Impact of adenotonsillectomy on urinary storage symptoms in children with sleep-disordered breathing

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ABSTRACT

Objective: To prospectively evaluate the effectiveness of adenotonsillectomy on resolving urinary storage symptoms such as frequency, urgency, and urgency urinary incontinence (UUI) in indicated sleep disordered breathing (SDB) patients.

Methods: We prospectively analyzed changes in storage symptoms and SDB score before and after surgery in 102 children (74 males, 28 females, mean age 8.4 ± 2.8 years) who underwent adenotonsillectomy between July 2011 and Feb 2012. Before and 3 months after surgery, all children and their parents were requested to answer a self-reported SDB scale-questionnaire (22 questions, 0–22 points) and a urinary storage symptoms questionnaire.

Results: The prevalence of urgency in the overall patients was 31.2%. After adenotonsillectomy, prevalence of frequency and urgency in addition to SDB score were significantly decreased (p ≦ 0.001). The prevalence of UUI was also significantly lower (11.6%–7.4%, p < 0.001). Patients with urgency had a significantly higher SDB score than those without (11.4 ± 4.3 vs. 7.8 ± 4.0, p < 0.001). After treatment, there was no difference between these two groups.

Conclusion: Adenotonsillectomy markedly improved both SDB score and decreased the prevalence of voiding symptoms (frequency, urgency, and UUI). There was a strong correlation between preoperative SDB score and severity of urgency in children with SDB.

1. Introduction

Overactive bladder (OAB) is the most common pediatric urologic complaint and can have a major impact on health-related quality of life [1]. OAB is one of several storage symptoms and is defined as a symptom syndrome of urinary urgency, with or without urgency urinary incontinence (UUI), usually with urinary frequency and nocturia, in the absence of infections or other obvious pathologic features [2]. The prevalence of pediatric OAB is relatively high (16.6% in children between 5 and 13 years of age), although it is slightly lower than the adult prevalence of OAB in Korea [3].

Obstructive sleep apnea (OSA) syndrome is known to cause nocturia [4,5], overactive bladder [5,6], nocturnal enuresis [7], and UUI [8]. Sleep-disordered breathing (SDB), which is a condition characterized by repeated episodes of hypopnea and apnea during sleep, encompasses the spectrum of sleep disorders ranging in severity from primary snoring to OSA.

There is limited information about the real prevalence of urinary storage symptoms in children with SDB and the relationship between SDB and storage symptoms. Upper airway obstruction was suggested to be involved in daytime voiding symptoms in children. In that retrospective study, patients with SDB had significantly fewer voids per day and a lower prevalence of daytime incontinence after adenotonsillectomy than before surgery [9]. Therefore, we prospectively evaluated the prevalence of urinary storage symptoms in children with SDB and the effectiveness of adenotonsillectomy at resolving the urinary storage symptoms of frequency, urgency, and UUI in indicated SDB patients.

2. Materials and methods

This study was approved by the International Review Board of our institution (UHH-2011-063). All clinical data in this study were prospectively obtained after obtaining informed consent from their parents or guardians.

Among 158 patients who underwent adenotonsillectomy between July 2013 and Feb 2014, we analyzed changes in the urinary storage symptoms and SDB scores before and after surgery in 102 patients (74
males, 28 females, mean age 8.4 ± 2.8 years) whose parents or guardians completed a questionnaire. Exclusion criteria were age less than 5 years; neurological anomalies; psychological diseases such as attention deficiency, hyperactivity disorder, and mental retardation; congenital urogenital abnormalities; failure to complete the questionnaire before or after surgery. Among 158 patients who underwent AT for our study, forty-one children below age 5, 10 children with a preoperative SDB score of zero, and five children whose parents or guardians did not give permission for them to participate in this study were excluded per our exclusion criteria.

Before and 3 months after surgery, all parents of participating children were requested to answer a self-reported SDB questionnaire (22 questions, 0–22 points), and the presence of urinary storage symptoms was assessed using a storage symptoms questionnaire (frequency of voiding, number of episodes of urgency per month or week, and presence of UUI; this questionnaire has been validated in the Korean version of the overactive bladder symptom score questionnaire [10]). Information about snoring and its severity, breathing difficulty during sleep, daytime sleepiness, and mouth breathing were investigated by the SDB questionnaire, which is used as a screening test for OSA. The SDB scale consists of a total of 22 questions: four questions related to snoring, four questions related to daytime sleepiness, two questions related to breathing problems, two questions related to open mouth breathing, six questions related to attention deficient hyperactivity disorder, and four questions about other behaviors (Supplementary Table 1). Each question was scored 0 or 1 (yes = 1, no = 0); a commonly used clinical threshold is a total score of 8 of 22 or above, which has a sensitivity of 0.85 and a specificity of 0.81 for diagnosis of OSA [8,11]. To evaluate storage symptoms, parents were asked about the presence of previous voiding symptoms, presence of bowel diseases (such as constipation, encopresis, and diarrhea), and presence of current daytime voiding symptoms such as urgency, increased urinary frequency, and UUI (Table 1). Urinary frequency was defined as eight micturitions or more per 24 h. Urinary urgency was defined as the presence of a sudden feeling of having to urinate immediately, once or more per month.

Adenotonsillectomy was performed by electrocautery, adenoidectomy, and adenoid curette under general anesthesia following routine protocols. Mean operation time was 18.9 ± 3.1 min.

Statistical analyses were performed using SPSS 21 software (IBM Corporation, Somers, NY, USA). The paired t-test, Pearson Chi-square test, and Fisher’s exact test were used to evaluate the significance of differences in values between groups. To define the correlation between pre-operative SDB score and severity of urgency, the Kruskal Wallis test was used. All statistical analyses were two-sided, and P < 0.05 was considered statistically significant.

### 3. Results

The prevalence of urgency in all patients was 31.2% (29 of 93 patients). Mean SDB score was 9.1 ± 4.4. After adenotonsillectomy, the prevalence of frequency, urgency, UUI, and SDB score were significantly decreased (Table 2). The prevalence of frequency was significantly decreased from 4.2% to 2.1% (p = 0.001). The prevalence of urgency was also significantly decreased from 31.2% to 23.7% (p < 0.001). There was no occurrence of de novo urgency after surgery. When we used the definition of severe urgency as ≥ 1–3 episodes/week, we found that the prevalence of severe urgency decreased significantly from 12.1% to 4.2% (p = 0.019). The prevalence of UUI was also significantly lower after surgery (11.6% before surgery to 7.4% after surgery, p < 0.001). Mean SDB scale score was also significantly decreased from 9.1 ± 4.4 to 2.9 ± 3.1 (p < 0.001) after surgery.

Comparison of patients with and without urgency, revealed that those with urgency had significantly higher preoperative SDB scores than those without (11.4 ± 4.3 vs. 7.8 ± 4.0, p < 0.001). However, there was no difference in postoperative SDB score between these two groups (3.3 ± 3.2 vs. 2.7 ± 3.1, p = 0.386) because there was a greater decrease in the SDB scores of patients with more severe urgency before surgery (p = 0.012) (Table 3).

### 4. Discussion

This is the first prospective report about the relationship between storage symptoms (especially urgency) and SDB in children. Until now,
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