

Temporomandibular Joint Disorder & How it Contributes to Sleep Apnea

Eton Chen

New York University

“Some tortures are physical, and some are mental. But the one that is both, is dental.”

—Ogden Nash

There comes to a point in everyone's life where they experience a throbbing headache that interferes with one's concentration -whether it be at work or school. For many people, the pain can be traced back to the way their teeth occlude along with the alignment of the lower jaw, as well as trauma to the jaw -mainly the temporomandibular joint, but the exact causation of this pain is still unknown.

Living with a temporomandibular joint disorder is a lifelong challenge for many sufferers, like myself. When I was younger, I constantly felt pain around my temples and the outside of my ear. It wasn't until 2 years ago that I was diagnosed with temporomandibular joint disorder (TMD). I remember waking up during the middle of the night due to sharp pains around my jaw. At first, I thought it might be due to me clenching my teeth while sleeping. I still have TMJ pains to this day. My TMJ pains have caused my jaw to lock open therefore resulting in me having to make an emergency hospital visit to relocate my jaw. Due to this problem, I have missed about a handful of classes and clinic sessions combined. Today, I wake up worrying about jaw pain as well as my jaw dislocating again. When I am outside, I try not to yawn because of the TMD -the last time I yawned, my jaw dislocated itself and I was forced to have another emergency hospital visit to relocate its position.

Pain doesn't happen randomly or because of bad luck. There's a cause and effect to almost everything in the human body.” —Fred Abeles

The temporomandibular joint (TMJ) is different from the other joints located in the body. Unlike other joints, the formation of the TMJ consists of a bilateral hinge that articulates the lower jaw with the temporal bones while incorporating sliding motions, making the TMJ one of the most complicated joints throughout the entire body. It is the joint that connects the lower jaw, commonly known as the mandible, to the middle/side of the head, known as the temporal bone, and aids in opening and closing of the mouth, chewing, and also yawning. The tissues that make up the TMJ also differs from the “load-bearing” joints, like the knee or hip. Due to the complex movement and unique makeup, the temporomandibular joint and the supporting muscles can pose a tremendous challenge to both the patient and the health care provider when problems arise.

When this joint is injured or damaged, it can lead to a localized pain disorder called temporomandibular joint disorder (TMD). Injuries involving the temporomandibular joint (i.e., injury to the teeth or jaw, misalignment of the jaw, teeth grinding, stress, arthritis) are often painful and can result in discomfort around the outside of the ear and jaw area. Pain in the jaw may also occur on either one side or both sides, depending on the cause.

Epidemiology reports state temporomandibular joint disorders (TMD) affect up to 25% of the population (Bennett, 2014), with their etiology and progressions poorly understood. As a result, treatment options are limited and fail to meet the long-term demands of the younger patient population. The temporomandibular joint disorder is a degenerative musculoskeletal condition associated with morphological and functional deformities. In up to 70% of cases, TMD are accompanied by mal-positioning of the TMJ disc, termed “internal derangement” (Levendowski 2014). Due to the complex and unique nature of each TMD case, diagnosis requires patient-specific analysis and treatment requires customized plans to address the specific

characteristics of each patient's disease. According to Dr. Fred Abeles, these concerns may lead to the diagnosis of obstructive sleep apnea (OSA).

Abeles believed that the cause of headaches could often lead back to pain resonating from the temporomandibular joint. This joint can sometimes cause pain when the occlusion of the upper and lower are not aligned properly, increasing the strain on the facial muscles, therefore leading to headaches. Unfortunately, headaches caused by the TMJ will not go away because people try to look for an immediate solution (i.e., taking over-the-counter ibuprofen – Advil/Tylenol) rather than correcting its underlying issue.

“The TMJ is the only joint in the human body that has 28 teeth stuck between the opening and closing motion of the joint to complicate things.” –Fred Abeles

Temporomandibular joint disorder often causes severe pain and discomfort in one or both sides of the face. TMD is also more prevalent amongst women than men, and most commonly diagnosed among people between the ages of 20 and 40. Curing a temporomandibular joint disorder is also by far one of the most complicated dental treatments, usually involving long-term maintenance, along with patient cooperation. With the main cause of the temporomandibular joint disorder being unknown, the exact diagnosis for each individual TMD case provides a challenge for health care providers.

The most common symptoms of TMD are associated with clicking or popping of the jaw, malocclusion of teeth, pain, and even snoring. The clicking/popping of the jaw during speech or mastication is a clear sign that the synovial joint is not occluding in the proper position. All joints

in the body should be working unanimously and silently. Whether the pain is present or not, the muscles that support and stabilize the TMJ become fatigued, therefore produce pain.

Malocclusion can also be a symptom of a temporomandibular joint disorder. Every other joint is completely controlled by muscles –whether it be the position, movement and range of motion, they are all mediated by muscles. The positioning of TMJ is dictated by the occlusion of our teeth. There is a good chance that the TMJ is off if the teeth do not occlude or align against one another. Malocclusion has still not been determined if it is the cause or effect of TMJD.

Pain is usually prevalent when one is dealing with TMJ disorders. The forehead, temples, back of the head, or radiating down the neck are all common muscle pains pertaining to the TMJ.

Snoring can also be one of the symptoms of TMJD. One of the most important factors is the position of the lower jaw when sleeping. If your lower jaw is not occluded, the tongue slides backwards –creating a blockage in the airway by vibrating against our soft palate. Just snoring alone will not cause a headache but it could be a sign of the lower jaw sliding too far back from its optimal location. As a result, the muscles that support the jaw in an improper position can produce the headache.

According to Abeles, “the temporomandibular joint is the only joint in the human body whose position is dictated by where a bunch of teeth come together. No other joint in our body has this distinction. When the 14 teeth of our upper jaw mesh together with the 14 teeth of our lower jaw (our bite relationship), that’s where the lower jaw aligns. In fact it cannot align anywhere other than where our teeth habitually fit together.” Sleep-disordered breathing, including sleep apnea, can result from a partially obstructed airway. If the bite relationship positions the lower jaw slightly too far backward in a less than optimal position (known as a retruded position), the lower jaw along with the TMJ will be positioned further backwards, as

well as the tongue. The tongue also retrudes because its position is determined by the location of the mandible –therefore affecting the degree of opening in the airway.

“75% of people with TMJ dysfunction have signs that suggest sleep-disordered breathing; a narrow maxillary arch (upper arch of teeth) is 90% predictive of OSA; and a retruded chin is 70% predictive of OSA.” –Fred Abeles

Today, the most effective treatment that dentists use to help their patients deal with sleep apnea is referred to as a mandibular advancement device (MAD) or oral appliance. These oral appliances come in many different forms, but all made for the same purpose. When worn during sleep, they prevent the mandible from falling backward and closing off the airway by latching on to the tongue in a “vacuum” seal, creating a continuous positive airway pressure (CPAP). “Most CPAP devices laterally inflate the airway. Mandibular advancement devices open the airway in an anterior/posterior dimension, so the two devices may even complement each other in certain indications (Ables, 2016).

“You’re not healthy, unless your sleep is healthy.” –Dr. William Dement

We spend about a third of our lives sleeping, so why not try to get the most out of it? Sleep apnea is a common disorder in which one or more pauses in breathing or shallow breaths occur while you sleep. The “pauses” can range from a few seconds to minutes and can occur 30 times or more in an hour. Sleep apnea is also measured by an index known as the Apnea-Hypopnea Index (AHI). Sleep apnea, usually a chronic condition, also disrupts your sleep and

often goes undiagnosed by doctors, due to the inability to detect this condition because no blood tests will be able to pick it up. Most people who have sleep apnea are unaware of their condition because it only occurs during sleep. The first ones to notice signs of sleep apnea is usually a family member or partner.

There are 3 main types of sleep apnea –Obstructive Sleep Apnea (OSA), the more common form that occurs when the muscles in the throat relax, Central Sleep Apnea (CSA) occurs when the brain does not send proper signals to the muscles that control breathing, and Complex Sleep Apnea Syndrome (CSAS), occurs when both OSA and CSA are present. The most common type of sleep apnea is the Obstructive Sleep Apnea. This condition causes the airway to collapse or blocked out during sleep and often results in shallow breathing or breathing pauses.

Sleep apnea is a chronic condition that requires long-term management that requires lifestyle changes, mouthpieces, surgery, and breathing devices.

Oral Appliances



Oral appliances help prevent the tongue from collapsing into the soft tissues in the back of the throat by supporting the jaw in a forward position, allowing the airway to remain open

during sleep.

These oral appliances are recommended for mild to moderate OSA patients. Some of these oral appliances may be available for over-the-counter purchases but it may not be as effective. When considering an oral appliance, the best option is to obtain one from a dentist –a dentist can customize an oral appliance to each individual's personal preference as well as securing a custom fit, unlike the ones that are available over-the-counter. Oral appliances obtained from the dentist have also been shown to be 50% more effective.

There are also some considerations when it comes to these oral appliances. Patients with a lower Body Mass Index (BMI) and lower Apnea-Hypopnea Index (AHI) have higher success rates with oral appliances. It is most effective for patients who sleep in a supine (semi-upright or reclining) position. Patients with craniofacial retrognathism (over-bite) also have been successful with oral appliances. Patients with long necks have more difficulties benefitting from an oral appliance.

It is not advised for patients with central sleep apnea, obesity, or those with poor dentition to use any oral appliances. It is recommended for patients with poor dentitions to undergo any restorations necessary before opting for an oral appliance. Patients with acute Temporomandibular Disorders or disc displacements are also not advised to use oral appliances due to the limited ability to open mouth for inserting and removing the appliance.

There's no way of knowing if Oral Appliance Therapy (OAT) will work on patients before they try it. It is important for sleep physicians to collaborate with a dentist who can conduct a thorough intraoral examination to assess candidacy for an oral appliance. The dentist will evaluate the patient's teeth, jaw, and airway, determine the protrusive range with a measuring device, and review the data of the sleep study in order to help determine the chance of

success (Bennett, 2014).

Night Shift (www.nightshifttherapy.com)



The Night Shift Therapy consists of a small device that is worn on the back of the neck. Night Shift (by Advanced Brain Monitoring) begins to vibrate when users begin to sleep on their back and slowly increases in intensity until a position change occurs.

Night Shift therapy is recommended for mild to moderate positional OSA and is usually the first line therapy for positional OSA. While positional therapy can reduce the overall AHI, its effect on snoring is more variable. For patients with an elevated supine apnea index, overall snoring may increase with positional therapy because supine apneas are replaced with snoring. Also, to avoid long-term complications from side sleeping, patients should select a pillow that aligns the head with the spine during lateral sleep and/or allow the cervical and thoracic spine to be as horizontal as possible during sleep.

Patients with acute neck, shoulder, or back pain, those with cardiac arrhythmia corrected with an artificial pacemaker, or who have skin sensitivity or an open wound around the neck should not use the Night Shift Therapy.

Night Shift decreases the number of interruptions in patients with positional OSA. In our study, the number of arousals due to sleep disorder breathing exceeded the number of supine

attempts resulting in positional feedback by a factor of 15. Use of Night Shift resulted in significant reductions in stage N1 and increased in N2, while REM and sleep efficiency increase and arousals and awakenings were significantly reduced (Levendowski, 2014).

Winx Sleep Therapy System (www.apnicure.com) <https://youtu.be/-k7Nb7nHIsE>



Winx (by ApniCure) generates negative pressure in the oral cavity, which draws the soft palate and uvula forward, and stabilizes the tongue position, therefore enlarging the upper airway.

The Winx Sleep Therapy System is recommended for patients with mild, moderate, and severe OSA but probably most commonly effective in those with AHI between 10 and 50. It is also best for patients who prefer to easily change positions during sleep, have a BMI <40 kg/m² and can breathe easily through the nose.

Patients who have loose teeth, advanced periodontal disease, under 18 years of age, and severe respiratory disorder –such as severe lung disease, should not use Winx. Winx should not be used to treat central sleep apnea.

There's no way of knowing if Winx will work on patients before they try it. A single

night sleep study either in the lab or in the home can easily determine if the Winx device will work in a given patient. The demonstrated efficacy or lack of efficacy on the first night has been shown to be a durable effect over time (Farrar, 2016).

Provent Sleep Apnea Therapy (www.proventtherapy.com)



“Provent Sleep Apnea Therapy is a disposable, nightly-use nasal device placed just inside the nostrils and held securely in place with hypoallergenic adhesive.”

During inhalation, the proprietary microvalve technology opens, allowing the user to breathe in freely. When exhaling, the valve closes and air passing through the nose is directed through two small air channels. This increases and maintains pressure in the airways as well as helps keeping the airway open until the start of the next inhalation.

The Provent Therapy is recommended for all OSA severities but ideally for patients that are newly diagnosed mild or moderate OSA. The Provent Therapy is usually for patients looking for alternatives when travelling.

Patients with severe breathing disorder (including respiratory muscle weakness, bullous lung disease, bypassed upper airway, pneumothorax, pneumomediastinum, etc), severe heart disease (including heart failure), pathologically low blood pressure, acute upper respiratory (including nasal, sinus, or middle ear) inflammation or infection should not be using Provent as it

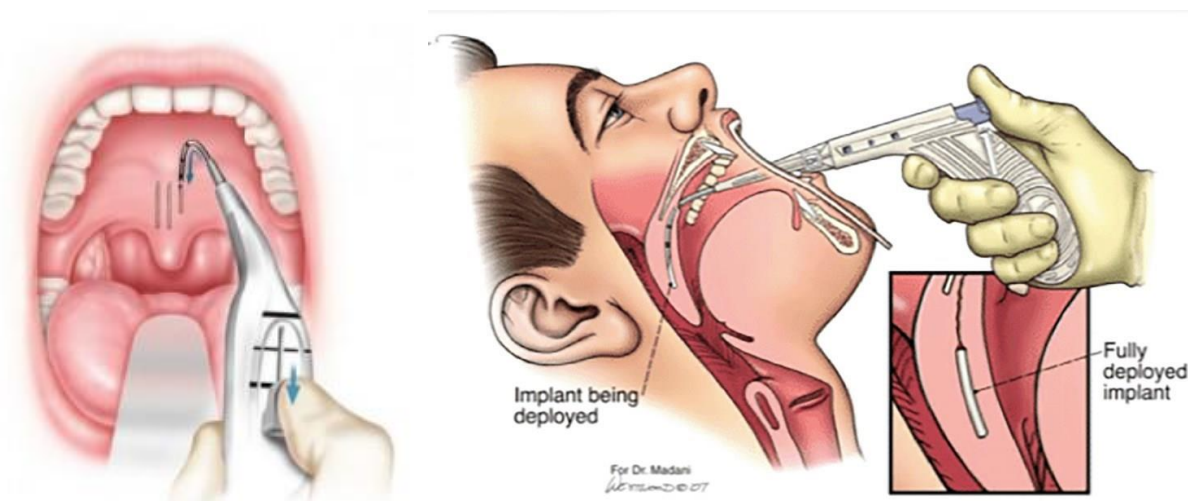
may interfere with breathing.

There is also no way of knowing the success rate of Provent on patients. This is similar to any medication; the only way for a patient to know if a lipid lowering medication or an asthma treatment works is to use the therapy for a week or up to a month, then be reassessed. The same can be done with Provent (Williams, 2011).

IN-OFFICE PROCEDURES

Pillar Procedure (www.pillarprocedure.com)

<https://www.youtube.com/v/pkVO7NTHCwM/?rel=0>



The Pillar Procedure stiffens the soft palate, decreasing its flutter and stabilizing the retro-palatal airway. This is accomplished in a nondestructive way by the placement of small woven inserts into the soft palate, under local anesthetic.

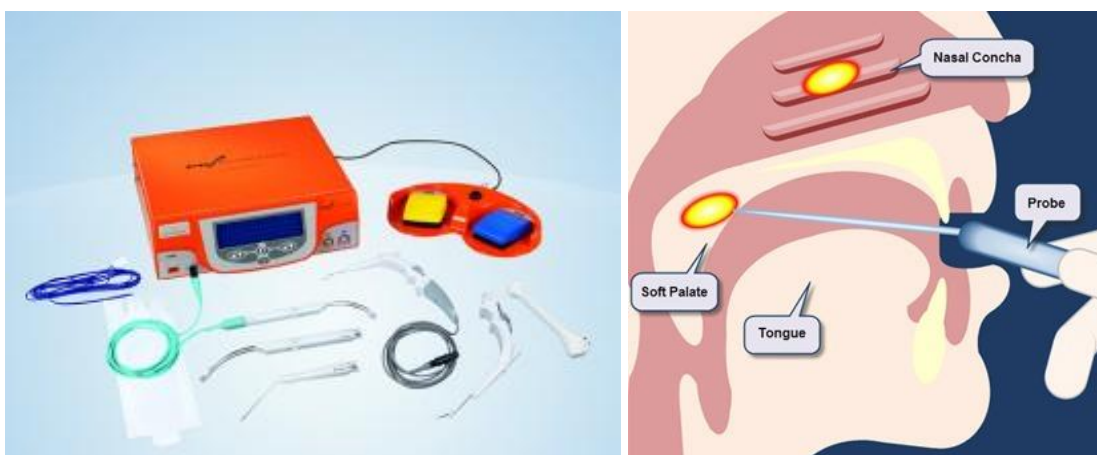
The Pillar Procedure is available to interested patients with mild to moderate OSA. It does not require the removal or destruction of tissue, therefore it is less painful and less risky than traditional palatal stiffening procedures. For these reasons, the Pillar Procedure may be indicated in any patient with a significant palatal component. OSA does not typically result

solely from palatal flutter so the results are usually optimized when the Pillar Procedure is combined with other sleep apnea therapies.

Patients without a significant palatal component to their snoring, allergy to the implant material, or those with inadequate palatal length do not benefit from this procedure and should be advised against it.

Over 45,000 Pillar Procedures have been performed. Not a single “serious” complication has been reported. The overall reported rate of extrusion is less than 1%. The reported rate of infection is less than 1%. Pillar has been on the market in the United States for over 12 years, and has been shown to be a remarkably safe procedure. Pillar Procedure alone may not adequately treat a patient’s OSA. The soft palate is a significant contributing factor in most patients with OSA, and by combining the Pillar Procedure with other minimally invasive treatments, many patients can achieve significant improvement, without the pain, risk, and inconvenience of surgical intervention (Schwimmer, 2013).

Somnoplasty



Somnoplasty, also known as temperature-controlled radio frequency (TCRF), is a minimally invasive surgical technology that uses radiofrequency current to modify the tissues of

the uvula and soft palate in a precise and targeted manner.

Somnoplasty is available to all patients with mild to moderate OSA. There are also no known absolute contraindications to the use of RF (radio frequency) surgery. The use of somnoplasty probes and G3 RF workstation is contraindicated when—in the judgment of the physician—electrosurgical procedures are contrary to the best interest of the patient. There is a risk of bleeding and infection and Somnoplasty will only reduce snoring but not sleep apnea (Jarrett, 1997).

"Laugh and the world laughs with you; snore, and you sleep alone!" -Anthony Burgess

Surgery is often known as “the cry of defeat”. Whether it is a broken car part or a damaged organ; when all else fails, people suggest removing the defective part to resolve the problem. In today’s society, surgery is often discussed as a “last alternative”, or “a quick fix”, in getting rid of the problem.

TMJ disorders can cause pain in the muscles that control the jaw movement (Yaremchuk, 2003). Some symptoms of the TMJ disorders include pain or tenderness in one of both sides of the jaw, pain or ringing in and around the ear, difficulty chewing or pain while chewing, facial pain, “clicking” or “locking” of the joint, and limited mobility when opening and closing of the mouth.

There are many alternatives to combat the pain from TMJ whether it is over-the-counter products to anti-inflammatory medications to oral appliances customized from the dentist, but not all of them proved to be effective. As a result, some dentists would suggest surgery as a last choice resort because the result is irreversible.

Uvulopalatopharyngoplasty (UPPP) with or without Tonsillectomy

The most common type of oral surgery for Obstructive Sleep Apnea (OSA) is known as Uvulopalatopharyngoplasty (UPPP). UPPP enlarges the upper back palatal airway by making an incision at the posterior soft palate and uvula with trimming and reorienting the tonsils and tonsillar pillars.

Uvulopalatopharyngoplasty is not recommended to all patients with sleep apnea. UPPP is usually suggested after refusal or failure of other oral appliances or when the airway fails to remain open while sleeping.

When determining the success of this procedure, the patient's oral anatomy plays a major role. Favorable anatomy for UPPP includes large tonsils and favorable tongue placement (small base of tongue). Patients that have a BMI > 40 should opt for bariatric surgery over this oropharyngeal surgery (Yaremchuk, 2003). Yaremchuk has had success with UPPP in patients with BMIs in this range and characterizes high BMI as a "relative" contraindication.

After Uvulopalatopharyngoplasty, an infection risk is always present. An infection after this procedure is highly unlikely, but just like every other surgery, there is always a risk.

Bariatric Surgery

There is a strong relationship between obesity and the development of OSA. Respectively, bariatric surgery is often touted as the most effective option for treating obesity and its comorbidities, including OSA. Nevertheless, there remains paucity of data in the literature of the comparison of all the specific types of bariatric surgery themselves.⁹ Gastric banding, sleeve gastrectomy, and gastric bypass surgery can lead to significant weight loss,

including lessening the buildup of fat tissue in the upper thorax and neck. Studies have shown that weight loss may result in improvements to OSA.

Patients with BMI > 40 and AHI > 15 are usually the minimum requirements for bariatric surgery. Bariatric surgery is not recommended for patients with severe pulmonary hypertension because they require a more extensive plan to be prepared for this type of surgery.

One major concern for this procedure is the coverage. Most health insurances will not cover bariatric surgery because it is only safe and effective for the patients that meet the minimum requirements. The patients other health concerns should also be addressed and can play a deciding factor as to whether or not their current health insurance will provide coverage to this procedure.

Bariatric surgery and subsequent weight loss can provide better treatment options for patients if they are in need of further treatment. Medical weight loss without surgery is also sometimes used, including diet, exercise, behavioral therapy, and pharmacotherapy (Morton, 2014).

Inspire Upper Airway Stimulation (UAS)

Inspire therapy is an implanted system that senses breathing patterns and delivers mild stimulation to key airway muscles, which keeps the airway open during sleep.

Inspire UAS may be used in adult patients 22 years of age and older that are unable to tolerate CPAP that does not have a complete concentric collapse at the soft palate level.

All surgeries carry a risk of infection. In contrast to other surgical options to treat sleep apnea, Inspire therapy does not require removing or permanently altering an OSA patient's facial or airway anatomy. Inspire's procedure is less invasive and should result in a shorter recovery

time. It also does not require a mask or oral appliance (Strollo, 2014).

Arthrotomy

Arthrotomy is frequently used to treat painful limitation of mouth opening associated with disc displacement or adhesion. Most surgeons attempt to reestablish disc mobility and reposition the disc in its normal anatomic position (discoplasty). However, when there is irreparable perforation of the disc, or the disc is so misshaped, shortened, or rigid that it cannot be properly repositioned, removal (discectomy) is indicated.

Once the disc is removed, there is the question of whether replacement is necessary to prevent recurrent pain. The use of alloplastic interpositional materials (such as Silastic or Proplast-Teflon) was originally reported to be highly successful, subsequent studies showed that particulation of the implant under function produces a severe foreign body reaction associated with bone destruction and pain. As a result, these materials were withdrawn from the market (Cowley, 2016).

Arthroscopy

Arthroscopy also has been used to treat painful anteriorly displaced disc as well as lifting the restriction on the opening of the mouth due to TMJD. Follow-up studies have shown that postoperative patients show considerable reduction in pain and greatly improved range of jaw movement even though disc position is relatively unchanged. This shows that the disc position in the TMJ plays an important role in the symptoms that associate with this disorder.

Although this procedure also has been used for treatment of rheumatoid and degenerative arthritis, its main use is in the treatment of patients with anteriorly displaced nonreducing discs

or those in whom the disc is in relatively normal position but is adhered to the glenoid fossa of the TMJ (Cowley, 2016).

“Sleep is the most moronic fraternity in the world, with the heaviest dues and the crudest rituals.” -Vladimir Nabokov

For patients seeking management of TMD symptoms, it has been established that non-invasive modalities should first be explored. However, the complicated nature of the TMJ, along with the debilitating nature of late stage disease, has created a demand for more invasive solutions. An analysis of current non-invasive, minimally invasive, and fully invasive management options now follows. The ultimate goals of the presented modalities are to: 1) increase mandibular range of motion, 2) decrease joint and masticatory muscle pain and inflammation, and 3) prevent further degenerative change in articulating tissues, including direct or indirect joint damage.

During the past few weeks, I have been following up with three of my patients that have been diagnosed with Temporomandibular Joint Disorder. These three patients were kind enough to agree and participate in my research study of TMD –Jeffrey, Linda, and Tomas. These three patients were selected because they had the same underlying problem –unable to sleep due to pain from TMJ. Of this two-week duration, I have recommended them to purchase some over-the-counter oral appliances to help reduce the pain of TMD. These appliances were recommended based off their jaw mobility (opening and closing of the jaw) as well as their age and medical history/complications.

Jeffrey is currently 25 years old and has been diagnosed with TMD since the age of 15. During the initial medical history review, Jeffrey reported to have a clean medical history, does

not smoke and is currently not taking any medications. He has reported to have been in a car accident about 2 years ago and has not been able to get a good night's sleep since due to pain around the jaw and lower neck pains (possibly related to the accident). Given this information, I have suggested that Jeffrey can try the over-the-counter oral appliance (aka Night guards) first, to see if it may help. Night guards are one of the most commonly chosen appliances by dental professionals due to their individually designed custom fit product to reduce grinding and clenching by eliminating interference from the molars as well as muscle stimulations during sleep, allowing the muscles and tendons in the jaw to relax in a position that will obviate the pain and discomfort. Many patients that develop any wear to their dental structure do not even realize the problem until it is brought up by a dental professional. When given the option to Jeffrey, he preferred the over-the-counter oral appliance over the custom fit appliance, for the time being, because he does not want to spend too much on an appliance that may or may not end up working for him.

The following week after Jeffrey's initial exam, he brought in an over-the-counter oral appliance manufactured by the company "DenTek". This particular oral appliance required the user to boil the appliance in water then placing the rubber tray into their mouth to have the tray "mold" into the shape of the patient's teeth. During the first week of using an over-the-counter night guard, Jeffrey started to have some concerns regarding the loose fit of the oral appliance. Due to the fact that any over-the-counter appliance is made for the estimated general population, the size and fit of the appliance will vary from person to person, as well as the limited selection available on the market. Jeffrey was aware of this issue when he first came in last week regarding TMJ pain, but wanted to try cheaper products out on the market first, before spending money on a costly appliance that was not guaranteed to relieve the complete stress and pain

caused by the TMJ.

After using the DenTek Night Guard for about two weeks, Jeffrey felt that the discomfort from the improper fit of the bulky rubber had increased his TMJ pain and opted for a custom fit oral appliance instead. Since receiving a custom fit oral appliance, Jeffrey reported to have no more of the ‘bulky’ feeling like the DenTek night guard. Jeffrey also noted that the pain from his TMJ has subsided for the time being and that he only wears the custom fit night guard every other night.

Jeffrey’s case had a relatively simple solution –he just needed to have the right oral appliance. Based off his medical history, Jeffrey does not clench or grind his teeth, and also does not clench or grind his teeth and the clinical evaluations show no signs of wear facets or attrition on the biting surfaces of his teeth. A custom fit oral appliance may have solved Jeffrey’s discomfort from his TMD, but that cannot be said for another person suffering from TMD. Just like every product out on the market, these night guards have their pros and cons, as well. A custom fit oral appliance/night guard will have a better fit and are modifiable over time but they are also more costly in comparison to the over-the-counter appliance. The over-the-counter oral appliances sold in pharmacies, as well as online, are often too thick, poorly retentive, inadequately cover all teeth, and are usually made for clenchers and grinders looking for an immediate fix. As a result, the over-the-counter appliances can often prompt more clenching, causing the user more discomfort and usually more harm to the TMJ.

“The stars were better company anyway. They were very beautiful, and they almost never snored.” –David Eddings

Lina is currently 38 years old and has been diagnosed with TMD since the age of 36.

Upon reviewing her medical history, Lina reported to have orthodontic treatments done when she was about 33 years old and believes that her TMJ pains may have originated from starting orthodontic treatments at a later age. Lina also reported that she has tried over-the-counter oral appliances as well as custom fit oral appliances to alleviate some of the pain from her TMD but neither has worked thus far. Lina still prefers to wear her retainers at night, in fear of her teeth relapsing if she discontinued her retainer wear after the completion of her orthodontic treatment, therefore does not prefer to wear any sort of oral appliance aside from the retainers. Lina has also mentioned that she occasionally snores when she does not wear her retainer and usually gets about 5-6 hours of sleep in each night, “when TMJ does not act up” –TMJ pains usually occur at most twice a week. Given this information, I have suggested that Lina can try the Night Shift Therapy device because most of the oral appliances that are made to help with reducing TMJ pains involve an oral appliance to be placed into the mouth, while the Night Shift Therapy Device is just a device that is strapped around the backside of the neck.

Once Lina received her Night Shift Therapy Device in the mail, she had called me that day regarding how small the actual device was. During our follow up appointment, I asked Lina to bring in the Night Shift device and I was actually surprised to see two magnets holding the device in place, instead of a buckle. Lina did report that it would take some time to get used to when she first started using the device.

When Lina first started using the device, she noticed the subtle vibrations that stirred her in her sleep when she was asleep on her back. Due to the number of times she woke up from the initial use of the device, she recommended that any new user should try the device on a weekend, or on a night that they don't have an important meeting or schedule to attend. Lina also reported that the vibrations are subtle at first, then increases during the allotted time that you have not

repositioned yourself, and that it does take some getting used to. During the first week, Lina reported to have gotten in about 7 hours of sleep because of this device, but she has also reported to have gone to bed about 30 minutes earlier each night because of the vibrations stirring her in the middle of sleep.

Lina's pain from her TMD has also subsided. We do not believe that the Night Shift Device has played a major role in resolving the pain from the TMD but we do believe that it has aided her in obtaining more hours of sleep per night. Lina has reported to wear her orthodontic retainers each night as well as incorporating the Night Shift Device before sleeping. We believe that the orthodontic retainer has, in a way, been substituted as a night guard. The combination of the Night Shift Therapy Device and Lina's orthodontic retainer has controlled her snoring as well as getting in an extra hour to two of sleep per night.

The downside to the Night Shift device is that it does need to be synced up to the correct date and time before its initial use. The Night Shift device also needs to be charged via micro USB at least once every 3 nights. The straps on the Night Shift device also tends cause some irritation from time to time and will need some time to get used to.

“The pain you feel today is the strength you feel tomorrow. For every challenge encountered there is opportunity for growth.” -Unknown

Tomas is currently 47 years old and has been diagnosed with TMD about 2 years ago and has been having sharp pains at the jaw and base of the skull at least once a week. After reviewing the medical history, Tomas reported that he often “turns” and “fidgets” in his sleep and prefers a device that will not be too restricting on him, as he already does not get a full 8 hours of sleep as is. I was originally going to recommend Tomas to try the Night Shift Therapy device as well but because he mentioned that he has a habit of turning and fidgeting during his sleep, the Night Shift Therapy Device will only further complicate his ability to sleep because of the consistent

movement, therefore triggering the vibrating sensors that are built in to the Night Shift Therapy Device. Instead, I recommended the Winx Sleep Therapy System because of Tomas' consistent movements during sleep.

When Tomas first tried the Winx Sleep Therapy System, he was not a big fan of it. Tomas mentioned that the mouthpiece was uncomfortable and the extra wire/tubing from the mouthpiece to the system only further complicated his sleep. But because he agreed to help me with my research, Tomas wanted to try the Winx Sleep Therapy System for at least a week to see if things would be different. Unfortunately, the Winx Sleep Therapy System proved to be very ineffective in Tomas' case. Tomas mentioned that he has been "constricted" by the tubing, connected from the mouthpiece to the system, a few times during that past week due to his constant "turns" and "fidgets" in his sleep. Tomas also reported to have woken up at least twice during his sleep because of the improper fit of the mouthpiece, causing a blockage in breathing since the mouthpiece was supposed to act like a suction to keep the tongue away from the back of the mouth. Tomas also reported that the Winx Sleep Therapy System also caused him to wake up with a really dry mouth because of the "suction" from the machine. The Winx Sleep Therapy System also did not help with Tomas' TMJ pain, instead, it has caused him more pain as well as lack of sleep.

Tomas, unfortunately, had no success with the Winx Sleep Therapy System, so he asked for another alternative that may help him with his TMD. Seeing as to how both Jeffrey and Lina were able to stabilize their TMD pains with an oral appliance, Tomas wanted to see if that may be the case for him as well.

On Tomas' third follow up appointment, he received his custom fit oral appliance and was ecstatic to try it out. At first, Tomas was hesitant because of how small the appliances

actually were, and he feared that he would swallow them during his sleep. After trying out the oral appliances for a week, Tomas reported that his TMD symptoms and pains have decreased within the last week. Today, Tomas is still amazed as to how two small molded pieces of plastic were able to stay fit in his mouth while he is asleep, as well as decrease the pain from his TMD. Although the pain from his TMD has not fully subsided, Tomas feels that the custom fit oral appliance is the starting point of many possibilities.

Patients like Jeffrey, Lina, and Tomas, a custom fit oral appliance can be the solution to TMD. For many others, TMD symptoms occur on occasionally and generally do not last long. Most TMJ cases tend to go away overtime with little to no treatment, while others can be successfully treated. The main cause of TMD is still unknown, but there are solutions to on the market to help minimize the discomfort level, as well as health care providers to help offer a solution.

Bibliography

- Bennett Sutherland K, Vanderveken O, Cistulli P. "Oral appliance treatment for obstructive sleep apnea: an update." American Academy of Dental Medicine. J Clin Sleep Med. 2014;10(2):215-227.
- Cowley T. *"Surgical Management of Temporomandibular Joint, Fact or Fallacy"* N.p., n.d Web. 12 Nov. 2016.
- Fred Ables. *"The New Method for Treating Chronic Headaches, Migrains and TMJ Without Medication."* Break Away (2015) Web. 17 Nov. 2016.
- Farrar WB, McCarty WL Jr 1979 Winter; 63(1):19-26. "The TMJ dilemma." J Ala Dent Assoc. N.p., n.d. Web. 08 Oct. 2016.
- Jarrett K, Powell NB, Riley RW, Troell RJ, Blumen MB, Guilleminault C. "Radiofrequency volumetric reduction of the tongue. A porcine pilot study for the treatment of obstructive sleep apnea syndrome." *Chest*. 1997;111(5):1348-55.
- Levendowski DJ, Seagraves S, Popovic D, Westbrook PR. "Assessment of a neck-based treatment and monitoring device for positional obstructive sleep apnea." J Clin Sleep Med. 2014;10(8):863-71.

Mayoclinic

<http://www.mayoclinic.org/diseases-conditions/tmj/home/ovc-20209398>

Morton J, Aguiar IC, et al. "Obstructive sleep apnea and pulmonary function in patients with severe obesity before and after bariatric surgery: a randomized clinical trial." *Multidiscip Respir Med*. 2014;9(1):43.

National Institute of Dental and Craniofacial Research. "NIH-TMJ Disorders." (2015, April).

Retrieved December 06, 2016, from

<https://www.nidcr.nih.gov/oralhealth/topics/tmj/tmjdisorders.htm#whatTmj>

Patient."Temporomandibular Joint Dysfunction and Pain Syndromes | Patient."

Patient.info. N.p., n.d. Web. 28 Oct. 2016. <http://patient.info/doctor/temporomandibular-joint-dysfunction-and-pain-syndromes>

Schwimmer C, Choi JH, Kim SN, Cho JH. "Efficacy of the Pillar implant in the treatment of snoring and mild-to-moderate obstructive sleep apnea: a meta-analysis."

Otolaryngology-HNS. 2013;123(1):269-76.

Solberg WK, Woo MW, Houston JB. "Prevalence of mandibular dysfunction in young adults." *J. Am Dent Assoc*. 1979 Jan; 98(1):25-34 N.p., n.d. Web. 10 Oct. 2016.

Strollo PJ, et al. "Upper-airway stimulation for obstructive sleep apnea." *N Engl J*

Med. 2014;370:139-149.

U.S National Library of Medicine. "What Is Sleep Apnea? - NHLBI, NIH." U.S. National Library of Medicine, n.d. Web. 30 Oct. 2016. <https://www.nhlbi.nih.gov/health/health-topics/topics/sleepapnea>

WebMD. "Temporomandibular Joint Disorders (TMJ, TMD): Symptoms, Treatment and More." *WebMD*. WebMD, n.d. Web. 29 Oct. 2016. <http://www.webmd.com/oral-health/guide/temporomandibular-disorders-tmd>

White DP, Colrain IM, Black J, Siegel LC, et al. "A multicenter evaluation of oral pressure therapy for the treatment of obstructive sleep apnea." *Sleep Med.* 2013;14:830-837.

Wikipedia. "Temporomandibular Joint." Wikipedia. Wikimedia Foundation, n.d. Web. 27 Oct. 2016. https://en.wikipedia.org/wiki/Temporomandibular_joint

Williams M, Berry RB, Kryger MH, Massie CA. "Theravent –A novel nasal expiratory positive airway pressure (EPAP) device for the treatment of obstructive sleep apnea: a randomized controlled trial." *Sleep.* 2011;34(4):479-485.

Yaremchuk KL, Friedman M, Ibrahim H, Lee G, Joseph NJ. "Combined

uvulopalatopharyngoplasty and radiofrequency tongue base reduction for treatment of obstructive sleep apnea/hypopnea syndrome.” *Otolaryngol Head Neck Surg.*

2003;129(6):611-21.