

# A REMOVABLE SNORE REDUCTION APPLIANCE FOR A MANDIBULAR EDENTULOUS PATIENT

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A snore reduction appliance can be constructed for the atrophic mandibular edentulous patient. Two endosseous implants can be surgically placed that retain a complete mandibular denture and, in turn, an overlying bimaxillary removable snore reduction appliance. A dual laminate appliance is vacu-form fitted to the maxillary teeth and the mandibular denture and luted in a protrusive relation with cold cure acrylic. The appliance maintains the mandible in a protrusive position to open the upper airway to reduce snoring.

**Key Words:** mandibular repositioning appliance, obstructed airway, sleep disturbance, sleep apnea

**M**any patients snore during sleep. Snoring occurs by the vibration of the soft palate as air passes through the upper airway. The proximity of the soft palate to the tongue and the posterior wall of the pharynx causes the soft palate to vibrate and produce a growling noise that can awaken and disturb the sleep of the patient and any bed partners. Snore reduction appliances are available for dentate patients and are successful in most patients in reducing snoring.<sup>1,2</sup> Generally, 6–10 natural teeth are required to retain an oral snore reduction appliance.<sup>1</sup> However, a mandibular complete removable denture that restores an atrophic ridge may not provide enough retention to keep a snore reduction appliance in place. This article reports on a successful denture-implant retained snore reduction appliance for a mandibular edentulous patient.

## CASE REPORT

A 75-year-old woman was treated for an atrophic edentulous mandible with a complete denture retained by 2 endosseous implants with 2 overdenture retainers (Locators, Zest Anchors, Escondido, Calif) (Figure 1). Subsequently, she complained of nocturnal

snoring that disturbed her and her husband's sleep. After an evaluation and discussion with the patient's physician, a snore reduction appliance was constructed. Maxillary and mandibular casts were made of the patient's dentate maxilla and the satisfactory removable implant retained mandibular complete denture. The patient was then instructed to place her mandible in a comfortable protrusive position. A large cotton roll placed between the maxillary and mandibular incisors was used for the patient to comfortably maintain this position. The position was recorded with a fast set polyvinyl siloxane (Futar, RoyDent, Johnson City, Tenn) on the right and left sides. The records were then disinfected and taken to the casts. The casts were mounted using the polyvinyl siloxane records. Dual laminate vinyl sheets composed of a soft side and hard side (ProForm, Maple Lake, Minn) were vacu-formed on each cast with the soft side against the cast. The laminates were separated from the casts and trimmed to the apical height of tooth contour. The two vacu-formed appliance parts were then placed back on the remounted casts. They were then luted together in the protrusive relation with cold cure clear acrylic, heat and pressure cured, and finished and polished (Figures 2 through 4).

The appliance was delivered and the patient instructed on its use (Figure 5). The patient was instructed to place a tiny amount, approximately 0.1 mL, of toothpaste inside the appliance to freshen the taste and deliver an overnight fluoride treatment to the remaining natural dentition. At follow-up, she

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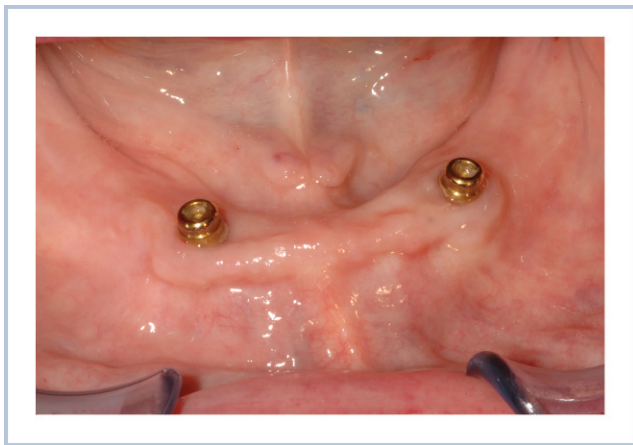


FIGURE 1. Two mandibular implants were placed with denture retainers.

reported a dramatic reduction of her snoring and more restful sleep for her and her husband.

### DISCUSSION

Snoring is a result of the soft palate vibrating in the pharyngeal space. Oral snore reduction appliances can successfully reduce or eliminate snoring. There are 4 parameters that affect the success of oral snore reduction appliances: the dimension of mandibular protrusion, the sleep position, the degree of sleep apnea, and the patient's body mass index (BMI).<sup>1</sup>

The appliance described here advances the mandible anteriorly or protrusively and vertically to provide more space in the upper airway to reduce snoring. The open space allows for air flow that is less impeded by the tonsils, fauces, tongue and soft palate.

The genioglossus muscle and its associated tendon connects the tongue to the genial tubercle of the lingual aspect of the anterior mandible (Figure 6). This muscle and tendon is a base for the tongue, protrudes the tongue and prevents the tongue from displacing posteriorly into the pharynx. When the mandible is positioned protrusively, the tongue is pulled forward as well, thus creating more space in the pharynx, reducing the collapsibility of the airway and the tendency for snoring (Figure 7).

Generally, the mandible is advanced 6–10 mm or 50%–75% of maximum protrusion.<sup>3,4</sup> The more the mandible is protruded, the more the airway is opened. However, patient discomfort may interfere with therapeutic compliance by causing the patient to remove the appliance during the night. As the mandible is protruded, the condyle advances toward the eminence and the tendons and ligaments are put under tension. An excessive protrusion may place the

condyle in an uncomfortable position at or approaching the eminence. Therefore, a protruded position that is about 50%–75% of the maximum protrusion has been found to be optimal for patient comfort and prevention of tension on the structures of the joint.

The amount of vertical opening of the mandible can increase the airway somewhat as well, but may also cause discomfort. A mandibular vertical opening of 10–15 mm produced only a slight improvement of airway opening compared with a 5-mm vertical opening.<sup>4,5</sup> Thus, the vertical opening should be minimal to ensure patient comfort.

Patients with obstructive sleep apnea that occurs while in a supine position appear to have a reduction of sleep apnea with an oral appliance. One study found that an oral appliance achieved more snore reduction while patients were in a supine position than in a lateral recumbent position.<sup>6</sup>

However, the outcome of oral appliance therapy in patients with severe obstructive sleep apnea is unpredictable.<sup>1</sup> Patients who have a reduction or elimination of snoring may not have a reduction of sleep apnea. Oral appliances have been found to be helpful in reducing snoring and resultant sleepiness and, therefore, are found to increase quality of life, but they are less effective for severe sleep apnea and the related neurocognitive outcomes.<sup>1</sup> Imaging and physiologic monitoring has shown that the success of these appliances is related to reducing the obstruction of the upper airway.<sup>1</sup> Most patients have been found to be compliant in wearing oral snore reduction appliances and prefer an oral appliance to continuous positive pressure (CPAP) or surgical alteration of the soft palate and pharynx, uvulopalatopharyngoplasty (UPPP).<sup>1</sup> Patients are more apt to be compliant with an oral appliance than with CPAP.<sup>1</sup>

The patient's BMI refers to corpulence, which anatomically constricts the airway. This airway constriction is a major contributing factor in sleep apnea and snoring. The mandible can only be advanced as far as anatomically possible. A patient with large BMI may not be successfully treated with an oral appliance.

There are design variations in oral snore reduction appliances that produce variable results. Appliances that are uncomfortable produce noncompliance. Palatal elevators had less compliance than mandibular positioning appliances.<sup>7</sup> These appliances have an extension from the hard palatal portion of the appliance to the soft palate.

The dual laminate appliance described here comfortably maintains the tongue in a protrusive position to reduce snoring. The dual laminate is made of soft vinyl on the interior surface while the outside is



FIGURES 2-5. FIGURE 2. The appliance was made of dual laminate, soft and hard sided, vinyl and vacu-formed to the mounted casts. FIGURE 3. Anterior view of the snore reduction appliance. FIGURE 4. Lateral-superior view of the snore reduction appliance. FIGURE 5. The appliance was delivered to the patient and had an adequate opening for air flow through the mouth.

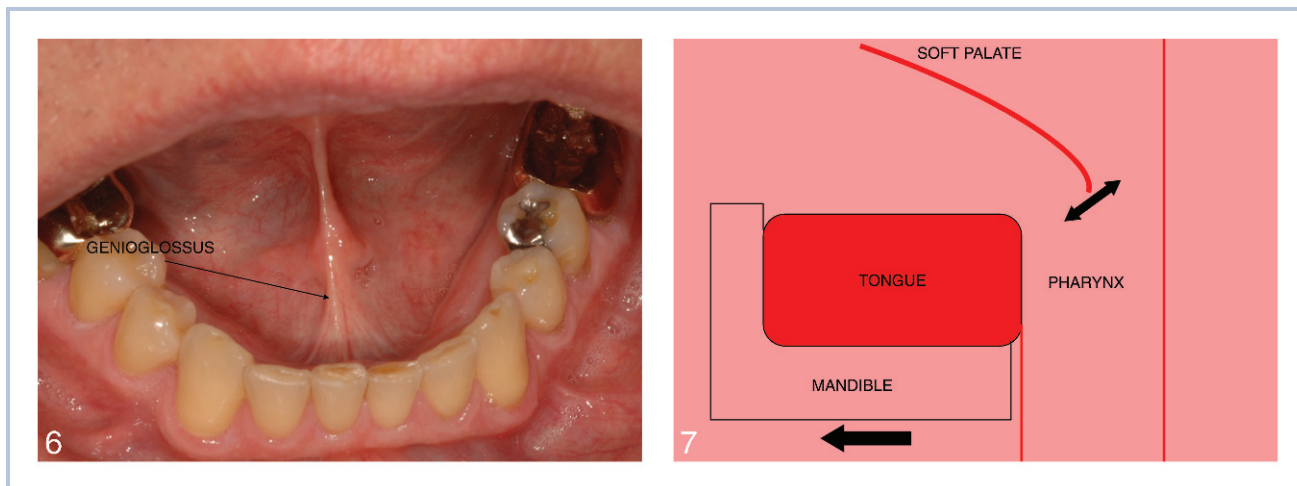
hard vinyl. This design allows for adequate and comfortable retention of the appliance on teeth and denture in the soft side. The hard side provides a rigid surface to connect the 2 vacu-formed parts. This appliance design also allows for slight movement of the mandible and yet has adequate retention for the complete denture while the implants, in turn, retain the complete denture. This slight leeway for movement makes this appliance design much more comfortable. It does not give the patient a restricted rigid sensation. Other appliance designs are completely rigid and do not allow any movement of the mandible, which some patients find uncomfortable. Other designs also may require intraoral adjustment to position the mandible appropriately. The adjustment apparatus may be uncomfortable. Additionally, these appliances may be difficult to adjust in order to titrate the positioning of the mandible.

The location of a comfortable protrusive position for the mandible depends on the clinical skills of the clinician. The recording of this relation is critical for the success of the appliance.

Some patients have temporary symptoms that include dental, temporomandibular joint, and myofascial pain, salivation, xerostomia and gingival irritations.<sup>4,5</sup> The patient may need reassurance or adjustment to get beyond this period. Generally, hard appliances have more side effects than soft appliances.<sup>8,9</sup>

#### CONCLUSIONS

A dual laminate snore reduction appliance was constructed and successfully used to reduce snoring for a mandibular edentulous patient. Two endosseous implants were surgically placed that retained a removable complete mandibular denture and, in turn,



FIGURES 6-7. FIGURE 6. The genioglossus muscle tendon displays as the lingual frenum. FIGURE 7. The mandible is placed in a protrusive relation to create more pharyngeal airway space to prevent or reduce vibration of the soft palate during sleep that would produce snoring.

an overlying bimaxillary removable snore reduction appliance. The soft/hard dual laminate appliance parts were vacu-form fitted to the casts of the maxillary teeth and mandibular denture. The parts were then luted together with cold cure clear acrylic and positioned in a comfortable protrusive relation that produced an increased airway space and reduced the incidence of snoring for this patient. The soft internal side of the appliance allows slight movement for the mandible that imparts greater patient comfort than that of hard appliances.

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