

Mitigating Side Effects in Oral Appliance Therapy

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Conflict of Interest Disclosures for Speakers

Anjoo Chaudhry Ely, DDS, DABDSM has no relevant financial relationships with ineligible companies to disclose.

Learning Objectives

- Upon completion of this course, attendees should be able to...
 - Understand the most common side effects of oral appliance therapy in order to better educate our patients
 - Understand the various approaches to mitigate these side effects
 - Understand how to prevent/minimize the most common side effects of oral appliance therapy.



AASM and AADSM Clinical Practice Guidelines

- “We suggest that qualified dentists provide oversight—rather than no follow-up of oral appliance therapy in adult patients with obstructive sleep apnea, to survey for dental-related side effects or occlusal changes and reduce their incidence.”



Consensus Conference

The Rand/UCLA Appropriateness
Method User's Manual

To establish a published set of guidelines
that clinicians and dentists can refer to
for the management of the side effects
associated with OAT



Management of Side Effects of Oral Appliance Therapy for Sleep-Disordered Breathing

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As the field of oral appliance therapy (OAT) to manage obstructive sleep apnea has evolved over the past 30 years, side effects of therapy have become increasingly recognized. Although the most commonly observed side effect is unwanted tooth movement, a number of other side effects have been reported through anecdotes, case reports, and observational studies. Members of the American Academy of Dental Sleep Medicine developed a set of consensus recommendations to guide dentists in the management of side effects as a consequence of OAT. Thirteen expert clinicians were appointed to the panel, which used the modified RAND/UCLA Appropriateness Method to review the body of evidence on OAT side effects and to establish the recommendations. Clinicians are encouraged to use these recommendations in conjunction with their clinical expertise to minimize the side effects of OAT. The recommendations are based on knowledge to date and are expected to evolve over time. Future research should aim at timely identification of these side effects for positive treatment outcomes.

KEYWORDS: malocclusion, mandibular advancement, mandibular repositioning, mouth diseases and therapeutics, oral device, orthodontic appliance, sleep apnea (obstructive and snoring), tooth disease

CITATION: Sheats RD, Schell TG, Blanton AO, Braga PM, Demko BG, Dort LC, Farquhar D, Katz SG, Masse JF, Rogers RR, Scherr SC, Schwartz DB, Spencer J. Management of side effects of oral appliance therapy for sleep-disordered breathing. *Journal of Dental Sleep Medicine*. 2017;4(4):111–125.

INTRODUCTION

The American Academy of Dental Sleep Medicine (AADSM) and American Academy of Sleep Medicine recently updated their clinical practice guideline for the treatment of obstructive sleep apnea (OSA) and snoring with oral appliance therapy (OAT).¹ The guideline included the following recommendation: “We suggest that qualified dentists provide oversight—rather than no follow-up—of oral appliance therapy in adult patients with obstructive sleep apnea, to survey for dental-related side effects or occlusal changes and reduce their incidence.”

The management of side effects is essential to maximize treatment adherence and the clinical effectiveness of oral appliances. The guideline further states that although multiple manuscripts refer to side effects, the overall evidence is limited and of low quality.

The field of dental sleep medicine lacks a set of published guidelines that clinicians and dentists can refer to for the management of side effects associated with OAT. Most of the information available to clinicians is derived from individual lecturers and is anecdotal. In an effort to begin to address this gap in knowledge, the AADSM Board of Directors convened a panel of experts to develop consensus-based recommendations for managing the most common side effects encountered in OAT.

BACKGROUND

OSA has a reported prevalence of 2% to 8% in older literature, with more recent estimates suggesting that more than 18 million adults in the United States have sleep apnea, a leading cause of excessive daytime sleepiness. An oral appliance, while effective in ameliorating the respiratory events of OSA, often causes alterations in occlusal (tooth) contacts and mandibular positioning as well as other side effects. During the Advanced Course in Oral Appliance Therapy in 2009, the AADSM first catalogued some of these side effects and proposed solutions for their management. This was originally published in *Dialogue* and was considered a work in progress.²

The purpose of this consensus paper is to update those recommendations and to develop a touchstone reference for practitioners and researchers seeking guidance on the management of side effects of OAT for sleep-disordered breathing.

METHODS

Expert Panel Selection

In accordance with the recommendations of the RAND Appropriateness Method,³ the Consensus Conference panel comprised 13 voting members. All panel members were dentists who were trained and experienced in the overall care of oral health, the temporomandibular joint (TMJ), dental occlusion, and associated oral structures with focused emphasis on the proper protocol for diagnosis, treatment,

JDSM October, 2017

Table 1—Side effects.

Temporomandibular joint-related side effects

- Transient morning jaw pain
- Persistent temporomandibular joint pain
- Tenderness in muscles of mastication
- Joint sounds

Intraoral tissue-related side effects

- Soft tissue and tongue irritation
- Gingival irritation
- Excessive salivation/drooling
- Dry mouth

Occlusal changes

- Altered occlusal contacts/bite changes
- Incisor changes
- Decreased overjet and overbite
- Alterations in position of mandibular canines and molars
- Interproximal gaps

Damage to teeth or restorations

- Tooth mobility
- Tooth fractures or damage to dental restorations

Appliance issues

- Appliance breakage
- Allergies to appliance material
- Gagging
- Anxiety

TEMPOROMANDIBULAR JOINT RELATED SIDE EFFECTS



- Transient morning jaw pain

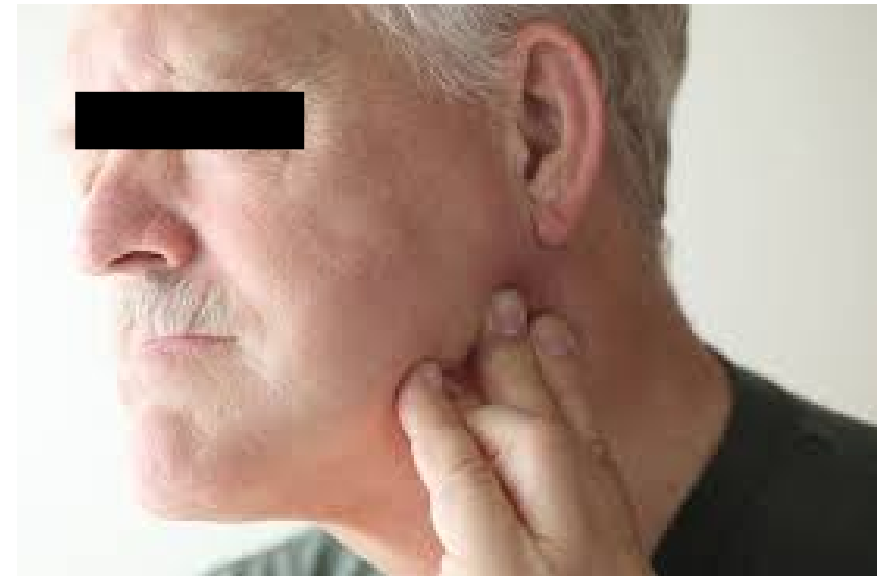
- Persistent temporomandibular joint pain

- Tenderness in muscles of mastication

- Joint sounds

Transient Morning jaw Pain

- Watchful waiting
- Palliative care
- Isometric contraction
- Jaw exercise
- Decreasing the titration rate



Isometric Contractions

- Blue Tabs



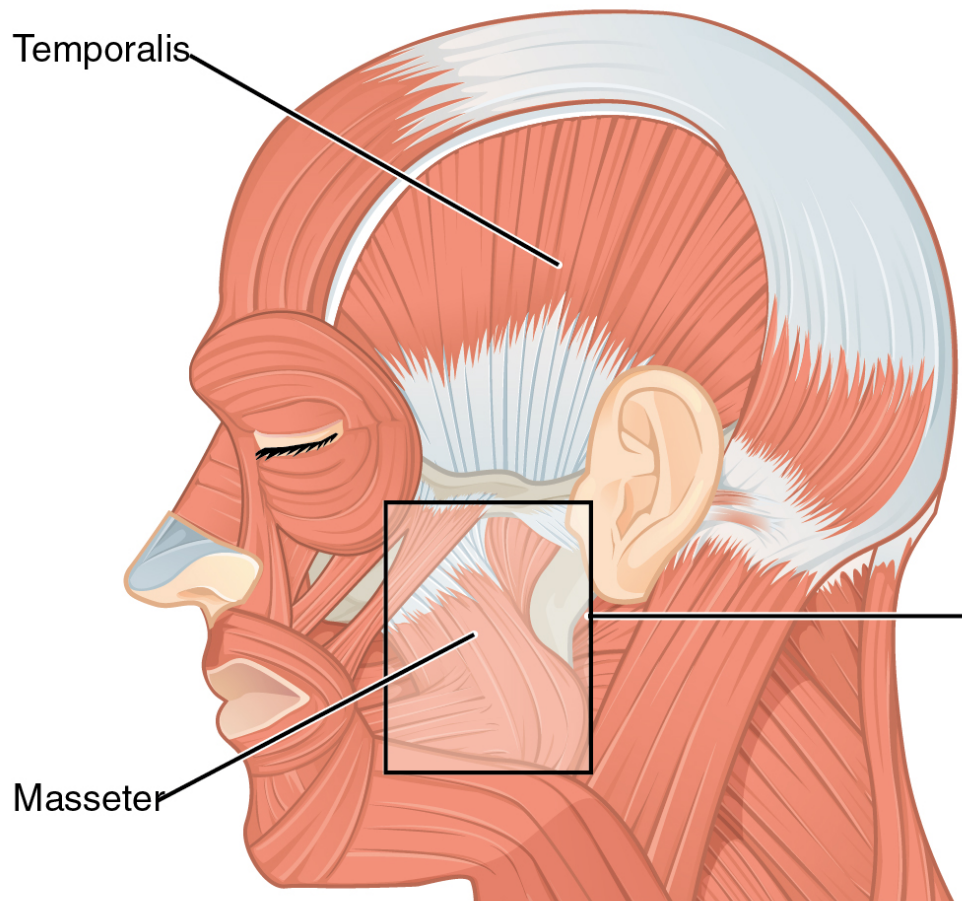
Persistent TMJ Joint Pain

- Palliative care, isometric contractions, jaw stretches
- Discluding elements
- Posterior stops
- Steroid dose pack
- Decrease advancement
- Possible need for daytime orthotic
- Discontinuation of appliance

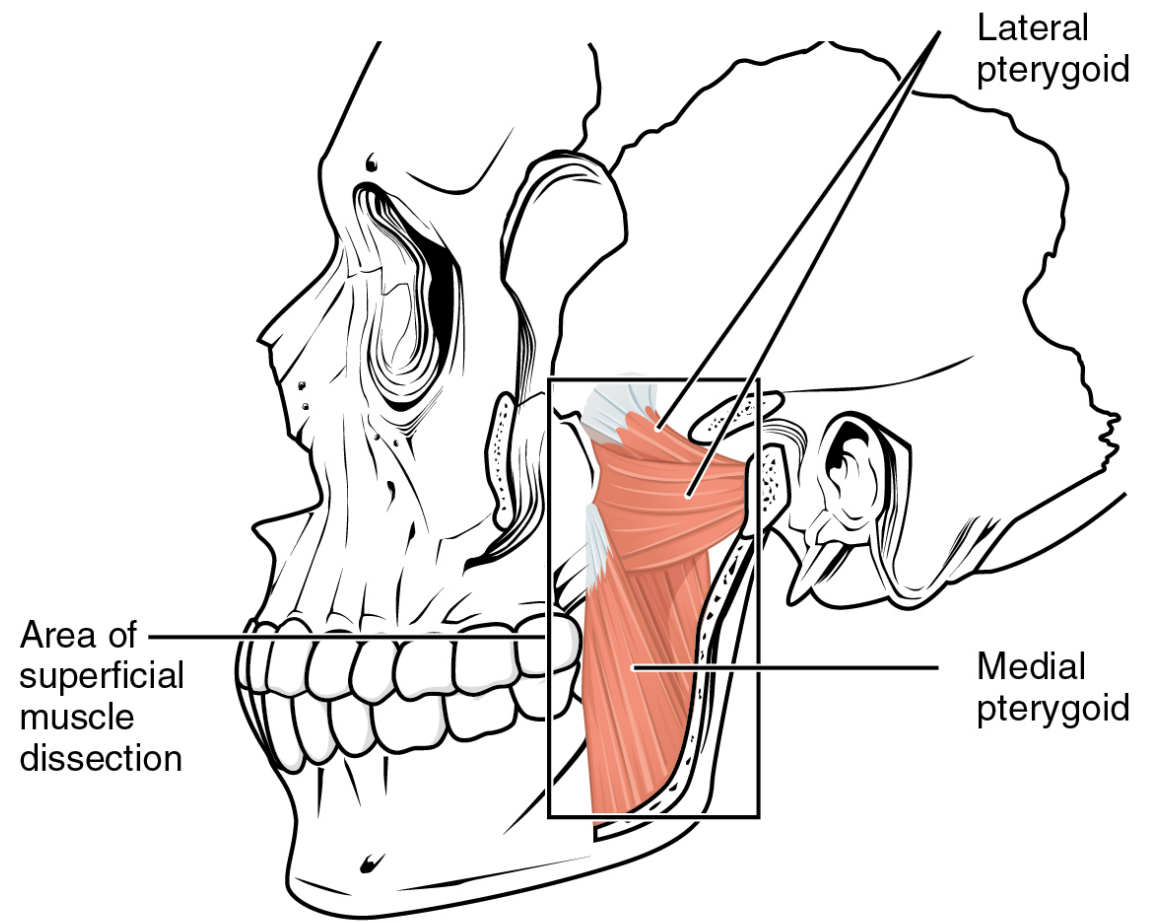


Tenderness in Muscles of Mastication

- Palliative care, watchful waiting, verifying or correcting midline positions, use of a morning occlusal guide, and isometric contraction and passive jaw stretching exercises are considered first-line treatments to manage tenderness in the muscles of mastication.
- Decreasing oral appliance advancement, vertical dimension, and the rate of forward titration, modifying the acrylic, and temporarily discontinuing use of oral appliance therapy are considered second line treatments.
- If these treatment options are insufficient or inappropriate, recommending a different oral appliance design, referring to a dental specialist or additional health care provider, and permanently discontinuing oral appliance therapy may also be appropriate. In very rare instances, increasing oral appliance advancement may be indicated.”



Chewing muscles (superficial)



Chewing muscles (deep)



Morning Occlusal Guide

- Morning occlusal guide encompasses many custom-made appliances and prefabricated devices used in the effort to reposition the mandible into its habitual pretreatment position. These devices may function by utilizing biting force to re-seat the condyles to help reestablish/maintain the appropriate occlusal relationship in the morning following each night of OAT. Some of these custom devices may function by reversing changes that may have occurred in tooth position or work to exercise or stretch muscles of mastication as well. They are intended to address the occlusal discrepancy noted after removal of the oral appliance each morning.

Morning Repositioner

- AM Aligner or similar
- Jaw Exercises



[MOG] MIP



Verification and/or Correction of Midline Position

- Verification and/or correction of midline position describes an effort to ascertain and maintain the appropriate lateral position of the mandible in its forward position, often similar in lateral dimensions to the nonprotruded (non-treatment) position.

Verify midlines



Verification and/or Correction of Occlusion

- Verification and/or correction of occlusion describes an effort to ascertain balanced occlusal forces on the oral appliance both bilaterally and anteriorly-posteriorly. This balance may be altered as the mandibular position is advanced or as muscles alternatively relax or contract with use. This may also encompass consideration of changes to the vertical dimension of the oral appliance.

Isometric and Passive Jaw Stretching Exercises

- Isometric and passive jaw stretching exercises include instructing patients to move the mandible against resistance both vertically and laterally and to stretch the mandibular range of motion assisted by the fingers, targeting the masticatory muscles. Examples would include instructing a patient to move the mandible against gentle resistance both vertically and laterally within their physiologic range of motion and using finger pressure to stretch the lateral pterygoid, temporalis, and masseter muscles. These have been shown to decrease the level of discomfort and improve adherence to OAT. Duration and frequency of exercises will be dependent on the ease with which the patient is able to reestablish occlusion.

Conservative Titration

- Conservative titration refers to the minimum amount of advancement of the appliance required to manage sleep-disordered breathing. Aarab et al. demonstrated that the number of side effects increases as protrusion exceeds 50%. Moreover, research reveals that both 50% and 75% protrusion can be equally effective in groups of patients with mild to moderate OSA.

Tegelberg A, Walker-Engstrom ML, Vestling O, Wilhelmsson B. Two different degrees of mandibular advancement with a dental appliance in treatment of patients with mild to moderate obstructive sleep apnea. *Acta Odontol Scand.* 2003;61(6):356–362.

Joint Sounds

- Watchful waiting is considered first-line treatment to manage joint sounds caused as a result of using an oral appliance. If this treatment option is insufficient or inappropriate, temporary or permanent discontinuation of oral appliance therapy may also be considered.”

Intraoral Tissue-Related Side Effects

- Palliative care and appliance modification are considered first-line treatments to manage soft tissue and tongue irritation side effects. Temporarily discontinuing use of the oral appliance is considered second-line treatment. If these treatment options are insufficient or inappropriate, orthodontic wax and switching to a different oral appliance design may also be considered appropriate.”

Gingival Irritation

- Check for tissue blanching
- Modification of the appliance and palliative care are considered first-line treatments to manage gingival irritation. Discontinuing oral appliance therapy temporarily is considered second-line treatment



Excessive Salivation

- Watchful waiting is considered first-line treatment to manage excessive salivation/drooling. Modification to the appliance is considered second-line treatment. If these treatment options are insufficient or inappropriate, prescribing medications to decrease salivary input may also be appropriate.”



Excess Salivation

Climatization period – transient side effect

Usually resolves in 2-3 weeks

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Dry Mouth

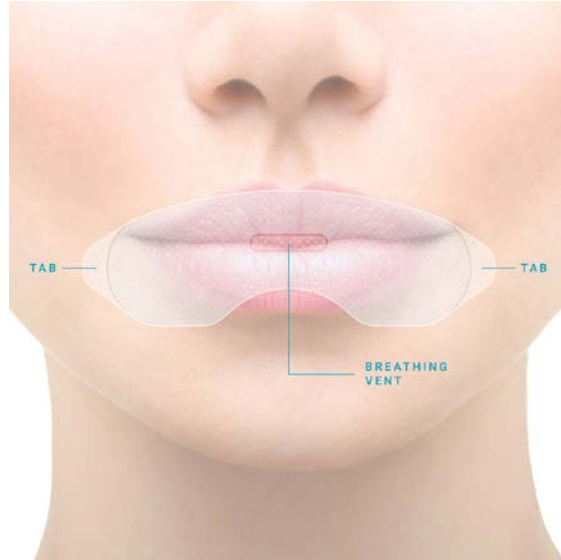
- Mouth breathers, lack of lip seal, possible ENT referral
- Can use salivary substitutes
- Reevaluate type of appliance/decrease vertical dimension

Consider possible medication side effects, caffeine/alcohol before bedtime, possible drying effects of alcohol containing mouthwashes.



Mouth tape

- Somnifix




- 3M medipore medical tape



Occlusal Changes

- Altered Occlusal Contacts/Bite Changes
 - Watchful waiting, jaw stretching exercises, and use of a morning occlusal guide are considered first-line treatments to manage altered occlusal contacts or bite changes. Chewing hard gum in the mornings and making modifications to the appliance are considered second-line treatments. If these treatment options are insufficient or inappropriate, discontinuing oral appliance therapy temporarily or permanently may also be appropriate.”



Obstructive Sleep Apnea and Mandibular Advancement Splints: Occlusal Effects and Progression of Changes Associated with a Decade of Treatment

Benjamin T. Pliska, D.D.S., M.Sc., Hyejin Nam, Hui Chen, D.M.D., Ph.D., Alan A. Lowe, D.M.D., Ph.D.,
Fernanda R. Almeida, D.D.S., Ph.D.

Published Online: December 15, 2014 • <https://doi.org/10.5664/jcsm.4278> • Cited by: 88

A posterior openbite, which for the purposes of this study is defined by the loss of occlusal contact on at least 2 posterior teeth, developed in 51% (39/77) of the sample.

N=77
After 8 years
in MAS

Posterior Open Bite (POB)

- Methods

- Visit 1 167 patients studied – baseline
- Visit 2 159 patients after 118 days
- Visit 3 129 patients after 208 days
- Visit 4 85 patients after 413 days

Results

POB was found to develop with an average incidence of 6.1 % per visit. The prevalence of POB was 5.8 % on visit II, 9.4 % on visit III, and 17.9 % on visit IV.

POB was found to develop in 17.9 % of patients; however, only 28.6 % of these patients were aware of any bite changes.

Perez, C.V., de Leeuw, R., Okeson, J.P. *et al.* The incidence and prevalence of temporomandibular disorders and posterior open bite in patients receiving mandibular advancement device therapy for obstructive sleep apnea. *Sleep Breath* 17, 323– 332 (2013). <https://doi.org/10.1007/s11325-012-0695-1>

Photos of bite Change



11/08/2018



02/12/2020

Bite Changes



Bilateral Posterior Open Bite – patient wearing appliance for 15 months.



Some patients do not get bite change.



11/23/2015 -
preop



12/16/2015 delivery

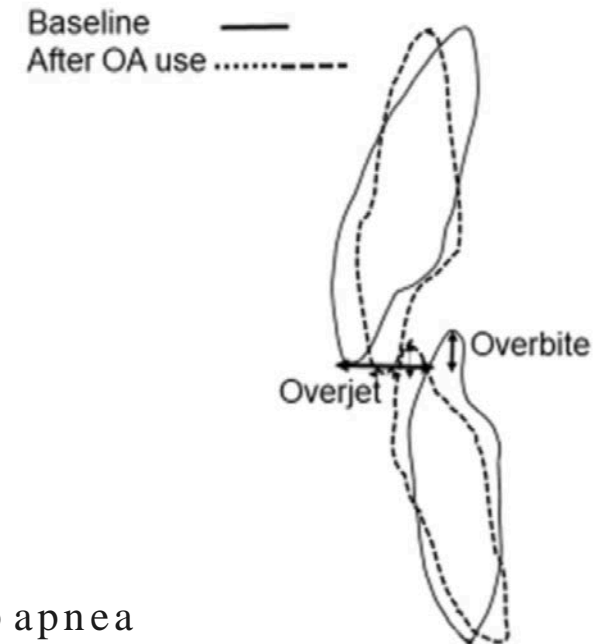
02/20/2020

Decreased Overjet and Overbite

- “ Watchful waiting, isometric contraction and passive jaw stretching exercises, and use of a morning occlusal guide are considered first-line treatments to manage decreased overjet and overbite. Chewing hard gum in the morning is considered second-line treatment.”

Marklund, M. Subjective versus objective dental side effects from oral sleep apnea appliances. *Sleep Breath* 24, 111– 117 (2020). <https://doi.org/10.1007/s11325-019-01852-0>

Fig. 1



Dental side-effects of mandibular advancement splint wear in patients who snore

J.M. Battagel, B. Kotecha

First published: 12 April 2005 | <https://doi.org/10.1111/j.1365-2273.2004.00944.x> | Citations: 36

- **Results:** Median duration of MAS wear was 3.64 years. Small, statistically significant reductions in both vertical (-0.4 mm) and horizontal (-0.5 mm) overlap of the incisor teeth were found.

N=192

Wearing oral appliance 5 hours /night at least 6 days a week



Damage to the Teeth or Restorations

- **Tooth Mobility**

- “ Palliative care and modifying the appliance are considered first-line treatments to manage tooth mobility. Decreasing the titration rate is considered second-line treatment. If these treatment options are insufficient or inappropriate, daytime/fixed splinting of teeth may also be appropriate.”

- **Tooth Fractures or Damage to Dental Restorations**

- “ Modifying the appliance and referral to a general/ restorative dentist are considered first-line treatments to manage tooth fractures or damage to dental restorations. If these treatment options are insufficient or inappropriate, recommending a different oral appliance design may also be appropriate.”

Appliance Issues

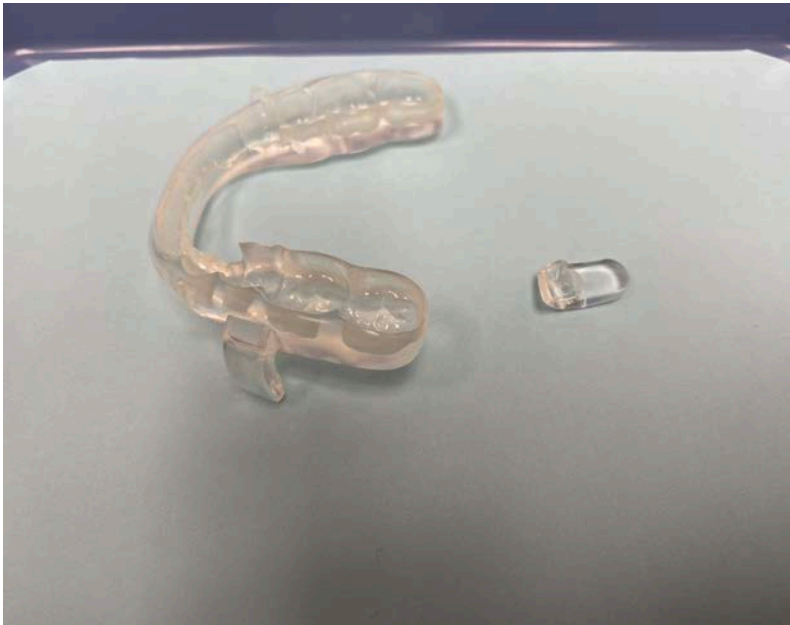
- **Appliance Breakage**

“ Repairing or replacing the appliance is considered first-line treatment to manage appliance breakage. If these treatment options are insufficient or inappropriate, recommending a different oral appliance design may also be appropriate.

- **Allergies to Appliance Materials**

“ Removing the allergenic material and temporary discontinuation of oral appliance use are considered first-line treatments to manage allergies to appliance material. If these treatment options are insufficient or inappropriate, referring to another health care provider may also be considered as a treatment option.”

Appliance Breakage



Appliance Breakage





Allergies

- Removing the allergenic material and temporary discontinuation of oral appliance use are considered first-line treatments to manage allergies to appliance material. If these treatment options are insufficient or inappropriate, referring to another health care provider may also be considered as a treatment option.”



Appliance issues continued

- Gagging

- **“Modification to the appliance is considered first-line treatment to manage gagging. Deprogramming the gag reflex is considered second-line treatment. If these treatment options are insufficient or inappropriate, recommendation of a different oral appliance design may also be appropriate.”**

- Anxiety

- **“Watchful waiting and use of desensitization techniques are considered first-line treatments to manage anxiety. If these treatment options are insufficient or inappropriate, recommending a different oral appliance design and referring to a different health care provider may also be appropriate.”**

Informed Consent

- Informed consent is the process in which a health care provider educates a patient about the risks, benefits, and alternatives of a given procedure or intervention.





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DENTAL SLEEP & TMJ

Thank you!

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