Dr. Harry Legan is Professor and Director of the Division of Orthodontics at Vanderbilt University in Nashville, Tennessee. Dr. Legan is an engaging speaker with an extensive knowledge and background in orthognathic surgery and distraction osteogenesis, both of which are key treatment modalities for obstructive sleep apnea (OSA). OSA is an upper airway disorder that is characterized by recurring interruptions in normal sleep patterns due to pharyngeal obstruction. It is primarily a pharyngeal obstruction, though there is also a nasal component as well.

It is a disorder that affects the quality of life and if left untreated can potentially lead to death. Anyone can get sleep apnea, though it is more prevalent among middle-aged men and women. Dr. Legan estimates that at least 13 million Americans have OSA but notes that it is a very under-diagnosed disease.

There are certain behavioral and systemic factors that can contribute to sleep apnea. These include obesity, sleeping in the supine position, and alcohol (or any other central nervous system depressant). There are also anatomic factors that can contribute to OSA: maxillary or mandibular retrognathism, increased lower face height, large tongue, elongated soft palate, and an inferiorly positioned hyoid bone. This list points out how critical the role of the orthodontist can be in diagnosing and treating OSA.

**SYMPTOMS**
The symptoms of OSA can be very revealing. The obvious one is, of course, snoring, but some less obvious symptoms include daytime sleepiness, impaired intellectual function, insomnia, depression, irritability, and poor workplace performance.

As noted before, OSA can be a fatal disease if left undiagnosed. This is primarily due to the circulation of unsaturated blood during the night, which can cause cardiopulmonary changes, congestive heart failure, and strokes. Daytime sleepiness can also lead to fatal motor vehicle accidents.

**DIAGNOSIS**
So how does an orthodontist participate in diagnosis of OSA? If a patient is suspected of having OSA, the diagnosis is confirmed by an overnight polysomnography (PSG), commonly referred to as a sleep study. This is also a requirement medico-legally to ensure that the correct treatment is rendered. If a patient visits the orthodontist asking for an oral appliance to alleviate snoring, Dr. Legan recommends discussing the possibility of OSA with the patient and recommending a PSG to confirm the diagnosis. Communicate this recommendation to the patient’s physician. If the patient refuses a sleep study, he recommends having the patient sign a waiver prior to providing an oral appliance.

Once a sleep study is undertaken, the resulting data is the Respiratory Disturbance Index (RDI). This is a somewhat complex index that measures the number of apnic (total cessation of breathing) and hypopnic (shallow breathing) events per hour of REM and non REM sleep. For example, someone who has an RDI of 30 has 30 apnic or hypopnic events an hour. The range of RDIs is as follows: RDI < 5 Normal; RDI 5-15 Mild; RDI 15-30 Moderate; RDI > 30 Severe.

**TREATMENT**
The guideline for treating mild cases of OSA include increasing the hours of night sleep to eight, weight reduction, sleep posture training, avoiding any CNS depressants including prescription medications, and oral appliances, which can be very effective in treating mild cases.

The treatment of moderate to severe cases is done primarily through the prescription of Continuous Positive Air Pressure, or CPAP, which is considered the gold standard and the first line of treatment by many sleep teams, though Dr. Legan points out that it is not the first treatment option at Vanderbilt. CPAP is a cumbersome mask connected to a loud machine and has to be worn every night. It is not well tolerated by most patients and has to be worn every night to be effective. The other main treatment option is orthognathic surgery. Most people who opt for surgical correction are individuals who have already tried the CPAP and want a more permanent treatment. The last treatment option for moderate to severe cases of OSA is the use of oral appliances. These include most introral functional appliances, such as Class II correctors that bring the mandible forward and keep the airway open. Oral appliances can result in a 10% to 20% improvement in sleep-related symptoms.
in muscle and airway function. Dr. Legan discussed a Vanderbilt study where the use of oral appliances successfully decreased the mean RDI from 11.2 to 2.9. Success is indicated by an RDI that is less than 5.

**SOFT TISSUE SURGERY**

Surgical correction has been used with the goal to improve soft tissue anatomy and function. But evidence has shown that any improvement gained from soft tissue surgery is not lasting and has only a limited improvement. The most common soft tissue surgical procedure is uvulopalatopharyngoplasty (UPPP), which involves excision of tonsils, anterior and posterior tonsilar pillars, and an uvulectomy. Laser assisted uvuloplasty (LAUP) was the next surgical procedure to be tried for OSA treatment. It could be done under local anesthesia, but had to be done multiple times. It was painful, and had limited effectiveness. Radiofrequency ablation is a procedure used at the base of the tongue or soft palate, where a coagulative lesion is precisely positioned where tissue reduction is desired. It is effective for only one year and thus not a desirable treatment option. The last resort procedure is a tracheotomy, which bypasses the pharyngeal airway and is thus 100% effective. Of course it is a rather extreme procedure and not generally recommended. The general conclusion about soft tissue surgeries is that they are not as effective or as long lasting when compared to skeletal surgery or oral appliances.

**SKELETAL SURGERY**

Surgical correction of the jaw position is the most effective treatment for OSA, with good long-term stability. Dr. Legan showed several severe OSA cases successfully treated with orthognathic surgery during his lecture. Skeletal surgery can involve maxillary and mandibular expansion and/or maxillary and mandibular advancement. Dr. Legan notes that a paradigm shift occurred in the treatment of OSA when mandibular expansion surgery was first described in 1990. Mandibular expansion is done using a modified RPE in conjunction with a vertical osteotomy in the mid symphysis to create a suture. Maxillary expansion is done using the familiar technique of surgically assisted RPE.

Orthognathic surgery primarily involves maxillomandibular advancements. Mandibular advancements usually have to be over 10mm to be effective in treating OSA, so, typically, maxillary advancement is also necessary. Dr. Legan pointed to stability studies and orthognathic surgery effectiveness for treating severe cases of OSA. In one study patients had a pre surgical RDI of 50-70. After maxillomandibular advancement, the RDI dropped to 5-10, which is the same as that achieved by CPAP, except the change here is permanent and no device is needed. As for stability, most patients treated surgically have been followed for 10 to 20 years, and none so far has required the surgery to be repeated.

**PREVENTING AND TREATING OSA IN CHILDREN**

Clinical symptoms of pediatric OSA include disrupted nocturnal sleep, snoring, fatigue, school difficulties, hyperactivity or inattention. In some cases children who are diagnosed with ADHD are actually not hyperactive but rather are showing the clinical symptoms of OSA. The most common treatment for OSA in children has been and still is adenotonsillectomy. RPE is another effective way for treating OSA in children. Recent studies show that adenotonsillectomy is not always effective in resolving OSA in children and that RPE may still be necessary.

Dr. Legan made a strong case for the importance of the orthodontist in diagnosing OSA. His very informative and thorough presentation showed how the orthodontist is uniquely suited to recognize the symptoms of OSA, make a tentative diagnosis, and make the necessary referrals to coordinate treatment options for these patients.

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**Soft Tissue Laser**

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would be possible with a gingivectomy. Clinically, the same steps as for crown lengthening for bracketing are followed, although the tissue can come back if there is subsequent poor oral hygiene.

It can be useful to use computer simulation to show the patient what might be expected from laser surgery. In Dr. Yanosky’s practice, there is no special charge for the laser procedure, but he suggested it may be appropriate. To avoid criticism, talk to and educate your general dentist colleagues regarding your use of laser procedures.

Our patients want aligned, beautiful, and white teeth along with a gorgeous smile. The use of the soft tissue laser in the orthodontic practice can help us to achieve these goals and create happy patients and nice clinical outcomes.