# PEDIATRIC NEUROLOGY BRIEFS
## A MONTHLY JOURNAL REVIEW

**J. GORDON MILLICHAP, M.D., F.R.C.P., EDITOR**

Vol. 21, No. 7 July 2007

## ATTENTION DEFICIT DISORDERS

### ADHD AND EPILEPSY COMORBIDITY

The prevalence of ADHD, its neurological correlates, and the effect of ADHD on health-related quality of life in 203 children (mean age 11.8 years, SD 3.8) with severe epilepsy were evaluated at British Columbia Children's Hospital, Vancouver, Canada. Epilepsy patients were mainly (74%) pre- or postsurgical or vagal nerve stimulator candidates; 74.4% were localization related and 16.7% were generalized epilepsies. Approximately 60% of epilepsy patients had either ADHD-Inattentive subtype (ADHD-I) or ADHD-Combined Inattentive/Hyperactive-Impulsive subtype (ADHD-C). Inattention was diagnosed in 40% and hyperactivity-impulsivity in 18%. Age of onset of seizures, epilepsy duration, and seizure frequency were not related to severity of inattention or hyperactivity-impulsivity. ADHD-C was associated with earlier onset of seizures, generalized epilepsy, and more frequent seizure intractability, compared to ADHD-I. ADHD-I was associated with a greater frequency of localization-related epilepsy, and more frequent use of AEDs with cognitive side effects (benzodiazepines, topiramate, phenobarbital). Quality of life was impaired two-fold in children with severe epilepsy complicated by ADHD-I, and four-fold with ADHD-C comorbidity, when compared to non-ADHD/epilepsy patients. (Sherman EMS, Slick DJ, Connolly MB, Eyrl KL. ADHD, neurological correlates and health-related quality of life in severe pediatric epilepsy. **Epilepsia** June 2007;48:1083-1091). (Reprints: Dr Elisabeth MS Sherman, Neurosciences Program, Alberta Children's Hospital, 2888 Shaganappi Trail NW, Calgary, AB, Canada T3B 6A8).

COMMENT. Children with severe epilepsy are at high risk for inattentive symptoms with ADHD. ADHD, particularly ADHD-C, is significantly correlated with poor quality of life in epilepsy patients. Neurological correlates of comorbid epilepsy and ADHD include the

PEDIATRIC NEUROLOGY BRIEFS (ISSN 1043-3155) © 2007 covers selected articles from the world literature and is published monthly. Send subscription requests ($68 US; $72 Canada; $75 airmail outside N America) to **Pediatric Neurology Briefs - J. Gordon Millichap, M.D., F.R.C.P.-Editor,** P.O. Box 11391, Chicago, Illinois, 60611, USA. The editor is Pediatric Neurologist at Children's Memorial Hospital and Professor Emeritus, Northwestern University Medical School, Chicago, Illinois.
PNB is a continuing education service designed to expedite and facilitate review of current scientific information for physicians and other health professionals. Fax: 312-943-0123.

age of onset of seizures, seizure frequency, seizure type, and use of AEDs with cognitive side effects. ADHD-C and epilepsy comorbidity is a marker for severe epilepsy and/or severe brain dysfunction. Characteristics of ADHD/epilepsy comorbid cases differ from those of 'primary' ADHD in the prominence of inattentiveness as a core symptom. Impulsivity and dyscontrol are more frequent as core symptoms in children with primary ADHD (Barkley, 2006).

For a comprehensive review of ADHD and epilepsy, supported by 108 references, see Schubert R, 2005, included in **Ped Neur Briefs** Jan 2005;19:1-2; All types of epilepsy and even children with recent onset of seizures are involved. Patients with absence epilepsy have difficulty sustaining attention despite adequate seizure control and normal IQ. Other forms of epilepsy frequently complicated by ADHD include electrical status epilepticus during slow-wave sleep, and benign rolandic epilepsy. Brief cognitive deficits (transient cognitive impairment) occur with subclinical epileptiform discharges, and may adversely affect attention and cognitive function without the occurrence of clinical seizures. AED use in these patients is controversial. Treatment of ADHD with methylphenidate (MPH) is effective and safe in patients with epilepsy, provided seizures are controlled with AEDs. (Feldman H et al. **Am J Dis Child** 1989;143:1081-1086; Tan M et al. **Arch Dis Child** 2005;90:57-59). MPH-treatment of ADHD complicated by centrotemporal (rolandic) spikes in the EEG has a risk of precipitating seizures in 16.7% compared to only 0.6% in patients with normal EEGs. (Hemmer SA et al. **Pediatr Neurol** 2001;24:99-102).

## ATTENTION AND NEUROCOGNITIVE IMPAIRMENT IN ADHD

Specific executive functions (EFs) and attention deficit patterns in ADHD subtypes were studied in 50 boys (ages 8-14 years, mean 10.42) with ADHD and 44 controls, at the University of Rome, Italy. The executive functions test battery included the Wisconsin Card Sorting Test (measure of cognitive flexibility), Stroop Test (interference control), Tower of London (planning ability), Digit Span Backwards (verbal working memory), FAS Test (verbal fluency), Trail Making Test (visual search and divided attention), Continuous Performance Test II (sustained attention and inhibition), and visual-spatial, visual-object, and phonological working memory tests. ADHD patients, both inattentive and combined subtypes, differed from controls on tests of response inhibition, divided attention, phonological, and visual object working memory, and reaction times. Executive functioning profiles were similar for ADHD subtypes. Response inhibition predicts performance on working memory tests but not on divided attention/set shifting and on sustained attention. Boys with ADHD have a selective impairment of executive functions and attention tasks. Neural circuits that control response inhibition (right prefrontal cortex) and divided attention (left dorsolateral prefrontal cortex) in ADHD subtypes are involved independently in the pathogenesis of neuropsychological deficits. Impairments in phonological and visual-object working memory are additional characteristics of ADHD males with inattentive or combined subtypes. (Pasini A, Paloscia C, Alessandrelli R, Porfirio MC, Curatolo P. Attention and executive functions profile in drug naïve ADHD subtypes. **Brain Dev** August 2007;29:400-408). (Respond: Dr Augusto Pasini, Department of Neuroscience, University of Rome "Tor Vergata", Via Alberico 2 n.35, 00193 Rome, Italy).