The Importance of Early Orthodontic Treatment for Your Health

A Peer-Reviewed Publication
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Educational Objectives
Upon completion of this course, the clinician will be able to do the following:
1. Understand the differences between the functional and retractive philosophies in orthodontics
2. Understand the impact of sleep apnea on patients and childhood development
3. Understand the advantages of early orthodontic treatment for children
4. Understand the use of anterior repositioning devices in the treatment of temporomandibular dysfunction

Abstract
Early orthodontic treatment is good for a child’s self-esteem and overall health. Functional orthodontics involves treating patients in the primary or mixed dentition using appliances. Further, functional appliances are useful in the prevention and treatment of TM dysfunction and sleep apnea.

Introduction
Many general dentists have indicated during my orthodontic courses that they received little information on the diagnosis and treatment of patients with orthodontic problems as part of their education in dental school. Many orthodontic clinicians are reluctant to treat patients prior to the eruption of the permanent teeth.

There are many reasons why early orthodontic treatment is good for a child’s self-esteem and is also important for the child’s overall health. There are basically two different treatment philosophies within orthodontics: the retractive philosophy and the functional philosophy. The more traditional approach favors the retractive philosophy. The current school of thought favors early treatment with the functional philosophy.

Each year, more orthodontic clinicians are treating their younger patients with functional appliances. For several years, the American Association of Orthodontists has promoted early treatment by recommending that all children be screened by age 7.

Retractive philosophy
The retractive philosophy, often referred to as the bicuspid extraction technique, mainly involves treating patients by using fixed braces in the permanent dentition. The upper first bicuspids are extracted and the six maxillary anteriors are retracted into the extraction site to correct the overjet. This is the treatment of choice if the patient has no signs or symptoms of temporomandibular (TM) dysfunction and has a prognathic maxilla and a prominent upper lip. In my experience, less than 5 percent of Caucasians have prognathic maxillas. This technique is also used when treating patients with malocclusions known as bi-max protrusion with prominent maxillas and mandibles. African-Americans and people of Asian decent display this type of malocclusion. Bicuspid extraction is also an acceptable technique in cases of severe crowding when the patient refuses to wear functional appliances to either expand or lengthen the arch.

Functional philosophy
The functional philosophy involves treating patients in the primary or mixed dentition, using functional appliances to develop the maxillary and mandibular arches and to reposition the lower jaw forward to correct the overjet. The utilization of functional appliances at an early age enables the clinician to develop the arch transversely, sagittally, and vertically to make room for all the permanent teeth. This eliminates the need for extractions. Children, and their parents, prefer that they be treated early and without extractions or orthognathic surgery.

It has been estimated that 70 percent of all malocclusions are Class II and 80 percent of these patients have normally positioned maxillas and retrognathic mandibles. If the mandible is retrusive, it would seem obvious that the treatment of choice would be to use some type of functional jaw repositioning appliance to advance the mandible to a more normal position.

The treatment of choice for a patient under age 11 would be to use a Twin Block, while for a patient over age 11 a MARA (Mandibular Anterior Repositioning Appliance) would be used. The Twin Block was developed by Dr. William Clark, orthodontist, Fife, Scotland, and the MARA Appliance by Dr. Jim Eckhart, orthodontist, Manhattan Beach, California. If treatment is initiated while patients are actively growing, then many of these patients will not have to undergo orthognathic surgical procedures to advance the mandible after age seventeen.

Dr. Sabine Ruf and Dr. Hans Pancherz examined 69 patients and concluded in their article titled, “Orthognathic Surgery and Dentofacial Orthopedics in Adult Class II Division 1 Treatment: — Mandibular Sagittal Split Osteotomy vs. Herbst Appliance” that in patients with pre-existing TM dysfunction (internal derangements), the Herbst® Appliance not only corrected the Class II skeletal malocclusion but also eliminated the TMD symptoms. The orthognathic surgery approach corrected the Class II skeletal malocclusion, but the TMD symptoms worsened. The authors also reported that 50 percent of patients treated with orthognathic surgery suffered from neurosensory disturbances of the lower lip. Other complications reported included non-union or mal-union of the bony fragments and condylar resorption.

In light of the experience of many clinicians, it would seem to be in the best interests of the patient’s overall health to advance the mandible non-surgically with functional appliances prior to age 17, in order to avoid orthognathic surgery. Parents do not want to have their children to suffer from Class II skeletal dysplasias through high school when they can easily be rectified at an earlier age.
Parents also do not want to have their children subjected to orthognathic surgery.

The result of the retractive technique, if applied to patients with normal maxillary lip support, is a retraction of the upper lip. This makes the nose appear more prominent, which most patients do not want. While the functional philosophy encourages the development of the arches, the retractive philosophy causes a constriction of the maxillary arch following the extraction of 16 mm of tooth structure. Consequently, patients treated with the functional philosophy end up with broader smiles, fuller lips, and straighter profiles compared to patients treated with the retractive philosophy, who end up with narrow smiles, thinner lips, and retrognathic maxillas and mandibles.

When I started offering orthodontic treatment to my patients, I practiced the retractive technique; however I have been utilizing the functional philosophy for the past 24 years. This change in philosophy was due to the significant improvement in the patient’s facial appearance and profile achieved by using functional appliances, as well as the reduction in the signs and symptoms of TM dysfunction. In order to achieve optimum health, the treatment of choice is the functional philosophy.

It has been estimated that for every one inch the head is in front of the cervical spine, ten pounds of pressure are added to the cervical (neck) muscles. Four inches equals forty pounds of pressure. Improved head posture following functional orthodontic treatment routinely eliminates neck pain for patients.

**Class II skeletal malocclusion**

Most Class II skeletal patients have a normally positioned maxilla and a retrognathic mandible. The majority of these patients have their condyles posteriorly displaced, resulting in the condyles impinging on the nerves and blood vessels in the bilaminar zone distal to the condyles. This causes an internal derangement within the joint, causing the discs to be displaced anteriorly or antero-medially. Many of these patients are overclosed vertically with deep overbites, which results in shortening of the muscles and increases the incidence of painful muscle spasms and trigger points. These knotted muscles or trigger points often refer pain to different parts of the body, including the head and neck, which results in headaches and neck, ear, and shoulder pain. If the TMJ is in a pathological position, it is in the best interests of the patient to reposition the lower jaw and condyles downward and forward in an effort to recapture the displaced discs and solve the TM dysfunction. The overjet must be corrected by advancing the mandible with a functional appliance rather than retracting the maxillary incisors following the extraction of the upper first bicuspids.

Many orthodontic clinicians have observed that a large number of patients have TM dysfunction and internal derangements due to the extraction of bicuspids in cases where the mandible was retrognathic and the condyles were in a pathological position prior to treatment. Two methods utilized to determine whether the condyles are in a pathological position are:

a) Tomogram X-rays of the TMJ, which would show the position of the condyle in the fossa with the patient occluding in centric occlusion.

b) Joint Vibration Analysis (JVA), which measures vibrations within the joint. Each of the five types of internal derangement has a distinct vibration that tells the clinician how serious the problem is prior to treatment. A normal healthy TMJ has no noise or vibrations.

The pre-treatment left TMJ tomogram below shows the position of the condyle posteriorly displaced. This is a post-orthodontic patient, Class II skeletal with a large overjet and a retrognathic mandible, who had her upper first bicuspids extracted (retractive technique). The patient presented with numerous signs and symptoms of orthognathic surgery.
TM dysfunction due to compression of nerves and blood vessels distal to the condyle.

Following treatment utilizing an anterior repositioning splint, the condyle changed position to be downward and forward in the glenoid fossa. Signs and symptoms of TM dysfunction were reduced after the TMJs were decompressed.

Dentists should consider this information before extracting bicuspids to correct an overjet on a patient with existing TM dysfunction (clicking, jaw locking, headaches, ringing in the ears, neck pain, stuffiness in the ears, dizziness, shoulder pain, etc.).

Functional jaw orthopedics is important for health. To achieve proper health, patients must have properly developed maxillas and mandibles, properly positioned mandibles in relation to the maxillas, and correct vertical dimension. When the maxillary and mandibular arches of younger patients are developed, the size of their nasal airways increases both transversely and vertically. After the use of expansion appliances, the palate drops and increases the size of the nasal airway.

Parents and children alike prefer two-phase orthodontic treatment.

Two-Phase Orthodontic Treatment

Phase I (Orthopedic Phase)
Mixed Dentition Ages 4 – 11
Functional and skeletal problems are solved, including any problems with constricted airways. Functional problems include habits such as tongue thrusting or thumb sucking. Skeletal problems include constricted arches and retrognathic (underdeveloped) maxillas or mandibles.

Phase II (Orthodontic Phase)
Permanent Dentition Ages 12 – 14
Orthodontic braces are used in phase II for the permanent dentition to correct dental problems and to straighten the teeth.

Many growing patients with dento-facial deformities must be diagnosed and treated early. Most Class III problems in the mixed dentition are due to midface deficiencies as a result of an underdeveloped maxilla. Treatment for these patients involves wearing a removable appliance such as an Anterior Sagittal Appliance or a fixed appliance such as the Tandem Appliance. If these appliances are used while the child is growing, these dental deformities can be corrected and the need for orthognathic surgery at age 17 eliminated.

Snoring and sleep apnea
It has been estimated that 90 million people in North America suffer from sleep disorders including insomnia, snoring, and sleep apnea. Snoring occurs when the tongue partially blocks the airway, usually when the patient is sleeping on their back. While snoring is a problem, it is the obstructive sleep apnea that is the most serious problem. Patients with sleep apnea have their quality of life impaired by an increase in daytime sleepiness, an increased incidence of motor vehicle and work-related accidents, and health problems.

Sleep apnea occurs when the airway is completely blocked for 10 seconds or longer, more than 15 times per hour. When the patient stops breathing several times per hour for 10 seconds or more, this results in a decrease of oxygen, which can lead to a rise in blood pressure, gastroesophageal reflux, Type II diabetes, increased risk of heart attacks, and strokes. These are serious health risks, many of which can be prevented if younger patients receive proper treatment at an early age and have their mandibles and tongues repositioned forward with functional jaw orthopedic appliances.

Sleep apnea, which can cause oxygen desaturation in the blood, can result over time in an increase in blood pres-
sure and a risk of cardiovascular complications. Patients with hypertension and suffering from chronic fatigue and depression are routinely given antihypertensive and antidepressant medication. I have treated many patients with oral appliances to solve snoring and sleep apnea, and the majority of these patients have been able to reduce or eliminate these medications.

**Early orthodontic treatment and childhood development**

It is vitally important to the health and normal development of the child to achieve nasal breathing. Mouth breathing can cause many problems, including snoring, obstructive sleep apnea, malocclusions such as posterior crossbites, anterior open bites, and retrognathic (underdeveloped) mandibles. The cause of the skeletal Class II malocclusion is primarily due to airway obstructions, which cause the maxillary arch to constrict and the mandible to become retrognathic.

One of the main problems with patients who snore or who have obstructive sleep apnea is that when their mandible is retrusive, this causes the tongue to fall back, which subsequently obstructs the airway. In the past year, I have treated approximately 15 patients per month who present with snoring and sleep apnea. Many of these patients are Class II skeletal with deep overbites and retrognathic mandibles, or patients who were Class II skeletal treated with bicuspid extractions. This technique is frequently called the camouflage technique, as the extractions are performed despite the underlying skeletal problem.

The decision to treat a Class II skeletal patient with TM dysfunction, narrow maxillary arch, and retrognathic mandible with either the retractive technique or the functional approach has far-reaching health ramifications, quite apart from the psychological and profile considerations previously discussed.

The use of functional appliances can help maintain a patent airway, which ensures the patient receives an adequate amount of oxygen to achieve normal sleep. Functional appliances open the airway by expanding the maxilla and thus increasing the width and height of the nasal airway located directly above the palate. Functional appliances also increase the airway by repositioning the lower jaw and tongue forward.

**Obstructive sleep apnea and ADHD**

One of the serious consequences of snoring and obstructive sleep apnea in children is that the lack of oxygen due to the obstruction in the airway can often cause ADHD (Attention Deficit Hyperactivity Disorder). Airway obstructions cause a reduction in the amount of oxygen in the blood, which results in interruptions in breathing during sleep, causing the brain to become aroused and wake up the patient several times per night. Children with ADHD become aggressive and hyperactive in school and pose a problem.
for teachers. Their medical doctors often prescribe a stimulant called Ritalin to calm them down; however in some cases this causes the patient to be extremely subdued. ADHD affects one in twelve children, and it has been estimated that approximately 580,000 children in North America may have sleep apnea. Earlier research has shown that children who snore due to airway obstructions such as enlarged tonsils were four times as likely to have ADHD.

Dentists must assess airway obstructions using cephalometric X-rays and then communicate this information effectively to E.N.T. specialists so that the patient’s tonsils and/or adenoids can be removed. The ideal treatment is to eliminate the cause of the problem (enlarged tonsils and/or adenoids) rather than to merely treat the symptoms with drugs. Elden et al, citing a short term follow-up study on children who had adenotonsillectomy for obstructive sleep apnea, reported that symptoms disappeared in 80 percent of the cases. In a study conducted by Dr. Ronald Cherin, Director of the University of Michigan Sleep Disorders Center, Ann Arbor, Michigan, of the 22 children diagnosed with ADHD, the problem was eliminated in 11 children following a tonsillectomy.

In a study involving 105 children ages 5 to 13, published in the medical journal *Pediatrics*, 78 of the 105 children had their tonsils removed. The study showed that at the outset, the children with enlarged tonsils had far more behavioral and sleep problems but, after surgery, the two groups were virtually the same.

While tonsils are one of the main problems causing airway constriction, others include obesity, allergies, acid reflux, and other structural abnormalities such as narrow maxillary arches, high palates, and Class II skeletal patients with retrognathic mandibles. In a set of guidelines the American Academy of Pediatrics stated in 2002 that all routine checkups of children should include questioning about snoring and sleep apnea. These sleep disorders can have serious health implications, including high blood pressure, bed-wetting, stunted growth, and chronic fatigue that often translates into hyperactivity or learning problems. In the most extreme cases, sleep apnea can lead to mental retardation or heart failure.

**Pharyngometry and rhinometry**
In a normal, healthy adult the cross-sectional diameter of the airway is similar during wakefulness and sleep. With age, fat infiltrates the upper airway muscles causing them to lose their tonicity, and the airway collapses at night during sleep.

When treating patients for snoring and sleep apnea, it is necessary to measure the size of the pharyngeal airway with a diagnostic device called a pharyngometer and the nasal airway with a rhinometer. Oral appliances to prevent snoring and sleep apnea work mainly by advancing the mandible as well as the tongue and also by increasing the vertical (opening the bite), which subsequently opens the pharyngeal airway. Prior to fabrication of the oral appliance, it is necessary to move the jaw to different positions (using wax bite registrations) to determine which position results in the greatest increase in the size of the pharyngeal airway.

The gold standard for treating sleep apnea in the past has been CPAP (Continuous Positive Airway Pressure). This device is similar to a vacuum cleaner in reverse, forcing air up the nose to keep the airways open. Long-term compliance is extremely poor, and a more patient-friendly approach is to use an oral appliance to open up airways by moving the mandible and the tongue forward.

Oral appliance therapy for snoring and sleep apnea received a significant step in credibility when the American Academy of Sleep Medicine made the statement in the January 2006 issue of the medical journal *Sleep* that oral appliances are now the first treatment option for patients with mild to moderate sleep apnea.

**Diagnosing sleep apnea**
The diagnosis of sleep apnea is made during an overnight sleep study using a polysomnogram in a sleep lab. Many patients do not sleep well in a strange environment. The results from the sleep lab are verified with
a device called the Watch Pat 100, which allows the patient to sleep in their own bed at home.

**TM dysfunction**

TM dysfunction has often been called the “great imposter” since so many of the signs and symptoms can mimic other disorders. These include headaches; neck pain or stiffness; earaches; congestion or ringing in the ears; clicking, popping or grating noises when opening or closing the mouth; dizziness and fainting; difficulty in swallowing; pain behind the eyes; numbness in the hands; and shoulder and back pain.

It has been my experience that most general dentists do not wish to treat patients with TM dysfunction, based upon the limited curriculum on this subject in dental schools. The American Dental Association stated in 1991 that “general dentists have the responsibility to diagnose and treat, to the best of their ability, patients with TM dysfunction.” If intra-capsular and extra-capsular problems are not diagnosed and treated, the patient may suffer needlessly for many years. It is imperative that dentists diagnose and treat these problems and, if they choose not to treat, refer these patients to clinicians with special training in this area. The American Academy of Craniofacial Pain is an organization that I recommend you consider joining if you wish to pursue your education in the area of TM dysfunction and craniofacial pain.

Many dentists were taught that the correct position of the condyle in the fossa was up and back and that flat plane splints and occlusal adjustments would solve most problems. This is incorrect. A careful review of the anatomy of the TM joint reveals that this could not possibly be the correct position since the nerves and blood vessels occupy the area posterior to the head of the condyle. The fact is that most patients who suffer from internal derangements have the condyle posteriorly displaced. The treatment of choice for these patients is to reposition the condyle downward and forward utilizing appliances such as anterior repositioning splints and functional appliances (Twin Block, Rick-A-Nator, or MARA appliances). Following the use of these appliances, most patients experience a significant reduction in the signs and symptoms of TM dysfunction.

The key to any successful treatment is diagnosis. One of the most important roles a dentist can play is to determine whether the patient presents with intra-capular or extra-capular problems. Patients with extra-capular problems (outside the TM joint) often have related muscular problems. Their condyles are usually located in a physiologically correct position in the glenoid fossa (downward and forward). When the condyle-fossa relationship is normal, there is no clicking or crepitus.

**Extra-capular problems**

Extra-capular problems are mainly caused by occlusal interferences in lateral and protrusive movements or parafunctional habits such as clenching or grinding. To solve these problems, an upper appliance should be worn at night, with an anterior biteplate with only the lower central and lateral incisors contacting this biteplate during swallowing. When the posterior teeth do not touch, the temporalis and masseter muscles are unable to contract excessively and this eliminates the parafunctional habits such as clenching and grinding. If the patient is waking up with morning headaches due to clenching, then a night appliance, called an anterior deprogrammer, frequently eliminates these headaches. If the diagnosis is that muscle spasms are being caused by occlusal interferences, then occlusal adjustments will be the treatment of choice to eliminate the extra-capular problems.

**Intra-capular problems**

With intra-capular problems, the disc is usually anteriorly or antero-medially displaced. There are five stages of internal derangement (intra-capular problems) ranging from clicking to jaw locking and eventually to advanced degenerative osteoarthritis. Since internal derangements can worsen over time, it is essential that treatment be initiated as soon as possible. The treatment of choice would be to use some form of functional jaw orthopedic appliance or an anterior repositioning splint to try to recapture the displaced disc. It is only possible to recapture the displaced disc in the first two stages of internal derangement; that is why it is essential to diagnose and treat these problems as early as possible.

Most of us are taught in dental school to treat problems of TM dysfunction with maxillary flat plane splints at night only. These do not solve either intra-capular or

![Normal Disc Condyle](image1.png)

![Displaced Condyle](image2.png)

*Images courtesy of Dr. Peter Neff*
extra-capsular problems and frequently cause the man-
dible to become more retruded. The more the mandible retrudes, the more posteriorly displaced the condyle, which impinges on the nerves and blood vessels in the bilaminar zone and therefore increases the symptoms. Patients have reported that not only did these splints increase their TMD symptoms, but in some cases, they actually caused their jaws to lock. When this happens, the pain is much more intense. Maxillary flat plane splints do not solve extra-capsular problems since the patient’s clenching and bruxing actually increases when the posterior teeth have contact with the splint.

Summary

Narrow arches, retrognathic mandibles, and overclosed vertical problems can all be easily solved by early treat-
ment, prior to the eruption of the permanent teeth, with functional orthopedic appliances. The advantages of this type of treatment are that the patient’s appearance and overall health are improved. Widening the airway provides the patient with more oxygen and reduces the muscle spasms and trigger points that cause so much discomfort. As mentioned previously, one of the keys to preventing TM dysfunction as well as snoring and sleep apnea is to treat younger patients prior to the eruption of the permanent teeth with functional appliances. It is far better to try to prevent orthognathic surgery, TM dysfunction, and snoring and sleep apnea by treating with the functional philosophy.

As health care professionals, we need to look beyond the teeth and treat the whole body. Since a patent airway and jaw position are so vital to a patient’s overall health, it is imperative that we learn to diagnose and treat pa-
tients who have orthodontic, orthopedic (skeletal), TM dysfunction, or snoring and sleep apnea. The time has come for dentists to take courses to become proficient in the diagnosis and treatment of patients with snoring and sleep apnea.

The field of sleep disorder dentistry is full of op-
portunities for dentists who have the vision to become educated and proficient in this exciting area. Dentists must work in cooperation with the pulmonologists in sleep centers. At the present time only a small percent-
age of dentists are fabricating oral appliances to prevent snoring and sleep apnea. This is a tremendous oppor-
tunity for dentists to help their patients and to increase the size of their practices at the same time. As dentists, we have the ability to not only significantly improve the oral health, but also the overall health of our patients.

References


Author Profile

**Brock Rondeau, D.D.S., I.B.O., D.A.B.C.P.**

Dr. Rondeau is one of North America’s most sought after clinicians. He is the past president and senior certified in-
sstructor for the International Association for Orthodon-
tics. Over 16,000 dentists have attended his courses and study clubs in the United States, Canada, China, Austra-
lia, England and Poland. He has an extremely busy prac-
tice, which is limited to the treatment of patients with orthodontic, orthopedic, TMD, and snoring and sleep apnea. Dr. Rondeau is a Diplomat of the International Board of Orthodontics and has his Fellowship and Dip-
lomate in the American Academy of Craniofacial Pain. He has published over 26 articles in orthodontic and dental journals and has produced a series of videotapes on all phases of orthodontics. Dr. Rondeau was selected AAFO Clinician of the year in 1993. He is an editorial consul-
tant for the International Association for Orthodontics, American Association of Functional Orthodontics and the Journal of Clinical Pediatric Dentistry. Dr. Rondeau was recently inducted into the Academy of Dental Facial Esthetics and received a Townie Award (“DentalTown”) for 2003 for his contribution as an orthodontic educator.

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Questions

1. The American Association of Orthodontists recommends that all children should be screened by age _______.
   a. Five
   b. Seven
   c. Nine
   d. Eleven

2. The retractive philosophy is also known as the _______.
   a. Bicuspid extraction technique
   b. Molar technique
   c. Advancing technique
   d. None of the above

3. The retractive philosophy mainly involves _______.
   a. Treating patients with braces for the permanent dentition
   b. Treating patients with braces for the mixed dentition
   c. Treating patients with removable appliances only
   d. None of the above

4. The functional philosophy involves _______.
   a. Treating patients with a primary or mixed dentition
   b. Using functional appliances to develop the arches
   c. a and b
   d. None of the above

5. It has been estimated that _______ of malocclusions are Class II.
   a. 30 percent
   b. 50 percent
   c. 70 percent
   d. 85 percent

6. Orthognathic surgery can be avoided by starting orthodontic treatment early.
   a. True
   b. False

7. Orthognathic surgery has been found to _______.
   a. Correct Class II skeletal malocclusions
   b. Result in neurosensory disturbances of the lower lip
   c. Result in condylar resorption
   d. All of the above

8. A result of the retractive technique is retraction of the upper lip.
   a. True
   b. False

9. Patients treated using the functional philosophy end up with _______.
   a. Broader smiles
   b. Fuller lips
   c. Straighter profiles
   d. All of the above

10. It has been estimated that for every one inch the head is in front of the cervical spine, ten pounds of pressure are added to the cervical (neck) muscles.
   a. True
   b. False

11. Most Class II skeletal patients have _______.
    a. A normally positioned maxilla
    b. A retrognathic mandible
    c. a and b
    d. None of the above

12. A method used to determine the position of the condyles is _______.
    a. Tomogram images
    b. JVA
    c. a and b
    d. Panoramic radiographs

13. Two-phase orthodontics starts with the _______.
    a. Permanent dentition
    b. Mixed dentition
    c. Primary dentition at age three
    d. Any of the above

14. It has been estimated that _______ Americans suffer from sleep disorders.
    a. 40 million
    b. 50 million
    c. 90 million
    d. 120 million

15. People with sleep apnea have their quality of life impaired by _______.
    a. Health problems
    b. Daytime sleepiness
    c. An increased incidence of motor vehicle accidents
    d. All of the above

16. Sleep apnea occurs when the airway is completely blocked for 10 seconds or longer, more than _______ per hour.
    a. Five times
    b. Ten times
    c. Fifteen times
    d. Twenty times

17. Sleep apnea can result in _______.
    a. Oxygen desaturation of the blood
    b. Increased blood pressure
    c. a and b
    d. None of the above

18. It has been estimated that approximately _______ children in America suffer from sleep apnea.
    a. 80,000
    b. 180,000
    c. 280,000
    d. 800,000

19. Lack of oxygen due to the obstruction in the airway can cause ADHD.
    a. True
    b. False

20. The use of functional appliances can help maintain a patent airway.
    a. True
    b. False

21. Children with enlarged tonsils have _______.
    a. More behavioral and sleep problems than other children
    b. Fewer behavioral problems than other children
    c. As many behavioral problems as other children
    d. Any of the above

22. In a normal, healthy adult the cross-sectional diameter of the airway _______.
    a. Is similar during wakefulness and sleep
    b. Is greater during wakefulness
    c. Is greater during sleep
    d. Is not important

23. A pharyngometer is used to measure the size of the pharyngeal airway.
    a. True
    b. False

24. The American Academy of Sleep Medicine has stated that oral appliances are the first treatment option for patients with _______.
    a. Mild sleep apnea
    b. Moderate sleep apnea
    c. Severe sleep apnea
    d. a and b

25. The diagnosis of sleep apnea is made using a _______.
    a. Polysomnogram
    b. Polygram
    c. Polysomnogram
    d. None of the above

26. TM dysfunction can be _______.
    a. Intra-capsular
    b. Extra-capsular
    c. Intra-molecular
    d. All of the above

27. Extra-capsular problems are mainly caused by _______.
    a. Occlusal interference in lateral movements
    b. Occlusal interference in protrusive movements
    c. Parafunctional habits
    d. All of the above

28. There are _______ stages of internal derangement (intra-capsular problems).
    a. Three
    b. Five
    c. Seven
    d. Eight

29. Maxillary flat plane splints solve extra-capsular problems.
    a. True
    b. False

30. Narrow arches, retrognathic mandibles, and over closed vertical problems can be solved by _______.
    a. Late endodontic treatment
    b. No orthodontic treatment
    c. Early orthodontic treatment
    d. Late surgery
The Importance of Early Orthodontic Treatment for Your Health

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Educational Objectives
1. Understand the differences between the functional and retractive philosophies in orthodontics
2. Understand the impact of sleep apnea on patients and childhood development
3. Understand the advantages of early orthodontic treatment for children
4. Understand the use of anterior repositioning devices in the treatment of temporomandibular dysfunction

Course Evaluation
Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

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