Trauma from Occlusion

Occlusal Trauma

Occlusal Trauma:
“An injury resulting in tissue changes within the attachment apparatus as a result of excessive occlusal force.”

Result in pathological changes to the periodontium

Primary Occlusal Trauma
On a normal periodontium
Excessive Force

Secondary Occlusal Trauma
On a reduced periodontium
Normal or Excessive Force
**Signs of Occlusal Trauma**

- Fremitus
- Pulpal and/or Periodontal Sensitivity
- Abnormal Tooth Mobility
- Widening of the PDL
- Enamel Wear
- Tooth Fracture

**Glossary of Periodontic Terms**

**Mobility**
Visually perceptible movement of the tooth away from its normal position when a light force is applied.

**Fremitus**
Palpable or visible movement of a tooth when subjected to occlusal forces.

**Occlusal Trauma Research**

<table>
<thead>
<tr>
<th>Year</th>
<th>Study</th>
<th>Type</th>
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<tbody>
<tr>
<td>1901</td>
<td>Karolyi</td>
<td>Opinion</td>
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<td>1935</td>
<td>Box</td>
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<td>1938</td>
<td>Stones</td>
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<tr>
<td>1955</td>
<td>Glickman &amp; Bhaskar</td>
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<td>1962</td>
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<td>1975</td>
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<td>1976</td>
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<td>2009</td>
<td>Harrel &amp; Nunn</td>
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<td>2011</td>
<td>Branschofsky</td>
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Glickman’s Concept

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.

Therefore, the periodontium of non-traumatized teeth would present an even destruction (horizontal bone loss), while traumatized teeth would present angular bony defects.

Glickman & Smulow 1963

Glickman’s Concept

Marginal and Interdental Gingiva

Zone of irritation

Demarcated by the transepithelial fibers

PDL, Bone, Cementum

Zone of co-destruction

Glickman 1967

Glickman’s Concept

Inflammation in the “zone of irritation” is induced by plaque and leads to horizontal bone loss

The presence of traumatic occlusion extends the lesion into the “zone of co-destruction” and leads to the formation of an angular defect

Glickman 1967
Waerhaug’s Concept

Analysis of human autopsy specimens
Measurement of the distance between:
Plaque - Inflammatory Infiltrate - Bone
Traumatized vs Non-Traumatized Teeth

Conclusions:
Angular bony defects occur equally often in traumatized or non-traumatized
Angular bony defects are the result of the progression of plaque

Waerhaug’s Concept

Type of Occlusal Trauma

Unidirectional Trauma
Orthodontic Trauma

Jiggling Trauma
“Chewing” Trauma
Concomitant with the tissue alterations in the periodontal ligament can proliferate into the bone-resorbing osteoclasts soon appear on the bone and replace the previously hyalinized tissue, eventually allow the tooth to tilt in the direction of the force. In other words, since the supraalveolar connective tissue is pressure resistant, the tooth becomes, temporarily, hypermobile. When the tooth has moved (tilted) to a position where the effect of horizontal directed forces (arrow), pressure (P) and tension (T) zones tissue alterations take place which eventually allow the tooth to tilt in the direction of the force. The supra-alveolar connective tissue can thicken, eventually resulting in an orthodontic movement, \( \text{Orthodontic Movement} \) does not produce permanent damages to the PDL as long as there is no inflammation. The findings in some of the clinical studies referred to by Nunn and Harrel (2001) and Harrel and Nunn (2001) and in whom the occlusal adjustment was not included.
Type of Occlusal Trauma

Jiggling Trauma

Healthy Periodontium
Healthy but Reduced Periodontium
Diseased Periodontium

Occlusal Trauma

Healthy Periodontium

Occlusal Trauma

Healthy Periodontium

Occlusal Trauma

Healthy Periodontium

Control

Trauma

Meintner 1975
Occlusal Trauma

Healthy Periodontium

Occlusal trauma alone does not initiate periodontal disease

Healthy but Reduced Periodontium

When around 40–50% of the periodontal tissue support had been lost the animals were treated by scaling, root planing, and pocket elimination. When around 50% of the periodontal tissue support had been lost the animals were treated by scaling, root planing, and pocket elimination. During surgery, a notch was prepared in the root at the level of the bone crest. (c, d) The dogs were subjected to traumatizing forces of the jiggling type; a series of alterations occurs in the periodontal ligament tissue. (c) These alterations result in a widened periodontal ligament space and in an increased tooth mobility but do not lead to further loss of periodontal tissue. When the animals were subjected to traumatizing occlusal forces (secondary occlusal trauma), the periodontal disease was subjected to treatment by scaling, root planing, and pocket elimination. The dogs were exposed to traumatizing jiggling forces. There was no further loss of connective tissue attachment. (d) After occlusal adjustment the width of the periodontal ligament is normalized and the teeth are adapted to the altered functional demands.

Perio Disease

Health

Trauma

Ericsson & Lindhe 1977

Perior & Polson 1982
Occlusal Trauma
Healthy but Reduced Periodontium

Healthy reduced periodontium has capacity to adapt to altered functional demands.

Occlusal Trauma
Diseased Periodontium

Ericsson & Lindhe 1977

Fig. 14-12

Fig. 14-11
Plaque-associated periodontal disease

Experiments carried out on humans and animals regarding the degree of bone destruction and loss of connective tissue attachment. Note also in (a) the location of the subgingival plaque at the apex of the root. From Ericsson & Lindhe (1982).

Occlusal Trauma

Bone loss but not CT attachment loss

Gothenburg Study Model

Bone loss & CT attachment loss

Rochester Study Model

Gothenburg Study Model

Lindhe & Svanberg 1974

Meirion et al 1970

Nyman et al 1979

Polson & Zander 1983

From a clinical point of view, this knowledge strengthens the demand for proper treatment of plaque associated with periodontal disease. This process. From a clinical point of view, this knowledge strengthens the demand for proper treatment of plaque associated with periodontal disease. This process.

Trauma from occlusion does, however, result in the formation of teeth exhibiting increased mobility, see trauma of the jiggling type (T). The arrowheads denote the apical level of attachment loss.

On the other hand, more short-term experiments failed to produce additional loss of connective tissue in the absence of such a defect at the mandibular premolar (C).

The active bone resorption ceased but the angular bone destruction persisted as well as the increased width of the periodontal ligament. In teeth with progressive, plaque-associated periodontal disease, this process cannot induce loss of alveolar bone and an angular widening of the periodontal ligament space (arrows). However, the apical downgrowth of the dentogingival epithelium in the two areas (a) and (b) is similar. E indicates the apical level of attachment loss.

"Traumatizing" jiggling forces (Lindhe & Svanberg 1974) were exerted on premolars and were combined with plaque accumulation and in which trauma of the jiggling type was first initiated in dogs or monkeys (Svanberg 1974; Meitner 1975; Nyman 1982; Ericsson & Lindhe 1982; Polson & Zander 1983). In a few weeks, the active bone resorption ceased but the teeth became hypermobile (hypermobility) and angular bony defects could be detected in the radiographs. The forces were eventually nullified by the increased width of the periodontal ligament.

Increased tooth mobility should be regarded as a physiologic adaptation of the periodontal ligament to altered functional demands. It indicates the need for increased blood flow and increased vascular permeability and exudation.

The active bone resorption persisted for many years. It was, however, arrested by the increased width of the periodontal ligament. The effect of treatment directed towards the trauma alone, however, will not arrest the rate of destruction of the periodontal tissues even if the occlusal trauma persists. Treatment will arrest the destruction of the periodontal tissue breakdown and 180 days of trauma from occlusion of the jiggling type (T). The arrowheads denote the apical level of attachment loss.

In the absence of such a defect at the mandibular premolar (C). The arrowheads denote the apical level of attachment loss.
What Does Clinical Reality Show?

Periodontal treatment (SRP and/or surgery) increase mobility

Persson 1981
Kerry 1982
Fleszar 1980

Teeth with initial mobility do not respond to treatment as well as control

McGuire & Nunn 1996

Increase mobility is a risk factor for tooth loss

Cortellini et al 2001

Worst outcome during regenerative surgery

Occlusal Trauma and Periodontal Disease

Occlusal trauma **cannot** induce periodontal breakdown

However it results in resorption of alveolar bone increasing tooth mobility

In teeth with progressive plaque accumulation it may enhance progression of disease

**TREAT PERIO DISEASE FIRST**

Occlusal Trauma When do we adjust occlusion

During initial therapy:
Tooth with excessive mobility, especially when it makes the patient uncomfortable.

During maintenance:
if despite initial therapy, mobility is still bothering the patient or if mobility has increased.

During periodontal regenerative surgery.
Occlusal Trauma

When to splint

- If the mobility increases despite occlusal equilibration and periodontal health
- If the mobility is uncomfortable for the patient
- During periodontal regenerative surgery

Thank You!