

Choosing the Right Appliance

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The use of appliance therapy as a part of treatment for patients suffering from craniofacial pain or dysfunction has been well established. Unfortunately, there are far too many patients and clinicians who have had negative experiences with appliance therapy. There are many potential reasons for this, including the following:

1. The patient had pathology which could have been more appropriately treated using other modalities.
2. The patient was given the "wrong" appliance.
3. The patient was given the "right" appliance at the wrong time.

These reasons point to a lack of diagnosis as the primary cause of appliance therapy failure. Without an adequate differential diagnosis, the clinician's rate of success is dramatically reduced, regardless of his or her clinical skill.

Reasons for Appliance Therapy

The rationale for the use of appliances can be broken down into several categories.

1. Deprogram muscles by eliminating occlusal irritants
2. Alter vertical dimension
 - A. Change airway space
 - B. Establish cervical dynamics
 - C. Eliminate locked-in occlusion
3. Change mandibular posture (anterior-posterior and medial-lateral)
 - A. Reposition condyles
 - B. Capture dislocated disk
 - C. Correct malocclusion

Condylar Position and Internal Derangements

Before examining the intended use of various appliances, let us first define some terms and concepts.

1. The condylar position is dictated by the occlusal scheme when the patient closes his or her mouth.
2. Because the glenoid fossa is larger than the head of the condyle, the condyle can be located in any of several areas within the fossa. For the purposes of this paper, we have determined the following zones to describe the



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position of the condyle in the fossa.

- A. Zone A: A position in which the condyle is essentially concentric in the fossa. The joint space between condyle and fossa is uniform anteriorly, superiorly, and posteriorly. In addition, the disk is properly positioned between the head of the condyle and the articular tubercle. This would be considered centric relation by most clinicians.
 - B. Zone B: A position slightly anterior to Zone A, with less joint space anteriorly than posteriorly. The condyle is *not* very far down the posterior slope of the eminence, however. The disk is also in proper position. This is frequently the condyle position needed to capture a dislocated disk.
 - C. Zone C: Potential displacement of the condyle when the disk is dislocated anteriorly and/or medially. The condyle may be displaced superiorly, posteriorly, or anteriorly in the fossa. The condyle's position in this broad zone is determined by the type of internal derangement and/or occlusion involved.
3. Throughout this article, if an appliance is intended to be used when the condyle-disk apparatus is functioning normally (no internal derangement), it will be signified with a "+." If an appliance is to be used with internal derangements (i.e., the disk still out of position even with the appliance in place), it will be signified with a "-."

We have defined internal derangement as any remodeling or changes to the internal structures of the temporomandibular joint. The most frequently discussed internal derangement is displacement of the disk. However, internal derangements such as disk perforation; thinning; thickening; folding; vascularized, ankylosed, cartilaginous, or bony changes; or formation of ridges may also occur.

Classification of Occlusal Plane Orthopedic Appliances

I. Maxillary

- A. Deprogramming appliances (Zone A, B, or C) (+ or -)
 1. Anterior deprogrammer
 - a. without substructure (anterior jig)
 - b. with substructure
 2. Full-coverage deprogrammer (Shore appliance)
- B. Repositioning appliances
 1. Disk appliance (Zone A or B) (+)
 2. Orthopedic positioner (Zone C) (-)
 3. Night appliance (Zone A, B, or C) (+ or -)

4. Post-manipulation appliance (+ or -)

II. Mandibular

- A. Deprogramming appliances (Zone A, B, or C) (+ or -)
 1. Posterior deprogrammer ("pivot" appliance)
 2. Full-coverage deprogrammer (Tanner appliance)
- B. Repositioning appliances
 1. Disk appliance (Zone A or B) (+)
 2. Orthopedic positioner (Zone C) (-)

Description of Orthopedic Appliances

Maxillary Anterior Deprogrammer without Substructure (Anterior Jig)

This appliance is molded over the upper central incisors, labial and lingual. A smooth, flat plane is formed, with an inclination approximately parallel to that formed between the incisal edge of the central incisor and the TMJ. This incisal guide angle is extremely important—if too steep it may overretrude the condyles, if too flat it allows the patient to parafunction into a protrusive position. It is designed so that the posterior teeth are just separated in acquired occlusion and excursions. Only the lower central incisors should touch the appliance.

Advantages/Indications: This is a good "emergency" appliance to use when there is not time to fabricate a more sophisticated appliance. It may also be used as a diagnostic tool to determine how much of a patient's masticatory muscle symptoms are due to occlusal etiology. It is also indicated for acute problems that are not likely to require several months of therapy. Because there is no "occlusal plane," this appliance does not "program" the mandible into any particular position. The mandible may therefore reposition itself without adjustment as joint and muscle symptoms subside. Also, this appliance does not allow primary elevator muscles of the jaw to contract forcefully, because it prevents posterior tooth contact.

Disadvantages/Contraindications: Because of its size, it may possibly be swallowed by the patient during sleep. The practitioner may therefore want to drill a hole in the appliance so that string or floss may be tied to it to be worn around the patient's neck. It is esthetically displeasing and interferes with speech, so the patient may not want to wear it during the day. It should *not* be used for more than a few days because of the potential for tooth movement. The maxillary anterior deprogrammer with a substructure and/or the mandibular posterior deprogrammer should be used after the anterior jig.

Maxillary Anterior Deprogrammer with Substructure

This appliance functions in the same way as the anterior jig. The only difference is that the bite plane lingual to the upper central incisors is attached to a maxillary substructure instead of just the upper central incisors. The occlusal acrylic on the substructure is ground extremely thin so that the posterior teeth are only slightly separated (the posterior acrylic usually has holes for the cusp tips to protrude through).

Advantages/Indications: Same as anterior jig. In addition, this appliance may easily be converted to a full coverage deprogrammer once muscle irritability and joint inflammation have subsided and the mandible has repositioned. There is not the danger of this appliance being swallowed during sleep as might the anterior jig. Intended for short-term use only.

Disadvantages: Interferes with speech and may be esthetically displeasing to the patient. May also allow tooth movement if used by itself for more than a few days. (See treatment sequencing with appliances.)

Maxillary Full-Coverage Deprogrammer (Shore Appliance)

This appliance incorporates cuspid guidance, anterior disclusion, and a flat posterior plane on which lower buccal cusps occlude.

Advantages/Indications: This is the appliance of choice for long-term use as a nighttime "brux-guard" for patients with healthy joints and acceptably positioned condyles. It is generally used full-time for stabilizing the occlusion. It requires less adjustment than any of the other appliances once the condylar position has been properly established.

Disadvantages/Contraindications: This appliance would not be indicated for patients with internal derangements unless treatment in Zone C were indicated. The occlusal plane should not be generated on this appliance using mandible manipulation if x-rays of the manipulated position show it to be forcing the condyles too far back in the fossae. Speech and esthetics may be problems for patients who are asked to wear this appliance during the day. The occlusal plane established by this appliance does not allow the mandible to reposition to a more physiologic position if that is desirable. The appliance may need to be adjusted numerous times before an optimum position is established.

Mandibular Posterior Deprogrammer ("Pivot" Appliance)

This is a lower appliance in which only the mesiolingual cusp tip of the upper first molar touches on either side in the patient's acquired occlusion. There are no balancing interferences from these cusp tips during excursions, and no indentations where the cusp tips contact the appliance. The term "pivot" is a misnomer—no pivoting action takes place with this appliance.

Advantages/Indications: Best used for initial breakup of muscle spasm and reduction in joint inflammation. Because there is no occlusal plane established, it allows "auto-repositioning" of the mandible without clinician adjustment. Esthetics and speech are usually not a problem with this appliance. It is best used in conjunction with a maxillary anterior deprogrammer with substructure; the patient wears this lower appliance during the day and the upper deprogrammer during sleep. It is only indicated for short-term use, a few weeks at the most.

Disadvantages/Contraindications: This appliance may allow movement of teeth, so it should be watched closely by the clinician and exchanged for a different type of appliance within a few weeks. Some patients do not tolerate this appliance well because of the lack of anterior guidance and the interference with poor tongue habits.

Mandibular Full-Coverage Deprogrammer (Tanner Appliance)

This appliance performs the same function as the upper full-coverage deprogrammer except that it is on the mandibular teeth. Upper lingual cusp tips contact the posterior occlusal surface. Cuspid guidance is obtained off the mesial aspect of the maxillary cuspid, and anterior guidance is obtained by overlaying the incisal edges of the lower teeth with acrylic.

Advantages/Indications: Best used when good speech and esthetics are a factor, the joints are healthy, and there are no internal derangements unless treating to Zone C. May be used as a long-term appliance because it keeps tooth movement to a minimum.

Disadvantages/Contraindications: Same as maxillary full coverage deprogrammer.

Maxillary Disk Appliance

Same design as maxillary full-coverage deprogrammer, except that the occlusal plane is established in conjunction

with capturing the disk, usually by repositioning the condyles anteriorly. The occlusal plane itself helps maintain this condylar position, and there are subtle ramps posterior to the lower buccal holding cusps and posterior to the lower central incisors. All the essential factors of a gnathological appliance are maintained—no balancing or working interferences, with cuspid or anterior guidance.

Advantages/Indications: None over a mandibular disk appliance.

Disadvantages/Contraindications: Esthetics and speech are usually poor. Does not maintain the condylar position well during sleep.

Mandibular Disk Appliance

Same design as mandibular full-coverage deprogrammer (Tanner appliance), except that there are subtle ramps anterior to the maxillary lingual holding cusps to help the occlusal plane hold the condyles in the new position to recapture the disk, and generally no acrylic is needed for protrusive guidance. All the essential factors of a gnathological appliance are maintained—no balancing or working interferences, with cuspid and anterior guidance. (Anterior guidance is often achieved off the natural incisors because they are touching in the newly acquired occlusion.)

Advantages/Indications: Speech and esthetics are usually good, and the appliance is well tolerated by the patient.

Disadvantages/Contraindications: Does not maintain the new condylar position well during sleep.

Maxillary Night Appliance

Same design as the maxillary disk appliance, except that the ramp behind the lower incisors is much longer (approximately 10 mm). This maintains the proper condylar position as the patient opens until the normal translation of the condyle takes over. Thus if the patient sleeps with his or her teeth apart, the proper condylar position is still maintained. Condylar position in this appliance is the same as that used with the patient's daytime appliance.

Advantages/Indications: To be used in conjunction with maxillary or mandibular disk appliances or orthopedic positioners.

Disadvantages: The long anterior ramp in front makes this appliance impractical for daytime use, even though it

maintains the condylar position more positively.

Maxillary Orthopedic Positioner

Same design as the maxillary disk appliance, but used when the disk dislocation has not been reduced. This appliance is used to move the condyles into a more physiologic position (the middle or the anterior portion of Zone C).

Advantages/Indications: For many patients with late clicks or chronic closed locks, it is not practical to recapture the disk orthopedically. However, repositioning the condyles can still usually provide significant relief of symptoms for these patients.

Disadvantages: Same as the maxillary disk appliance.

Mandibular Orthopedic Positioner

Same design as mandibular disk appliance, but used when the disk dislocation has not been reduced. This appliance moves the condyles into a more physiologic position (the middle or anterior portion of Zone C.)

Advantages/Indications: Same as the maxillary orthopedic positioner. This appliance is tolerated much better than the maxillary appliance, however, because of the good speech and esthetics it provides.

Disadvantages/Contraindications: Same as the mandibular disk appliance.

Post-Manipulation Appliance

Same design as the maxillary night appliance, except that the occlusal plane of this appliance positions the condyles well down and forward on the posterior slope of the eminence. This appliance is used immediately following the manipulation of a closed lock (regardless of whether the disk was captured during the procedure). This protrusive position is maintained for four to eight weeks to allow healing of the posterior ligament if the disk was captured, and to prevent fibrous adhesions in the joint from reforming if the disk was not captured. Following the use of this appliance, the condyle is allowed to move into Zone A, B, or C, as appropriate, and this appliance is converted to a night appliance. The patient is then given a maxillary or mandibular disk appliance or an orthopedic positioner to wear during the day.

General Guidelines on the Use of Appliances

The use of any *repositioning* appliance should be delayed until the masticatory muscles are relaxed as much as

possible, because altering mandibular posture can often induce increased muscle symptoms. Also, once the mandible is repositioned, the patient will likely need extensive restorative or orthodontic therapy as a part of finalization. If the symptoms can be alleviated without condylar repositioning, this conservative treatment may be preferable even if the patient is left with an internal derangement. (The one exception to this is a patient with an acute closed lock.)

Some clinicians may want to avoid using maxillary appliances because they may inhibit normal movement of the cranial bones. Sectioning the appliance can eliminate this problem.

Treatment Sequencing with Appliances

Because of the variety of treatment modalities available to the clinician, we feel that appliances should not be the initial therapy introduced to the patient. There are a number of reasons for this. First, the patient is likely to perceive the first treatment presented as the most significant for recovery. This may be misleading, since other factors contributing to the symptoms may have little relation to appliance therapy. Secondly, appliance therapy is something that is done "for" the patient, while in many instances, the things patients must do for themselves are critical for a successful result. Before instituting appliance therapy, we therefore recommend considering the use of physical therapy, therapeutic exercises, nutrition, and a reduction in emotional stress.

Except in cases of an acute closed lock, we recommend the following appliance sequencing:

1. Regardless of the condition of the joints, use muscle deprogrammers initially in therapy. If they are properly designed, they will not aggravate the joint condition. Alleviating muscle irritability first will greatly reduce the patient's pain complaints and may alter the perceived need for treating internal derangements. We recommend starting with two appliances—a lower posterior deprogrammer during the day and a maxillary anterior deprogrammer with substructure during sleep. This will eliminate intrusion and give the patient good esthetics and speech as well as good therapy. If only one appliance can be used, the maxillary anterior deprogrammer with a substructure would be the appliance of choice.
2. After four to six weeks, these appliances should be converted to full-coverage deprogrammers if there is no need to alter condylar position. Joint x-rays should be taken at this time.
3. If there is a need to capture a disk or reposition the condyles, use a lower disk/orthopedic positioner during the day and a night appliance in the same condylar position. We recommend *not* attempting to capture a disk unless *all* of the following criteria can be met:
 - A. Opening click at less than 30 mm of interincisal opening.
 - B. Closing click at less than 10 mm of interincisal opening.
 - C. Click occurs when moving the mandible horizontally in the contralateral direction less than 4 mm from the acquired incisal midline.
 - D. With the disk captured, the tentative therapeutic condylar position as shown by x-rays is not farther forward than Zone B.
4. As a general rule, the patient should remain asymptomatic in the final therapeutic condylar position for three months before the appliances are removed and the case finalized.

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