

The Impact of Adenotonsillectomy on Attention-Deficit Hyperactivity and Disruptive Behavioral Symptoms

Adenotonsillektominin Dikkat Eksikliği-Hiperaktivite ve Yıkıcı Davranım Semptomları Üzerine Etkisi

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Abstract

Objective: The objective of this study is to investigate the impact of adenotonsillectomy on the neuropsychology of children using the Turgay DSM-IV-Based Child and Adolescent Disruptive Behavioral Disorders Screening and Rating Scale (T-DSM-IV-Scale).

Materials And Methods: Thirty children admitted to an otolaryngology clinic for treatment of sleep-disordered breathing or recurrent tonsillitis and who underwent adenotonsillectomy were included the study. All parents completed the T-DSM-IV-Scale before surgery and after 3 months of surgery. The T-DSM-IV-Scale consists of four sub-scales: inattention, hyperactivity, oppositional-defiant disorders, and conduct disorders. SPSS 15 for Windows was used to evaluate the data.

Results: Of the 30 children, 17 (56.7%) were boys and 13 (43.3%) were girls. The age range was between four and fourteen years, and the mean age was 6.6±2.6 years. The most common complaints of the children in their first admission to the otorhinolaryngology clinic were snoring (n = 25, or 83.3%), breathing from the mouth (n = 25, or 83.3%), stuffiness (n = 16, or 53.3%), post-nasal drip (n = 15, or 50%), halitosis (n = 14, or 46.7%), and odontopris (n = 12, or 40%). We found a statistically significant difference between the mean scores of the inattention, hyperactivity, oppositional-defiant disorders, and conduct disorder sub-scales of T-DSM-IV-Scale before and three months post-tonsillectomy (P<0.05).

Conclusion: In SDB inattention, hyperactivity and other neurobehavioral problems can be seen. This may cause a delay in accurate diagnosis and treatment. Children having neurobehavioral problems such as inattention, hyperactivity, oppositional-defiant disorders, and conduct disorder symptoms can be assessed for sleep-disordered breathing. After adenotonsillectomy, these neurobehavioral problems can improve without psychiatric medication; thus, adenotonsillectomy may have a positive impact on the neurobehavioral problems of children with sleep-disordered breathing.

Keywords: Adenotonsillectomy, Attention-deficit hyperactivity, Disruptive behaviors

Özet

Giriş: Bu çalışmanın amacı adenotonsillektominin çocukların nöropsikolojisi üzerine etkisinin Turgay DSM IV'e dayalı Çocuk ve Adolesanlarda Yıkıcı Davranım Bozuklukları Ölçeği (T-DSM-IV-Ölçeği) ile araştırmaktır.

Gereç ve Yöntem: Uyku bozukluğuna neden olan solunum problemi ve sık tekrarlayan tonsillit atakları nedeniyle Kulak Burun Boğaz kliniğinde adenotonsillektomi yapılmasına karar verilen 30 çocuk bu çalışmaya dahil edilmiştir. Tüm aileler T-DSM-IV-Ölçeğini operasyon öncesi ve operasyondan sonraki 3. ayda doldurmuşlardır. T-DSM-IV-Ölçeği, dikkat eksikliği, aşırı hareketlilik, karşıt gelme bozukluğu ve davranım bozukluğunu değerlendiren 4 alt ölçekten oluşmaktadır. Veriler SPSS 15.0 programı ile değerlendirilmiştir.

Bulgular: Toplam 30 çocuğun 17'si (% 56,7) erkek, 13'ü (% 43,3) kızdır. Çocukların yaşları 4-14 yaş arasında değişmektedir. Ortalama yaş 6.6±2.6'dır. KBB kliniğine başvuru sırasında çocukların en fazla şikayetleri sırasıyla horlama 25 (% 83,3), ağızdan nefes alıp-verme 25 (% 83,3), burun tıkanıklığı 16 (% 53,3), post nasal akıntı 15 (% 50), ağızda kötü koku 14 (% 46,7), dış gıcırdatma 12 (% 40). Dikkatsizlik, aşırı hareketlilik, karşıt olma bozukluğu ve davranım bozukluğu ortalama puanları arasındaki fark ameliyat öncesi ve sonrasında istatistiksel olarak anlamlı bulunmuştur (P<0.05).

Sonuç: Uyku bozukluğuna neden olan solunum problemlerinde aşırı hareketlilik ve nörodavranışsal problemler görülebilir. Bu durum uygun tanı ve tedavinin gecikmesine neden olabilir. Dikkatsizlik, aşırı hareketlilik, karşıt gelme ve davranım bozukluğu gibi nörodavranışsal problemleri olan çocuklar uyku bozukluğuna neden olan solunum problemleri açısından değerlendirilmelidir ve bu nörodavranışsal sorunlar psikiyatrik ilaç tedavisine gerek kalmadan adenotonsillektomi ile düzelebilir. Sonuç olarak adenotonsillektominin nörodavranışsal sorunları düzeltmek açısından olumlu bir etkisinin olduğunu söyleyebiliriz.

Anahtar Kelimeler: Adenotonsillektomi, Dikkat eksikliği-aşırı hareketlilik, Yıkıcı davranışlar

Introduction

Sleep-disordered breathing describes a spectrum of upper airway obstruction in sleep, from simple primary snoring, estimated to affect 10% of preschool children, to obstructive sleep apnea syndrome. Emerging evidence has challenged previous assumptions that primary snoring is benign. A recent report identified reduced attention, higher levels of social problems, and anxiety/depressive symptoms in snoring children, compared with controls. Uncertainty persists regarding clinical thresholds for medical or surgical intervention in sleep-disordered breathing, underscoring the need to better understand the pathophysiology of this condition [1].

Sleep-disordered breathing (SDB) is the result of a partial or complete airway obstruction that causes sleep fragmentation and/or a disruption in ventilation. The pathophysiology of childhood SDB is considered a combination of a mechanical obstruction of the pharyngeal space and a disorder affecting the activation of the neuromuscular tone responsible for dilating that space [2].

Obstructive sleep apnea (OSA) is a more severe form of SDB. OSA has been linked to depression, mood changes, problems with quality of life and self-esteem, hyperactivity, and behavioral problems. Other neuropsychological consequences of OSA in children include poor school performance and learning or memory impairments [2].

If the cognitive impairments, such as learning or memory, associated with untreated sleep apnea persist, the long-term potential of the child could be affected into adulthood. Few controlled studies have examined the occurrence or reversibility of specific neuropsychological deficits in childhood sleep apnea. There are critical pathophysiological and clinical differences between childhood sleep apnea and the adult syndrome. Children with sleep apnea may exhibit prolonged periods of hypoxemia or hypercarbia (airflow limitation), whereas adults experience discrete obstructive apnea events or sleep fragmentation. Probably the most important difference between childhood and adult OSA is that the "insult" associated with childhood OSA impacts a rapidly developing brain. Thus, the timing and duration of the insult in children may determine which functions are impaired and/or spared [2].

Disruptive behavioral disorders (DBDs) are known as conduct disorders (CDs), oppositional-defiant disorders (ODDs), and attention-deficit hyperactivity disorders (ADHDs) in children. ADHD is a relatively common, debilitating condition of childhood characterized by severe, persistent, and early-appearing symptoms of inattention, overactivity and impulsiveness. Conduct disorder constitutes a constellation of antisocial and aggressive behaviors that may become prominent in early childhood and persist into adolescence and even into adulthood, and oppositional disorder is characterized by persistent patterns of resistant and negative behavior in children [3].

ADHD is an etiologically heterogeneous disorder that is a result of biological, social, and psychological conditions. It is known that ADHD has genetic, neurochemical, neuropathologic, and cognitive impairments, but precisely how these conditions

Table 1. Demographics of study sample (N = 30 children)

	N	%
Gender: Female	17	56.7
Male	13	43.3
Age: 3-6 years	15	50
7-11 years	12	40
12-15 years	3	10
School: Not in school	13	43.3
Kindergarten	3	7.7
Primary school	15	50
First complaints: Snoring	25	83.3
Breathing from mouth	25	83.3
Stuffiness	16	53.3
Post-nasal drip	15	50
Halitosis	14	46.7
Odontoprisis	12	40
Sleepiness: Present	11	36.7
Absent	19	63.3

interact is poorly understood [1].

Generally, adenotonsillary pathologies increase snoring. Children with sleep-disordered breathing and snoring display ADHD symptoms more frequently than children without these symptoms [2-4].

The objective of this study is to investigate the impact of adenotonsillectomy on the neuropsychology of children using the Turgay DSM-IV-Based Child and Adolescent Disruptive Behavioral Disorders Screening and Rating Scale (T-DSM-IV-Scale).

Materials and Methods

Thirty children admitted to an otolaryngology clinic for treatment of sleep-disordered breathing or recurrent tonsillitis and who underwent adenotonsillectomy were included the study. They were evaluated by an otorhinolaryngologist and a child psychiatrist. Children having prior psychiatric diagnoses such as ADHD, ODD, CD, or mental retardation were excluded from the study. Each parent was given information about the study, and informed consent was obtained from the parents. All parents completed the T-DSM-IV-Scale before surgery and three months post-surgery.

The Turgay DSM-IV-Based Child and Adolescent Disruptive Behavioral Disorders Screening and Rating Scale (T-DSM-IV-S)

The T-DSM-IV-S was developed by Turgay and translated and adapted into Turkish by Ercan et al. [4]. The T-DSM-IV-S is based on the DSM-IV diagnostic criteria and assesses hyperactivity/impulsivity (9 items), inattention (9 items), opposition/defiance (8 items), and conduct disorder (15 items). The symptoms are scored by assigning a severity estimate for each symptom on a four-point Likert-type scale (i.e., 0 = not at all, 1 = just a little, 2 = quite a bit, and 3 = very much). Several studies from different cultures have demonstrated the validity of this scale for diagnosing ADHD using both parent and teacher respondents [5].

Table 2. Mean±SD scores of the T-DSM-IV-Scale in children before and after adenotonsillectomy

	Before adenotonsillectomy Mean score±SD	After adenotonsillectomy Total score±SD	P
Inattention	8.1±4.9	3.9±3.2	0.000
Hyperactivity	11.1±7.5	5.6±4.7	0.000
Oppositional-Defiant Disorder	6.3±4.3	4.1±3.5	0.000
Conduct Disorder	1.2±1.8	0.8±1.5	0.037

For statistical analysis SPSS 15 for Windows was used. The demographic findings are presented as numbers and frequencies. A paired samples t-test was used to evaluate the mean scores before and after tonsillectomy. $P < 0.05$ was defined as statistically significant for all values.

Results

Of the thirty children, seventeen (56.7%) were boys, and thirteen (43.3%) were girls. The age of the children was between four to fourteen years, and the mean age was 6.6 ± 2.6 . Three (10.0%) of the children attended kindergarten, fourteen (43.3%) attended primary school, and thirteen (46.7%) children did not attend school. The most common complaints of the children in their first admission to the otorhinolaryngology clinic were snoring ($n = 25$, or 83.3%), breathing from the mouth ($n = 25$, or 83.3%), stuffiness ($n = 16$, or 53.3%), post-nasal drip ($n = 15$, or 50%), halitosis ($n = 14$, or 46.7%), and odontopisis ($n = 12$, or 40%) (Table 1).

The mean scores of the inattention, hyperactivity, oppositional-defiance, and conduct disorder sub-scales of the T-DSM-IV-Scale were compared at the first application and after three months (Table 2). We found a statistically significant difference between the mean scores of the inattention, hyperactivity, oppositional-defiance, and conduct disorder sub-scales of T-DSM-IV-Scale before and three months post-tonsillectomy ($P < 0.05$).

Discussion

Adenotonsillar pathologies caused by obstruction of the airway such that sleep-disordered breathing and reduced brain oxygenation were observed. We also observed a positive impact of adenotonsillectomy on behavioral problems such as inattention, hyperactivity, oppositional-defiance, and conduct disorder symptoms. The mean scores of ADHD, ODD, and CD decreased significantly after adenotonsillectomy, to the extent that the parents were relieved about their children's behaviors. These findings are similar to those observed in the literature in that behavior dysfunction was associated with symptomatic childhood SDB. Parents and teachers commonly report behavior changes including aggression, impulsivity, hyperactivity, or decreased attention [2]. Although the brain constitutes only 2% of the whole body, it uses up to 20% of the total metabolic oxygen; it is thought that con-

ditions that reduce metabolic oxygen affect the brain and cause cognitive and neurobehavioral impairments.

Reduced cerebral blood flow and altered cerebrovascular responses to hypercapnia have been reported in patients with sleep apnea. It is unclear which of the multiple physiologic perturbations account for this neuropsychological dysfunction, and it is difficult to separate them because one or all of these perturbations are present in patients with SDB. In adults, the apnea hypopnea index (AHI) and oxyhemoglobin desaturation have been shown to correlate with decrements in attention, problem solving, psychomotor speed, and short-term recall [2].

Goldstein et al. [6] evaluated 36 children, aged 2-18 years, with the Child Behavior Checklist (CBCL) before and after adenotonsillectomy. They found a significant improvement in CBCL scores after adenotonsillectomy, especially in the subscales for withdrawal, somatic complaints, anxiety/depression, attention problems, and thought problems. In studies using different assessment tools, such as Conners' Parent and Teacher Rating Scales, the Test of Variables of Attention (TOVA), and the Quality of Life Survey (OSA-18), test scores decreased after adenotonsillectomy, similar to the results found in our study using the T-DSM-IV-Scale [7-10].

In the post-adenotonsillectomy patients, breathing and oxyhemoglobin desaturation were improved such that neurobehavioral problems such as inattention and hyperactivity due to hypoxia were clinically improved three months post-operation. Mitchel et al. found that this improvement was significant in the first month's follow-up and was maintained at the six-, nine-, and eighteen-month follow-ups [11]. In our study, we assessed the patients before and three months post-adenotonsillectomy, and significant improvement was observed on the T-DSM-IV-Scale.

Obstructive sleep apnea (OSA) children had symptoms of hyperactivity, learning and memory problems, and behavioral difficulties, including aggressiveness at home and at school. Sleep disturbances in children often affect their daytime alertness (including increasing inattentiveness), behavior (such as hyperactivity) and academic performance. These children are often diagnosed with ADHD [12].

In SDB inattention, hyperactivity and other neurobehavioral problems can be seen. This may cause a delay in accurate diagnosis and treatment [13,14].

Children having neurobehavioral problems like inattention, hyperactivity, oppositional-defiant disorders, and conduct disorder symptoms can be assessed for sleep-disordered breathing, and after adenotonsillectomy these neurobehavioral problems can improve without psychiatric medication.

Conflict interest statement The authors declare that they have no conflict of interest to the publication of this article.

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