

Visual function in infants with brain lesions (1994)

DMCN 
50th
Anniversary

Another in our series of commentaries on notable papers from the DMCN archives. The full paper is available at <http://www.mackeith.co.uk>

Pike MG, Holmstrom G, de Vries LS, Pennock JM, Drew KJ, Sonksen PM, Dubowitz LM. Patterns of visual impairment associated with lesions of the preterm infant brain. *Dev Med Child Neurol* 1994; 36: 849–62.

The visual function of 42 children with haemorrhagic and/or ischaemic cerebral lesions acquired before a gestational age of 35 weeks was examined and related to cranial ultrasound in the neonatal period and to MRI and neurodevelopmental status at follow-up. All 37 children with abnormal ultrasound scans and one of the five with normal ultrasound scans showed impairment of one or more aspects of visual function. While impaired acuity was more frequent among infants with MRI evidence of visual pathway damage, this was not an invariable finding. Normal or near-normal visual acuity did not preclude the presence of other functional visual deficits. The authors conclude that preterm cerebral insults may produce a variety of visual difficulties, the pattern and severity of which cannot be predicted on imaging. Each child therefore requires individual assessment of multiple aspects of visual function.

Commentary

Visual impairment due to damage to the central visual pathways is known as cerebral visual impairment. Most of the studies reporting cerebral visual impairment have only been published in the last two decades as a result of the wider availability of both appropriate and specific methods for assessing the maturing visual system in early childhood and paediatric brain imaging. These studies have helped to achieve a better understanding of the mechanisms underlying cerebral visual impairment and of the correlation between visual function and brain lesions.

In the early 1990s, Lilly Dubowitz and her team at the Hammersmith Hospital, London, in collaboration with Patricia Sonksen at Great Ormond Street Hospital, published in this journal some data on visual outcome in preterm infants. This paper was a great inspiration in stimulating my interest in this field and has influenced my career.

What marked this article out for me was its challenging approach to assessing visual function, combining neuro-radiological findings with age specific methods, that was relatively new at the time of publication.

The article had many stimulating aspects; first, the clinical application of a battery of tests specifically designed to assess various aspects of visual function, such as crowding acuity using Patricia Sonksen's linear crowding acuity cards. The paper also had the advantage of having detailed neonatal cranial ultrasound, diligently performed, collected, and scored by Linda de Vries and Lilly Dubowitz, that made it possible to correlate behavioural and imaging findings. This correlation was further enhanced by having brain MRI performed at a later stage that allowed further understanding of the correlation between function and integrity of the visual pathway.

The general conclusions reached by Pike et al. are still in line with contemporary views of visual maturation in the developing brain. Their findings raised a few questions about possible brain plasticity and the correlation between the extent of lesions and degree of visual abnormalities that have been extensively investigated in the last few years. The lack of a constant correlation between abnormal visual function and lesions in the visual pathway was strongly suggestive of possible plasticity of the brain. This concept has been further explored in more recent studies reporting how lesions in the developing brain can be compensated for by the immature brain in infants with focal or diffuse prenatal or perinatal lesions.

Pike et al. also suggested that, 'Each child therefore requires individual assessment of multiple aspects of visual function' and that other areas of the brain outside the geniculate optic radiations primary visual cortex may be associated with specific aspects of visual function. Recent studies using new tools for the assessment of visual function in young infants and early brain MRI have provided new and more objective information about the early disturbance of visual development, confirming what is postulated in the paper by Pike et al. It has become increasingly obvious that several other cortical and subcortical areas are involved in the development of various aspects of visual function and that children at risk of visual impairment can be identified in the first months after birth using clinical and brain MRI findings. Some of these messages appear to be quite obvious now but they were not at the time that Pike et al.'s article was published and many of the subsequent studies have been largely inspired by it.

Eugenio Mercuri

Professor of Paediatric Neurology, Catholic University, Rome, Italy