Dental Treatment for Snoring and Obstructive Sleep Apnoea

Snoring and obstructive sleep apnoea (OSA) are breathing disorders caused by the narrowing of the upper airway during sleep. This reduction in airway size results in increased resistance to the passage of air during breathing and may lead to repeated events of partial or complete airway collapse. Medical science is now very aware that these events or blockages, which may occur up to several hundred times a night, can have serious health risks. Chronic snoring associated with repetitive apnoeas (literally, ‘without breath’) disrupts a healthy sleep pattern and causes adverse changes that stress the cardiovascular system.

When we are awake, our upper airway is held open by specialized muscles that maintain muscle tone in the tongue, soft palate and the back of the throat. However, during sleep the muscles of these structures relax, reducing the size of the airway. To counteract this effect, a number of specialized mouth-pieces, referred to as oral appliances, have been developed to enlarge the airway at this level. Numerous clinical research trials have now shown that oral appliance therapy can be very effective in improving the snoring or the ability of OSA patients to breathe during sleep.

The dental devices, which are based on modified orthodontic appliances, achieve this mainly by holding the tongue and the lower jaw in a forward position, stabilizing the airway muscle tissues. This reduces resistance in the airway and thereby the snoring vibration and collapse of the soft tissues of the pharynx. The effect is similar to restoring an open airway position in a patient during cardio-pulmonary resuscitation (CPR).

Development of Oral Appliances for Treating OSA

Since the early 1980’s, the most common and effective treatment used for OSA is nasal CPAP (continuous positive airway pressure), a machine which works by delivering a stream of air through a facial mask, at a critical pressure that splints the upper airway open – creating a type of ‘pneumatic splint’. The CPAP treatment was developed by an Australian respiratory physician, Professor Colin Sullivan, in response to the high morbidity of OSA. Up until then, tracheostomy (a tube surgically inserted into the windpipe) was the only option for therapy in many cases. During the same period, the urgent need to find a less invasive treatment method also drove the development of the first use of oral appliances for OSA.

In 1982, a Chicago psychiatrist, Dr Charles Samelson and his sleep physician colleague, Professor Rosalind Cartwright, introduced a technique for treating patients using a tongue-retaining device (TRD). A custom–made silicone suction bulb secured the tongue forwards and was shown to reduce both snoring and obstructive apnoeas during sleep.

In 1984 at the European Congress of Sleep Research, Professor Karlheinz Meier-Ewert presented an alternative technique using a ‘mandibular repositioning device’ to advance the lower jaw and mechanically splint the upper airway wider in a group of sleep apnoea syndrome patients. Further advancements in the design and technology of both types of these devices are the basis of oral appliance therapy used to treat sleep-disordered breathing (SDB) patients today.

The latter approach using mandibular advancement splints has proven to be the most popular method. However, the preformed tongue-stabilising devices (aveoTSD) are economical and are especially useful if patients do not have teeth or where their oral health is a problem.
Mandibular Advancement Splint Design

Many different designs of these appliances are in use but they fall into two general categories:

1. Fixed – one-piece designs, similar to an upper and lower sports mouthguard bonded together, usually at 60-75% of the maximum jaw protrusion; commonly moulded directly in the mouth using a ‘boil & bite’ method versus the dental laboratory-fabricated models.

2. Moveable – usually two-piece designs retained by the upper and lower teeth; generally custom-made using dental impressions; allows for gradual forward advancement of the lower jaw according to treatment effect and patient comfort.

The current appliance designs and materials now favour by far custom-made, moveable appliances that can be advanced as the user becomes accustomed to wearing them. This flexibility allows jaw movement from side-to-side as well as forwards. This type of splint can be easily adjusted to open the airway to the most optimal level.

Although cheaper, the ‘boil & bite’ thermoplastic devices tend to be bulky, more difficult to clean and fit like a ‘gumboot’. Conversely, the laboratory-made acrylic appliances are more durable, easier to clean, and their superior fit allows a much more unobtrusive, low profile design that fits like a ‘comfortable shoe’.

Oral Appliance Therapy for Sleep-Disordered Breathing

Dentists have pioneered the continuing development of oral appliances and scientific research in collaboration with their medical colleagues.

Increasing clinical evidence suggests that patients prefer the less intrusive convenience of a dental device compared to surgery or CPAP. In 2006, following an extensive research review, the Board of the American Academy of Sleep Medicine revised their recommendations regarding this treatment. Although oral appliances are generally considered to be not quite as effective as CPAP, “oral appliances are indicated for patients with mild-moderate OSA who:

- prefer them to CPAP, or
- do not respond to CPAP, or
- are not appropriate candidates for CPAP, or
- who fail attempts with CPAP or treatment with behavioural measures, such as weight loss or sleep position change.”

[Sleep 2006; 29(2):240-43]

Effectively, this means that oral appliance therapy is the treatment of choice for the following:

- Primary/heavy snoring
- Mild-moderate OSA
- Poor tolerance of CPAP
- Surgical failure
- Travel convenience
- Combination treatment – prior to surgery or during weight loss.

Oral appliance therapy is generally not considered to be suitable for children and adolescents because of the rapid growth changes, but snoring in children is recognised as an important problem. The detrimental effect that mouth-breathing and nasal obstruction has on childhood development is undergoing much more extensive research. Adenoid and tonsil removal (adenotonsillectomy) and
earlier orthodontic intervention to help develop the airway is proving to be very effective in correcting breathing disorders in sleep which impacts markedly on children’s physical and mental development.

**Side-effects**

Wearing an appliance can have some side-effects, especially in the early stages of treatment. Producing excess saliva initially is common, although conversely some patients can complain of a dry mouth. Other effects can include tooth movement, or sometimes teeth or jaw joint discomfort but these are usually minor or temporary in nature.

However, because of the potential for such side-effects, it is very important that oral appliance therapy is managed by a dentist with specific training in this field. Dentists must be prepared to monitor the patient’s condition on a regular basis (at least annually) and adjust the device when necessary to maintain the best effect and comfort level for the patient.

**Dental Sleep Medicine**

Although oral appliance treatment is not suitable or effective for everybody, patients who have been assessed appropriately by dentists experienced in dental sleep medicine, can count on a high degree of success.

To date, no perfect appliance has been designed or constructed, so a dentist practising in this area should be familiar with a variety of devices and use different techniques according to each patient’s individual needs. It is equally important that such a dentist or orthodontist maintains a close working relationship with the sleep physicians and understands the workings and requirements of sleep laboratories. The most successful health outcomes in treating sleep-disordered breathing come from a close teamwork approach of different specialties working with well-informed patients.

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