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## Attention-deficit/hyperactivity disorder with obstructive sleep apnea: a treatment outcome study.

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#### Abstract

**BACKGROUND:** Children diagnosed with attention-deficit/hyperactivity disorder (ADHD), based on Diagnostic and Statistical Manual of Mental Disorders, Fourth edition (DSM-IV) criteria, may also have obstructive sleep apnea (OSA), but it is unclear whether treating OSA has similar results as methylphenidate (MPH), a commonly used treatment for ADHD.

**METHODS:** This study enrolled 66 school-age children, referred for and diagnosed with ADHD, and 20 healthy controls. Polysomnography (PSG) performed after ADHD diagnosis showed the presence of mild OSA. After otolaryngological evaluation, parents and referring physicians of the children could select treatment of ADHD with MPH, treatment of OSA with adenotonsillectomy or no treatment. Systematic follow-up was performed six months after initiation of treatment, or diagnosis if no treatment. All children had pre- and post-clinical interviews; pediatric, neurologic, psychiatric and neurocognitive evaluation; PSG; ADHD rating scale, child behavior checklist (CBCL) filled out by parents and teacher; test of variables of attention (TOVA); and the quality of life in children with obstructive sleep disorder questionnaire (OSA-18).

**RESULTS:** ADHD children had an apnea-hypopnea index (AHI)  $>1 < 5$  event/hour; 27 were treated with MPH, 25 had adenotonsillectomy, and 14 had no treatment. The surgical and MPH groups improved more than the non-treatment group. When comparing MPH to post-surgery, the PSG and questionnaire sleep variables, some daytime symptoms (including attention span) and TOVA subscales (impulse control, response time and total ADHD score) improved more in the surgical group than the MPH group. The surgical group had an ADHD total score of  $21.16 \pm 7.13$  on the ADHD rating scale (ADHD-RS) post-surgery compared to  $31.52 \pm 7.01$  pre-surgery ( $p=0.0001$ ), and the inattention and hyperactivity subscales were also significantly lower ( $p=0.0001$ ). Finally, the results were significantly different between surgically and MPH-treated groups (ADHD-RS  $p=0.007$ ). The surgical group also had a TOVA ADHD score lower than -1.8 and close to those obtained in normal controls.

**CONCLUSION:** A low AHI score of  $>1$  considered abnormal is detrimental to children with ADHD.

Recognition and surgical treatment of underlying mild sleep-disordered breathing (SDB) in children with ADHD may prevent unnecessary long-term MPH usage and the potential side effects associated with drug intake.

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