

## Effects of oral care in Down syndrome children with obstructive sleep apnea

Kieko Sato<sup>1)</sup>, Tetsuo Shirakawa<sup>1)</sup>, Naoko Niikuni<sup>1)</sup>, Hideaki Sakata<sup>2)</sup>  
and Satoshi Asanuma<sup>3)</sup>

<sup>1)</sup>Department of Pediatric Dentistry, Nihon University School of Dentistry, Tokyo, Japan

<sup>2)</sup>Faculty of Health Sciences, Mejiro University, Saitama, Japan

<sup>3)</sup>Department of Otolaryngology Saitama Children's Medical Center, Saitama, Japan

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**Abstract:** Down syndrome (DS) children with sleep apnea often present with oral breathing associated with nasal obstruction. This causes the oral cavity and pharynx to become dry. We describe the treatment of three DS children with sleep apnea who were treated using products for oral dryness. Snoring disappeared after treatment in two of the children and apnea disappeared in all three. The symptoms of a reddened oral mucosa and coated tongue disappeared in all three DS children. Saliva pH testing demonstrated that the pH value increased in all of the children after treatment. These results indicate that oral care can improve the oral hygiene status of DS children, and that proper oral care can help prevent oral mucosal dryness and thereby reduce sleep apnea symptoms. (*J Oral Sci* 52, 145-147, 2010)

**Keywords:** Down syndrome; child; OSAS; dry mouth; mouth breathing.

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### Introduction

Children with Down syndrome (DS) develop sleep apnea in addition to other complications such as physical and mental retardation and heart disease (1,2). The causes of sleep apnea include adenoid and palatine tonsil

hypertrophy, which produces symptoms of hypertension, heart failure, and growth impairment (3-5). DS children may develop physical growth retardation, mental retardation, and heart disease as complications, thus even snoring during sleep cannot be disregarded. Pediatric snoring and apnea is generally treated by pharmacotherapy (anti-allergic agents and nose drops), adenoidectomy, tonsillectomy, CPAP (continuous positive airway pressure), and nasal reduction. Although adenoidectomy and tonsillectomy are indicated when adenoid vegetation and palatine tonsil hypertrophy are causing snoring and apnea (6), these treatments are performed under general anesthesia, thus placing a physical burden on pediatric patients. Oral dryness is a chronic obstruction of nasal breathing (7), and is common in children with obstructive sleep apnea syndrome (8). Ungkanont and Areyasathidmon (9) reported that adenoid, palatine tonsil hypertrophy and mouth breathing affected children with sleep-disordered breathing. Exacerbating factors for adenoid and palatine tonsil hypertrophy include oral dryness, but no measures against this have been taken in the field of otolaryngology.

This study applied oral care to decrease snoring and apnea in 3 DS children, using products for treating xerostomia to suppress oral and pharyngeal mucosal inflammation caused by mucosal dryness due to mouth breathing, and to adjust the intra-oral environment.

### Case Report

The subjects were three children with DS (case 1, a male aged 5 years and 0 months; case 2, a male aged 10 years and 2 months; and case 3, a female aged 6 years and 0 months) who presented at the Snoring Clinic of the

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Correspondence to Dr. Kieko Sato, Department of Pediatric Dentistry, Nihon University School of Dentistry, 1-8-13 Kanda-Surugadai, Chiyoda-ku, Tokyo 101-8310, Japan

Tel: +81-3-3219-8106

Fax: +81-3-3219-8353

E-mail: onodera-k@dent.nihon-u.ac.jp

Department of Otorhinolaryngology, Saitama Children's Medical Center, with complaints of snoring and sleep apnea, and were diagnosed as having obstructive sleep apnea syndrome (OSAS) with adenoid and palatine tonsil hypertrophy by the otolaryngologist at the Medical Center. The AHI (apnea hypopnea index) of night sleep in the children was less than 20. None of them was treated with CPAP. The oral symptoms were characterized by a reddened oral mucosa and coated tongue, suggestive of oral dryness. The patients and their families were interviewed about their problems, and saliva pH testing was performed before oral care. Oral care methods employing products for oral dryness: *First Teeth*<sup>®</sup> (Laclede Inc., California, USA) (an abrading agent), *Mouth Wash*<sup>®</sup> (Laclede Inc., California, USA) (a mouth-washing solution), and *Oralbalance*<sup>®</sup> (Laclede Inc., California, USA) (a moisturizing gel), were described to the affected children and their parents, and they were instructed to practice oral care at home twice daily (after breakfast and before bedtime) for one month. They were recommended to practice nasal breathing and avoid mouth breathing. One month later, the patients and their families were interviewed regarding the previous problems, and the patients underwent saliva pH testing, and the results were compared with those obtained before treatment. The salivary pH was measured as an index of oral hygiene. The intra-oral environmental condition is poor (the patients are susceptible to dental caries) when the pH value is low (in cases of acidity) (10).

This study was conducted after obtaining consent from the patients and their caregivers.

Patient interview items and oral care products used in this study were as follows:

- 1) Patient interview items (when their caregivers did not notice symptoms, the answer was given as "absence.")
  1. Presence of snoring
  2. Presence of apnea
  3. Presence of mouth breathing
- 2) Oral care products  
*First teeth*, *Mouth wash*, *Oralbalance* and two kinds of *Tooth ette*<sup>®</sup> (Sage Products Inc., Illinois, USA) (short and long type).
- 3) Procedures of oral care
  1. Tooth brushing with a small amount of toothpaste (0.2 g of *First teeth*).
  2. Mouth washing.
  3. After immersing *Tooth ette* (short type) in *Mouth Wash* and squeezing it slightly, insert the *Tooth ette* into the posterior area of the oral vestibule and move it toward the anterior direction while rotating it to clean the vestibular mucosa and gingiva.
  4. Tooth brushing with a small amount of the *First teeth*

paste.

5. Mouth washing.

6. After putting *Oralbalance* (0.5 g) on *Tooth ette* (long type), spread it over the whole oral mucosal surface including the tongue and palate.

## Results

All three DS children had adenoid and palatine tonsil hypertrophy, and also demonstrated all-night snoring and apnea, as well as diurnal and nocturnal mouth breathing prior to treatment. The body mass index was within normal limits in all three children.

Table 1 shows the results of this study. After treatment, the symptoms of a reddened oral mucosa and coated tongue disappeared in all three DS children. In case 1, snoring and mouth breathing were reduced and apnea disappeared. In case 2, snoring, apnea and mouth breathing disappeared. In case 3, snoring and apnea disappeared. The salivary pH value also increased in all three children.

## Discussion

Children, including DS children with snoring and sleep apnea, often present with mouth breathing associated with nasal obstruction. The oral cavity and pharynx become dry in such cases (11), which is a presumed cause of tonsillar hypertrophy. Moreover, loss of the self-cleaning ability of the oral cavity due to oral dryness can easily lead to gingivitis (12). Although adenoidectomy and tonsillectomy are indicated when adenoid vegetation and palatine tonsil hypertrophy are found to cause snoring and apnea (6), these treatments are performed under general anesthesia, thus placing a physical burden on DS children. Therefore, the present study attempted to treat DS children with sleep apnea using special products aimed at relieving oral dryness.

Snoring disappeared in two of the DS children after treatment, and apnea disappeared in all three DS children. The symptoms of a reddened oral mucosa and coated tongue disappeared in all three children. These results suggest that oral care prevents oral mucosal dryness and relieves sleep apnea symptoms. Saliva pH testing showed that the pH value increased in all three DS children after treatment. The salivary pH value approached 7, reducing the risk of caries, indicating that oral care improves oral hygiene status and the oral environment. The method of oral care using products for oral dryness was easily applicable to DS children.

In conclusion, the method of oral care performed in this study appeared to improve the oral environment, and either relieve or prevent dryness of the oral (including pharyngeal) mucosa, thereby aiding in the relief of snoring and sleep

Table 1 The results of oral care on snoring, apnea, mouth breathing and salivary pH

	Snoring	Apnea	Mouth breathing	Salivary pH
Case 1				
pretreatment	+	+	+	5.6
posttreatment	↓	—	↓	6.4
Case 2				
pretreatment	+	+	+	6.2
posttreatment	—	—	—	6.6
Case 3				
pretreatment	+	+	+	5.8
posttreatment	—	—	+	6.2

+ = presence; ↓ = reduction; — = disappearance

apnea in these subjects.

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