Preterm children experience a high prevalence of long-term serious cognitive deficits. Fetuses of 23 weeks of gestational age are now viable. Subsequent physiological stress can seriously disrupt the maturational processes that lay down this architecture. The ensuing abnormalities in brain may then contribute to the long term cognitive deficits. We aimed to measure regional brain volumes on the magnetic resonance imaging of prematurely born 9-year-old children and group matched term children. Nineteen nine year old preterm children and 21 term children recruited for the study. All subjects were under the volumetric magnetic resonance imaging. In the neurocognitive assessment, it was observed that preterm children had impairments in visuospatial functioning, three- dimensional thought ability, data processing and learning speed, executive function, complicated executive attention, perseveration, working memory, abstract thinking, installation replacement, focused attention. Volumes of cerebellum, right and left caudate nucleus, right and left putamen, right and left globus pallidus. Right and left hippocampus and corpus callosum were significantly smaller in preterm children. There was a correlation between cerebellar volume and attention, arithmetics, verbal and performance IQ, bilateral caudate nucleus volume and full scale IQ score, vocabulary and verbal IQ scores.

Our data indicate that preterm birth is associated with regionally specific, long term reductions in brain volume, in turn lead to poorer cognitive outcome.

FA-values in the left PLIC were correlated with cognition (r=0.435, p<0.05), fine motor (r=0.335, p<0.05) and gross motor (r=0.337, p<0.05) outcome at two years corrected age. There was no such association for the right PLIC. After correction for gender, the correlation persisted only in boys. Postmenstrual age (PMA) and WMI were both significantly correlated with FA values in the left PLIC (resp r=0.253, p<0.05 and r= -0.368, p<0.05). Conclusion FA-values measured by ROI-analysis ATE are significantly correlated with neurodevelopmental outcome at two years. This is in agreement with studies that used advanced post-processing techniques to measure diffusion parameters. These measurements in this study are easy to perform, reproducible and directly applicable on MRI data and therefore particularly eligible for use in clinical care.

Microstructural changes in white matter (WM) can be detected by Diffusion Tensor Imaging (DTI). This study tests the hypothesis that Fractional Anisotropy (FA) in the posterior limb of the internal capsule (PLIC), as measured directly on the FA-maps in preterm infants ATE is correlated to neurodevelopmental outcome at two years corrected age.

Methods MRI at term was performed in 66 preterm infants (GA<32wks). Using colour-coded DTI maps, FA-values were assessed in the PLIC. Regions of interest (ROI’s) were manually positioned in the PLIC bilaterally at the level of the foramen of Monro. FA-values from these ROI’s were assessed in relation to scores for cognition, fine and gross motor outcome measured with the Bayley Scales of Infant and Toddler Development (BSITD)-III. Correlations were corrected for clinical factors.

Results FA-values in the left PLIC were correlated with cognition (r=0.435, p<0.05), fine motor (r=0.335, p<0.05) and gross motor (r=0.337, p<0.05) outcome at two years corrected age. There was no such association for the right PLIC. After correction for gender, the correlation persisted only in boys. Postmenstrual age (PMA) and WMI were both significantly correlated with FA values in the left PLIC (resp r=0.253, p<0.05 and r= -0.368, p<0.05).

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There are numerous findings of the literature about premature born children having a higher degree of risk for different types of communication, language, reading and writing difficulties, compared to children born at term. These problems may seem minor in early language development and they are generally not recognized in that period. As the rule of language grows, particularly through reading and writing abilities, the problems become more evident and recognizable, and can significantly affect the academic achievement of children, especially if they do not provide help and support.

These theoretical findings were the basis for setting the aim of the study: to compare the outcome of prematurely born children in the age of 10 years, with the outcome of children born at term on linguistic tasks, especially in syntactic knowledge. According to this, one of the goals of the study was to investigate the relationship between biological variables (gestational age, birth weight, Appgar score) and linguistic- syntactic knowledge. The characteristics of this relationship were also examined. 34 prematurely born children and 34 children born at term participated.

Results showed statistically significant differences between premature born children and children born at term on syntactic knowledge tasks: prematurely borns’ performances were significantly poorer. Biological factors were predictive for the level of syntactic knowledge. The purpose of this paper is to emphasize the importance of systematic monitoring of communication, language and speech development in prematurely born children.

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