Reduced interhemispheric temporal lobe connectivity predicts language impairment in adolescents born preterm

Gemma Northam[*1], Frederique Liegeois[2], and Torsten Baldeweg[†2]

[1]Institute of Child Health [London] (UCL) – University College of London (UCL) – University College London 30 Guilford Street London WC1N 1EH, United Kingdom
[2]Institute of Child Health (UCL) – 30 Guilford Street London WC1N 1EH, United Kingdom

Abstract

Background: Language impairment is common in children born very prematurely, but robust neuroanatomical correlates for these deficits have not yet been established. A potential explanation could be the vulnerability of two regions: (i) the periventricular white matter and (ii) the corpus callosum. Methods: We carried out a comprehensive assessment in a group of adolescents born very prematurely (n=50, mean age 16 years) and compared them to a term-born control group (n=30). All children underwent structural and functional MRI. Results: Language impairment (in 38% of preterm children) was not related to abnormalities in the periventricular white matter, including the arcuate fasciculus, but was strongly associated with reductions in the corpus callosum. This reduction was most pronounced in the splenial region, which contains the interhemispheric connections of the occipital, parietal and temporal lobes. DWI-tractography revealed a specific reduction in the language-impaired group of the temporal fibres only. Furthermore, language impairment was more likely to occur if the other commissural bundle that connects the temporal lobes, the anterior commissure, was also reduced. Regression analyses showed that a combination of anatomical measures of temporal interhemispheric connectivity explained 60% of variance in language abilities preterm adolescents, partially independent of non-verbal IQ scores (32%). Conclusions: Reduction in the interhemispheric connections between the temporal lobes via the splenium of the corpus callosum (tapetum) and the anterior commissure are limiting factors in the development of normal language abilities.

[*]Speaker
[†]Corresponding author: T.Baldeweg@ucl.ac.uk