ABSTRACT

Pupillometry Predicted Alerting Methylphenidate Dosage Also Predicts Cognitive Improvement In Nonvigilant ADHD

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OBJECTIVE: To determine if dosages of methylphenidate (MPH) which acutely produce alertness as determined by pupillometry in nonvigilant ADHD also produce acute cognitive improvement.

BACKGROUND: ADHD of childhood origin is characterized by excessive inattention, impulsivity, and hyperactivity. Associated features may include specific academic underachievement and cognitive deficits in auditory and visual attention, learning, recall, and vigilance both as sustained attention and as alertness (Weinberg & Brumback, 1991; Duane et al, 1996). Oral dosages of MPH within one hour achieve maximum serum concentrations in non-alert subjects, therapeutic dosages will, at that point, produce wakefulness (Yoss et al, 1969). Wakefulness can be readily assessed by pupillometry (Keegan & Merritt, 1995). Whether there may be an improvement in cognition which parallels wakefulness is unknown.

METHOD/DESIGN: Retrospective analysis of 10 right-handed males, ages 8 through 13 years (mean age 10.5), with DSM-IV criteria for ADHD assessed by Conners, DSM-IV & Achenbach rating scales and cognitive measures including the Rey AVLT, Three Letter Cancellation Task and Digit Span who also demonstrated nonwakefulness on early afternoon pupillometry. One to four weeks later, repeat early afternoon pupillometry confirmed persistent nonwakefulness without sleep log evidence of nocturnal sleep disturbance. Acute dosages of MPH 7.5 or 10mg were followed by pupillometry within one hour. If still non-alert, an additional 5mg was administered. Once alertness was achieved, repeat alternative forms of the above cognitive measures were administered.

RESULTS: All 10 subjects achieved alertness with MPH. In 8 of the 10 at least 1 of the impaired at baseline cognitive measures also improved (verbal learning, verbal memory, auditory or visual attention). In one there was a slight regression in verbal learning. In none did tics occur.

CONCLUSION: In non-alert subjects with ADHD, pupillometry provides not only diagnostic but also therapeutic information as to what dose of alerting medication produces alertness. Acutely one can also verify if a parallel improvement in cognition has been achieved. However, longitudinal follow up is required to determine if behavior and academics also improve and whether response stability is maintained.

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