Increased Dental Trauma in Children with Attention Deficit Hyperactivity Disorder Treated with Methylphenidate – A Pilot Study

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*The **purpose** of this pilot study was to investigate the prevalence of trauma to incisor teeth in children with normal overjet and lip competence, treated with methylphenidate (Ritalin) for attention deficit hyperactivity disorder (ADHD). The **study** group consisted of 24 children (19 boys, 5 girls) aged 5-12 years (mean 8.45±2.25), diagnosed with ADHD and treated with methylphenidate at a minimal dosage of 10 mg per day. The control group consisted of 22 healthy children (13 boys, 9 girls) aged 5-12 years (mean 9.15±2.28). The dental examination included incisor relation measurements in the anterior segment (overjet), which was recorded using an orthodontic ruler. Lip competence was clinically determined, and anterior teeth were examined for dental trauma. The prevalence of dental trauma was significantly higher in the study group than in the control group (29.1% vs. 4.5% P = 0.02, t-test one tail). In **conclusion**, children with ADHD treated with methylphenidate have a high-risk for dental trauma. We believe that preventing dental trauma in this high risk group is possible. Consequently, the pediatrician and all medical staff attending to these children should encourage parents to consult frequently with a pediatric dentist to diagnose dental trauma and provide early treatment when needed.*

Keywords: *Attention deficit hyperactivity disorder, ADHD, Methylphenidate, Ritalin, children, trauma, teeth*
J Clin Pediatr Dent 34(4): 287–290, 2010

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is one of the most common psychiatric disorders in childhood. The condition affects 3-5% of children. Boys are three to five times more likely to be affected than girls.[1] Research shows that children suffering from ADHD are seriously at risk of long-term learning and social problems.[2] Numerous studies have examined the relationship between ADHD and dental health in children. This research has shown that dental treatment for affected children should be modified because they have more dental behavior management problems,[3,4] and are considered a high-risk group for caries.[5] Furthermore, children with ADHD exhibit poorer oral health than their peers without ADHD.[6] Pediatric hyperactivity has also been linked to the occurrence of major injuries to the face and teeth.[7] Additionally, minor physical anomalies of the orofacial region are frequently reported among this group. These anomalies may include a longer face, a pointed chin, shorter upper lip, and wider mouth.[2,8,9,10]

Methylphenidate (Ritalin) is the medication most often prescribed to treat ADHD.[2] The drug, considered a central nervous system stimulant, improves the child's ability to focus attention and concentrate, and it decreases motor activity.[11] One of the drug's main side effects is growth impairment and reduced appetite; it has been observed that higher doses produce greater weight and height suppression.[12,13] Another potential adverse side effect of Ritalin is dry mouth, often associated with increased frequency of the consumption of soft drinks and poorer oral hygiene. Furthermore, patients taking amphetamines have an increased risk of gingival enlargement.[3,14]

Various behavioral problems may play an important role in the occurrence of traumatic dental injuries.[15] One of the major risk factors for dental incisor trauma in healthy children is increased overjet (the horizontal distance between the incisal edges of the upper incisor teeth to the lower incisor

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teeth; the normal range is 2-4 mm). Increased overjet (4 mm and more) and lip incompetence (lack of lip coverage over the upper anterior teeth) is highly associated with dental trauma.[15,16] In addition, the rate of dental and orofacial injuries is higher in children with ADHD (both treated and untreated) than in healthy children.[17,18,19]

The purpose of this pilot study was to investigate the prevalence of trauma to incisor teeth in children with normal overjet and lip competence treated with methylphenidate for ADHD.

METHOD

The study population consisted of 24 children ages 5–12 years (19 boys, 5 girls) diagnosed with ADHD and treated with daily methylphenidate. Inclusion criteria for the study group were treatment with methylphenidate for at least 4 months, and a minimal dosage of 10 mg per day. All patients were treated by a senior pediatric neurologist from the Neuro-Pediatric Department at Hadassah Hospital, Jerusalem, Israel. Children were excluded from the study group if they had untreated ADHD. The control group consisted of 22 healthy children ages 5–12 years (13 boys, 9 girls).

The study was approved by the institutional ethical committee and by the National Institutes of Health (NIH identifier NCT00328224). Signed informed consent was obtained from parents of all participating children.

The dental examination included incisor relation measurements in the anterior segment. Overjet was recorded using an orthodontic ruler.

All examinations were performed by 3 pediatric dentists with a high inter-examiner concordance for assessment of trauma, incisor measurements and lip competence (kappa=0.89).

Anterior teeth were thoroughly examined for trauma. Dental trauma in this study was defined as enamel or enamel dentin fracture, restored or not. For the prevalence calculation, dental trauma was categorized as either absent (0) or present (1). All findings were recorded, and relevant data was verified with the accompanying parent. Parents were questioned about whether the child had suffered dental trauma in the past.

The statistical analysis was performed using *t-tests* when determining the statistical significance of differences between groups in continuous variables and chi square tests when comparing categorical variables.

RESULTS

Dental trauma percentage prevalence was significantly higher in the study group than in the control group (29.1% vs. 4.5%, $p = 0.02$). No significant differences were found in overjet measurements between the two groups range 0-5 (2.3 ± 1.28 mm) in the study group and range -1-6 (2.4 ± 1.63 mm) in the control group ($P > 0.5$, ANOVA).

All children from both groups exhibited normal relationships between the upper lip and upper incisors.

DISCUSSION

A 2002 study by Hinshaw that children with ADHD experienced higher injury rates than children without ADHD.[20] The assessment of normal and abnormal dental features is important because dental trauma is strongly correlated with protruded maxilla and upper incisors. Among healthy children, severe dental trauma is more common in those with a large incisor overjet (4-6 mm).[16,17] Previous investigations indicate that children suffering from ADHD also exhibit a higher prevalence of oral trauma, irrespective to their dental and oral features.[15,19,21,22,23]

The present study indicates that children who receive a diagnosis of and treatment for ADHD experienced a significantly higher prevalence of incisor dental trauma than their peers without ADHD. In this study, the definition of dental trauma probably under-estimates the true amount of trauma, as fractured teeth are only one of several manifestations of previous trauma. Teeth that had been concussed, displaced, or avulsed without having a clinical crown fracture were not included in this analysis.

Children with ADHD suffer from a higher incidence of dental trauma that is probably due to their behavior rather than their dental properties.[19,22]

In our study, children with ADHD treated by methylphenidate exhibited significantly higher prevalence of dental trauma than the control group. Therefore, these children may be considered prone to dental trauma, regardless of whether they are being treated with medication or have abnormal incisor relations. In addition, children treated with methylphenidate show stimulant rebound behavior deterioration,[24] a condition that occurs in children with ADHD when medication wears off. Symptoms of irritability/crankiness, tearfulness, or hyperactivity worse than in the unmedicated state (baseline) are subsumed in this description. This phenomenon may further increase the probability of dental trauma. Furthermore, rebound may be serious enough that parents insist on stopping methylphenidate treatment.

Traumatic injury to central incisors may result in long, time-consuming and costly treatment.[25,26]

The ideal means for preventing dental trauma is not entirely clear. Mouth guards are undeniably useful for injury prone individuals during sports and activities of predictable risk. However, mouth guards are not usually used for routine everyday use. On the other hand, we believe that a treatment plan for these children should involve a holistic approach, since poor primary management of dental trauma may have lifelong consequences. Early diagnosis and treatment of dental trauma may contribute in decreasing further complications.[25,26]

CONCLUSION

The results obtained in this pilot study indicate that children with ADHD treated with methylphenidate should be considered to have a high-risk for dental trauma. Consequently, healthcare providers attending to these children should

encourage parents to consult frequently with a pediatric dentist to diagnose and provide early treatment for dental trauma when needed.

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