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Re-Published Article*
Published on 09-10-98

Obstructive Apnea and Chronic Snoring

"Treatment with dental appliances worn during the night"

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*This article appeared in the 54th "Bollettino di Informazioni Ortodontiche".
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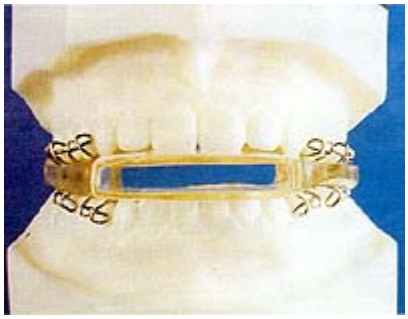
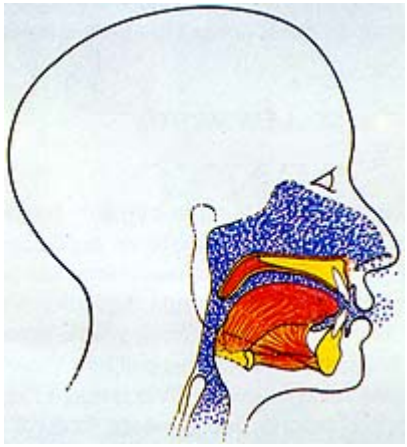
Abstract: The author describes features of several appliances used for the treatment of obstructive apnea and chronic snoring. Night-time wear of these appliances can prevent snoring by repositioning the mandible and the tongue anteriorly.

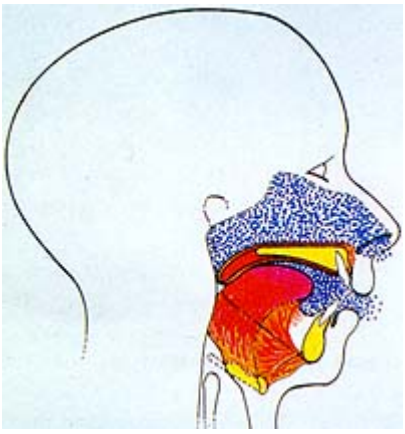


Snoring is one of the most common and unpleasant involuntary behaviors. It can contribute to family disagreements and irritability. In a statistical study of over 40-year-olds, 60% of men and 40% of women were found to snore.
Physicians usually suggest weight loss, sleeping on one's side, or simply tolerating the situation. In very severe cases the physician may suggest a surgical solution to widen the airway with a uvulopalatopharingoplasty (UPPP) or to install a positive continuous pressure device in the airway (CPAP) which is a compressor to pump air in the lungs all night long through a nasal mask.



In 1983, it was discovered that a modified orthodontic functional appliance (fig.1) could not only resolve snoring but was also capable of preventing obstructive sleep apnea (OSA) which is quite dangerous.

What exactly is snoring, and how can these appliances prevent it? Everyone is aware of how unpleasant snoring can be, but few know that it can seriously affect one's performance during the day. One must understand the mechanism of breathing during the night in order to clarify what can be done to prevent obstructive apnea.



Snoring is the result of airway constriction. Following the Bernoulli rule, the speed of a fluid through a pipe is inversely proportional to the circumference of the pipe. This accelerated air causes the pharyngeal tissues, especially the soft palate and the uvula to vibrate like a contra-bassoon pipe.

Several factors are able to cause a reduction of the airway: nasal congestion, enlargement of tonsils and adenoids, retrognathia, macroglossy, or adipose tissue in pharyngeal area. All these elements can contribute to snoring. However, the main trigger is over-relaxation of the tongue.

Since the posterior part of the tongue is the anterior part of the airway (fig. 2), the posterior movement of the tongue reduces airway space. In addition when the diaphragm contracts, it causes the tongue to become more flaccid. This accelerated flux causes the vibrations of the soft palate and uvula to become audible.

Fig4

When the tongue moves posteriorly and completely obstructs the posterior wall of the pharynx (fig. 3) the oral and nasal air cannot reach the lungs.

This is the mechanism by which obstructive sleep apnea occurs. Progressively the diaphragm improves this sucking activity and causes an ever-tightening closure. The pharyngeal occlusion will not stop until blood levels of carbon dioxide reach a level that wakes up the sleeper with a loud puff. Within a second the individual will fall back asleep again. This activity can repeat itself a hundred times a night, and often the subject will not remember anything in the morning.

The two most common OSA symptoms are loud snoring and sleepiness during the day, but also headache, irritability, cognitive weakening and sexual impotence.

Long term consequences related to OSA are hypertension and a higher incidence of myocardial infarction. In 1983 Dr. Peter T. George conceived and fabricated an orthodontic modified functional appliance for treatment of OSA and in the same year he treated his first patient who had been recommended a tracheotomy by his physician.

The appliance modifications consisted of total occlusal coverage and clasps in both arches to prevent dental movement in any direction. The mandible was advanced

to allow free passage of air (Figs. 4 - 7).

The device was called NAPA "NOCTURNAL AIRWAY PATENCY APPLIANCE".
It prevents airway obstruction during sleep by:

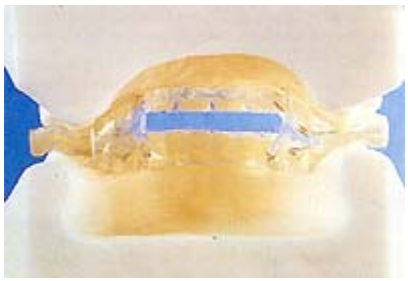
1) Advancing the mandible to prevent the tongue from occluding the posterior wall of the pharynx;

2) stabilizing the mandible;

3) preventing the retraction of the tongue through the anti-bite reflex;

4) increasing the vertical dimension.

During the years that followed, patients who used NAPA's were monitored and studied both by physicians and orthodontists to confirm the absence of any unfavorable side effects, using a POLISOMNIGRAPH device. Most of the treated patients had a reduction of the Respiratory Difficulty Index, calculate on the numbers of apneas and ipoapneas, of 80%.



Several appliances are now available to prevent and reduce snoring. Basically they increase the vertical dimension, and advance the mandible to produce a different tongue posture, and/or support the soft palate to open the airway.

SOFT PALATE LIFTING APPLIANCES

Many patients have an excess of soft tissue in the oro-pharyngeal region that obstructs the airway. One of these devices has an acrylic button that distally extends itself until a point in the middle of the palate that lifts the tissue preventing vibration during airflow. Despite its effectiveness it is not widely accepted by patients because it triggers the gag reflex. It had been approved only for snoring and not for OSA. (fig. 8)

TOPS DEVICE

TEPPER ORAL PROPIOCEPTIVE STIMULATOR

This appliance was conceived for patients with chronic snoring and tongue pressure.

The appliance has a palatal bar behind the superior incisive region, a resin plate and a thin acrylic foil of trapezoidal shape parallel to the plate and anchored anteriorly, while posteriorly it is free to move on a

transversal elastic.

With this appliance the propioceptive system causes a repositioning of the tongue behind the lingual bar, permitting free airway space.

The TOPS appliance should be worn from 1 to 3 hours before bedtime. (figs. 9,10)

SPLINT WITH INCISAL STOP FOR MANDIBULAR REPOSITIONING (M.I.R.S.)

This appliance maintains an open and free airway by repositioning the mandible anteriorly and inferiorly.

A tilted flange is used to direct the mandible anteriorly and avoid posterior closure. This appliance is made entirely of acrylic and the posterior teeth are held in the occlusal surface. (figs. 11-12)

MODIFIED HERBST APPLIANCE (BY GARRY-PRIOR)

The Garry-Prior appliance positions the mandible inferiorly and anteriorly combining a scheletrate and mandibular splint through two Herbst pipes.

The peculiar feature of this appliance is that it allows free lateral and vertical movement of the mandible without any distal movement. In addition the thin framework of the appliance in the maxillary portion allows maximum space for the tongue.

Doctors Garry and Prior used a low frequency T.E.N.S. unit to find the neuromuscular mandibular position before taking the construction bite.

Vertical elastics in the canine region produce a propioceptive response when the patient opens his mouth during the night. (figs. 13,14)

MODIFIED HERBST APPLIANCE (BY CLARK -U.C.L.A.)

This appliance is a further modification of the Garry-Prior device.

A full coverage splint replaces the framework.

The occlusal surfaces are accurately refinished for full contact. Maximum retention is obtained with multiple ball clasps both on the upper and lower arch.
Vertical elastics in the cuspid area help the patient to keep the mouth closed (figs. 15,16).

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