the Journal of CONTEMPORARY DENTAL PRACTICE
at www.thejcdp.com
Volume 3 Number 4 November 15, 2002
Fall Issue

A Review of the Clinical Management of Mobile Teeth

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Abstract

The clinical management of mobile teeth can be a perplexing problem, especially if the underlying causes for that mobility have not been properly diagnosed. In some cases, mobile teeth are retained because patients decline multidisciplinary treatment that might otherwise include strategic extractions. This article discusses the relationship between occlusion and tooth mobility with an emphasis on identifying differences between *increased* mobility and *increasing* mobility. The indications, contraindications, and basic principles of tooth splinting are also reviewed. Provisional and definitive splints are defined and described with their respective occlusal considerations. Some mobile teeth can be treated through occlusal equilibration alone (primary occlusal trauma). Whereas mobile teeth with a compromised periodontium can be stabilized with the aid of provisional and/or definitive splinting (secondary occlusal trauma). It is important to consider splint therapy, because it may not only improve the prognosis of teeth, but may actually enhance the stability of the final prosthodontic treatment. The ultimate goal of successful management of mobile teeth is to restore function and comfort by establishing a stable occlusion that promotes tooth retention and the maintenance of periodontal health.

Keywords: Mobility, occlusal adjustment, occlusal trauma, primary occlusal trauma, secondary occlusal trauma, reduced periodontium, splinting

Citation: Bernal G, Carvajal JC, Muñoz-Viveros CA. Clinical management of mobile teeth. J Contemp Dent Pract 2002 November;(3)4:010-022.

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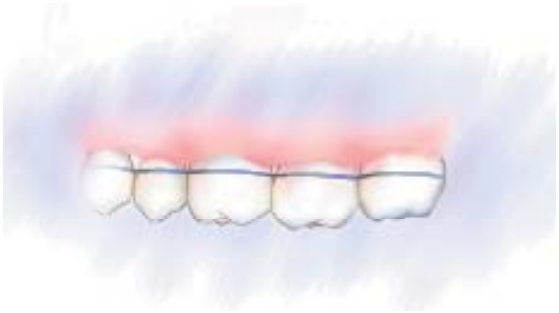
Introduction

The Glossary of Prosthodontic Terms defines splinting as "…the joining of two or more teeth into a rigid unit by means of fixed or removable restorations or devices."[1] Tooth splinting may be indicated for individual mobile teeth as well as for an entire dentition in more extreme situations where extraction and implant therapy is not a viable alternative. While extraction can benefit certain patients, other clinical situations can be successfully managed by retaining the teeth through more conservative treatment modalities such as splinting. In more complex situations, treatment may span multiple disciplines and require endodontic, periodontic, prosthodontic, and even orthodontic treatment.



This article describes the relationship between tooth mobility and occlusion, reviews the indications and contraindications for splinting, and includes a discussion of several different methods for splinting mobile teeth.

Correlation between Tooth Mobility and Occlusion

Occlusal trauma is described as trauma to the periodontium from functional or parafunctional forces causing damage to the attachment apparatus of the periodontium by exceeding its adaptive and reparative capacities.[2] Generally, two forms of occlusal trauma are recognized:

1. **Primary occlusal trauma** is a condition in which the pathologic occlusal forces are considered the principal etiology for observed changes in the periodontium.[3]

2. **Secondary occlusal trauma** occurs when the periodontium is already compromised by inflammation and bone loss.[3] Consequently, occlusal forces which might otherwise be well tolerated in a healthy periodontium, now have deleterious effects because of preexisting periodontal disease. Teeth with a reduced adaptive capacity and compromised periodontium may then migrate when subjected to certain occlusal forces. Factors such as the frequency, duration, and velocity of those occlusal forces, not just their magnitude, may be of greater significance in the development of tooth hypermobility. This mobility is a common clinical sign of occlusal trauma.[4]

Other factors that contribute to tooth mobility include:

* The number and distribution of the remaining teeth in the arch.
* The number of roots, root form, root proximity, amount of interradicular bone, and a history of root amputation

Increased versus Increasing Tooth Mobility

Two clinical features should be analyzed to understand the full scope of the relationship between occlusal trauma and tooth mobility:

The first is *increased tooth mobility.* This process is the adaptation of the periodontium to occlusal forces that may not necessarily be considered pathologic. In the absence of inflammation, mobile teeth with a complete and healthy connective tissue attachment can be maintained. The radiographic appearance of a widened periodontal ligament (PDL) space coupled with a clinical diagnosis of increased tooth mobility may merely be manifestations of adaptive changes to increased functional demand.[4] Removal of the excess occlusal load through equilibration and, perhaps, conventional splint therapy can decrease and, often times, eliminate tooth mobility. An occlusal equilibration that equalizes the occlusal stresses, produces simultaneous tooth contacts, or harmonizes cuspal relations may be all that is needed to reverse this hypermobility.

The second clinical feature is *increasing tooth mobility.* This clinical condition is best managed by treating any localized inflammation, performing an occlusal equilibration, and perhaps stabilizing or splinting the affected mobile teeth.[5]

Consequently, patients diagnosed with *increased tooth mobility* may need only an occlusal equilibration and, perhaps, conventional splint therapy. Those individuals diagnosed with *increasing tooth mobility* must first receive periodontal therapy. Treatment should include an occlusal analysis and equilibration, if needed, followed by a reevaluation for extraction or splinting of the affected teeth.

Indications and Contraindications for Splinting

There are several general clinical situations where tooth splinting may be beneficial. But, the overall objective is to create an environment where tooth movement can be contained within physiologic limits while restoring function and patient comfort.[6]

Indication

One obvious indication for splinting is when a patient presents with multiple teeth that have become mobile as a direct result of gradual alveolar bone loss, a reduced periodontium. A second indication for splinting is when the patient presents with increased tooth mobility accompanied by pain or discomfort in the affected teeth.[7]

Splinting may be a way to gain stability, reduce or eliminate the mobility, and relieve the pain and discomfort.

Contraindications

Splinting teeth is not recommended if occlusal stability and optimal periodontal conditions cannot be obtained.[8] Any tooth mobility present before treatment must be reduced by means of occlusal equilibration combined with periodontal therapy; otherwise if the tooth involved does not respond, it must be extracted prior to proceeding from provisional restorations to definitive treatment.[8]

Principles of Splinting

The main objective of splinting is to decrease movement three-dimensionally. This objective often can be met with the proper placement of a cross-arch splint. (Figure 1) Conversely, unilateral splints that do not cross the midline tend to permit the affected teeth to rotate in a facio-lingual direction about a mesio-distal linear axis. (Figure 2)

If splinting is to achieve any measure of success, the center of rotation of the affected teeth must be located in the remaining supporting bone. In this way, the affected teeth are able to resist tooth movement. Otherwise, the prognosis for any splint will be unfavorable if the occlusal or masticatory forces exceed the resistance provided by the splinted teeth.[9]

Thus, the ideal splint should reorient and redirect all occlusal and functional forces along the long axis of teeth, prevent tooth migration and extrusion, and stabilize periodontally weakened teeth.[10]

Types of Splints

Occlusal splints can be classified as provisional or definitive depending on the type of materials used and the intended duration the splint will be in place.[10]

The Provisional Splint

As the name alone implies, the objective of a provisional splint is to absorb occlusal forces and stabilize the teeth for a *limited* amount of time. Provisional splints can be useful adjuncts to many different types of treatment.[11] They provide insight into whether or not stabilization of the teeth provides any benefit before any irreversible definitive treatment is even initiated.

Provisional splints can either be placed externally or internally. External splints typically are fabricated using ligature wires, nightguards, interim fixed prostheses, and composite resin restorative materials. Internal splints, on the other hand, are fabricated using composite resin restorative material with or without wire or fiber inserts. Most provisional splints are made using some form of external support in their design.[9]

When anterior teeth require splinting, ligature wire is often used. Dead-soft round stainless steel wires[a] (0.25 to 0.30 mm) or brass wires have been recommended. A 6-inch section of wire is cut and placed across the anterior teeth, apical to the proximal contacts and incisal to the cervical

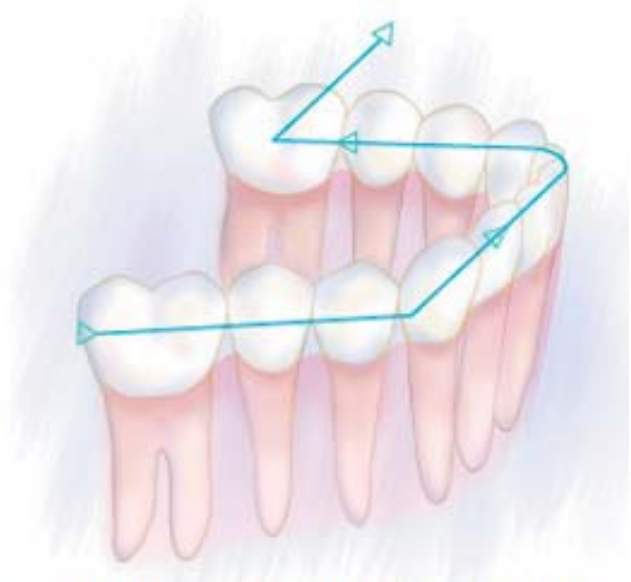


Figure 1: Polygonal design for splints to obtain cross-arch stabilization.

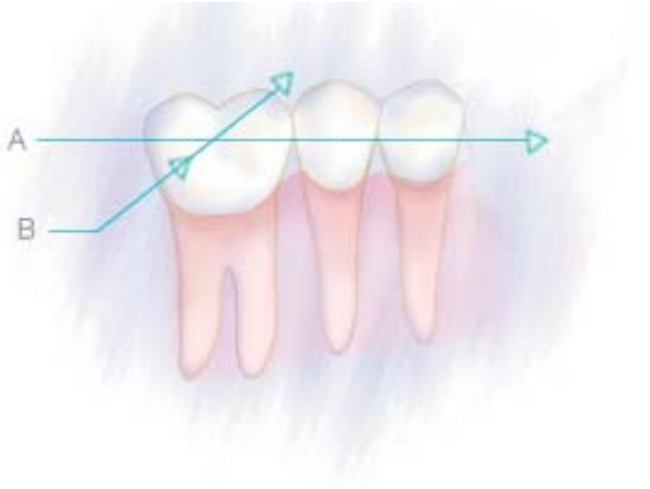


Figure 2: Unilateral design, where the entire splint can rotate in a buccal- lingual direction (B) over a mesio-distal linear axis and produce horizontal forces (A).

one-third on the facial surface and cingulum on the palatal surface. (Figures 3 and 4) Individual vertical wires are then placed between the teeth and tightened in a clockwise direction.

Occlusal devices are often recommended to patients with a history of bruxing and clenching to help stabilize teeth following selective occlusal adjustment.[12] One of the more common devices used is a heat polymerized poly (methyl-methacrylate)[b] occlusal splint. Typically, these devices overlap the incisal and occlusal one-third of the facial surfaces of the teeth, cover the entire occlusal surfaces of the teeth, and extend onto a portion of the hard palate. (Figure 5)

Provisional splinting can also be used when treating periodontally compromised patients with conventional fixed prosthodontics. An interim restoration not only can improve esthetics, it can restore the occlusal scheme to be incorporated into any definitive prostheses. After wearing a provisional splint, patients should be reevaluated to determine if treatment should proceed to a definitive restoration. Only after the interim restoration has been worn by the patient can the design and occlusal form be evaluated. This evaluation should be made before deciding to proceed with the definitive restoration.[9] Any design modifications can then be made in the definitive restoration.

For the provisional splint, the enamel surfaces are etched for 10 seconds with 35% phosphoric acid, rinsed, and a light-activated, dentin-bonding agent is immediately applied and polymerized. An appropriate shade of composite resin restorative material is selected, placed in the desired locations, and polymerized for 40 seconds.[c] The splint can also be reinforced several ways using one of the following materials: ligature wire, glass fiber, or a polyethylene fiberd reinforced polymer.[13] (Figures 6-9)

Definitive Splints

Definitive splints are placed only after the completion of periodontal therapy and once occlusal stability has been achieved in order to eliminate or prevent occlusal trauma, increase functional stability, and improve esthetics on a long-term basis.

Such treatment includes conventional fixed prostheses because they provide definitive rigidity and are better able to control and direct occlusal forces than removable splints. For partially edentulous patients, the definitive splint of choice is a complete coverage fixed partial denture. Fixed partial dentures not only stabilize the affected teeth, but they also improve esthetics and may even prevent further tooth loss. (Figure 10)

Occlusal Considerations

It is critical to evaluate the occlusion of patients being treated for periodontal disease who have diminished bone support. In terms of the occlusion alone, it is important to control the direction, magnitude, distribution, and intensity of functional and parafunctional forces. Treatment should be designed so that occlusal forces are transmitted to those teeth with the greatest amount of bone support.

In an effort to direct the occlusal forces along the long axis of the tooth, protheses should be designed with a narrower occlusal table and cusp-fossa occlusal contacts.[14]

In terms of the magnitude and intensity of the masticatory forces, treatment should be intended to reduce and distribute occlusal forces in the most favorable manner. This outcome is best achieved when the clinician splints the teeth and also reshapes the teeth to create a harmonious occlusion.

Other treatments to consider in occlusal equilibration are shortening extruded teeth, improving the alignment of rotated, malposed or tilted teeth, reshaping plunger cusps, and correcting discrepancies in marginal ridge relationships.[15]

Discussion and Recommendations

Occlusal trauma may manifest itself clinically in a variety of different forms that include: the movement and migration of the teeth, radiographic evidence of a widened periodontal ligament space, or patient complaints of discomfort during and after function. Splinting teeth with reduced periodontal support should be considered when these diagnostic findings are noted.

Figure 3: Provisional splint made of dead-soft stainless ligature wire. The ligature must be located in the cervical one-third of teeth below the proximal contact but coronal to the cingulum on the lingual aspect.

Figure 4: The 0.25 mm ligature wire must be contoured to avoid any interocclusal interference on the lingual aspect of the splinted teeth.

Figure 5: Occlusal device made of heat polymerized poly-methyl methacrylate. It overlaps the incisal and the occlusal one-thirds of the teeth and covers all the occlusal surfaces as well as the palate.

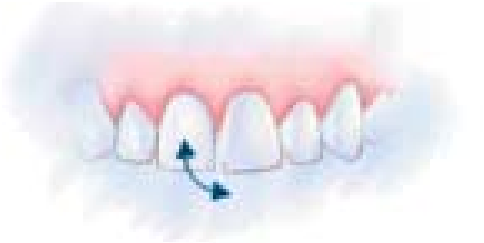
Figure 6: Radiographic evaluation of mandibular incisor with horizontal bone loss which is a sign of possible reduced perioduntum that may require splinting therapy.

Figure 7: Lingual aspect of teeth to be splinted using composite resin with a dental adhesive agent.

Figure 8: The incisal and the cervical aspects of the teeth are free of restorative material to ensure good oral hygiene.

Figure 9: Frontal view of the final splint with good access for oral hygiene and an acceptable esthetic result.

Figure 10: A fixed partial denture serving as a permanent splint. Full coverage is always recommended to achieve long-term stability.



The single observation of tooth mobility is not unto itself sufficient justification to splint teeth. Tooth mobility alone does not necessarily indicate the existence of an underlying pathologic condition. Splinting is best viewed as a preventive treatment measure for teeth that have minimal or no bone loss, yet are clinically mobile. Splinting affords no guarantee that occlusal stress can be completely eliminated.

Although extraction is an appropriate treatment for extremely mobile teeth, it may not resolve all the underlying pathology if the etiology of that mobility is not established first. Before treatment is started, it is recommended 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.

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