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REVIEW ARTICLE

OCCLUSAL SPLINT-A REVIEW

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ABSTRACT

The most common cause of masticatory muscle pain is displacement of the mandible to a position dictated by maximum intercuspation of the teeth. Displacement of the mandible always results in displacement of condyle-disk assemblies, which in turn can lead to progressive changes in condyle disk alignment. The misalignment along with connective tissue changes that can occur within the articular components, may make it difficult to determine the correct position for condylar axis. Injury to the intracapsular tissue may also make it difficult to ascertain the physiologic seated position for the condyle. There are exceptions, but it is generally improper treatment to directly alter an occlusion until it can be altered to confirm to a condylar axis that has been verified as correct.

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INTRODUCTION

The purpose of on occlusal treatment is to make the teeth confirm to a correct skeleton related position of the condylar axis. The most common cause of masticatory muscle pain is displacement of the mandible to a position dictated by maximum intercuspation of the teeth. Displacement of the mandible always results in displacement of condyle-disk assemblies, which in turn can lead to progressive changes in condyle disk alignment. The misalignment along with connective tissue changes that can occur within the articular components, may make it difficult to determine the correct position for condylar axis. Injury to the intracapsular tissue may also make it difficult to ascertain the physiologic seated position for the condyle. There are exceptions, but it is generally improper treatment to directly alter an occlusion until it can be altered to confirm to a condylar axis that has been verified as correct. Occlusal splints provide an acceptable surface for reversible occlusal treatment that can be altered as needed, to confirm with tentative treatment positions for the condylar axis.

DEFINITION

Occlusal splint or **occlusal device**

A removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of maxilla to the mandible.

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It may be used for occlusal stabilization, for treatment of temporomandibular disorders or prevent wear of the dentition. Certain types of splint may temporarily reduce symptoms while simultaneously provoking long-term instability. Since the cause and interrelationship of many TMD's are often complex, the initial therapy should generally be reversible and non-invasive. When the appliance reduces symptoms, the precise cause and effect relationship be identified before irreversible therapy is begun.

How occlusal splint work?

Occlusal splints can prevent the existing occlusion from controlling the jaw to jaw relationship at maximum intercuspation.

When the occlusal surfaces are covered, either partially or completely, the splint material becomes the occluding surface. How that occluding surface is contoured determines how the mandible must be positioned to occlude the teeth with the splint. Since the condyle must move as the mandible moves, the ultimate effect of the occlusal splint is accommodation of condylar axis to the splint-dictated jaw relationship.

Five distinct theories explain its mechanism

- Occlusal disengagement theory
- Vertical dimension theory
- Maxillomandibular realignment theory
- TMJ repositioning theory

- Cognitive awareness theory

Occlusal disengagement theory

It is based on the the concept that providing the patient with an interocclusal appliance that has an interference free, ideal occlusal scheme will reduce or eliminate abnormal muscle activity caused by occlusal interference. The occlusal scheme of the splint is usually designed to have simulataneous bilateral posterior contact with excursive guidance on canine or anterior teeth.

Vertical dimension theory

Abnormal muscle activity due to abnormal vertical dimension is eliminated or reduced by splint that reestablishes original occlusal vertical dimension.

Maxillomandibular realignment theory

It states that the mandible in position of maximum intercuspation has an abnormal, nonadaptive position relative to the maxilla. It is theorized that only by changing this relationship to a more anatomically and physiologically correct jaw position with a splint will the various dysfunctional symptoms improve or disappear.

How to determine the need for mandibular realignment?? Two methods

By traditional use of what was called "ligamentous determined jaw position " or centric relation jaw position. To determine this position operator performs a jaw manipulation technique of a hinge type movement , while attempting to seat condyles with an upward pressure into the temporomandibular fossa.

Muscle determined positioning of the mandible

A transcutaneous low frequency electrical stimulation is applied over the preauricular area to stimulate, theoretically at least , the motor division of trigeminal nerve. It is postulated that nerve excitation produces a jaw closing trajectory resulting in a harmonious jaw position. This position is recorded and a splint is constructed to create this relationship.

TMJ repositioning theory

It is based on the concept that by improving the position of the condyle in the fossa, the function of TMJ and neuromuscular system will improve.

Most common method of radiographically evaluating the TMJ is with the flat plate transcranial projection. In this approach a high percentage of normal asymtomatic population would also require repositioning if they were to be evaluated with this criteria.

This theory is recommended for the treatment of a specific intracapsular derangement. This is applied to induce a change in the disk condyle relationship, which implies putting the mandible into a new position for a period of time. The basic premise of this "condyle – disc repositioning" theory is that a disk repositioning actually occurs.

It involves serial adjustment of the appliance . As reapproximation of a normal condyle relationship occurs , it is hoped that clicking will not begin again. If it does return, a more permanent anterior repositioning may be required by irreversible alteration of the occlusion following reuse of the splint.

Risk factors

- It may produce other occlusal problem.
- It may induce a long-term dysfunctional remodeling changes in TMJ.
- Stabilization of occlusion in different position is difficult and expensive.
-

Cognitive awareness theory

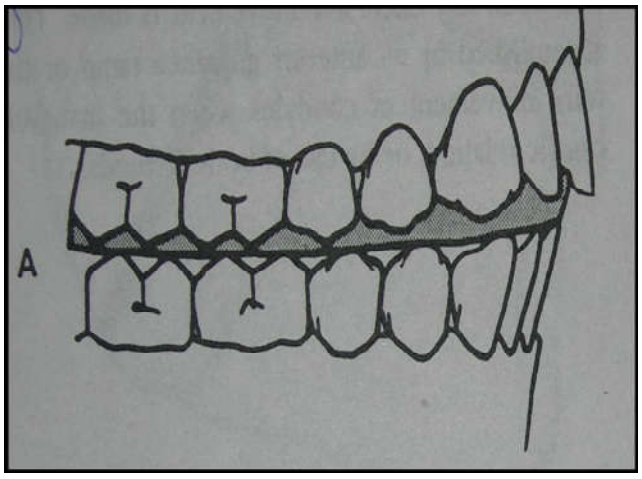
It can be applied to any and all of the appliances utilized. It is based on the concept that having an interocclusal appliance in the mouth constantly reminds the patient to alter his or her normal behavior so that harmful muscle activity is decreased.

TYPES OF OCCLUSAL SPLINT

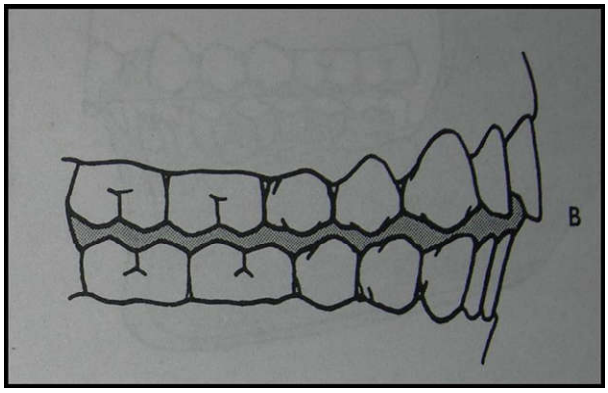
There are two types of occlusal splints. Regardless of the many different splint designs, every occlusal splint can be classified as either,

- Permissive splint
- Directive splint

Permissive splints are designed to unlock the occlusion to remove deviating tooth inclines from contact. When this is accomplished, the neuromuscular reflex that controls closure into maximum intercuspation is lost. The condyles are then allowed to return to their correct seated position in centric relation if the condyle of the articular components permits.
Because all corrective tooth inclines are either separated or covered with smooth plastic, permissive splints allow the muscles to function according to their own coordinated interactions; thus eliminating the cause and the effect of muscle in-coordination. For this reason permissive splints are often referred as *muscle deprogrammers*.



Directive splints are designed to position the mandible in a specific relationship to the maxilla. Any splint with occlusal force that intercuspate is a directive splint because the mandible is directed into the specific jaw to jaw relationship at which the intercuspation of the teeth occurs.



The positioning of the mandible may also be accomplished by contacting inclines against anterior teeth that direct the mandible in a particular position of closure. The sole purpose of directive splint is to position or align the condyle-disk assemblies. Thus directive splints should be used only when a specifically directed position of condyles is required.

Contraindications for directive splints

- The condyle and the disk can be aligned correctly.
- The correctly aligned condyle disk assembly can move to the most superior position against the eminentia without derangement.
- The disks can maintain their alignment with the condyles during function.

If the above conditions can be verified, it is an indication that the joints are functioning in a physiologically acceptable relationship. There would be no need to alter that relationship, and so there would be no reason for using any appliance that directs the mandible away from that condylar axis.

FABRICATION TECHNIQUE

Fabrication of maxillary occlusal appliance

Maxillary alginate impression made
↓
poured in gypsum product (die stone)
↓
cast trimmed
↓
2 mm sheet of biostar sheet adapted to cast with pressure or vacuum adapter
↓
Outline of the appliance made at the level of interdental papilla on the buccal and labial surface of teeth and cut off the cast with a separating disk
↓
The adapted resin appliance is removed from the stone case
↓
Excess resin is eliminated in the palatal area
↓
The lingual border of the appliance extends 10-12mm from the gingival border of the teeth throughout the lingual portion of the arch
↓
The labial border of the appliance terminates between the incisal and middle thirds of the anterior teeth.

A small amount of clear acrylic (self cure) is added to the occlusal surface of the anterior portion of the appliance. This acts as an anterior stop. It is approximately 4mm wide and should extend to the region where a mandibular central incisor will contact.

ANTERIOR REPOSITIONING APPLIANCE

It is an interocclusal device that encourages the mandible to assume a position more anterior than the intercuspal position. Its goals is to provide a better condyle-disk relationship in the fossae so that tissues have a better opportunity to adapt or repair. It prevents the condyle form loading on the retrodiscal tissues. The reduction of pressure behind the disk allows the synovial fluid to circulate better through the joint spaces and aids the healing process. Once tissue adaptation has occurred, the appliance is eliminated allowing the condyle to assume the musculoskeletal stable position and painlessly function on the adaptive fibrous tissues. The practicality of anterior repositioning splint is limited to those joints that have not been damaged beyond their capacity for adaptive repair of connective tissues.

SUPERIOR REPOSITIONING SPLINT

After the condyle disk alignment and position have been determined by the anterior repositioning splint, a superior repositioning splint should be worn to allow complete reseating of the condyle disk assemblies up the eminence to the superior craxis. The purpose of anterior repositioning splint is fulfilled when the retrodiscal tissues have healed sufficiently to regain a backward pull on the disk. However, either the condyle or disk may have difficulty moving back to centric relation after being held forward. The purpose of superior repositioning splint is to eliminate the effect of neuromuscular reflex that directs the mandible to close repetitively into maximum intercuspation. The goal is to true a skeletal relationship of the mandible to the maxilla and not one that is influenced by MI of the teeth. The purpose of the superior repositioning splint is to establish the correct skeletal relationship before the correct occlusal relationship is determined.

ANTERIOR BITE PLANE

The anterior bite plane is a hard acrylic appliance worn over the maxillary teeth, providing contact with only the mandibular anterior teeth. It is primarily intended to disengage the posterior teeth and thus eliminating their influence on the function of the masticatory system. It is a diagnostic splint. It is only worn for a day/two to verify that the TMJ are comfortable and the disks stay aligned in function.

Indications

- For treatment of muscle disorders related to orthopaedic instability or an acute change in occlusal condition.
- Parafunctional activity may also be treated with it but only for a short period.

POSTERIOR BITE PLANE

The posterior bite plane is usually fabricated for the mandibular teeth and consists of areas of hard acrylic located over the area of posterior teeth and connected by a cast metal lingual bar.

The treatment goals of the posterior bite plane are to achieve major alterations in vertical dimension and mandibular positioning.

SOFT AND RESILIENT APPLIANCE

The soft appliance is a device fabricated of resilient material that is usually adapted to the maxillary teeth. Treatment goals are to achieve even and simultaneous contact with the opposing teeth. In many instances this is difficult to accomplish precisely, since most of the soft material do not adjust readily to the exact requirements of the neuromuscular system.

Conclusion

Splinting affords no guarantee that occlusal stress can be completely eliminated. Before treatment is started, it is recommended that the cause of any mobility be identified to determine if it is related to an occlusal discrepancy. It may be that an occlusal equilibration and splinting (provisional or definitive) may actually prevent tooth loss and restore both patient comfort and function. Thus splinting may serve as a boon, improving the health of the periodontium, thereby decreasing tooth mobility, but may become a bane if used incorrectly or not managed properly.

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