

# OCCLUSION IN FIXED PROSTHODONTICS

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## ABSTRACT

Most restoration and prosthesis involve the occlusal surfaces of maxillary and mandibular teeth and necessitate functional contact relationships restored in harmony with both dynamic and static conditions. Unfortunately, the occlusion of teeth is frequently overlooked or taken for granted during various restorative procedures. This may be due to the fact that the symptoms of occlusal diseases are often hidden from the clinician not trained to recognize them or appreciate their significance. The aim of this article is to provide basic knowledge to the beginners to diagnose and treat simple occlusal disharmonies, and avoid the creation of iatrogenic occlusal diseases.

## INTRODUCTION

Occlusion refers to the relationship of the maxillary and mandibular teeth when in functional contact during various activity of the mandible<sup>1</sup>. More specifically, occlusion denotes static state whereas articulation denotes dynamic state.

Occlusion in fixed prosthodontics is the complex interaction of teeth, periodontium, temporomandibular joint, and neuromusculature; not merely the interdigitation of teeth. The rationale of restorative procedures is to preserve, restore, and maintain a state of harmony between occlusion and other components of masticatory system within the adaptive range. Exceeding the functional tolerances of the individual patient will affect the entire system.

## CLINICAL FEATURES OF OCCLUSAL INTERFERENCE

In the healthy patient with perfect dentition, the variety of responses can occur, if a high crown with occlusal interference is placed. There are at least 15 different ways that patient might respond to this specific insult<sup>2</sup>.

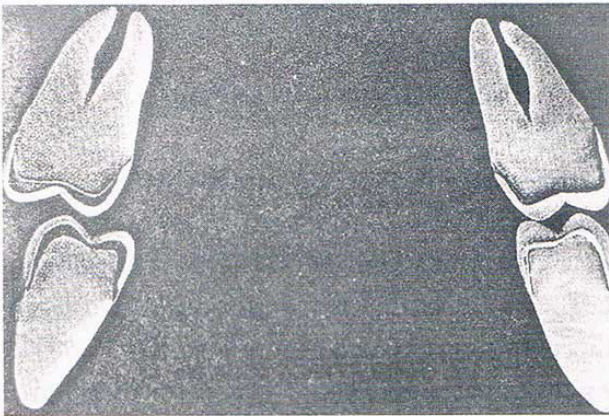
1. the tooth may become sensitive to hot and cold or it may ache.
2. the tooth may become tender to touch
3. the tooth may become loose
4. the tooth may become worn
5. the mandible may deviate around interference causing other teeth to be worn down
6. the deviated jaw function may cause other teeth to be loosened
7. the deviated jaw function may causes masticatory muscles to be hyperactive
8. trismus may result from the muscle spasticity
9. muscle tension headache may develop
10. combination of sore teeth, headache and sore muscles may causes tension, and stress
11. tension and stress may lead to depression
12. combination of the deviated mandible, and spastic musculature may causes condyle-disc derangement
13. combination of disc derangement and elevator muscles spasm may initiate degenerative arthritic changes in temporomandibular joint
14. all of the above
15. none of the above

## OCCLUSAL INTERFERENCE

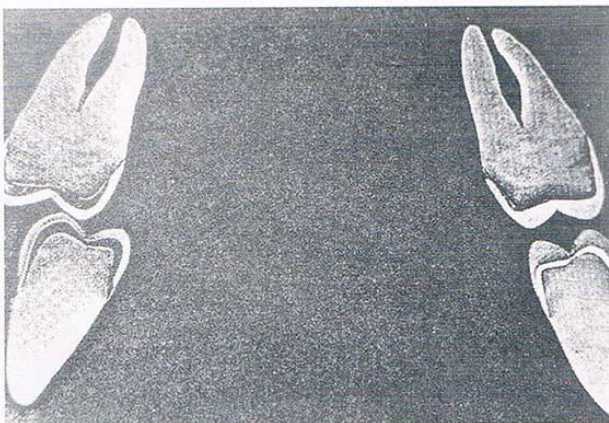
Interferences are undesirable occlusal contacts that may produce mandibular deviation during closure to maximum intercuspation or may hinder smooth passage to and from the intercuspal position. There are four types of occlusal interferences<sup>3</sup>;

1. centric
2. working side
3. nonworking side
4. protrusive

The centric interference is the premature contact that occurs when the mandible closes with the condyles in their optimum position in the glenoid fossae.



A working side interference may occur when there is contact between the maxillary and mandibular posterior teeth on the same side of the arches at the direction in which the mandible has moved.



A nonworking side interference is an occlusal contact between the maxillary and mandibular teeth on the side of the arches opposite the

direction in which the mandible has moved in the lateral excursion. This interference is of most destructive nature.

The protrusive interference is a premature contact occurring between the mesial aspects of mandibular posterior teeth and the distal aspects of maxillary posterior teeth.

## METHODS TO CHECK OCCLUSAL INTERFERENCE

Restorations must be checked in the mouth for occlusal interferences before cementation. Cast restoration should be checked preferably before final polishing. Ceramic restorations must be checked during bisque baked stage (before glazing) so that unnecessary trimming of glazed restoration or the opposing dentition is avoided.

The following methods are generally used to check occlusal interferences<sup>4</sup>

1. occlusal tapes
2. shim stock
3. sandblasted surfaces
4. t-scan

1. **Shimstock;** shimstock of twelve micron



thickness should be held in mosquito forceps and placed between the teeth. On closure, resistance when pulling the foil buccally indicates tooth contact in maximum intercuspation. Shimstock should first be used to check the occlusal contact of unprepared teeth before placement of the restoration. Later, it should be repeated over the same sites with the restoration. Absence of resistance over

unprepared teeth indicate high points over the restoration which should be trimmed until same types of resistance is felt initially.

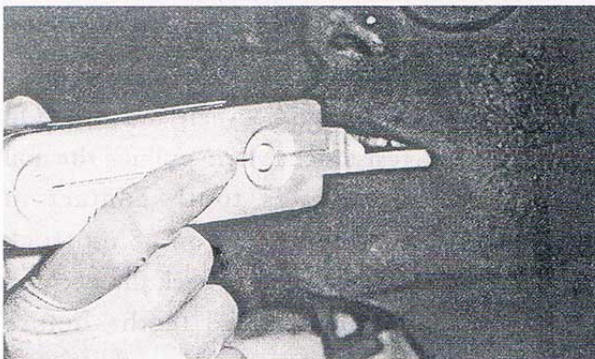
2. **Occlusal tapes;** black and red occlusal



tapes of fifteen micron thickness are available. The teeth and restoration should be air dried. The tape should be held between the teeth and restoration with the help of Miller forcep and mandible guided to intercuspal position and other excursive positions. The occlusion is assessed by examining the marks on the restoration. All interferences over the restoration should be trimmed; unnecessary grinding of natural dentition should be avoided .

3. **Sandblasted surfaces;** sandblasting the occlusal surface of metallic restoration with 15 micron aluminium oxide will produce a matt finish. If the restoration is checked for interference, it will appear as shiny areas, making it easy to locate without the use of occlusal tapes.

4. **T-scan;** this electronic device enables



tooth contact to be observed on the monitor screen and also indicate relative forces on

each of these contacts. This is the dynamic mode to locate working as well as nonworking side contacts. However this instrument identifies only the approximate locations so tapes must be used for exact location.

### OCCLUSAL SCHEMES

Historically, the study of occlusion has undergone an evolution of concepts. There are three recognized concepts that describe the manner in which the natural teeth should and should not contact in the various positions of the mandible in fixed prosthesis<sup>5</sup>. They are as followings

1. bilaterally balanced occlusion
2. unilaterally balanced occlusion(group function)
3. mutually protected occlusion

#### Bilaterally balanced occlusion

Bilateral balanced occlusion is based on the work of **VON SPEE** and **MONSON**. This scheme advocates of having maximum number of teeth in contact in maximum intercuspation and all excursive movements in working and nonworking sides. This concept is centered around the concept of complete denture fabrication in which bilateral balance is necessary to maintain denture stability.

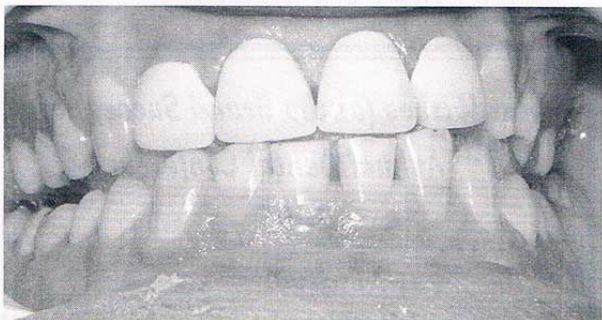
#### Unilaterally balanced occlusion



This concept had its origin in the work of **SCHUYLER** who observed the destructive

effects of tooth contact on the nonworking sides. This scheme, also known as group function, advocates of having excursive contact between all opposing posterior teeth on the working sides only. On the other hand, teeth on the nonworking side are contoured to be free of any contact. Thus, the load is distributed among the periodontal support of all the posterior teeth on the working side only.

### Mutually protected occlusion;



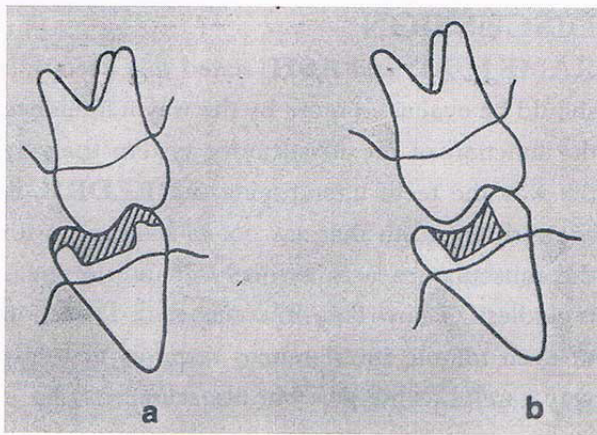
This scheme advocated by **D'AMICO**; **STUART**; and **STALLARD** states that all posterior teeth should be in contact during maximum intercuspation with the forces being directed along their long axis. During this stage, all anterior teeth should be very slightly out of contact (disocclusion of approximately 25 micron), relieving them of the obliquely directed forces. On the other hand, the anterior teeth are so arranged that their vertical and horizontal overlap prevent the posterior teeth from making any contact on either the working or nonworking sides during protrusive and lateral movements. As the result, the anterior teeth prevent the posterior teeth during mandibular excursions and the posterior teeth protect the anterior teeth during intercuspation position.

## DISCUSSION

**RAMFJORD** and **ASH**<sup>6</sup> stated that occlusion should be evaluated more by the way it influence the function of the masticatory system than by the way the teeth intercuspate. **FREEDRICK** showed that teeth that are not in harmony with the musculature acts as occlusal interferences regardless of how they intercuspated. Detection of even minute interferences requires not only very careful techniques but also clinical skills.

The concept of bilateral balanced occlusion, as in complete denture fabrication where contacts on nonworking sides is important to prevent tipping of denture, should not be used in restorative treatments to share the stress among as many teeth as possible. Natural teeth act as an individual units whereas complete denture act as a single unit. Application of this concept to the natural dentition or fixed prosthodontics results in increased rate of occlusal wear, periodontal breakdown, neuromuscular disturbances and higher rates of failures. Thus the concept of bilateral balance occlusion are not applied these days. Currently, the emphasis are on the concept of mutually protected occlusion. As the anterior teeth protect the posterior teeth in all mandibular excursion and the posterior teeth protect the anterior at the intercuspation position, this arrangement is most widely accepted because of its easy of fabrication and greater tolerance by most patients. However the orthodontic relationship of anterior teeth and their periodontal status is very critical to the success of this scheme. In the presence of anterior bone loss, missing tooth or improper teeth relationship, the alternate occlusal scheme will probably be unilateral balance occlusion (group function). In this scheme, canine or premolars and mesial cusps of first molar on the working side distributes the occlusal load whereas contact should not be present on the nonworking side.

Whatever occlusal scheme is provided in crown or fixed partial denture, the basic principal that should be followed are as follows<sup>7</sup>.



- Teeth position should remain stable following restoration: the arrangements should be as in Figure a and not as in fig b in which instability can occur with tilting of teeth.
- The restoration must not introduce new deflective contacts.
- Occlusal forces should be directed along the long axes of teeth.
- There should be simultaneous contact between the restoration and other teeth in the intercuspatal position, with neither high spot nor lack of occlusion. It should be noted that small high spots may remain undetected by the clinician since the tooth is intruded following initial contact.
- There should be no non-working side contacts on the restoration as these produce rotational forces on the tooth and restoration and their removal is dependent on working side contacts to 'pick up' the guidance.
- The anterior guidance should be in harmony with the temporomandibular joints and musculature and should not introduce an occlusal interference.
- Occlusal forces should be directed through the strongest areas of the restorative material and tooth.

## CONCLUSION

The long term success of cast metal, metal ceramic or ceramic restoration is dependent on various factors but optimum oral health, anatomic harmony, functional harmony and above all occlusal harmony are the primary contributing factors. Every clinician should always have basic concepts on occlusion during prosthodontics rehabilitation.

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