Appliance Therapy

A Peer-Reviewed Publication
Written by Steven R. Olmos, D.D.S.

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Educational Objectives

1. Understand how to select the proper appliance based on the diagnosis.
2. Be able to explain the difference between day and night orthotics.
3. Know the proper delivery of the appliances and adjustments necessary to allow the orthotics to function.

Introduction

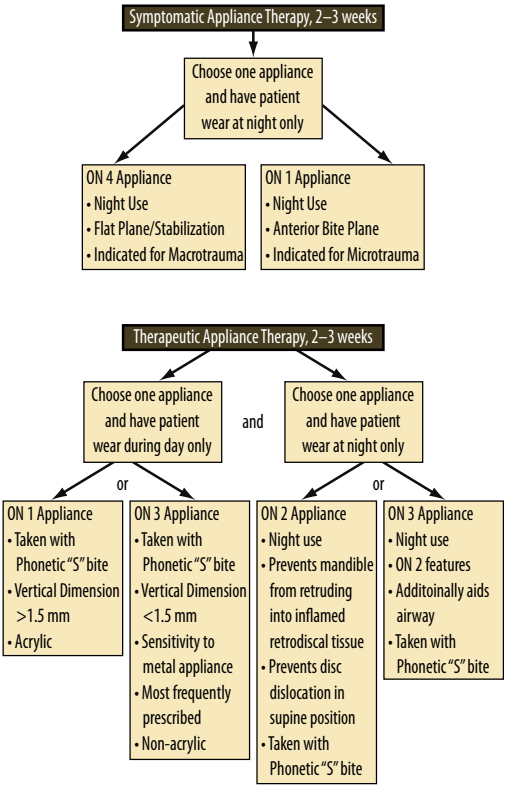
Once a diagnosis is made for a patient presenting with TM pain or disorders, the next step involves orthotic selection and treatment. It is important to know which oral appliances should be used. Proper bite registration, appliance fabrication, and delivery are essential. It is also essential to know which patients should be treated with oral appliances, and which type of appliance should be used for individual patients.

Patient selection

Patients must first be triaged based on those whose problem is of TMD or primary headache origin. Other patients should be referred to the appropriate specialist, depending on their medical condition. The next stage in the selection process is determining which patients can be treated based on their TMD condition and which should be referred.

Patients with intra-capsular derangements and inflammatory disorders are selected for oral appliance therapy depending upon their signs and symptoms. Only patients willing to comply with treatment should be offered oral appliance therapy. Patients must also understand and accept that there may be a permanent change in their TMJ that would preclude them from returning to their original occlusion and that long-term stabilization may be necessary for continued relief of symptoms – this can be achieved using overlay partial dentures, orthodontics, fixed prosthodontics, or a combination of these.

Day positioned appliances are indicated for patients with inflammatory TMDs and disc derangements.



Night appliances are indicated for patients with airway obstructions. Day and or night appliances are indicated for patients with limited opening, muscle contraction and tension-type or temporal headaches.

It is important to consider the neurological and airway aspects of both day and night. During the day while awake, patients are able to exert their will and may, for instance, be able to control daytime clenching of their teeth through biofeedback mechanisms. Nocturnal clenching is an unconscious act and there are no limitations or restrictions imposed on it by the patient. The purpose of orthotic therapy is to restore function and reduce symptoms, not to restore all of the injured or degenerative components

back to their original dimensions and health. The reduction of inflammation and restoration of proper musculoskeletal relationships allows for improved function, which in turn will produce better form of the component parts.

The goals of orthotic appliance therapy for patients with disc displacement are:

1. To provide the best condyle-fossa relationship possible at the time of treatment.
2. To decompress the capsular inflammation.
3. To restore proper muscle length bilaterally.

Oral appliances

An orthotic is an orthopedic appliance or apparatus used to support, align, prevent, or correct deformities or to improve the function of movable parts of the body. In contrast, splints are rigid or flexible appliances that are used to maintain in position a displaced or mobile part, or to keep in place or protect an injured part. In order to effect changes in alignment or to improve function of the TMJ, it is necessary to use an orthotic appliance. A flat plane appliance is a type of splint. A positioned appliance is an orthotic device.

Oral Appliance Designs

Surveys of practitioners conducted by the Academy of Dental Therapeutics and Stomatology indicate that practitioners routinely use the same TM appliance for every condition. The goal of this article is to guide the practitioner into formulating a diagnosis, and then choosing the correct appliance to treat the ailment. As with prescription drugs, or physical therapy, the end goal is to wean the patient off therapy – symptom-free and with no need for an appliance. All TM orthotics/appliances are intended to be worn short-term only. Wearing orthotics/appliances for long periods can lead to them acting as functional appliances and changing the position of the teeth.

Olmos Appliances

Olmos appliances include both day and night orthotic appliances. Based on the diagnosis (review the decision tree charts located in both this article and the article on diagnosis), the practitioner needs to determine the following:

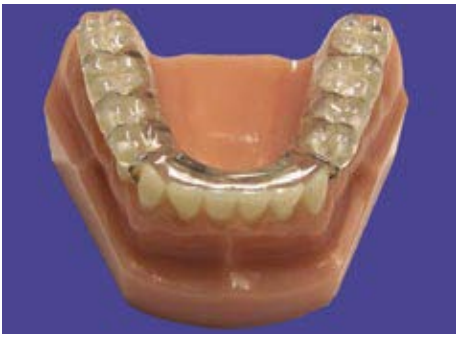
1. Is the treatment for an acute or chronic condition?
2. Does the patient need night appliances only (acute) or both night and day appliances (chronic).

Regardless of the path taken to treat, the phonetic "S" bite registration is used for these appliances. Please review the section on taking this bite in the Ideal TM Position article.

Studies have shown that using the phonetic bite results in a significantly higher freeway space, than after swallowing with the mandible in a relaxed postural position.[1] It has also been found to be a reliable and reproducible bite registration that is not subject to the influence of the patient's will.[2]

It is recommended that patients be weaned off all TM orthotics after therapy is completed.

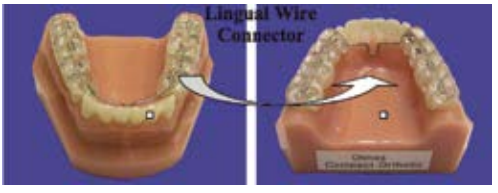
The Olmos Day Positioned Orthotic OD 1, OD 3



The OD1 is a mandibular appliance – this is preferable to a maxillary appliance from both a functional and esthetic perspective. It is fabricated in clear acrylic, has no visible wires, and covers only the posterior teeth to ensure that there is minimal impact on phonation and mastication. There must be at least 1.5 mm of posterior inter-occlusal space to allow space for the acrylic of sufficient width that it will not fracture.

This appliance is indicated for chronic dysfunction of intra-capsular origin (disc displacement) or skeletal and muscular asymmetry. It functions as a positioning stent to correct vertical dimension, rotational, cant and protrusive changes. It is designed to correct skeletal muscular, tendon and ligament asymmetries. The goal is to create the proper spacing between condyle and fossa to allow room for tissue movement such that the disc can reposition. The lingual anatomic ridge guides disclusion and protects the contralateral joint in working movements, and the height of the ridge is determined by the opposing occlusion. It is not the intent to recapture all discs (and additionally this may not be possible – for instance, patients may have translated past the eminence and it is not possible to restore to that position). Compact and labial bow versions of the OD 1 are available that may increase patient comfort.

Compact and labial bow versions

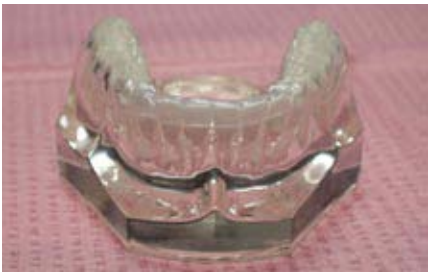


Patient instructions

Patients must be instructed that the OD 1 is a functional appliance and must be worn during all waking (upright) hours and meals. Swallowing without it will produce symptoms. They must also understand that the appliance should be regularly cleaned by brushing gently with water and a toothbrush.

The Olmos Day Positioned Orthotic OD 3

This appliance serves the same functions as the OD 1. It requires less inter-occlusal space and it does not have any metal components. The OD 3 is indicated for narrow arches, inter-occlusal distances less than 1.5 mm and for patients with allergies to metals. The OD 3 is a full coverage appliance.

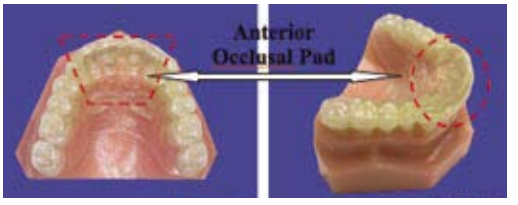


As with all orthotics, treatment and wearing of the appliance should not go on indefinitely due to the potential functional changes that can occur as a result of prolonged use of an appliance.

Night Orthotics (ON 1, ON 2, ON 3, ON 4)

Night orthotics are used to obtain a patent airway, to control para-functional activity, to protect inflamed or injured tissues, and to prevent disc dislocation in the supine position.

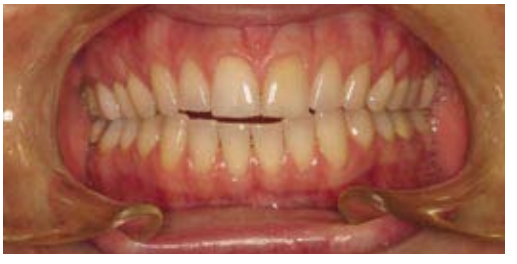
The Anterior Deprogrammer ON 1

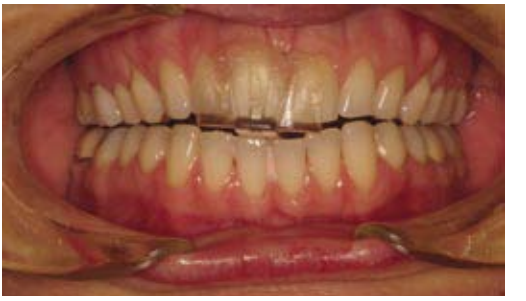


The anterior deprogrammer is an anterior bite plane. It is indicated for the reduction of clenching and grinding at night, thereby reducing temporal headaches and facial pain. It can be used for acute and chronic bruxism, both symptomatic and asymptomatic. It works by changing the fulcrum of the elevator muscles, and reduces the patient's ability to forcefully close. It also activates some degree of proprioception from the lower anteriors.

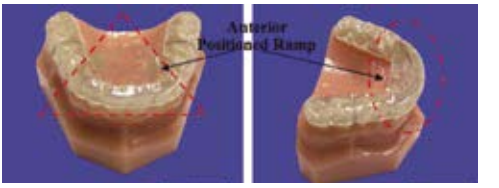
It must be fabricated using the phonetic "S" bite registration, adding on the amount of vertical necessary for the posterior teeth to be out of occlusion. The appliance must cover the four lower anterior teeth in all movements, and extend far enough labially so that the patient cannot protrude past the edge of the appliance or retrude far enough to lock behind it. Extra material ('padding') should be provided perpendicular to the incisal edge of the lower teeth at the corrected angle. As the patient's range of motion increases, it may be necessary to increase the material labially and perpendicular to the incisal edge.

The anterior bite plane spreads the forces of the elevator muscles over a larger surface than other anterior deprogramming appliances. This reduces the chances of evulsing or damaging the lower anterior teeth. Anterior deprogrammers are fabricated completely out of acrylic. Extended use of anterior bite planes can result in unwanted dental and osseous changes, as shown here.





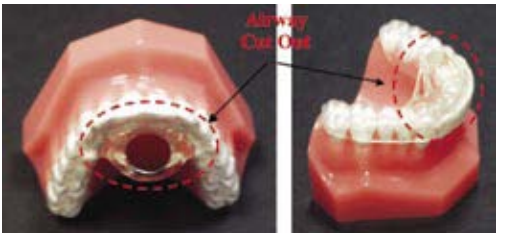
Olmos Night Positioner ON 2



The Olmos night positioner ON 2 is indicated for patients who lock in the supine position. It can also be used to augment a day appliance, to prevent retrusion that will produce inflammation. The ON 2 limits movement of the capsular and discal ligaments.

The ON 2 is fabricated with a ramp behind the upper incisors; this prevents retrusion of the mandible. The lower anterior teeth rest on the ramp, which is contoured to the lingual surfaces of the lower anteriors and contoured to engage the lower cuspids. The floor of the mouth determines the length of the ramp. In order to accommodate the ramp, it may be necessary to open the vertical more than the ideal relationship of the day appliance. Minimum thickness dimensions are 2 mm. If necessary, the occlusion can also be shifted to the anteriors to make the fulcrum more difficult to clench. The ON 2 (ramp) blocks the airway and is contraindicated in patients with obstructed nasal breathing.

Olmos Night Positioner ON 3



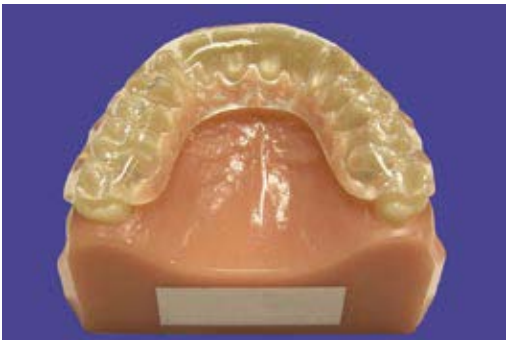
The ON 3 appliance is designed to combine the benefits of all the previous appliances. It has a circular ramp to hold the mandible forward, which may be necessary for a patient who locks in the supine position. The ON 3 also maintains the airway, both oropharyngeal and nasopharyngeal. The round hole allows air to pass to the oropharyngeal airway and allows the tongue to rest in it, which improves nasal breathing. It has an anterior pad with no posterior occlusion – therefore it acts as an anterior deprogrammer to reduce para-functional activity.

The ON 3 appliance is universal. It can be used with patients who have inflammation of the joint capsule (capsulitis), lock in the supine position, have

airway obstruction, clench or grind their teeth, or any combination of these.

Olmos Night Positioner ON 4

The ON4 appliance is a full coverage maxillary appliance, fabricated as a transparent acrylic base with or without ball clasps. It is a flat plane, full coverage splint similar to other stabilization appliances currently being used by practitioners. Flat plane splints are excellent for stabilizing the mandible in a position dictated by the bite registration taken. This appliance is also used to decompress the joint.

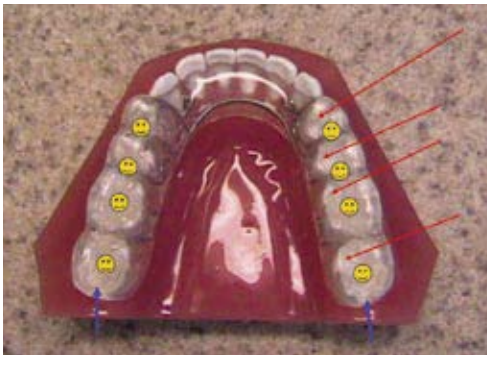


Fitting Orthotic Appliances

Orthotic appliances should be checked prior to seeing the patient. Note should be taken of the relationship of the maxillary and mandibular models.

Prior to fitting the appliance, the patient should be educated on how the appliance should fit, wearing of the appliance, and how to take care of it. The appliance should then be placed in the mouth, demonstrated to the patient, and the intraoral fit should be checked. If an appliance does not fit, it may be due to poor impressions, distorted models, improper or inadequate adjustments on delivery, and finally even a laboratory error.

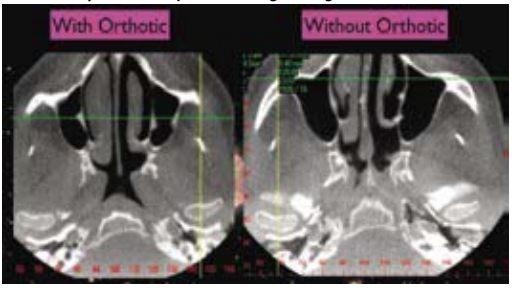
Any necessary adjustments should now be made to the orthotic. If an Energex or Aqualizer was used prior to bite registration, it should also be used prior to making adjustments. Using the phonetic "S"- bite technique, have the patient count from 66 to 77 and then bite onto the orthotic. The patient should drop into the correct bite position. The patient should be asked if the bite feels even posteriorly, and should practice biting into the new bite. After this, the bite should be checked for centric stops, using articulating paper.



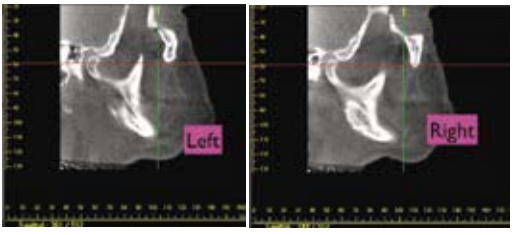
If the orthotic is a day orthotic intended to only have centric contacts, then all protrusive and non-working interferences must be removed - these are the only adjustments that should be made to this appliance as the patient's range of motion returns to normal. Even posterior centric contact (happy faces), the red arrows indicate the area of future adjustments as lateral range of motion increases over time, and the blue arrows indicate where the first prematurity is likely to occur.

Care should be taken during adjustments not too remove too much material or at inappropriate spots. For instance, due to the decompression of the posterior joint space there will be a decrease in inflammation, therefore reduced nociception, therefore reduced tonus in the masticatory muscles, therefore increased range of motion. In such a situation, reducing the vertical would most likely bring back the symptoms that you are trying to relieve. After placement of an orthotic, centric tomograms should be taken to check positioning. CT scans can be used to view condyle positioning.

Condyles with positioning using ICAT CT Scan.



Condyles with positioning using ICAT CT Scan.



If after a week a patient says, "I am only hitting on the right side", the tomograms of the original position should be checked. If that was correct, the appliance should be relined on the opposite side to the side where the patient was hitting.

As discussed, it is important to wean patients off appliances once a resolution to TMD has been achieved. In the event symptoms reoccur, therapy can again commence.

Efficacy

The benefits of condyle-fossa positioning are well-documented and range from relief of joint pain, facial muscle pain, tinnitus, dizziness, ear pain, dysfunctional posture, to cervical and low back pain. A 2002 study examined 2,104 treated patients and 250 untreated patients. Upon completion of the study, it was found that untreated TMD patients did not improve spontaneously, and that treated patients had statistically significant clinical improvements in their condition and exhibited no evidence of relapse after completion of treatment. The study concluded that the use of anterior repositioning appliances

produced superior treatment outcomes than flat plane splint treatment.[3]

A 2004 study by Steed examined 270 patients 41 months after completion of active treatment (which had ceased when the patients reached the maximum medical improvement). At the end of 41 months, improvements compared to pre-treatment were significant. Steed concluded that the benefits of active treatment were long-term.[4] Pertes and Gross concluded in their book "Temporomandibular Disorders and Orofacial Pain" that capsulitis and synovitis secondary to microtrauma or disc displacement could be treated using a joint stabilization splint to reduce bruxism and pressure on the joint, and that repositioning therapy would reduce trauma to the discal ligaments.

Summary

Careful patient selection and deselection for TMD treatment using oral appliances is mandatory. Oral appliances are available that function as orthotics, move the mandible forward, and prevent clenching and grinding. Appropriate appliance selection must consider the indication as well as the advantages and any disadvantages of particular appliances. Oral appliances should be chosen that maximize treatment outcomes and minimize undesired side effects. Oral appliance therapy has been found to be highly effective in the treatment of TMDs.

Endnotes

1 Miralles R, Dodds C, Palazzi C, et al. Vertical dimension. Part 1: comparison of clinical freeway space. Cranio. 2001;19(4):230-236.

2 Bassi F, Schierano G, Marinacci M, et al. Preliminary study of the behavior of the rest position and the minimum phonetic distance in edentulous patients rehabilitated with prostheses with modification of the palatal thickness. Minerva Stomatol. 1999;48(6 Suppl 1):21-27.

3 Brown D.T., Gaudet E.L. Jr. Temporomandibular Disorder Treatment Outcomes: Second Report of a Large-Scale Prospective Clinical Study. J Craniomand Pract. 2002;20(4):244-253.

4 Steed P.A. The longevity of temporomandibular disorder improvements after active treatment modalities. J Craniomandib Pract. 2004;22(2):110-114.

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Questions

1. All patients complaining of sleep disorders or pain disorders should be treated with appliances.
   a. True
   b. False
2. All patients with TMDs and headaches can be treated with oral appliances.
   a. True
   b. False
3. Long-term stabilization can be achieved using _____.
   a. Overlay partial dentures
   b. Orthodontics
   c. Fixed prosthodontics
   d. Combinations of a, b and c
4. Day-positioned appliances are intended for _____.
   a. Therapeutic appliance therapy
   b. Sleep-disordered breathing
   c. a and b
   d. None of the above
5. An orthotic appliance is _____.
   a. Used to restore function
   b. Used to reduce symptoms
   c. Used to restore all injured components back to their original dimensions
   d. All of the above
6. The goals of orthotic appliance therapy for patients with disc displacement are _____.
   a. To provide the best possible condyle-fossa relationship at the time of treatment
   b. To decompress the capsular inflammation
   c. To restore proper muscle length bilaterally
   d. All of the above
7. A splint is _____.
   a. Rigid or flexible
   b. Used to maintain a displaced or mobile part in position
   c. Used to keep an injured part in place or protected
   d. All of the above
8. Wearing orthotic appliances for long periods of time (long-term) _____.
   a. Is essential
   b. Can lead to changes in the position of the teeth
   c. Is always useful
   d. None of the above
9. Anterior bite planes spread the force of the elevator muscles over a larger area than other anterior deprogrammers.
   a. True
   b. False
10. The Olmos Day Positioned orthotic is indicated for _____.
    a. Chronic dysfunction of intra-capsular origin (disc displacement)
    b. Skeletal and muscular asymmetry
    c. Dysfunction of the cervical vertebrae
    d. a and b
11. The goal of the OD 1 is _____.
    a. To create proper spacing between the condyle and fossa
    b. To enable room for tissue movement and disc repositioning
    c. To change the ligamentous relationships
    d. All of the above
12. The objective of the OD 1 is to recapture all discs.
    a. True
    b. False
13. Compact and labial bow OD 1s may increase patient comfrot.
    a. True
    b. False
14. Patients must be instructed _____.
    a. That the OD 1 is a functional appliance
    b. That the appliance must be worn during all waking hours
    c. How to clean the appliance
    d. All of the above
15. The use of an anterior bite plane may result in the development of undersired dentl and osseouse changes.
    a. True
    b. False
16. Swallowing without wearing functional daytime appliances will_____.
    a. Produce symptoms
    b. Reduce discomfort
    c. Make no difference
    d. None of the above
17. AN OD 3 appliance is indicated instead of an OD 1 appliance if _____.
    a. The patient is allergic to metals
    b. The arch form is very narrow
    c. There is less than 1.5 mm of space inter-occlusally
    d. All of the above
18. If an appliance does not fit, it may be due to _____.
    a. The patient being uncooperative during the fitting appointment
    b. Poor impressions or distorted models
    c. Improper or inadequate adjustments upon delivery
    d. b and c
19. For a day orthotic intended to have only centric contacts, _____.
    a. All protrusive interferences must be removed
    b. All non-working interferences must be removed
    c. All centric contacts must be removed
    d. a and b
20. Centric tomograms should be taken after placement of an orthotic to check positioning.
    a. True
    b. False
21. If the position was correct but the patient complains that he or she is only hitting on one side, _____.
    a. The patient should be taught how to adapt to this
    b. The orthotic should be made again from a new impression and model
    c. The side where the patient is not hitting should be relined
    d. All of the above
22. The ON 4 appliance is _____.
    a. A full coverage maxillary appliance
    b. A flat plane, full coverage splint
    c. Used to decompress the joint
    d. All of the above
23. Pertes and Gross found that repositioning therapy would reduce trauma to the discal ligament.
    a. True
    b. False
24. The benefit of condyle-fossa positioning is _____.
    a. Relief of joint pain
    b. Relief from tinnitus
    c. Correction of dysfunctional posture
    d. All of the above
25. CT scans can be used to view condyle positioning.
    a. True
    b. False
26. Indications for night orthotics include _____.
    a. Clenching or grinding at night
    b. Sleep interrupted by temporal headaches
    c. Episodes of bruxism
    d. All of the above
27. The Anterior Deprogrammer (ON 1) is designed to _____.
    a. Reduce nocturnal clenching and grinding
    b. Change the fulcrum of the elevator muscles
    c. Reduce the patient's ability to forcefully close
    d. All of the above
28. The Olmos Night Positioner is indicated for _____.
    a. Patients who lock in the supine position
    b. Stretched capsular and discal ligaments
    c. To augment a day orthotic appliance
    d. All of the above
29. The ON 3 orthotic appliance _____.
    a. Holds the mandible forward by using a circular ramp
    b. Has a round hole that lets air pass to the oropharyngeal airway
    c. Improves the airway
    d. All of the above
30. The ON 3 orthotic appliance can be used in patients with _____.
    a. Inflammation of the joint capsule
    b. Airway obstruction
    c. Clench or grind their teeth
    d. Any combination of the above

ANSWER SHEET

Appliance Therapy

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Course Evaluation

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

1. How would you rate the objectives and educational methods?
   5 4 3 2 1 0
2. To what extent were the course objectives accomplished?
   5 4 3 2 1 0
3. Please rate the course content.
   5 4 3 2 1 0
4. Please rate the instructor's effectiveness.
   5 4 3 2 1 0
5. Was the overall administration of the course effective?
   5 4 3 2 1 0
6. How do you rate the author's grasp of the topic?
   5 4 3 2 1 0
7. Do you feel that the references were adequate?
   Yes No
8. Do you feel that the educational objectives were met?
   Yes No
9. If any of the continuing education questions were unclear or ambiguous, please list them.

   _____

10. Was there any subject matter you found confusing? Please describe.

    _____

11. Would you participate in a program similar to this one in the future on a different topic? Yes No

12. What additional continuing dental education topics would you like to see?

    _____

1.	①	②	③	④	16.	①	②	③	④
2.	①	②	③	④	17.	①	②	③	④
3.	①	②	③	④	18.	①	②	③	④
4.	①	②	③	④	19.	①	②	③	④
5.	①	②	③	④	20.	①	②	③	④
6.	①	②	③	④	21.	①	②	③	④
7.	①	②	③	④	22.	①	②	③	④
8.	①	②	③	④	23.	①	②	③	④
9.	①	②	③	④	24.	①	②	③	④
10.	①	②	③	④	25.	①	②	③	④
11.	①	②	③	④	26.	①	②	③	④
12.	①	②	③	④	27.	①	②	③	④
13.	①	②	③	④	28.	①	②	③	④
14.	①	②	③	④	29.	①	②	③	④
15.	①	②	③	④	30.	①	②	③	④

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

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INSTRUCTIONS
Each question should have only one answer. Grading of this examination is done manually. Participants will receive verification in the mail within three to four weeks after taking an examination.

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PARTICIPANT FEEDBACK
Questions can be e-mailed to aeagle@ineedce.com or faxed to (216) 255-6619, (440) 845-3447, or (216) 398-7922.

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The ADTS maintains records of your successful completion of any exam. Please contact our offices for a copy of your continuing education credits report. This report, which lists all credits earned to date, will be generated and mailed to you within five business days of receipt of your request.

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Any participant who is not 100% satisfied with this course can request a full refund by contacting the Academy of Dental Therapeutics and Stomatology in writing.

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We encourage participant feedback pertaining to all courses. Please be sure to complete the survey included within the answer sheet.