



## TRAUMA FROM OCCLUSION

**Occlusal trauma** has been defined as **injury** to the periodontium resulting from **occlusal** forces that exceeds the reparative capacity of the attachment apparatus.

**Trauma from occlusion** refers to tissue **injury** due to distorted **occlusion**. An **occlusion** that produces such **injury** is called a **traumatic occlusion**.



**WHO Definition (1978)** : “Damage in the Periodontium caused by stress on the teeth produced directly or indirectly by the teeth of the opposing jaw”

**Orban and Glickman’s Definition (1968)** : “When occlusal forces exceed the adaptive capacity of the periodontal tissues , the tissue injury results . This resultant injury is termed as trauma from occlusion”

### CLASSIFICATION OF TRAUMA FROM OCCLUSION

#### 1. Depending on the onset & duration





## 2. Depending on the nature of the cause



**Primary**

**Secondary**

**Acute Trauma from Occlusion :** Acute TFO results from an abrupt occlusal impact such as that produced by biting on a hard object . In addition, restorations or prosthetic appliances that interfere with or alter the direction of occlusal forces on the teeth may induce acute trauma.

**Chronic Trauma from Occlusion :** Chronic TFO is more common than the acute form and is of greater clinical significance. It most often develops from gradual changes in occlusion produced by tooth wear, drifting movement, and extrusion of teeth, combined with parafunctional habits such as bruxism and clenching, rather than as a sequel of acute periodontal trauma.

**Primary trauma from occlusion :** It is generally referred to as a condition resulting from abnormal occlusal forces on relatively sound periodontal structure. In effect, the traumatic forces acting on teeth with normal support are greater than the forces that can be withstood without injury to the periodontium.

**Causes :** 1. High Fillings

2. Prosthesis which creates excessive forces on abutments & antagonists

3. Supraeruption of teeth

4. Orthodontic movement of teeth into functionally unaccepted positions

**Secondary trauma from occlusion :** Applied to a condition resulting from physiologic or abnormal occlusal forces, which act on a dentition that is seriously weakened by the loss of supporting alveolar bone. This lack of periodontal support may result not only from effects of periodontal disease but also from injudicious bone resection during periodontal therapy or oral surgery, from accidental trauma or from excessive apical resorption associated with orthodontic or endodontic therapy.

**Causes :** 1. Alveolar bone loss due to marginal inflammation

2. Systemic disorders – reduce tissue resistance



### **Hamp, Nyman, and Lindhe's classification (1975)**

This classification is based on a horizontal component of tissue destruction that has occurred in the interradicular area, i.e., degree of horizontal root exposure or attachment loss.

- **Degree I:** Horizontal loss of periodontal tissue support not exceeding one-third of the width of the tooth
- **Degree II:** Horizontal loss of periodontal support exceeding one-third of the width of the tooth
- **Degree III:** Horizontal through-and-through destruction of the periodontal tissue in the furcation area.

### **NOTE :**

**Ross** has divided the factors causing chronic destructive periodontal disease into two groups:

**Precipitating factors:** Precipitating factors are the irritants and the destructive occlusal forces that further destroy the tissues weakened by predisposing factors

**Predisposing factors:** Factors which take the place of those contributing to the histopathologic lesion are listed as developmental factors, functional mechanisms, and the systemic component.



### **SIGNS & SYMPTOMS**

1. Excessive tooth pain
2. Tenderness on percussion



3. Increased tooth mobility
4. Periodontal abscess formation
5. Cemental tears
6. Infrabony pockets
7. Furcation Involvement
8. Attrition
9. Pathologic tooth migration
- 10. Fremitus test is positive**
11. TMJ dysfunction may be seen
12. Presence of chipped enamel
13. Crown / Root fractures
14. Presence of tenderness in muscles of mastication

**NOTE : Fremitus** can be assessed by gently placing a gloved index finger against the facial aspect of the tooth as the patient either taps the teeth together or simulates chewing movements.

**Box** in the year 1930 , proposed the following additional changes :

1. TFO may lead to formation of Mc Call's festoons & Stillman's clefts
2. Gingival Recession
3. Wedge – shaped defects in the buccal surface of teeth at CEJ
4. Gingival Crescent formation



*Gingival Recession*



*Mc Call's festoon*



*Stillman's Cleft*

### **PATHOGENESIS OF TRAUMA FROM OCCLUSION :**

The response of the tissue can be explained under three stages :

- 1. Stage I : Injury**
- 2. Stage II : Repair**

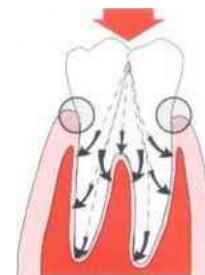
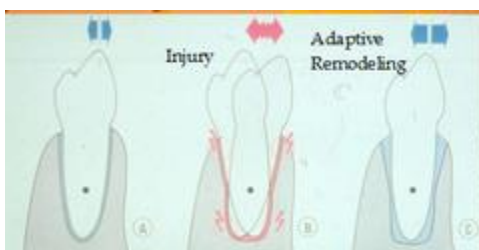


### 3. Stage III : Adaptive remodeling of Periodontium

- Tissue injury is produced by excessive occlusal forces. Nature attempts to repair the injury and restore the periodontium. This can occur if the forces are diminished or if the tooth drifts away from them.
- However, if the offending force is chronic, the periodontium is remodeled to cushion its impact. The ligament is widened at the expense of the bone; angular bone defects occur without periodontal pockets; and the tooth becomes loose.

### Stage of Injury :

- Under the forces of occlusion, a tooth rotates around a fulcrum or axis of rotation that is located in single-rooted teeth, in the junction between the middle third and the apical third of the clinical root.
- This creates areas of pressure and tension on opposite sides of the fulcrum. Different lesions are produced by pressure and tension although if jiggling forces are exerted they may coexist in the same area.
- Slightly excessive pressure stimulates resorption of the alveolar bone, with a resultant widening of the PDL space. Slightly excessive tension causes elongation of PDL fibers and opposition of alveolar bone.
- In areas of increased pressure, the blood vessels are numerous and reduced in size, in areas of increased tension they are enlarged. Greater pressure produces a gradation of changes in the PDL, starting with compression of the fibers, which produces areas of hyalinization.
- Subsequent injury to the fibroblasts and other connective tissue cells leads to necrosis of areas of the ligament.





## Stage of Repair :

- Repair is constantly occurring in the normal periodontium. During TFO, the injured tissues stimulate increased reparative activity.
- The damaged tissues are removed, and new connective tissue cells and fibers, bone, and cementum are formed to restore the injured periodontium. Forces remain traumatic only so long as the damage produced exceeds the reparative capacity of the tissues.
- Cartilage-like material sometimes develops in the PDL space as an aftermath of the trauma. Formation of crystals from erythrocytes has also been shown. When bone is resorbed by excessive occlusal forces, nature attempts to reinforce the thinned bony trabeculae with new bone.
- This attempt to compensate for lost bone is called buttressing bone formation and is an important feature of the reparative process associated from TFO.
- It also occurs when bone is destroyed by inflammation or osteolytic tumors.

## NOTE :

### 1. Buttressing Bone Formation :

When bone is resorbed by excessive occlusal forces , the body attempts to reinforce the thin bony trabeculae with new bone. This attempt to compensate for lost bone is called Buttressing Bone Formation.



### 2. Lipping :

The shelf like thickening of bone on the facial & lingual plates of the alveolar bone is termed as lipping.



### **3. Stage of Adaptive Remodeling :**

- If the repair process cannot keep pace with the destruction caused by the occlusion, the periodontium is remodeled in an effort to create a structural relationship, in which the forces are no longer injurious to the tissues.
- This results in a thickened PDL, which is funnel shaped at the crest and angular defects in the junctional epithelium with no pocket formation.
- The involved teeth become loose. An increase in vascularization had also been reported.

### **Radiographic Features :**

- Widening of PDL space
- Thickening of lamina dura at lateral, apical & bifurcated areas of root
- Presence of Angular bone loss
- Vertical destruction of interdental septum
- Disruption of lamina dura
- Presence of radiolucency in the furcation areas & apex of vital teeth
- Presence of root resorption





## **ROLE OF TRAUMA FROM OCCLUSION IN THE PROGRESSION OF PERIODONTAL DISEASES**

### **Glickman's Concept :**

- Concept given in 1965,1967
- The pathway of the spread of a plaque-associated gingival lesion can be changed if forces of an abnormal magnitude are acting on teeth harboring subgingival plaque
- It would imply that character of progressive tissue destruction of periodontium at a “traumatized” tooth different from that in a “non-traumatized” tooth .
- Instead of an even destruction of the periodontium and alveolar bone (suprabony pockets and horizontal bone loss), which, according to Glickman, occurs at sites with uncomplicated plaque-associated lesions, sites which are also exposed to abnormal occlusal force will develop angular bony defects and infrabony pockets.

**Periodontal structures divided into two zones: 1. Zone of Irritation**

**2. Zone of co-destruction**

#### **Zone of irritation**

- Includes the marginal and interdental gingiva.
- The soft tissue of this zone is bordered by hard tissue (the tooth) only on one side and is not affected by forces of occlusion.
- This means that gingival inflammation cannot be induced by trauma from occlusion but is the result of irritation from microbial plaque.
- The plaque-associated lesion at a “non- traumatized” tooth propagates in the apical direction by first involving the alveolar bone and only later the periodontal ligament area.
- The progression of this lesion results in an even (horizontal) bone destruction.

#### **Zone of co-destruction**

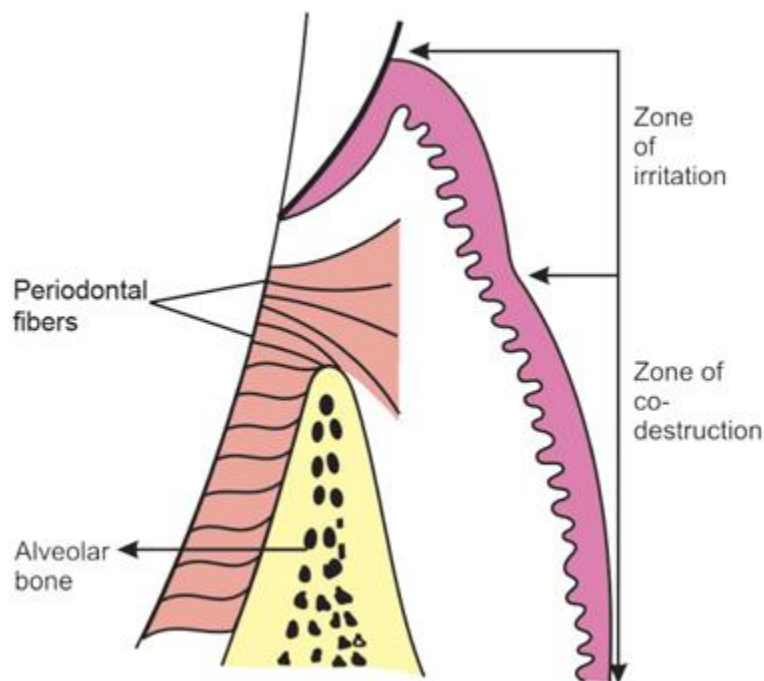
- Includes PDL, Root cementum & alveolar bone
- Coronally demarcated by the transseptal & the dentoalveolar collagen fiber bundles
- TFO may cause a lesion here





### Waerhaug's Concept (1979)

- Refuted the hypothesis that trauma from occlusion played a role in the spread of a gingival lesion into the "zone of co-destruction".
- He measured in addition the distance between the subgingival plaque and 1. the periphery of the associated inflammatory cell infiltrate in the gingiva. 2. the surface of the adjacent alveolar bone.
- He concluded that angular defects and infrabony pockets occur equally frequently in teeth with TFO and in teeth without TFO,



### MANAGEMENT OF TRAUMA FROM OCCLUSION:

- Restoration with removable prosthesis / implant supported crown or bridge
- Splinting
- Selective grinding of certain interarch tooth contacts
- Employing a nightguard for bruxers
- Periodontal Therapy & Orthodontic correction
- Extraction & replacement of migrated teeth



## PATHOLOGIC TOOTH MIGRATION

**Pathologic tooth migration (PTM)** is defined as tooth displacement that occurs when the balance among the factors that maintain the physiologic tooth position is disturbed by periodontal disease.

### **Drifting :**

- Drifting of teeth into the spaces created by unreplaced missing teeth often occurs.
- Drifting differs from pathologic migration in that it does not result from destruction of the periodontal tissues.
- However, it usually creates conditions that lead to periodontal disease, and thus the initial tooth movement is aggravated by loss of periodontal support.
- Drifting generally occurs in a mesial direction, combined with tilting or extrusion beyond the occlusal plane. The premolars frequently drift distally.
- Although drifting is a common sequela when missing teeth are not replaced, it does not always occur.

### **NOTE :**

1. Two major factors play a role in maintaining the normal position of the teeth: 1. The health and normal height of the periodontium . 2. The forces exerted on the teeth.
2. Changes in the forces exerted on the teeth may occur as a result of :

\*Unreplaced missing teeth : This leads to drifting of teeth into the edentulous spaces

\* Failure to replace the first molars :

- The second and third molars tilt, resulting in a decrease in vertical dimension.
- The premolars move distally, and the mandibular incisors tilt or drift lingually.
- While drifting distally, the mandibular premolars lose their intercuspal relationship with the maxillary teeth and may tilt distally.
- Anterior overbite is increased.
- The mandibular incisors strike the maxillary incisors near the gingiva or traumatize the gingiva.
- The maxillary incisors are pushed labially and laterally.
- The anterior teeth extrude because the incisal apposition has largely disappeared.
- Diastema are created by the separation of the anterior teeth.



\* Pressure from the tongue

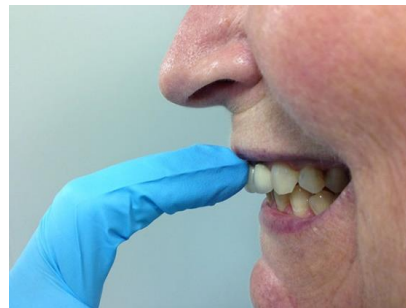
\* Pressure from the granulation tissue of the periodontal pocket

**Clinical Indicators of Trauma from Occlusion :**

- Mobility
- Fremitus test being positive
- Malocclusion
- Wear Facets
- Tooth migration
- Fractured tooth / teeth
- Thermal sensitivity
- Muscle Hypertonicity



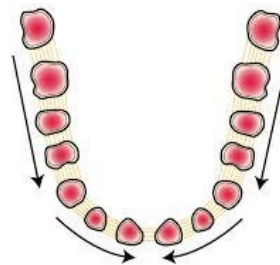
Pathologic Tooth Migration



Fremitus Test



Malocclusion



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