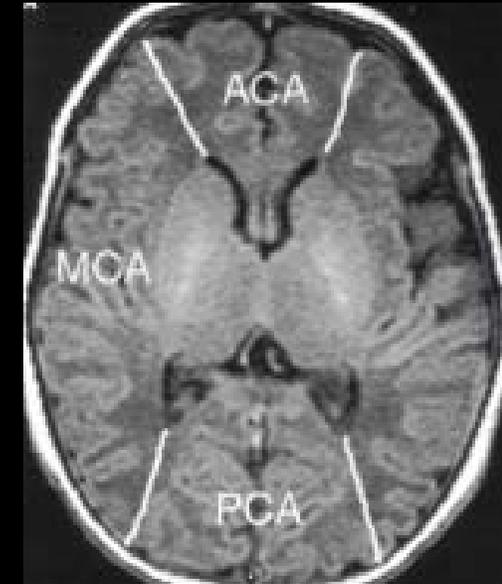
RN



MRS



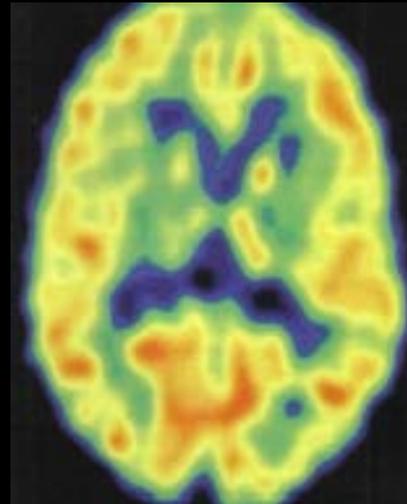
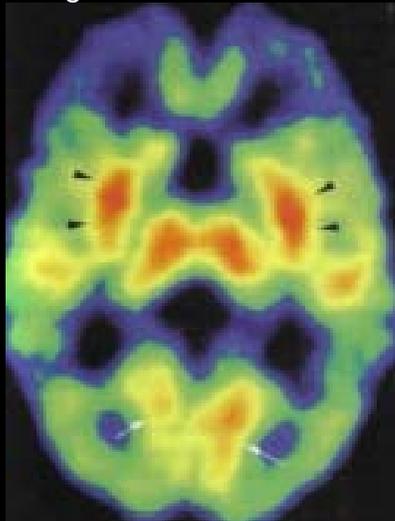
**NACIDO
PRETÉRMINO**
Patrón de Flujo
ventrículo-petal
(Vulnerabilidad
Periventricular)



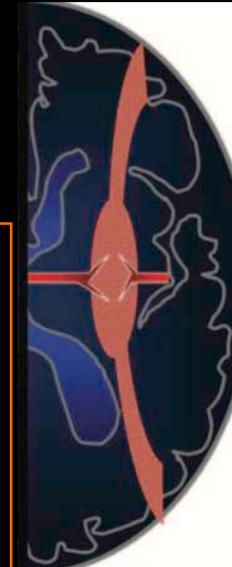
Las zonas más maduras y metabólicamente activas son las que tienen:

- Mielinización más avanzada
- Composición química más compleja
- Mayor perfusión
- Mayor consumo de glucosa

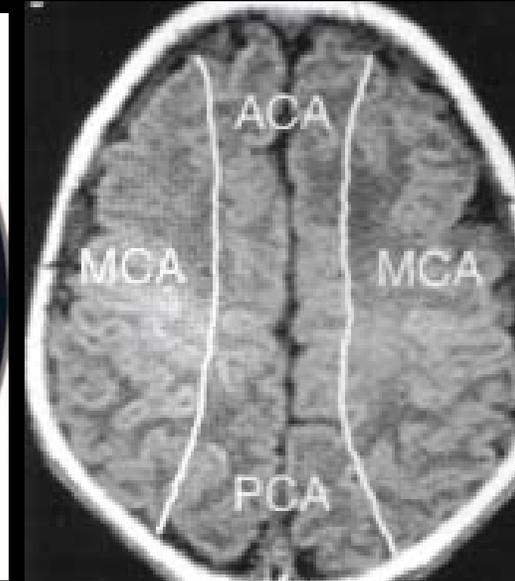
3 m



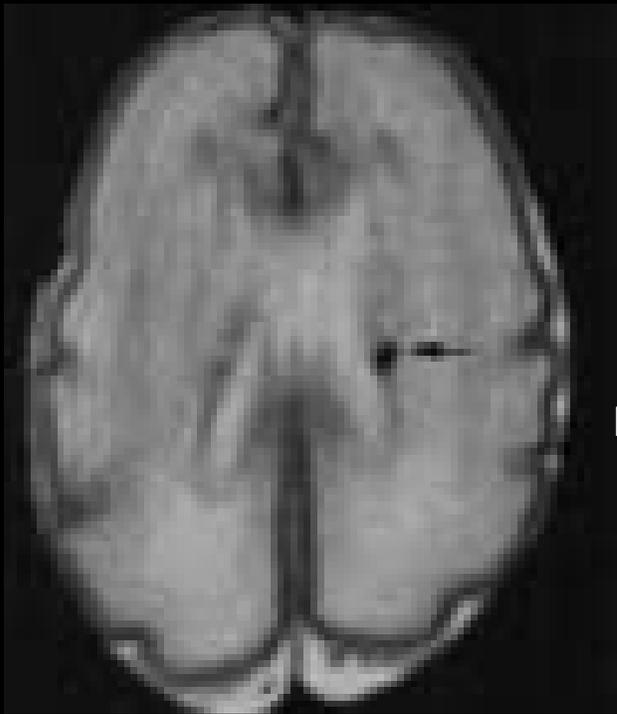
PET
FDG



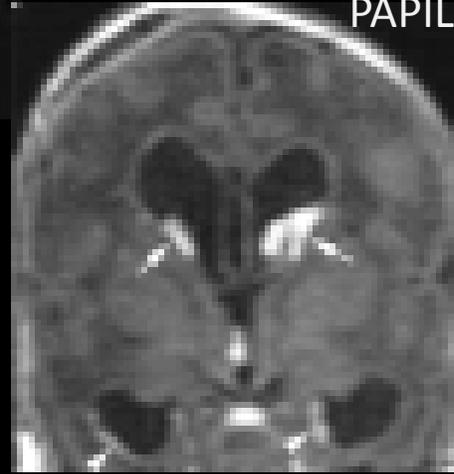
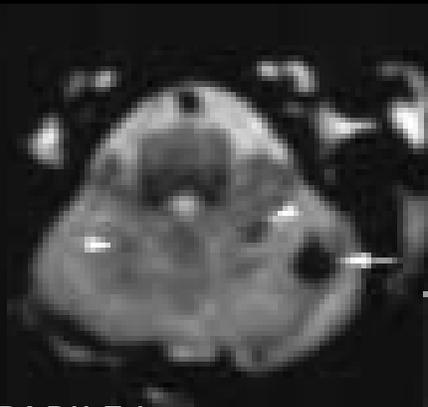
**NACIDO A
TÉRMINO**
Patrón de Flujo
ventrículo-fugal
(Vulnerabilidad
T. Limitrofes)



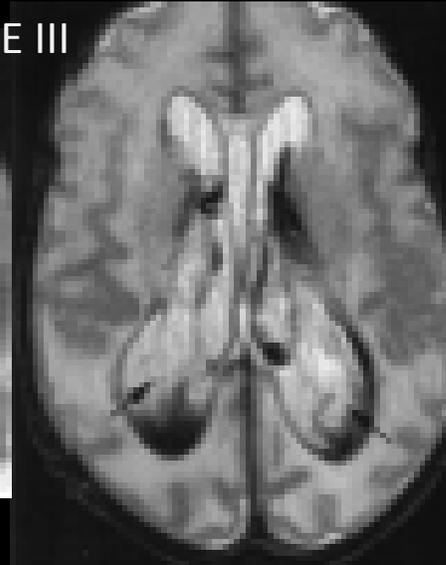
Patrones en el RN pretérmino



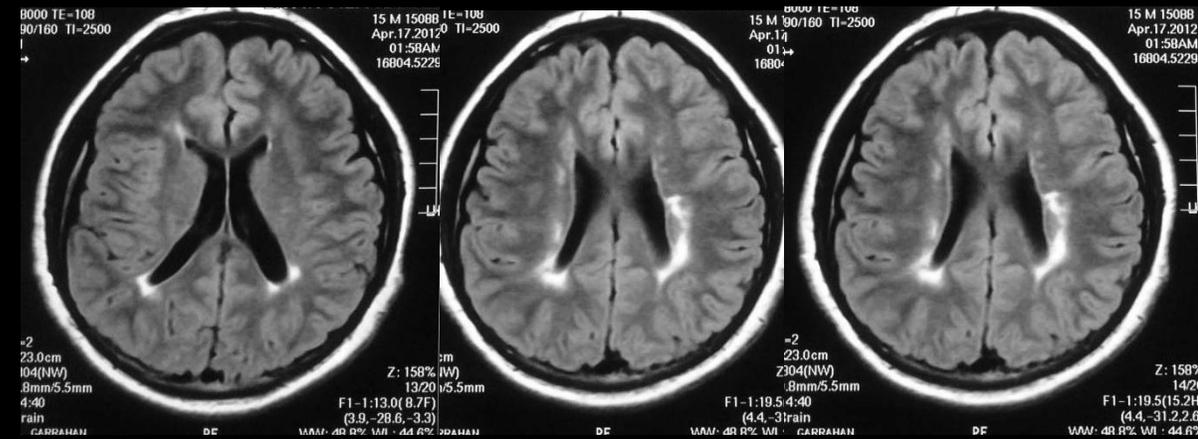
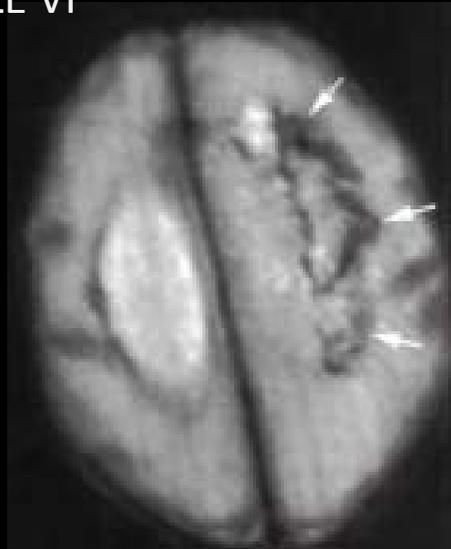
PAPILE I



PAPILE III



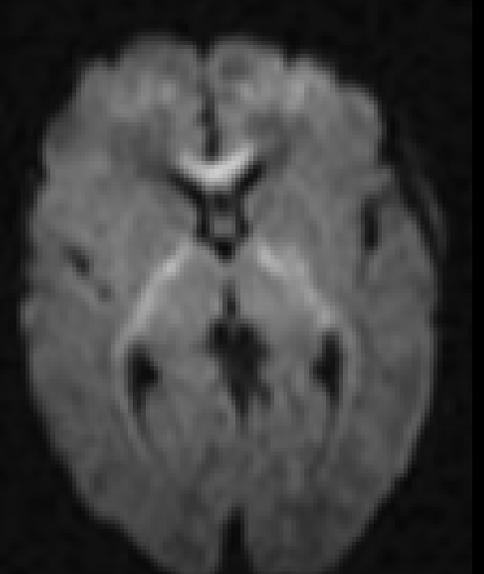
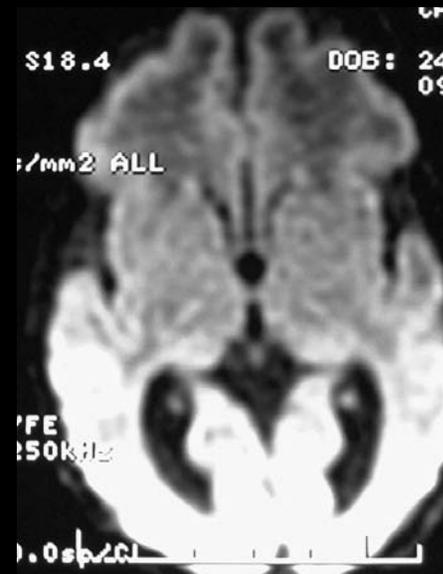
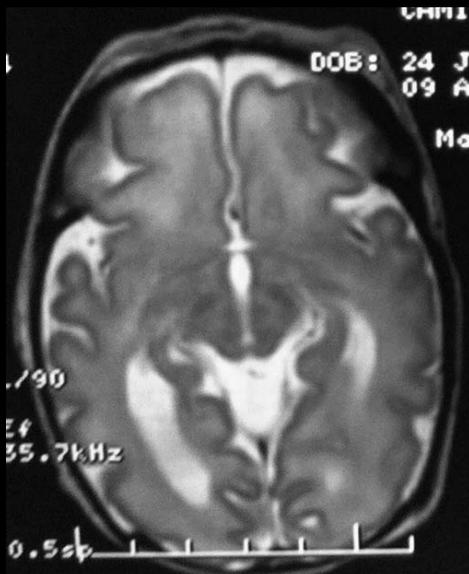
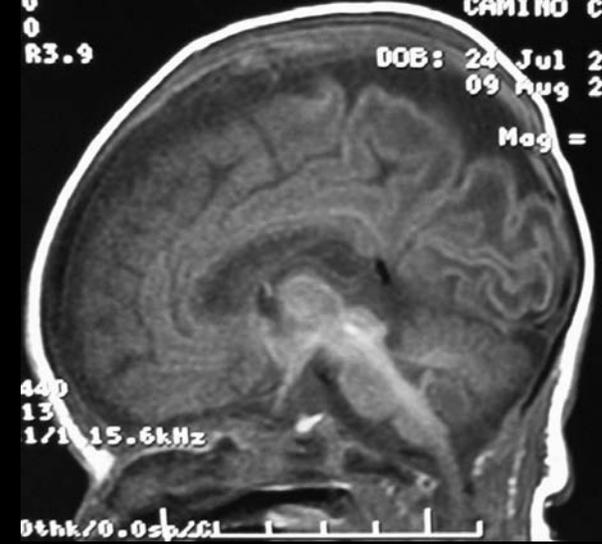
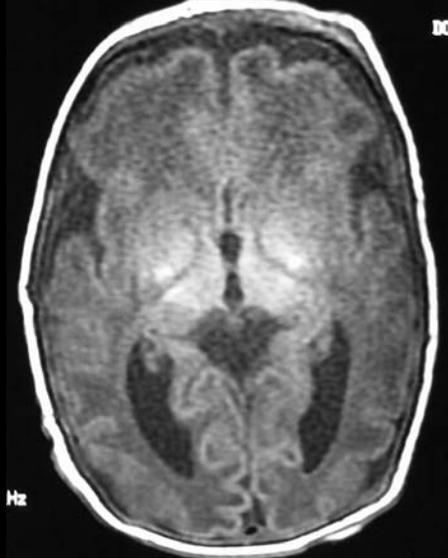
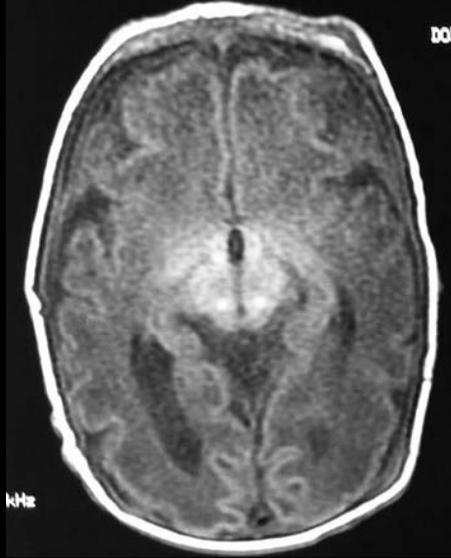
PAPILE VI



LEUCOMALACIA PERIVENTRICULAR (secular)

Asfixia profunda

Patrón nucleos basales y tronco

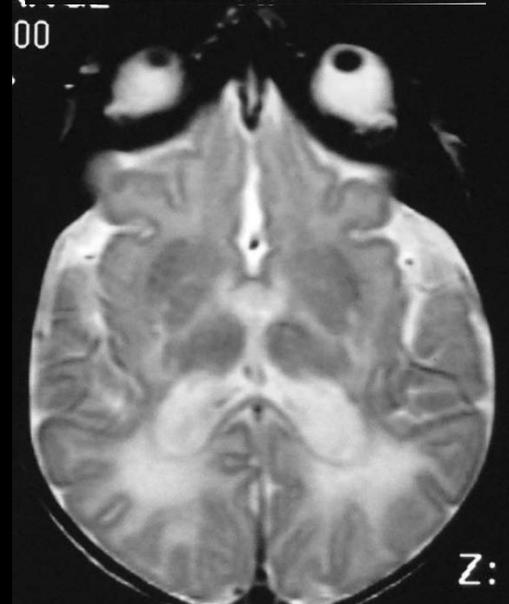
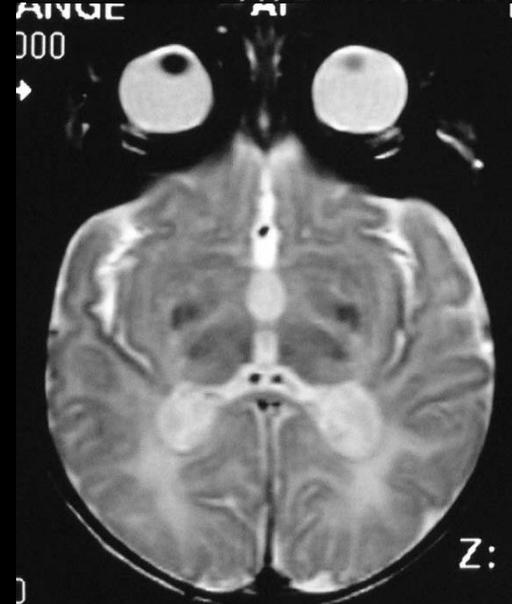
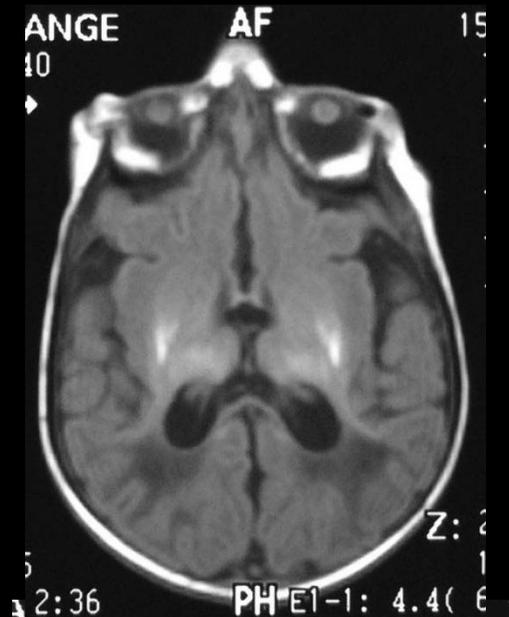
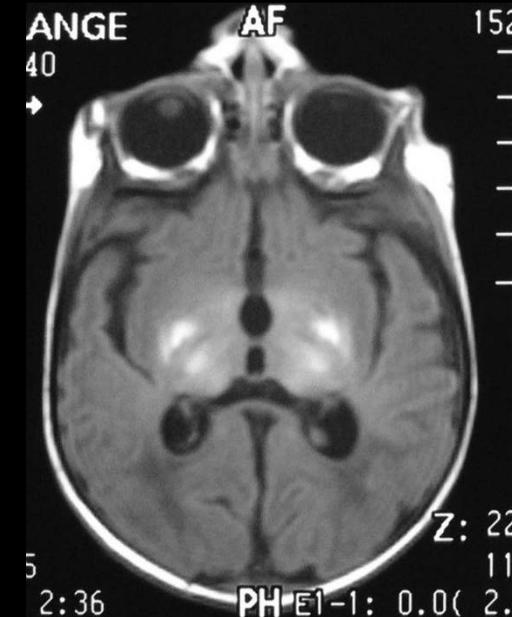


Patrón de asfixia parcial prolongada - RN Termino



Lesión en territorios limítrofes con daño excitotóxico propagado al CC

Patrón de asfixia severa – RN Termino



**Lesiones núcleos basales,
tálamos y corteza pericentral**

A prospective, longitudinal diffusion tensor imaging study of brain injury in newborns

R.C. McKinstry, MD, PhD; J.H. Miller, MD; A.Z. Snyder, MD, PhD; A. Mathur, MD; G.L. Schefft, RN; C.R. Almli, PhD; J.S. Shimony, MD, PhD; S.I. Shiran, MD; and J.J. Neil, MD, PhD

Neurology 2002

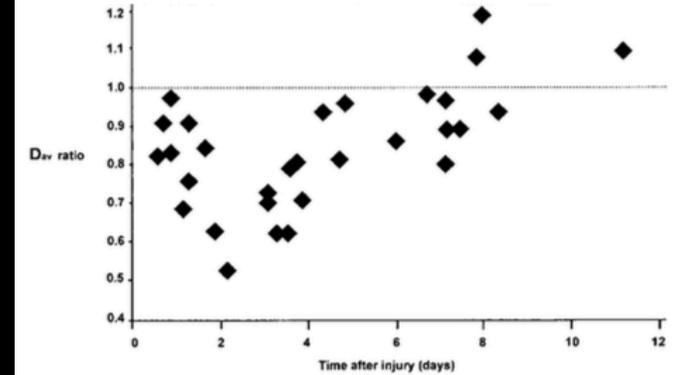
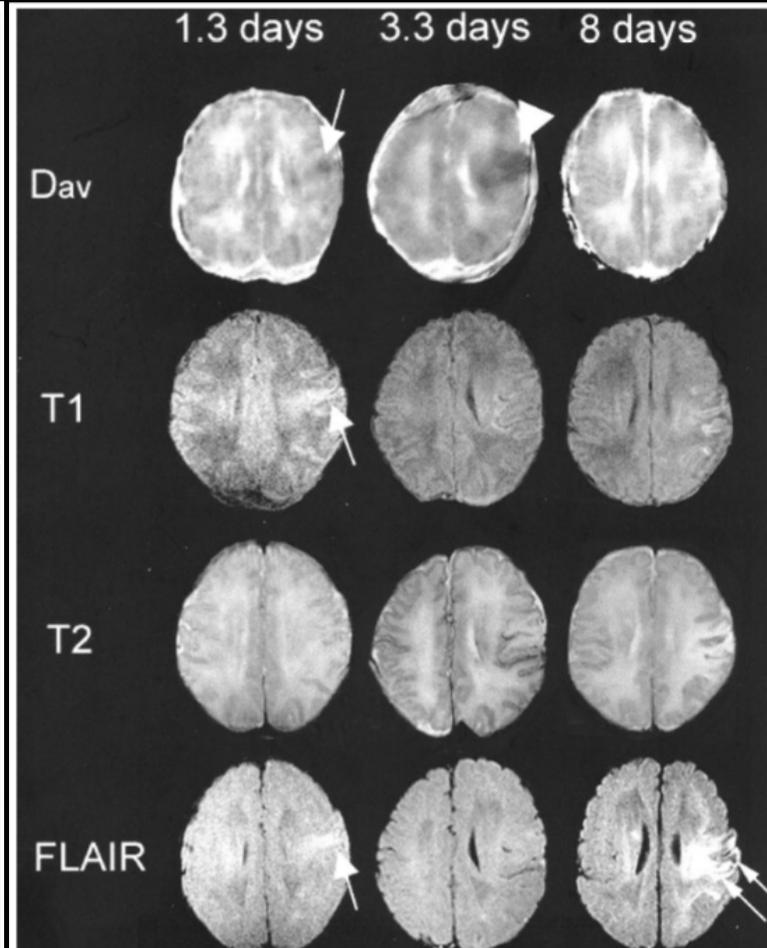
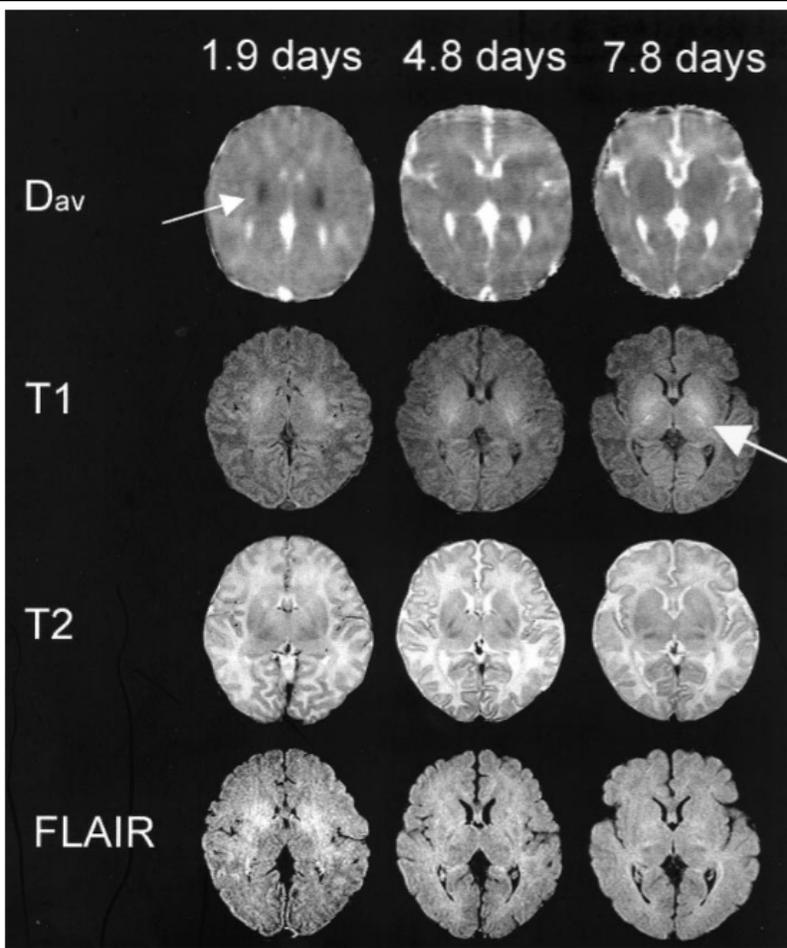
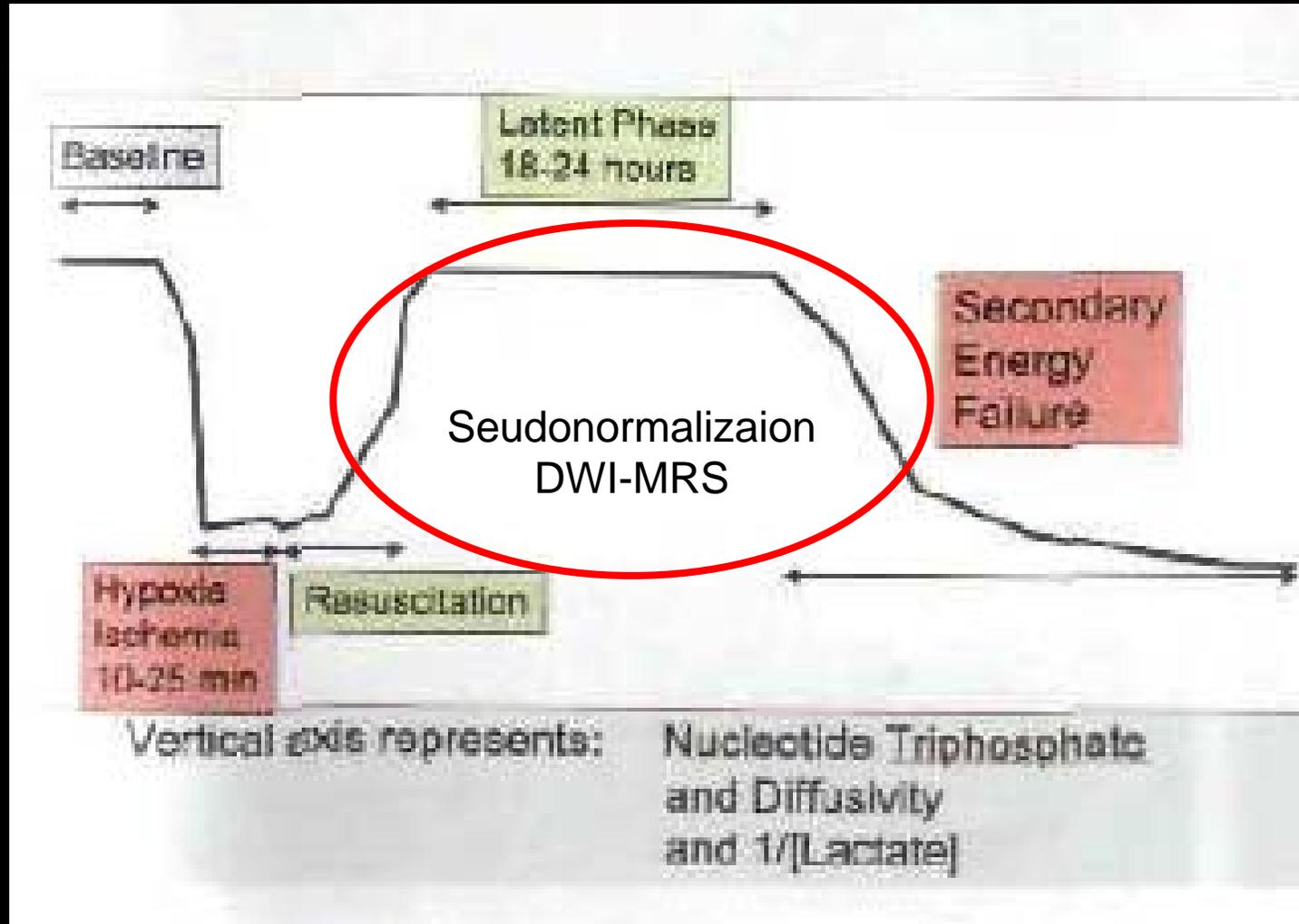


Figure 1. Time course of the diffusion abnormality following perinatal brain injury in newborn infants. D_{av} has been normalized to reference values for newborn infants (D_{av} ratio). The maximum reduction in D_{av} ratio of approximately 35% occurs between days 2 and 3. Pseudonormalization is noted after the seventh day.

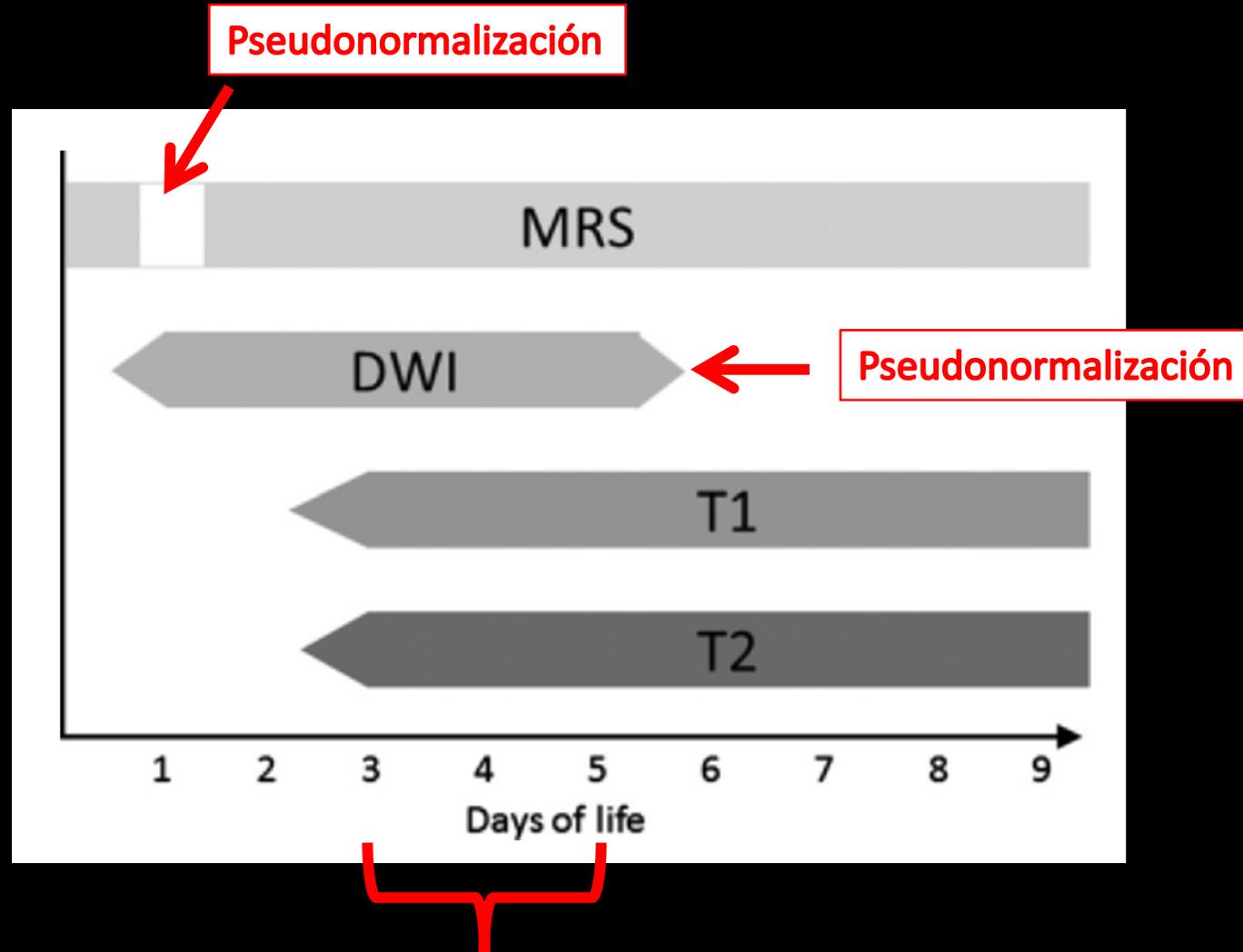


Períodos ciegos de la difusión Insuficiencia energética secundaria



Se postula que resulta del daño estructural en moléculas intracelulares importantes para el metabolismo, especialmente reservas de fosfatos de alta energía,. Estos daños se acumulan en el período de recuperación temprana hasta llegar a deteriorar el metabolismo celular.

TIEMPOS ÓPTIMOS PARA REALIZAR CADA TÉCNICA DE RM



Momento óptimo para valorar EHI reciente mediante RM



ELSEVIER

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Clinical Radiology

journal homepage: www.clinicalradiologyonline.net



Early MRI in term infants with perinatal hypoxic–ischaemic brain injury: Interobserver agreement and MRI predictors of outcome at 2 years

S.K. Goergen^{a,b,*}, H. Ang^{c,d}, F. Wong^{c,e}, E.A. Carse^c, M. Charlton^{c,e,f},
R. Evans^a, G. Whiteley^a, J. Clark^a, D. Shipp^a, D. Jolley^g, E. Paul^g,
J.L.Y. Cheong^{h,i,j}

^a Department of Diagnostic Imaging, Monash Health, Clayton, Victoria, Australia

^b Southern Clinical School, Monash University, Clayton, Victoria, Australia

^c Monash Children's and Monash Newborn, Clayton, Victoria, Australia

^d Department of Pediatrics, Chinese General Hospital and Medical Center, Manila, Phillipines

^e Department of Paediatrics, Monash University, Clayton, Victoria, Australia

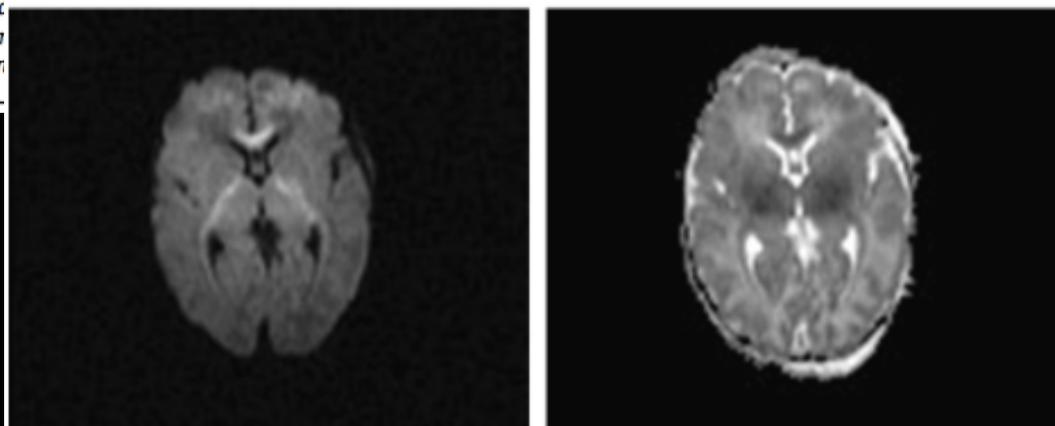
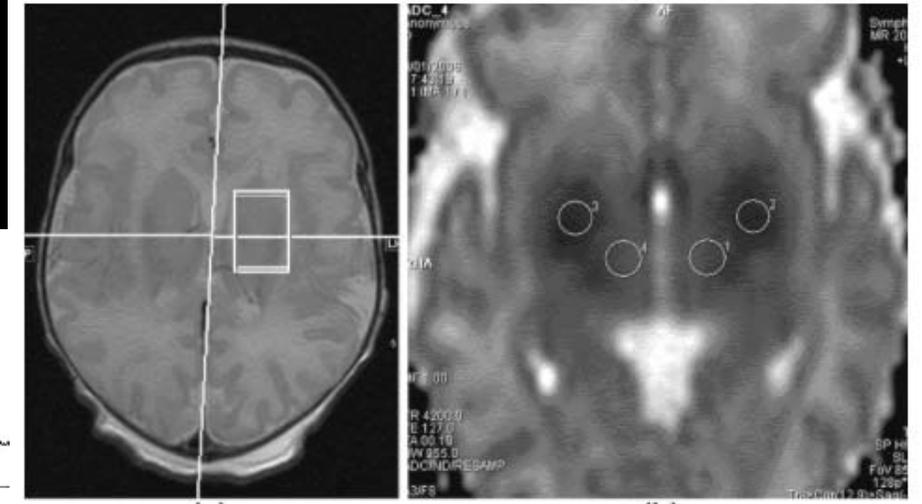
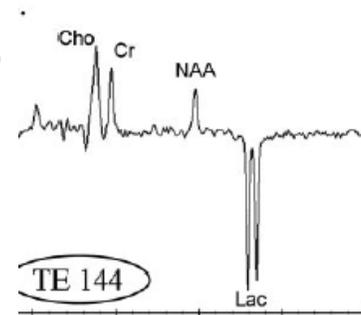
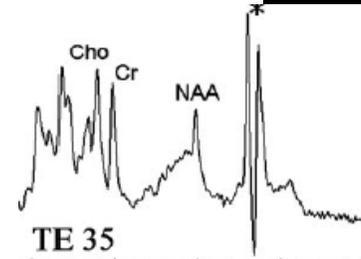
^f Department of Developmental Medicine, Royal Children's Hospital, Parkville, Victoria, Australia

^g School of Public Health and Preventative Medicine, Monash University, Prahran, Victoria, Australia

^h Neonatology

ⁱ Victorian

^j Department



A significant association was found between outcome and Lac:NAA ($p < 0.003$) and DWI scores for lentiform nucleus, thalamus, cortex, posterior limb of the internal capsule (PLIC), and para-central white matter ($p = 0.001$ to 0.013)

A validated clinical MRI injury scoring system in neonatal hypoxic-ischemic encephalopathy

Shamik B. Trivedi,^{✉1} Zachary A. Vesoulis,¹ Rakesh Rao,¹ Steve M. Liao,¹ Joshua S. Shimony,² Robert C. McKinstry,² and Amit M. Mathur¹

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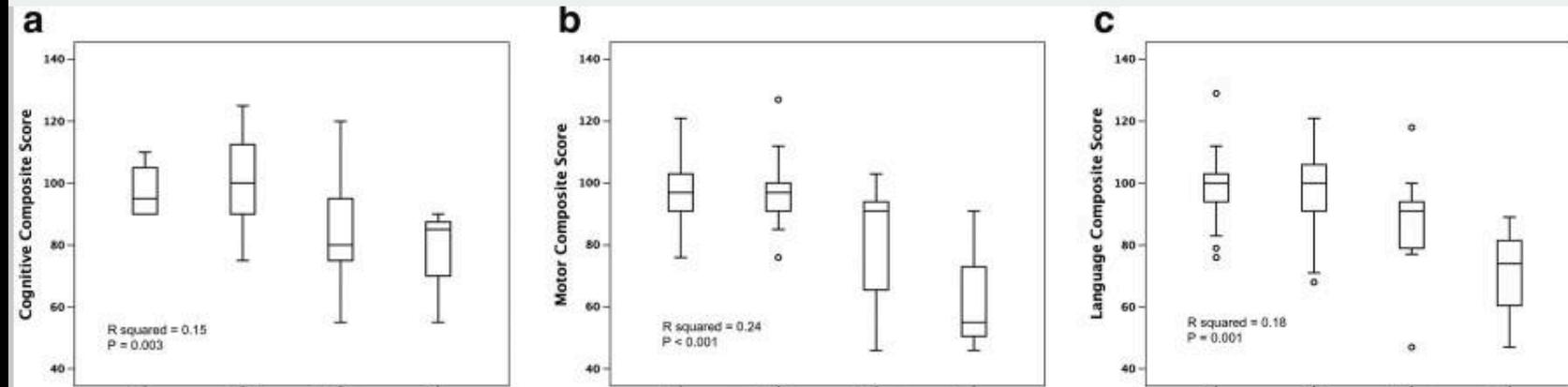
²Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO, USA

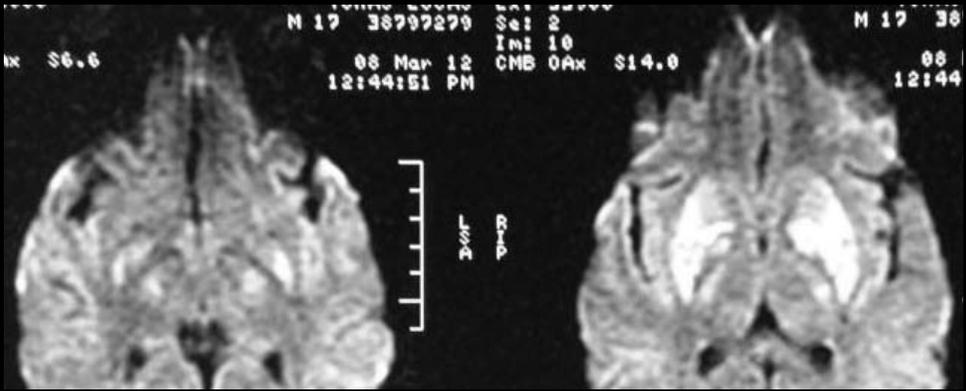
[✉]Corresponding author.

Signal abnormality was scored on *T1-weighted, T2-weighted and DWI* sequences and assessed using an established system in five regions: (a) subcortical: caudate nucleus, globus pallidus and putamen, thalamus and the posterior limb of the internal capsule; (b) white matter; (c) cortex, (d) cerebellum and (e) brainstem.

n(19)

Drag image to reposition. Double click to magnify further.



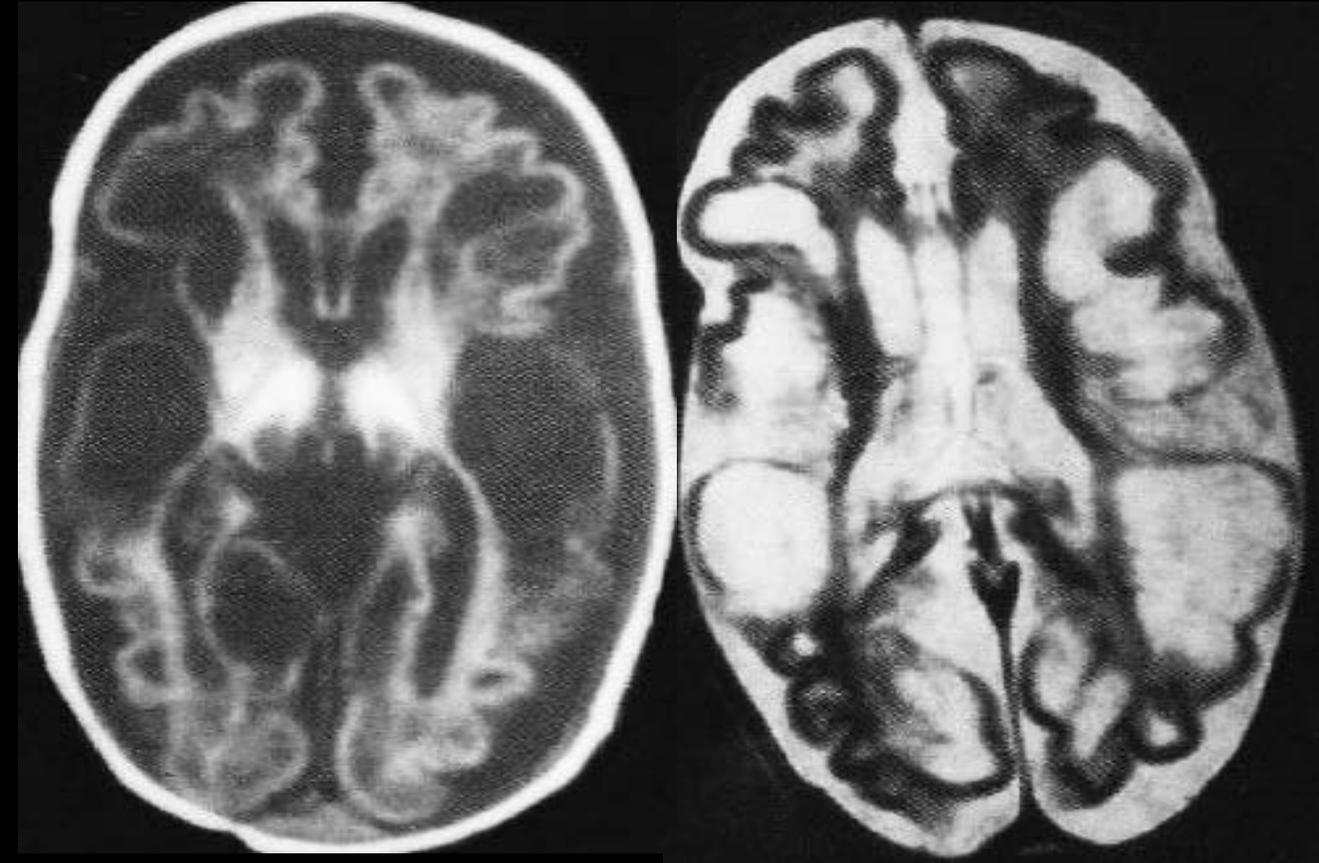


The American College of
Obstetricians and Gynecologists
WOMEN'S HEALTH CARE PHYSICIANS

2014

Neonatal Encephalopathy and Neurologic Outcome, Second Edition

*Report of the American College of Obstetricians and Gynecologists'
Task Force on Neonatal Encephalopathy*

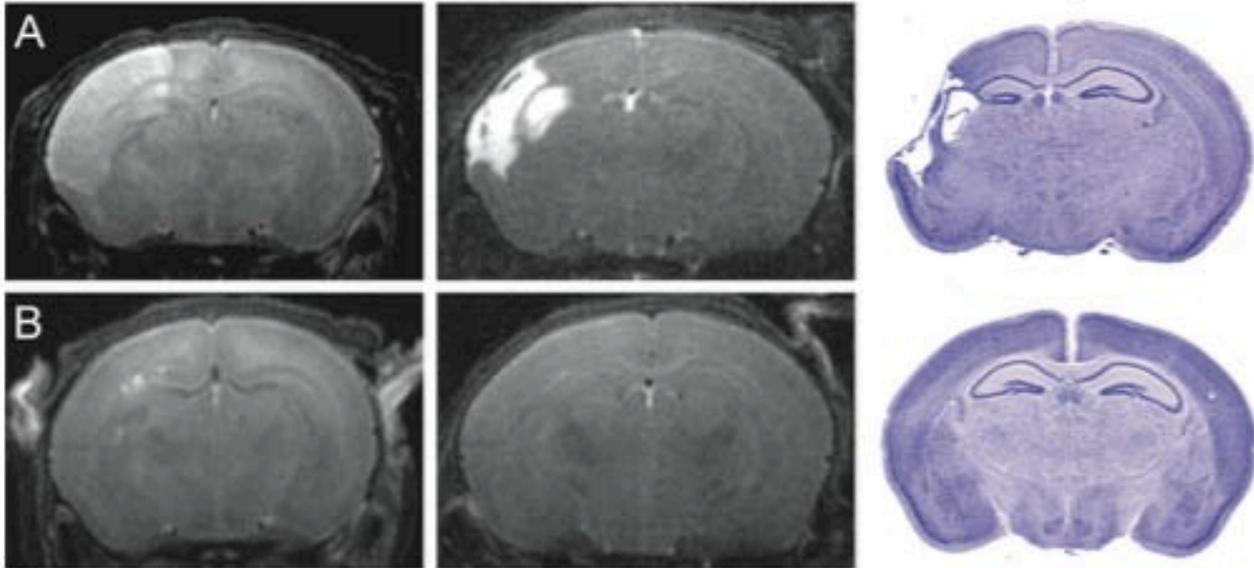


Las neuroimágenes adquiridas después de una semana (7d - 3 meses) proveen una estimación certera sobre la naturaleza y la severidad de la injuria con buena correlación en relación con el neuro-desarrollo.

Las imágenes (DWI) obtenidas entre las 24-96 hs pueden subestimar la extensión final de las anomalías pero son mas apropiadas para definir el momento de la injuria.



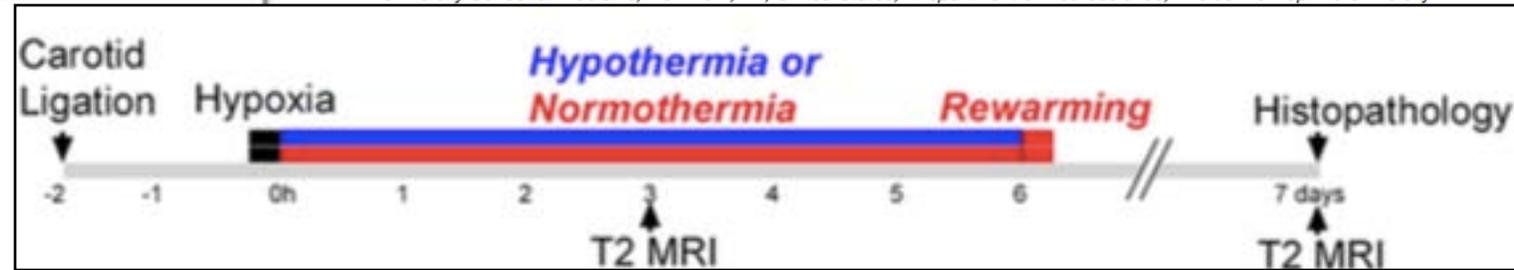
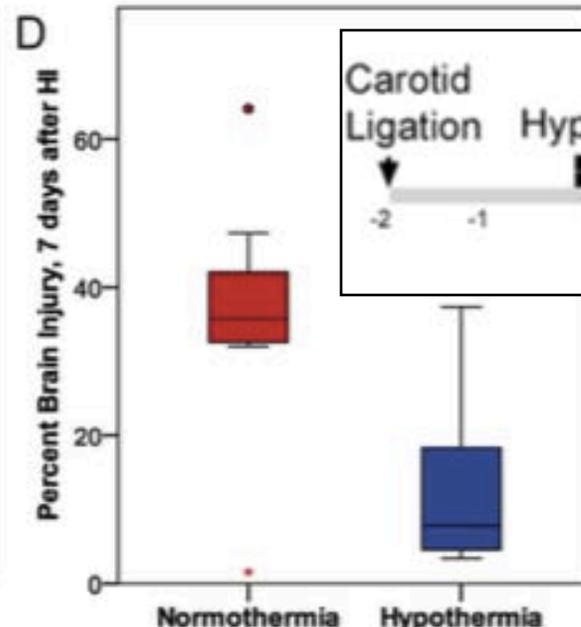
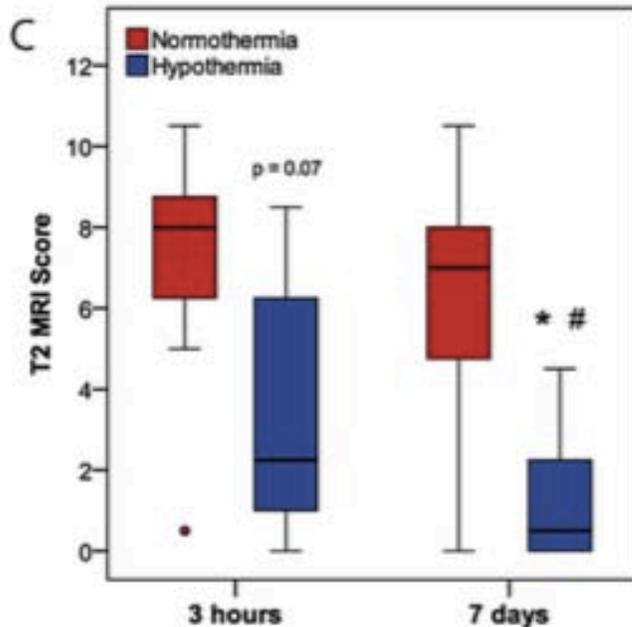
T2 MRI: 3h after HI T2 MRI: 7 days after HI Nissl: 7 days after HI



Early Detection of Hypothermic Neuroprotection Using T2-Weighted Magnetic Resonance Imaging in a Mouse Model of Hypoxic Ischemic Encephalopathy

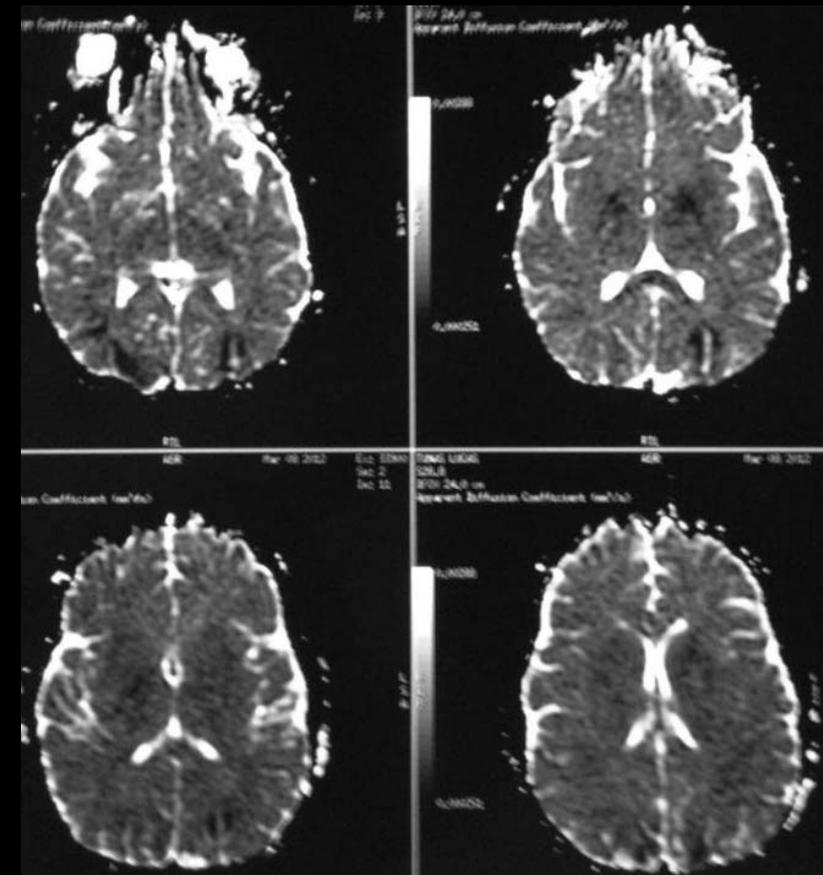
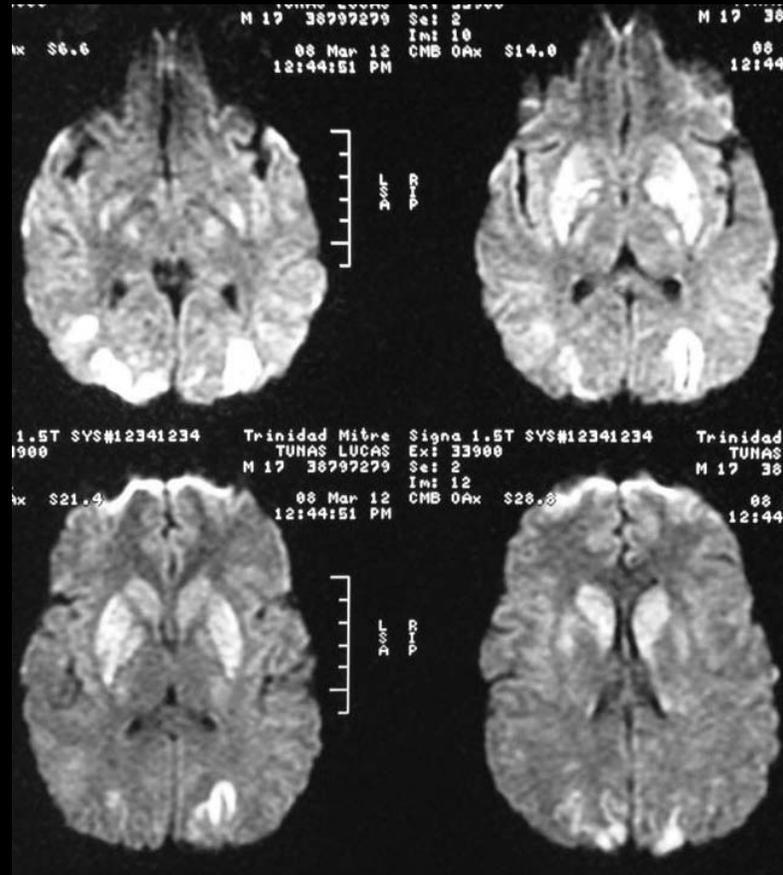
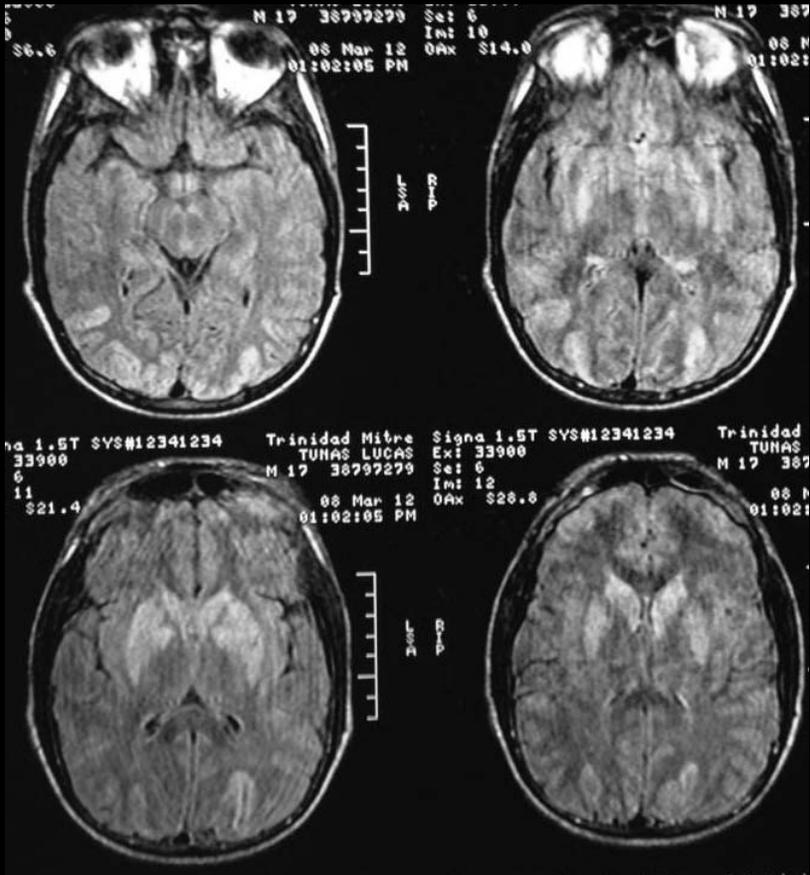
Sydney E. Doman^{1†}, Akanksha Girish^{1†}, Christina L. Nemeth¹, Gabrielle T. Drummond¹, Patrice Carr¹, Maxine S. Garcia¹, Michael V. Johnston^{1,2}, Sujatha Kannan^{1,3}, Ali Fatemi^{1,2}, Jianguang Zhang⁴ and Mary Ann Wilson^{1,2,5*}

¹Hugo W. Moser Research Institute at Kennedy Krieger, Baltimore, MD, United States, ²Department of Neurology, The Johns Hopkins University School of Medicine, Baltimore, MD, United States, ³Anesthesiology and Critical Care Medicine, The Johns Hopkins University School of Medicine, Baltimore, MD, United States, ⁴Department of Radiology, New York University School of Medicine, New York, NY, United States, ⁵Department of Neuroscience, The Johns Hopkins University



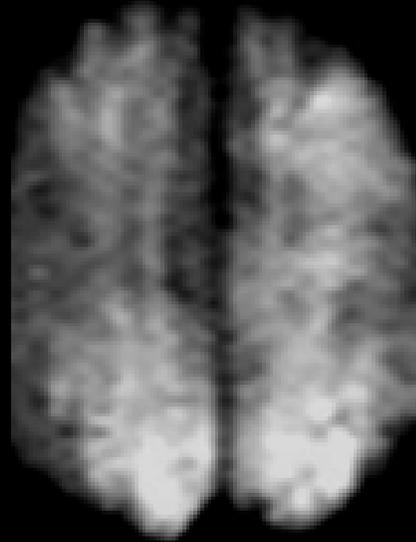
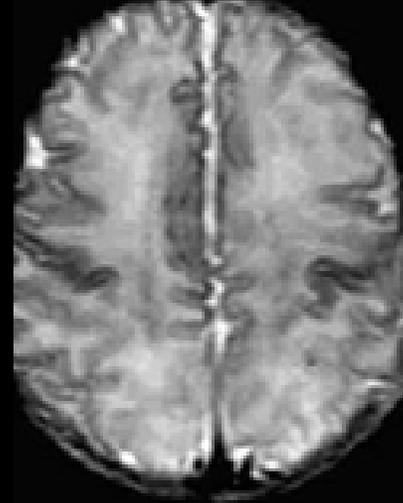
some of the neuroprotective effects of hypothermia may involve later mechanisms of injury such as inflammation. In neonatal rat HIE models, hypothermia reduces caspase-3 activation, apoptosis, and necrosis examined 24 h after HI (45), modifies complement factor expression (46), and reduces IL1 β levels

Patrón de hipoxia severa en niños mayores



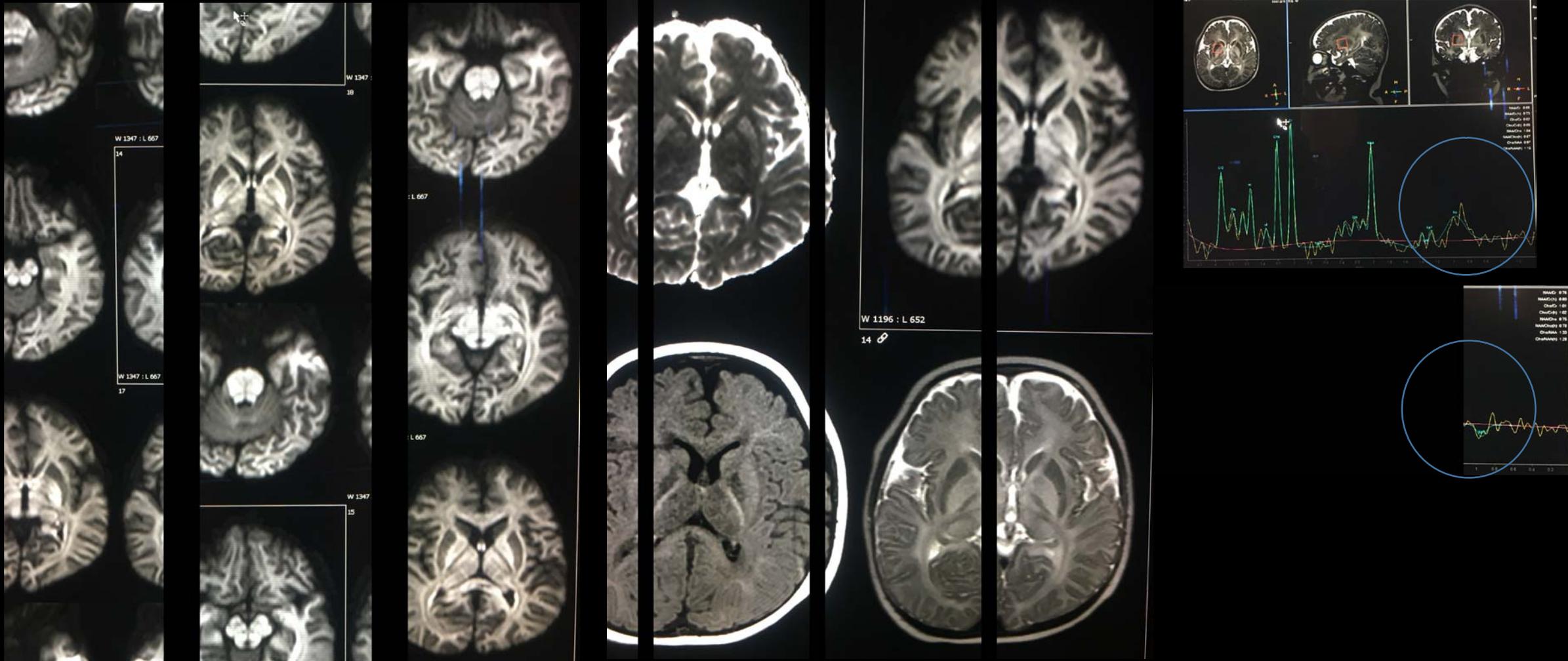
Lesión mixta de núcleos basales y corteza occipital

Diagnóstico diferencial



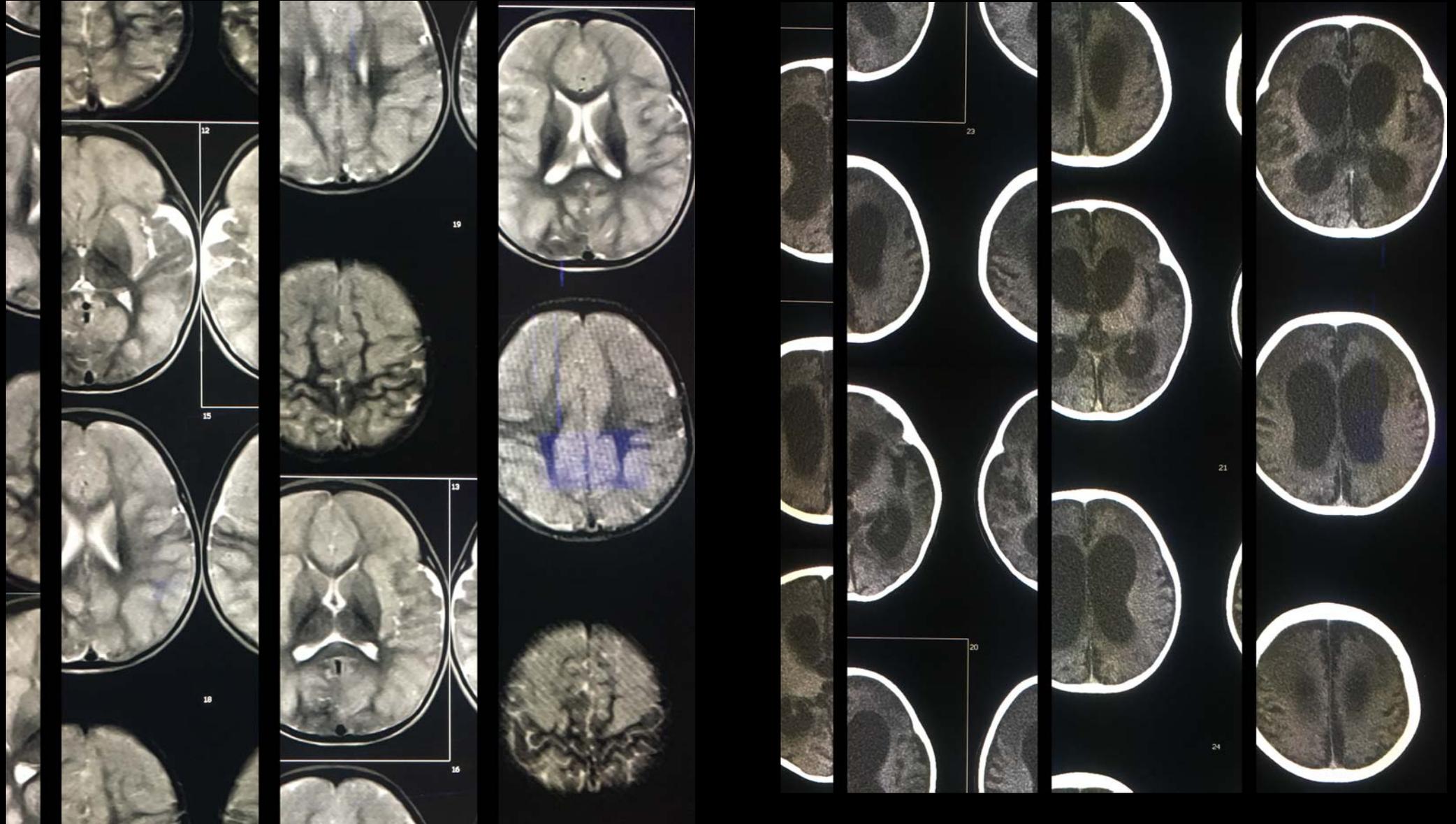
Injuria cerebral por hypoglucemia neonatal

Diagnóstico diferencial



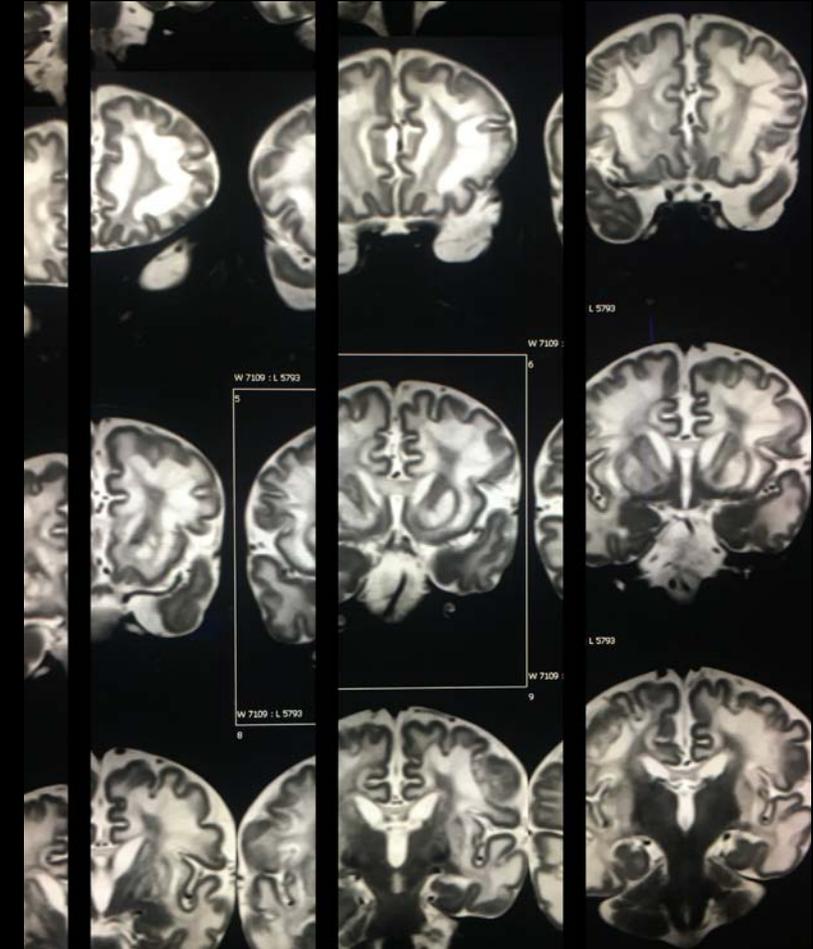
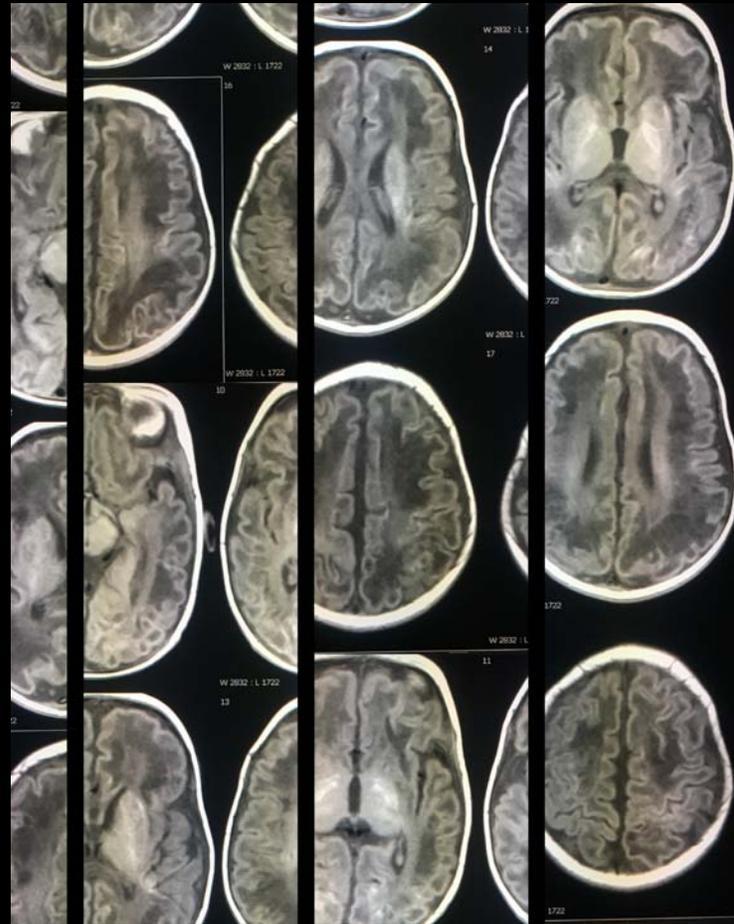
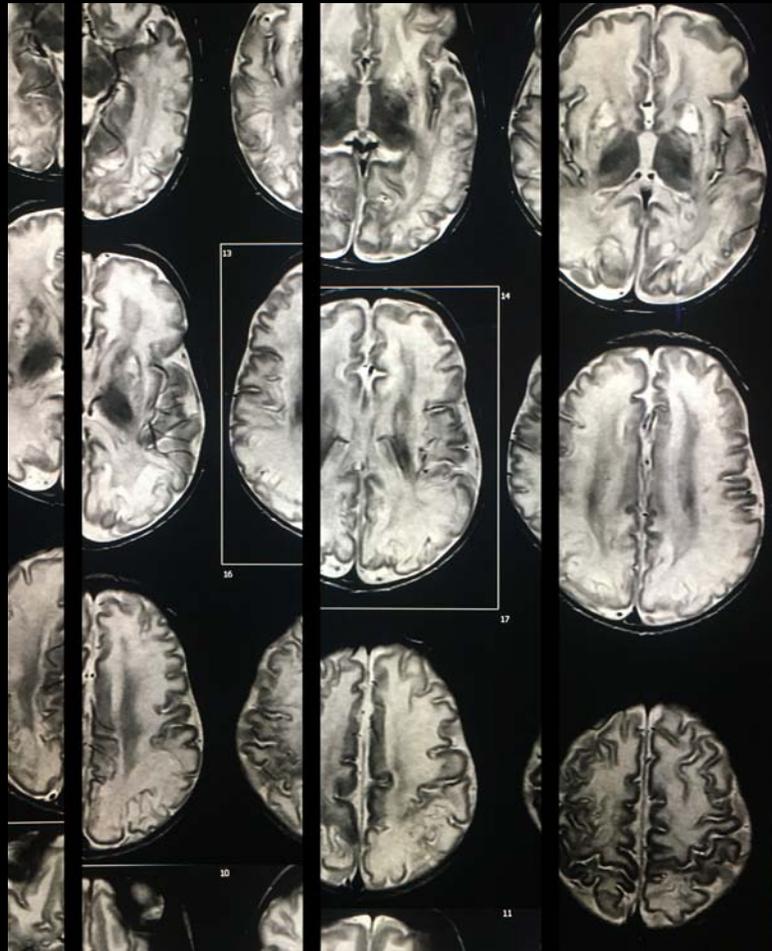
**Enfermedad de la orina con olor a jarabe de arce (MapleSyrup)
Aumento Aminoácidos Ramificados (1-0.8 ppm) Leu-isoLeu**

Diagnóstico diferencial



Trastornos del Ciclo de la UREA (Hiper-amoniemia - Citrulinemia)

Diagnóstico diferencial



Deficit de Cofactor Molibdeno / Sulfito Oxidasa

Muchas Gracias