

## Deep grey matter and brainstem involvement detected on brain MRI in the term infant with neonatal encephalopathy (NE)

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**Introduction:** Two predominant patterns of brain injury are seen on conventional brain MRI in the term infant with neonatal encephalopathy: a parasagittal cortical/subcortical pattern of cerebral infarction and a basal ganglia/ thalamic pattern. Although the first is more common, the basal ganglia/thalamic pattern is associated with a worse motor and cognitive outcome and is the focus of this study. Histopathological studies suggest that the extent of deep grey matter injury includes structures such as the hippocampus, subthalamic nucleus (STN), amygdala-hippocampal formation (AHF) and dentate nuclei as well as the brainstem and spinal cord.

**Objectives:** To define the extent of deep grey matter and brainstem observed on a single early conventional brain MRI scan (day 1-5) in term infants with NE. In a subgroup of infants, a second aim was to compare this early brain MRI with a later neonatal scan when brain injury was more mature.

**Methods:** The brain MRI scans of 27 consecutive term babies admitted to the neonatal unit at University College Hospital (London) with HIE Sarnat grades 1-3 were reviewed by 2 paediatric neuroradiologists blinded to outcome. T2-weighted fast spin echo (TR/TEeff=5.91/110 3mm slices), T1-weighted 3D-FLASH (TR/TE=6.06/17 flip angle 21°, 1mm slices), DWI (double spin echo EPI TR/TE=4200/118, 3mm slices) and calculated ADC maps were acquired on a Siemens Avanto 1.5T scanner. 4 infants were excluded (2 with meningoencephalitis, 1 trauma, 1 technically limited scan). Regions affected were described according to their anatomical site, size, signal intensity and margins and compared with images from standard neuroanatomical atlases and brain MRI in normal term controls acquired at day 2 and day 12 of life.

**Results:** Regional distribution of MRI abnormality is shown below. 13 infants had brain MRI on d1-5 of onset of encephalopathy and 10 infants had later MRI on d6-23. 11/13 in the early group and 5/10 in the later group had abnormal scans, in total 16/23 (70%). 10/13 infants scanned early had a second scan (range d2-16) and there was good correlation between them. 3 infants died in the neonatal period, all Sarnat grade 3 with abnormal MRI scans showing brainstem injury.

**Conclusion:** Deep grey matter injury seen on MRI in severe NE may affect the hippocampus, subthalamic nucleus, lateral geniculate bodies and brainstem. This can be detected on an early scan (day 1-5). There is evidence of a rostro-caudal pattern of involvement with increasing severity of injury.

