

Occlusion and its Significance in the Restoration of Teeth

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Received: April 18, 2024; Published: May 03, 2024

Abstract

As dentists, it is our professional duty to restore Pt's dentition, which is aesthetically acceptable, and maintain a favorable, functionally harmonious occlusal relationship between the restored and unrestored teeth. Providing a stable occlusion ensures clinically long-lasting restorations. It is vital to have a working knowledge of the basic principles of occlusion before embarking on a journey to undertake any restorative treatment, as the occlusal forces also play a decisive role in selecting the materials being used and the design features of the restorative work.

In a simplified manner, this article discusses the basic principles of occlusion and its application in restorative dentistry to safeguard the success and longevity of restorations. Applying these principles in routine restorative care of the patient will ensure that the patients have the highest standard of care and long-term oral health.

Keywords: Occlusion; Restoration of Teeth; Oral Health

Introduction

As a dentist, our professional responsibility is to ensure that the patient has a functionally stable and harmonious relationship between teeth, TMJ and the neuromuscular system. We must provide a healthy and easily maintainable masticatory system along with the aesthetically pleasing dentition. To achieve this, we should have unhindered smooth mandibular movements provided by the occlusal harmony between the patient's restored and unrestored teeth.

The morphology of dental restorations, when designed following the principles of occlusion, ensures smooth functional movement of the mandible without interferences.

The long-term success of restorations depends on their integration and harmony with the patient's occlusion. Hence it is crucial to have a clear understanding of the principles of occlusion for more predictable and long-lasting restorations and providing overall comfort during function.

Significance of occlusion

Teeth, periodontium, and the articulatory structure, together form the masticatory system. The articulatory component of the masticatory system further consists of three parts- TMJ, muscles, and occlusion [1]. All the individual structures are required to work in synchronization with each other to ensure a smooth and unrestricted functional movement of the jaws. Any change in one will affect the entire masticatory system of the patient.

Detrimental changes in occlusion will adversely affect the other components of the masticatory system (Table 1). So, to provide a harmonious occlusion during restorative treatment, the dentist should be familiar with the basic principles of occlusion [2-4].

The basic principles of occlusion

Occlusion can be defined as: The static relationship between the incising and masticating surfaces of the maxillary and mandibular teeth [5].

Though it is defined as a static relationship, but occlusion is not limited to morphological tooth contact, rather it is a dynamic association between all the constituents of the masticatory system including teeth, periodontium, TMJ and neuromuscular system, and together they all play a significant role in functional stability of the restorations [6,7].

The basic principles of occlusion include:

- Centric relation
- Maximum intercuspal position (MIP)
- Anterior guidance
- Canine guidance
- Group function.

Centric relation (CR)

Definition: A maxillo-mandibular relationship, independent of tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminence [5].

Significance of CR [1,6,8]

- It is reproducible, irrespective of the occlusal surface guidance.
- Even completely edentulous patients have CR.
- There is inter- and intraoperator reliability.

CR is the border position on the envelope of function and the mandible functions smoothly from this position when there are no interferences.

Recording CR is one of the initial steps before the treatment planning of restorative dentistry. If there are any deflective occlusal interferences, it will cause uncoordinated muscle activity, leading to TMD and the development of bruxism.

Maximum intercuspal position

Definition: It is defined as the complete intercuspation of the opposing teeth independent of the condylar position in the glenoid fossa [5].

It is the tooth-determined position. There should be bilateral and even occlusal contacts between the teeth. Occlusal interferences, if within the adaptive capacity can be well tolerated by TMJ. But when these interferences exceed this capacity the muscles will try to overcome these interferences by causing wear facets on the teeth [3,6,9].

Anterior guidance

It is the fabrication of a relationship of the anterior teeth preventing posterior tooth contact in all eccentric mandibular movements [5].

It is desirable to have shallow anterior guidance. A steeper incisal guidance can cause wearing and fracture of teeth and discomfort to the patient.

Canine guidance

Definition: A form of mutually protected articulation in which the vertical and horizontal overlap of the canine teeth disclude the posterior teeth in the excursive movements of the mandible [5].

It is desirable to have a canine-guided occlusion when posterior teeth are periodontally weak, restored with a fixed prosthesis, or replaced by an implant-supported prosthesis [6].

Group function

Definition: Multiple contact relations between the maxillary and mandibular teeth in lateral movements on the working side whereby simultaneous contact of several teeth acts as a group to distribute occlusal forces [5].

The group function is included in the treatment plan when anterior teeth have weaker periodontal support and there is a need to distribute the occlusal load to posterior teeth in excursive movements.

Group function has the advantage that occlusal forces are shared amongst several teeth, but with the disadvantage that these forces are not directed to the long axis of the teeth [6].

The occlusion and mandibular movements have three determinants [6,11,12]

- 1) Posterior determinant-TMJ
- 2) Anterior determinant-Teeth
- 3) Neuromuscular system.

Posterior determinant: The condylar inclination, morphology of the medial wall of the glenoid fossa, and shape of the condyle affect the steepness of the angles of the cusp and direction of ridges and grooves.

Anterior determinant: Includes both the anterior and posterior teeth.

During mandibular closure the posterior teeth provide the vertical stop and guide the mandible into maximum intercuspation position (MIP), this directs the force along the long axis. During maximum intercuspation, the anterior teeth are separated. If the anterior teeth touch during MIP, as in thick palatal surfaces of restored upper incisors, then the forces will not be directed along the long axis of the tooth and this will have a detrimental effect on the teeth and the periodontium.

Hence the posterior teeth reduce the occlusal load on anterior teeth in MIP, and anterior teeth safeguard the posterior teeth in lateral excursions, this is the basis of mutually protected occlusion (Figure 1).

Incisal guidance can be defined as: the influence of the contacting surfaces of the maxillary and mandibular anterior teeth on the mandibular movements [5].

It is represented by vertical (overbite) and horizontal (overjet) overlap of the anterior teeth.

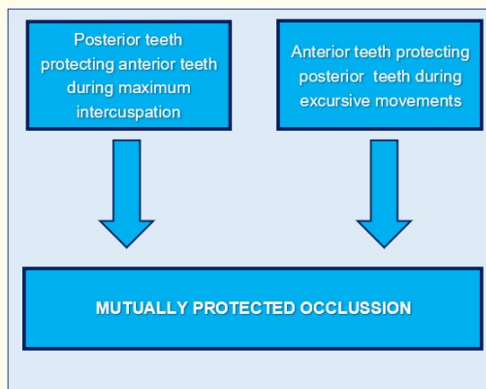


Figure 1: Mutually protected occlusion.

Influence of incisal guidance on the morphology of the teeth

When there is increased overbite the cusps of the posterior teeth can be longer with steeper cusp angles. But when overbite is reduced the cusps will be shorter with less steep cuspal angles. Whereas the greater the overjet shorter the cuspal height. With reduced overjet, the cuspal height of posterior teeth increases [6].

Incisal guidance is important for:

- Function
- Phonetic
- Aesthetics.

Neuromuscular system: Consists of the muscles of mastication and the central and autonomic nervous system.

The mandibular movements are controlled by the muscles and the proprioceptive nerves in the muscles, periodontium, and TMJ.

Occlusal assessment

Occlusal assessment should be done in a detailed manner. Both static and dynamic occlusion should be examined before doing any restorative work.

Table 2 and 3 list the detailed static and dynamic occlusal examination [10].

<p>Static occlusal examination:</p> <ul style="list-style-type: none">• Tooth rotations, super-eruptions, tilting/driftng• Crowding• Spacing• Overjet• Overbite• Vertical dimension of occlusion
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Table 2

<p>Dynamic occlusal examination:</p> <ul style="list-style-type: none">• Centric relation• Retruded contact position• Maximal Intercuspal position• Anterior guidance• Mandibular lateral excursive movements• Occlusal interferences

Table 3

Examination and analysis of the patient’s occlusion will help in creating a restorative treatment plan that will lead to [16]:

- Predictable outcome of the restorations.
- Increased longevity of the restorations.
- Less iatrogenic problems.
- Patient comfort and occlusal stability.

Factors to be considered when restoring the patient’s teeth

There should be simultaneous bilateral and even occlusal contact during maximal intercuspation: This is important for even distribution of occlusal forces and a stable occlusion. Tooth interferences during full closure will cause deflective contacts. This can cause hypersensitivity, abfractions, tooth wear, tooth fractures, and TMD. Posterior teeth deflections can cause forward movement of the mandible during full closure, which increases the force on anterior teeth leading to wearing of the anterior teeth [8,9].

The posterior teeth should disclude in excursive movements: Anterior or canine guidance should be present. This is because the mandible works as a Class III lever, the fulcrum being closer to the TMJ. As a result, any interferences on teeth that are closer to TMJ will have more severe occlusal diseases due to increased occlusal load on them.

The elimination of posterior contacts during lateral and protrusive mandibular movements reduces the activity of muscles of mastication. This also reduces the forces on anterior teeth [9].

<p>Consequences of posterior interferences during excursive mandibular movements [10]:</p> <ul style="list-style-type: none">• Fracture of the cusps• Fracture of the restorations• Indirect restoration de-cementation• Tooth wear• Fremitus

Table 4

Unobstructed envelope of function

Definition: The 3D space circumscribed by mandibular border movements within which all unstrained mandibular movement occurs [5].

It is important to have sufficient overjet to prevent interferences in protrusive movements and thus unobstructed envelope of function. If the overjet is insufficient or the palatal surfaces are not concave enough and cause interferences during the anterior path of closure, it will cause thinning of incisal edges or wear of palatal and facial surfaces of maxillary and mandibular teeth, respectively [9].

Occlusal morphology-while restoring teeth: The occlusal morphology of the restored teeth should be in accord with the mandibular movements. The direction of occlusal forces and the magnitude of the forces, borne by the tooth is decided by the occlusal anatomy of the tooth. The teeth should occlude with each other in a manner so that occlusal forces are directed along the long axis of the tooth.

The opposing cusps should contact the bottom of the fossa or crest of the marginal ridge. If there are incline contacts, it causes lateral forces on the tooth, causing cuspal fracture, tooth jiggling, or mandibular deflection [16,18].

Maxillary incisal edge position: If for aesthetic reasons, the length of the anterior teeth is augmented, then it should provide an overbite relationship that will reduce any stresses on the anterior teeth. Anterior guidance should be as shallow as possible. Steeper anterior guidance will cause excess force on anterior teeth causing wear, fracture, and discomfort [19,20].

Mandibular incisal edge position: Mandibular incisors gliding over the palatal surface of maxillary teeth determines the incisal guidance. They should contact the small horizontal area on the palatal surface of the maxillary incisors, and not on the inclines to direct the occlusal loads more vertically and prevent the lateral forces on the teeth [19].

Table 5 to summarize the application of principles of occlusion in restorative dentistry.

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| <ul style="list-style-type: none">• Maximum Intercuspal position should be checked before any cavity or tooth preparation. Contact points should be either on tooth or restoration but never on the junction.• Occlusal interferences should be checked and corrected.• In PFM crowns occlusal contact is to be 2 mm from the porcelain-metal junction and contacts are to be on metal to prevent abrasion.• In cantilever bridges, the pontic should be out of contact in all excursive movements.• When restoring anterior involving palatal surfaces, custom-made incisal guidance should be done.• For implant-supported prosthesis:<ul style="list-style-type: none">• No premature contacts.• No steep cuspal angles.• Narrow occlusal table. |
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Table 5

Conclusion

After the detailed discussion about the principles of occlusion and how every principle influences the morphology of teeth and their effect on the overall masticatory system of the patient, it can be said that we cannot ignore the important role it plays in deciding the outcome of the restored dentition.

The occlusal scheme of the patients should be evaluated before any treatment plan that will involve a small or major alteration on the occlusal surfaces of the teeth.

The occlusal forces also play a decisive role in the selection of the materials being used and the design features of the restorative work.

Applying these principles in routine restorative care of the patient will ensure that the patients have the highest standard of care and long-term oral health.

However, the restorations should not be provided to fit into this ideal occlusion scenario. The patient's occlusion may not meet all the criteria of an ideal occlusion, but it may have developed a stable, functional, healthy, and comfortable equilibrium with the rest of the masticatory system. In such cases causing any changes in the existing occlusion may change this equilibrium. Sometimes patient's stomatognathic system may adapt to these changes, whereas in other situations may have a more detrimental effect.

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Volume 23 Issue 5 May 2024

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