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Patterns of the cortical watershed continuum of term gestation hypoxic ischaemic injury – The 'wish-bone sign'

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Background: Partial prolonged-term hypoxic ischaemic injury (HII) involves the cortical and subcortical watershed zones of the brain, which are visually difficult to conceive. New innovative methods of demonstrating watershed cortical atrophy using flattened maps of the brain surface give added insight into distribution of the watershed zone by demonstrating the entire brain surface.

Aim: To determine and validate patterns of HII sustained at birth in term infants using cross-sectional magnetic resonance imaging (MRI) and the innovative Mercator and scroll map views of cortical surface anatomy, to define the distribution of the watershed zones in children with partial prolonged injury.

Materials and methods: A total of 100 paediatric MRI brain scan reports with an MRI and clinical diagnosis of chronic term hypoxic injury were read by three radiologists independently. All sites of abnormality were recorded and patterns were classified. Patients with partial prolonged and combined patterns were evaluated using Mercator and scroll map reconstructions, generating schematics of the watershed zone.

Results: Predominant patterns of disease were partial prolonged and acute profound types. The watershed zone was demonstrated, on the derived maps, representing a continuum of involvement in the shape of a 'wish-bone' extending bilateral from frontal lobes to posterior parietal lobes in band-like fashion along the para-falcine cortex and intersected by another band of atrophy in the peri-rolandic regions extending along peri-sylvian cortices. This is defined in schematics as a visual aid.

Conclusion: Predominant patterns of injury in term hypoxic ischaemic injury are described and quantified, with the 'wish-bone sign' introduced to describe the typical distribution pattern of partial prolonged HII in the watershed zone.

Note: A selection of conference abstracts: RSSA/SASPI Paediatric Imaging Congress, 03–06 November 2016, Spier Estate, Stellenbosch, South Africa. Faculty collaborators: Professor Kassa Darge (Body Imaging, University of Pennsylvania, Philadelphia, USA), Professor Edward Lee (Thoracic Imaging, Harvard University, USA), Professor Beverley Newman (Cardiac Imaging, Stanford University, California, USA), Professor Kimberly Applegate (Image Gently and Body Imaging, Emory University, Atlanta, USA) and Professor Savvas Andronikou (Thoracic Imaging, University of Bristol, UK) supported by South African Paediatric Radiologists, co-ordinated by Dr Jaishree Naidoo, President of the African Society of Paediatric Imaging and Head of Division of Paediatric Radiology, Charlotte Maxeke Johannesburg Academic Hospital.