The Use of Oral Appliances in the Management of Temporomandibular Disorders

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KEYWORDS

• Oral appliances • Temporomandibular disorders • Clinical indications • Patient selection

KEY POINTS

- Oral appliances (OAs) can be part of a conservative treatment plan for certain patients with temporomandibular disorders.
- The design of an OA depends on the clinical objectives for each case.
- The mechanisms of action underlying the clinical effects of an OA are not completely understood.
- Using OAs to produce permanent changes in mandibular positions is not supported by current evidence.

INTRODUCTION

There are few topics concerning temporomandibular disorders (TMDs) that elicit more disagreement and controversy than the use of oral appliances (OAs) in treating these disorders. Such devices can be designed to fit in the mouth in several different ways: they can be worn on either the upper or lower arch, they can cover all of the teeth in 1 arch, or they may provide only partial coverage (anterior only, posterior only, covering many teeth or only a few). Their design can be simple (eg, flat occlusal platforms) or they can be modified in several ways: added canine rise ramp, added anterior ramp to force the mandible forward, or added occlusal index to place the mandible in a certain position (eg, centric relation or neuromuscular relationship). They can be prescribed for full-time or part-time wear, and in some protocols they must be worn while eating meals. Some clinicians recommend a specific type of OA for daytime wear and a different type for nocturnal wear, whereas others use upper and lower appliances simultaneously.

Debate also persists regarding how an OA might reduce pain in various components of the stomatognathic system. For example, some clinicians claim that these devices can unload the temporomandibular joint (TMJ); however, it has been shown that this is anatomically impossible even if so-called pivots are added in the posterior areas. However, it may be possible to reduce loading inside the TMJs by a combination of OA design features and specific instructions for usage. Similarly, some clinicians claim that OAs can be used to recapture anteriorly displaced TMJ discs into a normal relationship but others maintain that this is only a temporary success even when it occurs.

The proposition that an OA may reduce the severity of nocturnal bruxism, as well as the amount and intensity of muscular activity at night, has been extensively studied in sleep laboratories. This outcome can occur but it does not occur uniformly in all subjects. For patients with masticatory

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muscle pain that seems to be related to nocturnal activities, it has been found that many of them will experience pain reduction from wearing an OA for a few weeks but some will not. For many of the successful patients, the OA can be discontinued without having pain return; but for others that is not possible. These variable outcomes need to be analyzed so that proper clinical decisions can be made.

This article discusses these issues and evidence-based conclusions are provided whenever possible. The main focus is on the use of OAs to treat TMDs; however, there is an overwhelming issue that also needs to be addressed that has not been mentioned yet, namely: What is the ultimate purpose in the mind of a clinician for providing this treatment modality to his or her TMD patient? Clearly, this is a conceptual question with important clinical consequences. At the risk of oversimplification, the authors propose to discuss this issue in terms of the following possibilities:

1. An OA is intended to reduce or eliminate the patient's pain and improve function. It may be used alone or in conjunction with other pain management methods such as medications, physical therapy, stress management, and self-help home care activities.
2. In addition to these goals, an OA is intended to produce a change in the mandibular relationship to the skull, also described as the condyle–fossa relationship. This can occur as a result of muscle relaxation, or it may occur due to specific OA design features. Clinical objectives such as deprogramming and finding optimal mandibular positions are often cited. The new condyle–fossa relationship is generally described as ideal.

In the first concept, there is no irreversible aspect to the use of an OA, and the worst-case outcome potentially should be nothing more than complete failure in the attempt to treat a patient's TMD problem. In the second concept, however, there is an intent to produce an irreversible change in the mandibular position, which later will require an irreversible change in occlusal relationships as well. This treatment concept, which has many different versions within the dental community, is generally referred to as the phase I–phase II approach. Because of the irreversible nature of this approach, a TMD patient could end up with both a failure to improve and a new jaw relationship that is unacceptable. This important clinical controversy is addressed thoroughly in this article.

Controversy 1: Oral Appliance Design: Full Coverage Versus Partial Coverage

The most common design for an OA is a full-coverage device that fits over all the teeth in 1 dental arch, known as a stabilization splint (also described as a Michigan splint). Although some full-coverage OAs are made from inexpensive composite materials that are vacuum-formed in the office, the more classic versions are made from methyl methacrylate acrylic that is processed in a dental laboratory. The latter version requires articulated dental models, a wax-up of the desired design, and careful adjustment of the finished product before it is sent back to the dentist. With the development of thermoplastic inner liners that can be heated with tap water, these devices generally fit quite well over all the teeth and, therefore, usually require little occlusal adjustment. They can be made for either the upper or lower arch, and there is no compelling evidence for preferring either. They should be placed over the arch with the most irregular occlusal plane to ease adjustment and to control thickness. If possible, they should also be placed on the arch with the most posterior teeth to avoid having unopposed teeth that could erupt. In clinical practice, most of these full-coverage OAs are made to cover the maxillary teeth.

There also have been several types of partial-coverage OAs proposed over the years, and various rationales have been offered for choosing to use them. The oldest design is the Hawley anterior biteplate, which is a maxillary appliance that has an occlusal platform from canine to canine. About 40 years ago the mandibular orthopedic repositioning appliance (MORA) was introduced by Gelb and Gelb.[1] This appliance featured a bilateral posterior-only coverage design. The MORA was used by some clinicians to deliberately produce a massive occlusal change in the posterior teeth (**Fig. 1**) that ultimately required major dental restorations on 16 teeth to reestablish the occlusion at a new vertical dimension.

More recently, the idea of a minimal-coverage OA has led to 2 current designs becoming popular. The first is the nociceptive trigeminal inhibition tension suppression system (NTI-tss), which is a commercially available device customized for fit and occlusion in the mouth.[2] A second type is called anterior midpoint stop appliance (AMPSA), which this can be fabricated in the office.[3] Both of these are based on the concept that only 1 to 2 lower anterior teeth should strike the occlusal platform and that this will lead to reflexive relaxation of the masticatory muscles. Many claims have been made about the value of these devices