

# PEDIATRIC NEUROLOGY BRIEFS

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### ATTENTION DEFICIT AND BEHAVIOR DISORDERS

#### ENTEROVIRUS 71 CNS INFECTION AND ADHD

ADHD symptoms as long-term sequelae of virus-confirmed enterovirus 71 infection were evaluated in 86 children, aged 4 to 16 years, followed at National Taiwan University Hospital, Taipei, and Chang Gung Children's Hospital, Taoyuan, Taiwan. CNS involvement diagnosed at the time of infection, 3 to 7 years before the study, was a viral meningitis in 42 (49%) of the children, and encephalitis, poliomyelitis-like syndrome, or encephalomyelitis in 35 (41%). CNS symptoms were complicated by cardiopulmonary failure in 9 (10%) patients. Scores on teacher- and mother-rated scales of ADHD and ODD were higher in the children previously infected with enterovirus 71 compared to matched controls. The rate of elevated ADHD symptoms among children with prior history of enterovirus 71 CNS infection was 20% compared to 3% among controls. Internalizing problems, also, were more frequent. WISC-III scores were significantly inversely correlated with severity of ADHD but not with ODD. Clinical severity of enterovirus 71 CNS infection during hospitalization was not predictive of ADHD sequelae. Age at time of infection showed no association with later occurrence of ADHD. (Gau S S-F, Chang L-Y, Huang L-M, Fan T-Y, Wu Y-Y, Lin T-Y. Attention-deficit/hyperactivity-related symptoms among children with enterovirus 71 infection of the central nervous system. *Pediatrics* August 2008;122:e452-e458). (Respond: Luan-Yin Chang MD, PhD, National Taiwan University Hospital, Department of Pediatrics, College of Medicine, National Taiwan University, 7 Chung-Shan South Rd, Taipei 100, Taiwan. E-mail:ly7077@tpts6.seed.net.tw).

COMMENT. Enterovirus 71 CNS infection in young children is associated with an increased rate of symptoms of ADHD, ODD, and internalizing problems. IQ scores are correlated with the severity of ADHD symptoms but not with ODD. The authors recommend

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early identification and intervention for ADHD symptoms and emotional/behavior problems in children with a history of enterovirus 71 CNS infection.

Increased risk of ADHD following CNS infection is not specific to enterovirus 71, but occurs with a variety of microorganisms. A recent review of etiologic factors, especially environmental causes, found an increased prevalence of ADHD in children born to women with a viral exanthematous rash of measles, varicella, or rubella during pregnancy. Other viral infections invoked include HIV, varicella zoster encephalitis, and influenza. (Millichap JG. *Pediatrics* 2008;121:e358-e365). A possible relation between ADHD and streptococcal infection, *Borrelia burgdorferi* and Lyme disease, or otitis media requires confirmation.

Clinical manifestations of enterovirus 71 infection are protean and include hand-foot-and mouth disease, brainstem encephalitis and polio-like paralysis. Isolation of the virus in cell culture is the standard diagnostic method, and stool and throat specimens produce the highest yield (AAP Redbook, 27<sup>th</sup> ed, 2006). In a previous report of a long-term study of neurologic sequelae in 142 children with enterovirus 71 CNS infection by the same group of investigators in Taiwan, children with cardiopulmonary complications had a significantly higher incidence of delayed neurodevelopment and lower IQ scores than children with CNS involvement alone. (Chang L-Y et al. *N Engl J Med* 2007;356:1226-1234).

ADHD is a highly heritable disorder, but various environmental factors, including viral infection may play a role in etiology. The recognition, prevention, and treatment of environmental causes may provide more effective management and reduce reliance on symptom modification with medication.

## ROUTINE ECG AND STIMULANT MEDICATIONS FOR ADHD

The American Academy of Pediatrics (AAP) has issued a statement contradicting the recommendation of the American Heart Association (AHA) for routine electrocardiograms (ECGs) before starting medication to treat ADHD. The AAP and the American Academy of Child and Adolescent Psychiatry (AACAP) have concluded that sudden cardiac death (SCD) in persons taking medications for ADHD is a very rare event, occurring at rates no higher than in the general population. There is no evidence that routine ECG screening would prevent SCD. The AAP recommends careful assessment by a targeted cardiac history and examination, and a cardiac consultation only if clinically indicated. The AAP urges further research on risk factors for SCD, and improved methods for detecting hidden cardiac disease. (Perrin JM, Friedman RA, Knilans TK, the Black Box Working Group and the Section on Cardiology and Cardiac Surgery. *Pediatrics* August 2008;122:451-453). (Reprint orders: <http://www.pediatrics.org/misc/reprints.shtml>).

COMMENT. This AAP statement is endorsed by AACAP, Society for Developmental and Behavioral Pediatrics, and National Association of Pediatric Nurse Practitioners. The AAP recommends careful cardiac assessment of children with a history of cardiac disease, palpitations, syncope, or seizures; family history of sudden death; hypertrophic cardiomyopathy; long QT syndrome; or Wolff-Parkinson-White syndrome.

Risks of not treating ADHD include: 1) academic failure; 2) driving and other accidental injuries; 3) loss of self-esteem; 4) nicotine use and substance abuse; and 5) obesity. (see *Ped Neur Briefs* August 2008;22:64).