

VOXEL BASED ANALYSIS OF PAEDIATRIC BRAIN AND ITS CLINICAL APPLICATION: BIOMARKER TOOL FOR FUTURE DRUG TRIALS

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Voxel-wise analysis is a class of modern methods of image processing in the medical field with increased popularity. It has replaced manual region of interest (ROI) analysis and has provided tools to make statistical inferences at voxel level. Voxel-based morphometry (VBM) is another popular inter individual voxel-based image analysis method that measures differences in local concentrations of brain tissue, through a voxel-wise statistical comparison of multiple tissue density maps. These maps are generated by the normalization of high-resolution structural images (i.e. 3-D T1-W spoiled gradient-echo) and their segmentation to grey matter, white matter and cerebrospinal fluid. Usually VBM is used to compare tissue density maps between two groups and detect regional brain atrophy or hypertrophy. The structural impact of many neuropsychological disorders or birth complications has been studied with VBM in children. Moreover VBM has allowed monitoring of childhood brain development. Combined with advanced normalization techniques it has allowed study of population-related effects. The wide use of standard atlases has facilitated the next level of application, which is voxel based meta-analysis comparing regional effects across studies, providing quantitative summaries with good control of statistical error. Future technological advances are expected to increase the clinical uptake; to improve the impact of quantitative techniques on clinical practice; and to improve our understanding of complex pathological processes. Likely to be an important biomarker in future drug trials to assess treatment effects at the group level.

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