

AUTOMATED ANALYSIS OF THE PRETERM NEONATAL CORTEX AT TERM EQUIVALENT AGE AND CORRELATION WITH COGNITIVE OUTCOME AT 1 YEAR CORRECTED AGE

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Background: Preterm birth (< 32weeks) is associated with differences in brain anatomical structure and adverse neurodevelopmental outcome. White matter volume and IQ have been shown to be reduced in ex-preterm infants in adolescence. Subtle differences in cortical folding at term equivalent age may be useful in predicting long-term neurodevelopmental outcome.

Methods: We segment grey matter (GM) and white matter (WM) using a *maximum a posteriori* expectation maximisation routine with adaptive priors. The GM/WM surface is extracted using a level set, and at every point we define the local shape-index, describing how cup-like or saddle-like the surface is (fig1A), and the curvedness, describing the distortion of the surface relative to that of a flat sheet. The distributions of each index may be summarised in a histogram (fig1B) and we use the histogram entropy as a potential biomarker.

Results: 39 infants without obvious structural abnormalities on MRI had brain volumes and cortical folding analysed from T1-weighted images. WM volume correlates significantly with gestation at birth ($p < 0.05$). Shape index and curvedness did not correlate with gestation at birth. Shape index correlates with combined cognitive / language outcome at 1 year using the Bayley III scales of infant development (fig1C).

Conclusion: Cortical folding analysis may be useful, possibly in combination with white matter volumes in the development of biomarkers of neurodevelopmental outcome.

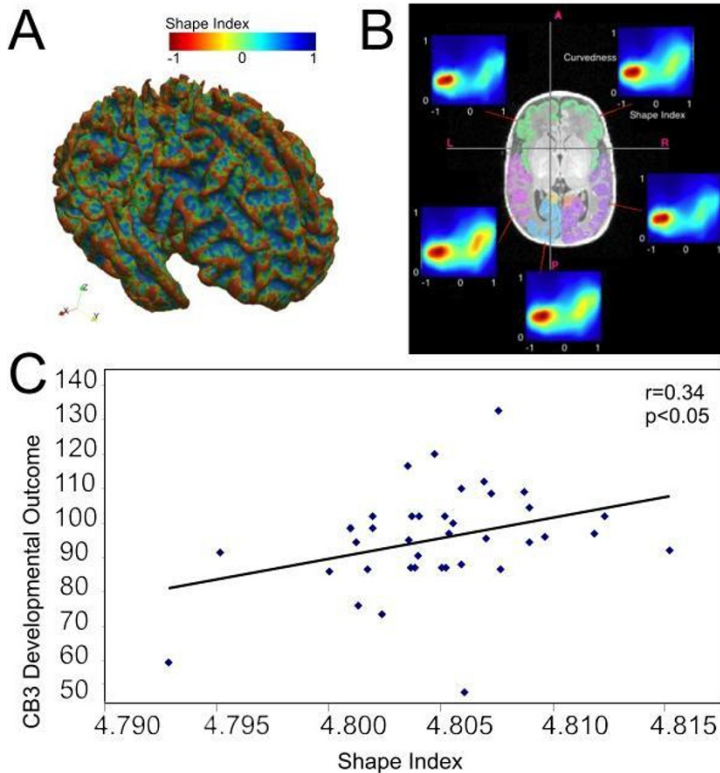


Figure 1 A: GM/WM interface coloured by shape-index B: Population average local surface histograms of curvedness and shape index overlaid on single subject GM parcellation C: Correlation between shape index & combined cognitive/language outcome.

[Figure1]