Infant
Irish Centre for Maternal and Child Health Research

Multi-modal Monitoring of Infants with Hypoxic Ischaemic Encephalopathy within 12 hours of Birth and Prediction of Outcome

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Introduction

Hypoxic-ischaemic encephalopathy (HIE) carries a significant risk of brain injury and adverse neurodevelopmental outcome

Early identification of at risk infants is critical to optimise intervention

Aim

To investigate the ability of currently available, bedside monitoring techniques to predict short- and long-term outcome in infants with HIE

Methods

Prospective observational study at Cork University Maternity Hospital, Ireland (Nov '17 - Mar '20)

Infants with all grades of HIE had
- continuous EEG
- near-infrared spectroscopy (NIRS) and
- non-invasive cardiac output monitoring (NICOM)

One-hour epochs of time-synchronised data were selected at 6 and 12 hours of age

Adverse short-term outcome was defined as an abnormal MRI (Barkovich score ≥1) and/or death within 1st week

Adverse long-term outcome was defined as a score of >1SD below the mean in any of the developmental domains of the Bayley's Developmental Assessment at 2 years or death of the infant

Results

Fifty-seven infants with HIE were included
- 27 mild, 24 moderate, 6 severe

Outcome measures:
- 3 infants died in the first week
- MRI was available in 56 infants
- Neurodevelopmental outcome was available in 42 infants

Abnormal Outcome:
- 18 (32%) infants had an abnormal short-term outcome
- 10 (18%) infants had an abnormal long-term outcome

At 6 hours
Short-term outcome:
- No marker predicted outcome

Long-term outcome:
- EEG relative spectral power and spectral difference at the higher frequency bands significantly predicted outcome
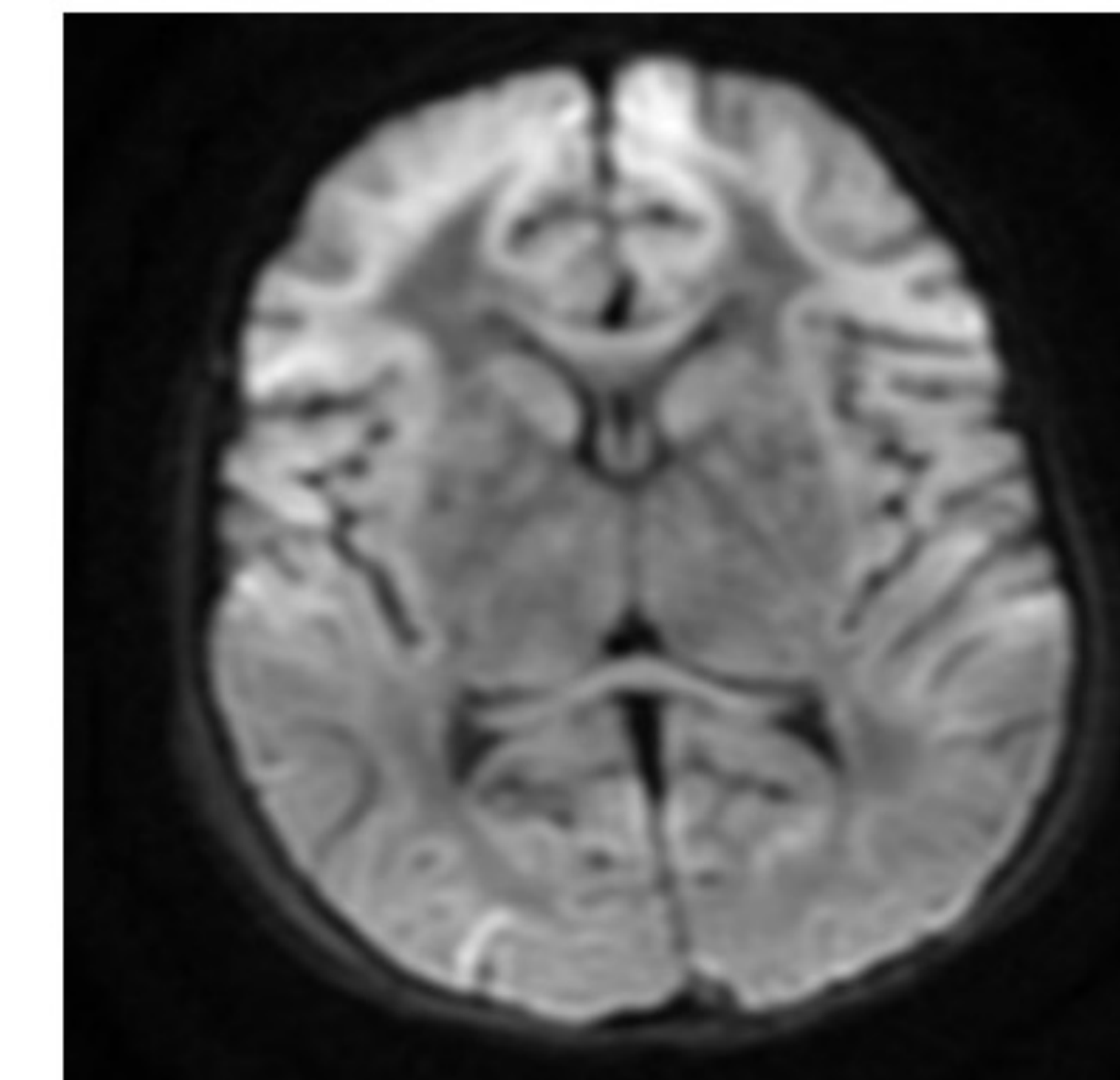
At 12 hours
Short-term outcome:
- EEG spectral power significantly predicted outcome

Long-term outcome:
- EEG spectral power and cerebral oxygenation (cSO$_2$) significantly predicted outcome

Conclusions

EEG remains a key tool in the monitoring of infants with HIE and prediction of outcome

Quantitative EEG features at 6- and 12-hours successively predicted both short- and long-term outcome in infants with HIE

Quantitative EEG algorithms may be useful in the future to aid in the prediction of infants at risk of brain injury

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