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# TRAUMA FROM OCCLUSION—TYPES, CLINICAL SIGNS AND CLINICAL SIGNIFICANCE. A REVIEW

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## ABSTRACT

Traumatic occlusal forces lead to occlusal trauma of teeth with intact or reduced periodontium. Traumatic occlusion can be classified according to the type of traumatic forces (acute and chronic) and according to the capacity of the periodontal tissues (primary and secondary). The main clinical sign of occlusal trauma is the increased tooth mobility due to the destruction of the periodontal fibers and enlargement of the periodontal ligament space. Other signs are also fremitus, tooth drifting, tooth abrasion, occlusal discrepancies, tooth fracture, root resorption. Occlusal trauma is reversible. The tissues of the periodontium are restored when the excessive occlusal forces are eliminated.

**Keywords:** *occlusal trauma, occlusal forces, periodontal disease*

## INTRODUCTION

The relationship between the occlusal trauma and periodontitis provoke a great interest during the years. According to the Glossary of Periodontal Terms (American Academy of Periodontology, 1986), traumatic occlusion is any occlusal force that exceeds the adaptive capacity of the periodontal apparatus (1).

It can be caused as a result of preliminary contact, parafunctions (clenching of teeth, bruxism) or migration of teeth due to tooth loss. Traumatic occlusal forces lead to occlusal trauma—adaptive mobility of teeth with intact periodontium and progressive mobility of teeth with reduced periodontium, excessive abrasion, tooth fracture, disorders of the temporomandibular joint, and masticatory muscles (2).

Synonyms of occlusal trauma used in practice are also: traumatic occlusion, periodontal trauma, traumatogenic occlusion, trauma of occlusion, etc.

## AIM

The aim of this literature review article is to analyze and summarize the etiology and the clinical and histological signs of different types of occlusal trauma.

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## MATERIALS AND METHODS

This literature review is based on various researches in PubMed, Google Scholar and Web of Science databases. Databases were searched using key words as: occlusal trauma, occlusal forces, periodontal disease. The survey concerns the etiology and classification of occlusal trauma and analyzes previous studies of the problem.

All the articles that are searched are in English only.

## LITERATURE SURVEY

Occlusal trauma is a lesion of the periodontal ligament, cementum and supporting alveolar bone, and is caused by excessive traumatic occlusal forces. The changes that occur in the periodontal tissues depend on the strength, direction, duration, and frequency of increased traumatic occlusal forces (3).

Traumatic occlusion can be classified according to the type of traumatic forces (acute and chronic) and according to the capacity of the periodontal tissues (primary and secondary).

Acute occlusal trauma is most often caused by chewing on hard things (e.g. an olive pyrene). It is associated with acute pain, percussion sensitivity and increased tooth mobility (4), fremitus (5), sensitivity to thermal irritation, tooth fracture (6).

Chronic occlusal trauma leads to changes in periodontal tissues associated with gradual discrepancies in occlusion due to tooth abrasion, migration and extrusion of teeth in combination with para-functional factors (e.g. bruxism) (7) and non-carious cervical lesions (NCCLs) (8,9). In radiographic examination it is characterized by enlargement of the periodontal ligament space and root resorption, as well as angular bony defects (5).

It can be observed both in the absence or in the presence of an inflammatory process. In the absence of a plaque-induced gingival inflammation, such vertical bone loss is not accompanied by loss of clinical attachment level and periodontal pocket formation (10). In this case the marginal gingiva is also not affected by the occlusal trauma (11) and no increase in gingival crevicular fluid is observed (12).

The main clinical sign of occlusal trauma is the increased tooth mobility due to destruction of the periodontal fibers and enlargement of the periodon-

tal space. Other clinical signs that are characterized for traumatic occlusion are also fremitus, tooth drifting, tooth abrasion, occlusal discrepancies, tooth fracture (5).

The periodontal ligament space increases and on a radiographic image has an hourglass shape with expansion in the marginal part of the periodontal ligament and in the apical third of the root (13). There is also vertical bone loss (angular bone defect) and root resorption.

Trauma from occlusion can lead to change in the shape of the alveolar ridge, due to adaptation to the so-called jiggling forces—pressure and tension on both sides of the tooth. In teeth suffering by occlusal trauma, histologically there are zones of tension and zones of pressure, adjacent to the periodontal tissues. The severity of lesions can vary depending on the strength and direction of the applied occlusal forces. The pressure zones are characterized by increased vascularization and permeability, some areas of hyalinization and necrosis of the periodontal ligament tissues, hemorrhage, thrombosis, bone resorption, and in some cases root resorption and cement pearls (14). In tension zones, these changes may include elongation of the periodontal ligament fibers and apposition of alveolar bone (13,15). In response to occlusal trauma, the density of alveolar bone decreases, a vertical bone defect is formed and there is an increased mobility of the tooth due to widening of the periodontal ligament space on the X-ray image. But clinically there is no formation of a periodontal pocket (3,16).

Occlusal trauma is reversible. When the excessive occlusal forces are eliminated, the tissues of the periodontium are restored (17,18).

The occlusal trauma may accelerate the progression of alveolar bone loss and alter the course of the inflammatory process in cases when it is accompanied by plaque-induced inflammation. This will favor the formation of periodontal pockets, loss of attachment level, and the formation of vertical bony defects (19). In cases of plaque-induced periodontal inflammation and presence of secondary occlusal trauma, this condition is more difficult to be reversed (17,20).

The combined effect of occlusal trauma and bacterial plaque-induced inflammation is referred to by Glickman as a zone of co-destruction (3,21).

The zone of irritation includes the free gingiva (marginal and interdental gingival tissues). In this zone the soft tissues border the hard dental tissues only on one side and are not affected by occlusal forces. Gingival inflammation is induced by the bacteria in the dental biofilm and cannot be caused by occlusal trauma. Plaque-induced inflammation progresses in periodontal tissues first affecting the alveolar bone and after that the periodontal ligament space and leads mainly to horizontal alveolar bone loss (3).

The zone of co-destruction includes the periodontal ligament, root cementum, and alveolar bone and is coronally demarcated by the transeptal and dentoalveolar collagen fibers of the gingival connective tissue. The occlusal trauma affects the tissues in this zone (3).

Glickman concluded that occlusal trauma may be a co-destructive factor in situations when there are angular bony defects with infraossal periodontal pockets in one or more teeth (22).

Later Waerhaug concluded that angular bony defects and infraossal periodontal pockets occur when the subgingival plaque proliferates more apically than the microbiota in neighboring teeth (21).

### 1. Primary Occlusal Trauma

Primary occlusal trauma is caused as a result of tissue alterations due to excessive occlusal forces in a tooth or teeth with intact periodontium—in cases of preliminary contact, migration and extrusion of teeth (phenomenon of Godon) or in orthodontic movement of the teeth (23).

It is not associated with inflammation of gingival tissues, loss of clinical attachment level, and formation of periodontal pockets (17).

### 2. Secondary Occlusal Trauma

Secondary occlusal trauma is caused as a result of tissue alterations due to normal or excessive occlusal forces in a tooth or teeth with reduced periodontal support (healthy periodontium with reduced height or in cases of compromised periodontium due to existing periodontitis) (23).

It does not cause gingival inflammation or the formation of periodontal pockets, but may increase

the risk of progression and severity of plaque-induced inflammation.

### 3. Orthodontic Forces

Clinical studies show that, in conditions of adequate plaque control, teeth with reduced but healthy periodontium can be successfully orthodontically treated without destruction of the periodontal apparatus (24,25). Uncontrolled orthodontic forces can adversely affect the periodontium and lead to root resorption, pulp disorders, and alveolar bone resorption (26,27).

In general, recent studies have proven that the orthodontic treatment has minimal adverse effects on the periodontium. If an orthodontic force is applied in horizontal direction over the clinical crown of the tooth, the tooth will be tilted in the direction of the applied force. These orthodontic forces lead to the creation of a zone of pressure and zone of tension in the marginal and apical part of the periodontium. In the pressure zone the tissue reactions are characterized by increased vascularization, increased vascular permeability, vascular thrombosis, disorganization of cells and collagen fibers, direct bone resorption. In the zone of tension bone apposition is observed in order to maintain the normal width of the periodontal space (28).

If a horizontal force is applied to the axial axis of the tooth, the tooth will not tilt, but it will move completely, and alveolar resorption is observed in the zone of pressure and apposition of bone—in the zone of tension. When moving the tooth in the vestibular direction this will lead to dehiscence of the vestibular bone wall and subsequent apical proliferation of the covering soft tissues and the formation of gingival recession on the vestibular surface in the direction of movement of the tooth (29,30,31).

## DISCUSSION

The presence of traumatic occlusal forces may lead to one or more of the following clinical signs: fremitus, progressive tooth mobility, sensitivity to thermal stimuli, excessive occlusal abrasion, tooth migration (especially in frontal teeth), discomfort and pain, tooth fracture, NCCLs, gingival recessions, radiographically enlarged periodontal ligament space, root resorption (15,32). Therefore, the diagnosis of occlusal trauma can be made in the presence of one or more of the above-mentioned symptoms.

The prevention and treatment of these signs and symptoms are associated with the elimination of traumatic occlusal forces.

Occlusal therapy is a part of periodontal treatment and can lead to reduction of tooth mobility and increase patients' comfort and their masticatory function. It can slow the progression of periodontal disease and improve the overall prognosis. If during maintenance therapy the parafunctional habits (such as bruxism and clenching) and the mobility of the teeth are not removed and controlled, there is an increased clinical attachment loss and tooth loss (33,34).

## CONCLUSION

Occlusal trauma does not cause periodontitis, but it can accelerate the destruction of tissues of periodontal apparatus in the presence of periodontal inflammation. In these cases, the elimination of occlusal trauma should improve the clinical status of periodontitis.

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