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Case report

Efficacy of torus mandibularis resection in a patient with obstructive sleep apnea (OSA): A case report

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ABSTRACT

Introduction: The aim of this study was to assess the contribution of a large torus mandibularis to induction of obstructive sleep apnea (OSA) due to upper-airway obstruction and to examine the efficacy of torus mandibularis resection in expanding the upper airway.

Methods: The Japanese version of the Epworth Sleepiness Scale (JESS), unattended portable sleep monitoring and computed tomography (CT) were performed before and at 18 months after surgery.

Result: The JESS score changed from 6 to 4. The lowest SpO_2 and the percentage of time during which the SpO_2 was < 90% changed from 32% to 76% and from 8.23% to 2.08%, respectively. The 3% oxygen desaturation index (ODI) and respiratory disturbance index (RDI) at 18 months after surgery were 6.5 and 4.9 times/h, respectively. The upper-airway volume changed from 6,645.31 mm^3 to 6,166.58 mm^3 at the level of the posterior soft palate, and from 8,802.93 mm^3 to 12,444.68 mm^3 at the level of the posterior tongue. The volume enlargement ratio evident on 3D image reconstruction was 92.8% at the level of the posterior soft palate and 143.37% at the level of the posterior tongue. The distance from the apex linguae to the anterosuperior point of the hyoid changed from 60 mm to 65 mm, and the distance from the SN plane to the superior point of the dorsum linguae changed from 53 mm to 47 mm.

Conclusion: Resection of a large torus mandibularis results in expansion of the upper- airway and may reduce airway obstruction during sleep.

1. Introduction

Obstructive sleep apnea (OSA) is a disorder characterised by intermittent and recurrent episodes of partial or complete upper airway obstruction during sleep. OSA causes oxygen desaturation, sleep disruption, daytime sleepiness, malaise, and morning headaches [1–4]. OSA is associated with the development of various diseases, including hypertension, cardiovascular diseases, stroke, diabetes mellitus, and psychiatric disorders [5–14]. Obesity, narrow nasopharynx and oropharynx, large inferiorly positioned soft palate, large tonsils and tongue, tongue retropositioning, micrognathia, mandibular retrognathia, and maxillary retrusion may all contribute to obstruction of the upper airway [4,15–25]. However, few reports have indicated that a large torus mandibularis can reduce the upper-airway space [3,26]. Therefore, we assessed the contribution of a large torus mandibularis to induction of OSA by upper-airway obstruction and examined the efficacy of torus mandibularis resection in terms of expanding the upper airway.

2. Case report

A 47-year-old female presented with a chief complaint of linguogingival pain while eating and mild daytime sleepiness. She reported no relevant medical history. She was 167 cm in height and weighed 56 kg. Her body mass index (BMI) was 20.1 kg/m^2. Her score on the Japanese version of the Epworth Sleepiness Scale (JESS) was 6 at the first visit. She exhibited no significant mandibular retrusion. Intra-orally, an extremely large bilateral torus mandibularis was evident, extending from

Abbreviations: OSA, obstructive sleep apnea; JESS, Japanese version of the Epworth Sleepiness Scale; ODI, oxygen desaturation index; RDI, respiratory disturbance index

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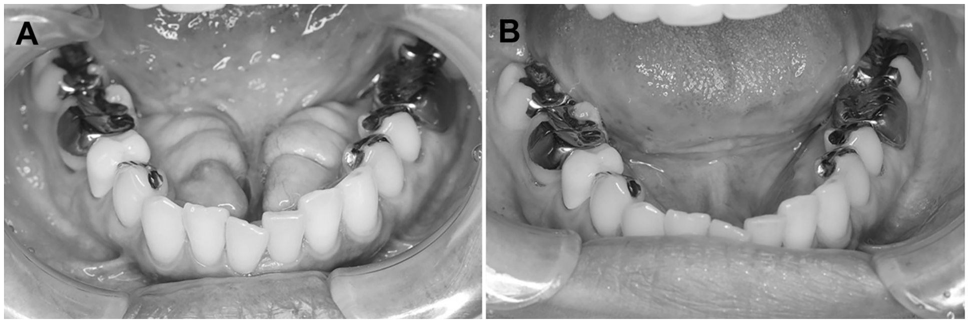

Fig. 1. The torus mandibularis. (A) Preoperative (the tissue is large). (B) Postoperative.

the lateral incisor to the second molar. The tongue was displaced posteriorly (Fig. 1). Her modified Mallampati grade was 4.

She underwent unattended portable sleep monitoring for one night before surgery and for another night 18 months after surgery using the Smart Watch E system (Philips, Eindhoven, the Netherlands). This system records nasal air flow, abdominal movement, and oxyhemoglobin saturation data (SpO_2 values) measured by pulse oximetry. Additionally, it calculates the oxygen desaturation index (ODI) and the respiratory disturbance index (RDI). The lowest SpO_2 prior to surgery was 32%. The percentage of time spent at an $SpO_2 < 90\%$ was 8.23%. The 3%ODI was 8.2 times/h. The RDI was 5.0 times/h.

Computed tomography (CT) (slice thickness: 1 mm) was performed with the aid of an Asteion device (TSX-021B/4; Toshiba, Tokyo, Japan) before and at 18 months after surgery. The patient was placed in the supine position and her head and neck were positioned on a pillow to hold the Frankfurt plane at right angles to the floor. CT was performed during inspiration at rest, without swallowing (Fig. 2). The upper-airway volume was measured in two regions: the region from the palatal plane to the most inferior point of the soft palate, which constitutes the posterior soft palate, and the region from the most inferior point of the soft palate to the deepest point of the epiglottis, which covers the posterior tongue (Figs. 3 and 4) [27]. The tongue position was assessed on lateral cephalograms by measuring the distance from the apex linguae to the anterosuperior point of the hyoid and the distance from the sella-nasion (SN) plane to the superior point of the dorsum linguae (Fig. 5). Three-dimensional (3D) image reconstruction from CT slices and data analysis were performed with the aid of Mimics software (Materialize, Leuven, Belgium). The patient underwent bilateral torus mandibularis resection under general anesthesia. A horizontal incision was made at the base of the torus mandibularis from the central incisor to the third molar region. The torus mandibularis was exposed via a lingual mucoperiosteal flap to allow removal of the bony torus with fissure burs and a chisel. After smoothing the bone edge with a large round bur, the wound was cleaned and the flap was replaced and sutured following trimming of excess soft tissue. (Fig. 1b).

3. Results

The JESS was 4 at 18 months after surgery. The lowest SpO_2 and the percentage of time during which the SpO_2 was < 90% at 18 months after surgery were 76% and 2.08%, respectively (Fig. 6). The 3% ODI and RDI at 18 months after surgery were 6.5 and 4.9 times/h, respectively. Fig. 4 shows the upper-airway after 3D image reconstruction. The upper-airway volume changed from 6,645.31 mm^3 before surgery to 6,166.58 mm^3 after surgery at the level of the posterior soft palate, and from 8,802.93 mm^3 to 12,444.68 mm^3 at the level of the posterior tongue. The volume enlargement ratio evident on 3D image reconstruction was 92.8% at the level of the posterior soft palate and 143.37% at the level of the posterior tongue. The distance from the apex linguae to the anterosuperior point of the hyoid changed from 60 mm before surgery to 65 mm after surgery, and that from the SN plane to the superior point of the dorsum linguae changed from 53 mm to 47 mm (Table 1).

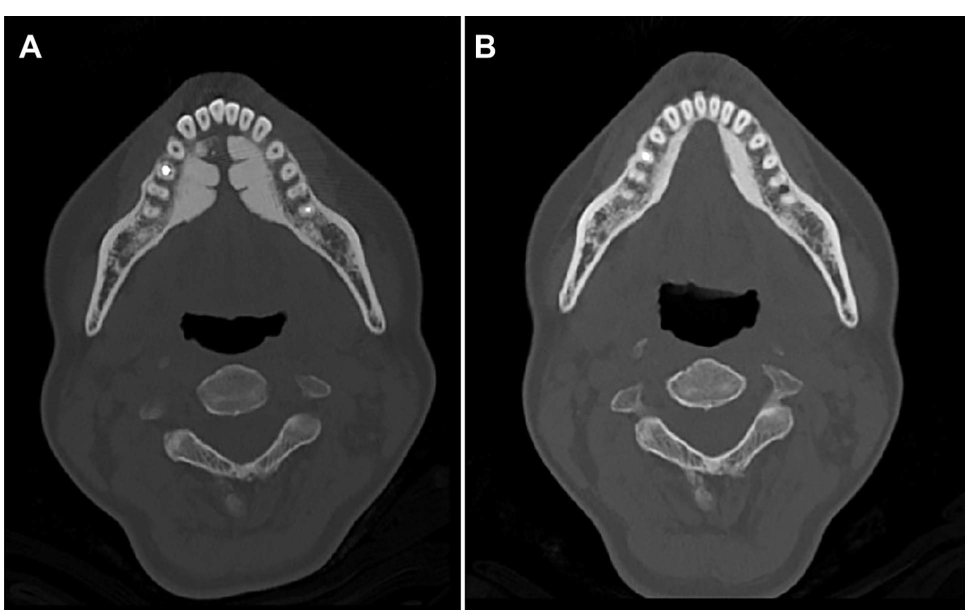

Fig. 2. Axial CT images of the bilateral torus mandibularis and airway. (A) Preoperative. (B) Eighteen months postoperative.