Obstructive Sleep Apnea Syndrome in a Pubescent Boy of Short Stature Was Improved with an Orthodontic Mandibular Advancement Oral Appliance: A Case Report

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We report a 16-year-old pubescent pediatric patient with obstructive sleep apnea syndrome (OSAS) and short stature whose apnea hypopnea index (AHI) was significantly reduced following the use of an orthodontic oral appliance that advances the mandible ventrally. The mandible was advanced 64% of the maximal mandibular protrusive position with use of the appliance over a 3-year period. The patient's AHI without the appliance in place decreased from 101.6/h at baseline to 11/h after treatment. Moreover, the patient's height increased 14 cm during treatment, resulting in height close to the average height for his age. Cephalometric analysis revealed an improvement in his retrognathic

mandible and proclination of the upper front teeth. In conclusion, an orthodontic mandibular advancement oral appliance played an important role not only in improving the patient's OSAS but also in normalizing his physical growth during puberty.

Keywords: catch up growth, mandibular advancement, sleep disordered breathing

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Obstructive sleep apnea syndrome (OSAS) is known to affect the physical development of children, making early treatment essential. Treatment of pediatric OSAS with surgery or nasal continuous positive airway pressure (CPAP) has been reported to stimulate physical growth.¹ Mandibular retrusion in Japanese children is often corrected with an orthodontic mandibular advancement oral appliance; however, there are no reports on the effects of this orthodontic appliance on physical growth in pediatric patients.

REPORT OF CASE

A 16-year-old boy who complained of heavy snoring, excessive daytime sleepiness, delayed growth, and short stature visited our clinic. His height was 156 cm (–2 SD) and he weighed 34 kg (body mass index [BMI] = 10.9 kg/m²; **Figure 1A**). Based on the results of polysomnography (PSG), he was diagnosed with severe OSAS, with an apnea-hypopnea index (AHI) of 101.6/h. Treatment with CPAP was begun immediately, and adenotonsillectomy was also recommended. According to a dento-facial morphological evaluation including SNB (angle between the Nasion [N]–Sella [S] line and the line from point B [supramentale] to N), the patient had protrusion of the maxillary front teeth and mandibular retrusion (SNB = 72°; –2 SD from Japanese mean value; **Figure 1B** left). The orthodontic treatment to promote the growth of the mandible was indicated for this patient. It was also expected to be simultaneously advantageous as a fundamental approach to pubescent OSAS.² We started the treatment with an orthodontic mandibular advancement oral

appliance for 3 years. The mandible advanced 64% of the maximal mandibular protrusive position with the appliance.

This treatment was remarkably effective, and the CPAP treatment and plans for adenotonsillectomy were cancelled. As a result, AHI without the appliance improved from 101.6/h at baseline to 11/h. The 3% desaturation index decreased from 55.9 to 0, the lowest percutaneous saturation index increased from 90% to 93%, and the arousal index improved from 104.5 to 17.0/h. The patient grew 14 cm in height, from 156 cm to 170 cm, while his weight increased from 34 kg to 53 kg; his BMI increased to 18.3 kg/m². Cephalometric analyses indicated positive ventral mandibular growth (**Figure 1B**). SNB had increased +2.2° (**Figure 1B** right). Overjet had decreased 6.0 mm (from 7.1 to 1.1 mm), indicating an esthetically favorable outcome due to retroclination of the upper front teeth. Notably, the reduction in AHI was associated with normalization of physical growth (**Figure 1B**).

DISCUSSION

Treatment for OSAS in children or those in the growth phase is generally surgery or CPAP. Recently, Guilleminault et al. proposed that rapid maxillary expansion (RME) would be effective in treating or preventing OSAS.³ RME is effective in selective cases when there is constriction of the maxillary arch, although the micrognathia and mandibular retrusion are said to be common maxillofacial morphologies among Japanese, and many people have large overjet from childhood.⁴ Furthermore, a positive correlation between AHI severity and overjet also

Figure 1—Physical developmental curve of Japanese males and the patient's height.

Source of curves are from the Ministry of Education, Culture, Sports, Science, and Technology, Japan. Note that the patient's height (dots) at first visit was below -2 SD from the mean but within the normal range after orthodontic treatment. Effects of the orthodontic oral appliance on growth of the mandible in the boy with OSAS. Note that 3-year use of the orthodontic oral appliance resulted in favorable growth of the mandible.

has been demonstrated.⁵ With advancement of the mandible using an orthodontic oral appliance, one may expect forward positioning of the tongue and soft palate, easier closing of the lips from decreased overjet, and a change from mouth breathing to nose breathing.⁵

Although the mechanism remains to be investigated, removal of the factors that inhibited the patient's growth by improving OSAS in this case may have elicited catch up growth. Thus, treatment using an orthodontic mandibular advancement oral appliance during puberty may prevent future treatment needs or OSAS. Considering the residual OSAS (i.e., AHI = 11.0/h) of the patient, careful attention and evaluation by PSG should be continued.

CONCLUSION

An orthodontic mandibular advancement oral appliance can play an important role not only in improving OSAS but also in normalizing physical growth during puberty.

REFERENCES

1. Bate TW, Price DA, Holme CA, McGucken RB. Short stature caused by obstructive apnoea during sleep. *Arch Dis Child* 1984;59:78–80.

2. Proffit WR, Fields HW. *Contemporary Orthodontics*. 4th ed. Mosby, St. Louis, MO, 2007.
3. Guilleminault C, Lee JH, Chan A. Pediatric obstructive sleep apnea syndrome. *Arch Pediatr Adolesc Med* 2005;159:775–85.
4. Esaki K. Morphological analysis by lateral cephalography of sleep apnea syndrome in 53 patients. *Kurume Med J* 1995;42:231–40.
5. Miyao E, Noda A, Miyao M, Yasuma F, Inafuku S. The role of malocclusion in non-obese patients with obstructive sleep apnea syndrome. *Intern Med* 2008;47:1573–78.

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