

fNIRS-based neuropharmacological assessment of Methylphenidate and Atomoxetine on inhibition and attention network in pediatric attention deficit/hyperactivity disorder

Masako Nagashima

Jichi Medical University, Japan

Attention deficit/hyperactivity disorder (ADHD) is among the most frequent neurodevelopmental disorders. Atomoxetine (ATX) and methylphenidate (MPH) have been recommended as primary medication choices to treat inhibition- and attention-related dysfunctions in ADHD children. This study used functional near-infrared spectroscopy (fNIRS) to explore the efficacy of both medications in school-aged children with ADHD for inhibitory and attention task performance. fNIRS is a promising tool, offering robust advantages such as its compactness, affordable price, tolerance to body motion and accessibility. We monitored the oxy-hemoglobin changes in ADHD children (6 to 14 years old) during go/nogo or oddball tasks before and 1.5 h after ATX, MPH or placebo administration, in a randomized, double-blind, placebo-controlled experiment. Age-, gender- and IQ-matched healthy controls, who did not receive medications or a placebo, were also monitored. In the control subjects, the go/nogo task modulated the right inferior and middle prefrontal gyri (IFG/MFG) and the oddball task modulated the right IFG/MFG and inferior parietal cortex (IPL). In ADHD children, these activations were absent in pre-medicated conditions. The reduction in the right IFG/MFG activation was normalized by both ATX and MPH for go/nogo and oddball tasks, but the right IPL was normalized only by ATX in the oddball task. These results led us to conclude that fNIRS could visualize the differential neuropharmacological effects of both substances in the inhibitory and attentional networks: ATX to up-regulate the noradrenergic system reflected in the right IFG/MFG and IPL activations, and MPH to up-regulate the dopamine system reflected in the IFG/MFG activations.

Biography

Masako Nagashima received her medical degree at Dokkyo Medical University, Japan (2004). She was a resident from 2004 to 2009 and has been a research associate since 2009 in the Department of Pediatrics, Jichi Medical University in Tochigi, Japan. Also, she was the Chief of Inpatient Medicine at the International University of Health and Welfare, Japan, from 2012 to 2013. Her research focuses on neuroimaging studies of neurodevelopmental disorders.

n-masako@jichi.ac.jp

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