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Paediatric clinical fMRI: Pushing the limits

Arshad Zaman
University of Leeds, UK

Functional Magnetic Resonance Imaging (fMRI) allows non-invasive assessment of human brain function in vivo by detecting blood flow differences. From a powerful research tool actively utilised in cognitive neuroscience, clinical fMRI has evolved and matured into a robust clinical tool, implemented with a wide spectrum of patients. In this study, we further push the limits of this unique tool with paediatric patients. The purpose of this study is to present the experience of a large teaching hospital centre in the utility of clinical fMRI in a paediatric cohort and in particular focusing on the typical problems, pitfalls, solutions and benefits. Twenty children (5 - 16 years) underwent fMRI, over a period of 2 years, as part of the regional epilepsy pre-surgical evaluation programme. fMRI was performed on a 3T Philips scanner. Some of the children additionally underwent DTI (tractography). Paediatric dedicated fMRI paradigms consisted of motor, sensorimotor, visual, auditory, memory and speech tasks. In some cases, we also compared pre- and post-operative fMRI. MRI image analysis was performed using SPM12. In all cases, fMRI successfully revealed activation of the desired eloquent cortical territories. Speech and memory fMRI was challenging for some of the younger children in our cohort. Numerous cases successfully revealed evidence of neuroplasticity. fMRI can be successfully applied in children and holds significant promise for both research and clinical purposes. Using dedicated paediatric protocols and paradigms can result in a more effective and successful clinical fMRI investigation. fMRI allows more accurate assessment of cortical resection margins and can determine if surgery is best performed with the patient awake or asleep. Clinical fMRI has significant potential to replace Wada for this challenging age group. Fusion of fMRI and DTI yields further useful clinical information in relevant cases.

Biography

Arshad Zaman is an experienced Neurospecialist with over 15 years' experience in developing and clinically applying functional Magnetic Resonance Imaging (fMRI) at international centers of excellence. His previous studies encompass a spectrum of clinical applications (epilepsy, oncology) to state-of-the-art applications (e.g. pain relief, mental health & brain training). His current commitments centre around further development and clinical utilisation of fMRI.

arshad.zaman@nhs.net

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