



## REVIEW

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**Receipt:** 08/05/2014 **Revised:** 08/22/2014  
**Acceptance:** 09/24/2014 **Online:** 09/24/2014

## Dental erosion: causes, diagnostics and treatment.

**Abstract:** Despite being a commonly studied topic, it is difficult to find studies which explain the problem of dental erosion. For this article, literature was analyzed to find information on the agents which trigger dental erosion, the main diagnosis methods, the most common treatments used nowadays and the interrelationship with dental materials. The etiology of dental erosion is multifactorial, including acids, eating disorders and gastro-esophageal reflux. However, biological factors such as saliva or habits also play a part in the establishment of this condition. In order to establish a reliable diagnosis, clinical appearance becomes decisive. The Basic Index Erosive Wear Examination (BEWE), created in 2008, is an auxiliary diagnosis tool for assessing the status and progress of the erosion. Treatment should be linked to the eradication of the causative agent and it can range from simple observational monitoring of slightly affected teeth to the placement of total crowns in the most severe cases, but this will depend entirely on the extent, severity, symptoms and type of dentition. Regarding dental materials used in the treatment of eroded parts, there are glass ionomer and composite; the latter presents the greatest resistance to biodegradation when interacting with acids. Glass ionomers are the most vulnerable material while resin is seen as the most resistant. In conclusion, dental erosion has become an issue of great importance in the dental practice because of its serious impact on dental structures. Consequently, it is ranked among the most important dental disorders in the present day.

**Keywords:** *Erosion, acidity, dental hypersensitivity, dental materials.*

*Cite as: Sosa-Puente C, Solís-Soto J, Cruz-Fierro N, López-Villarreal S, & Nakagoshi-Cepeda S. Dental erosion: causes, diagnostics and treatment. J Oral Res 2014; 3(4): 257-261.*

## INTRODUCTION.

Dental erosion is the loss of dental hard tissue due to various factors including acids, eating disorders and gastroesophageal reflux<sup>1</sup>. They can lead to loss of occlusal morphology and pulp exposure in more severe cases<sup>2,3</sup>.

It is very important to identify the factors which cause the establishment of dental erosion in order to prevent enamel demineralization in the initial stage which is followed by tissue softening and the final loss of tooth structure<sup>4</sup>.

In the last decade, there has been an increase in dental erosion affecting young and older people equally. This has forced to give this problem the importance

required since tooth integrity is compromised in its early stages, but the general oral health will be affected in the future<sup>5</sup>. Currently, dental erosion has increased its prevalence in our society, mainly due to a high intake of foods and drinks containing acids. Consequently, it has become a very important issue in the dental field because of its serious impact on teeth. Therefore, it is fundamental to identify both extrinsic and intrinsic etiologic agents which accompany it. That way, it is possible to make a reliable diagnosis and carry out the indicated therapy according to the case; taking into account the effects produced by the erosion on dental materials with the objective of selecting the best restorative material.

Today, there are numerous studies on dental erosion; however, there is no clear definition about the agents which trigger this condition. The objective of this research is to identify the main diagnostic methods and most used treatments at present.

## DENTAL EROSION.

A partial loss of mineralization in the enamel or dentin caused by the interaction of biological, chemical and behavioral factors is understood as dental erosion. It is mainly connected with acidity<sup>6,7</sup>. The impact of this disorder produces not only an alteration in functionality and aesthetics, but also on oral health in general<sup>3,6</sup>. Acids are a determining factor in dental erosion, but its magnitude will depend on the correlation between the structural properties of the tooth and the characteristics of saliva<sup>8,9</sup>.

Other elements originating this condition are eating habits, such as the intake of acidic foods and beverages; as well as eating disorders like bulimia and gastroesophageal reflux<sup>3</sup>.

Dental erosion affects health in general because of the scope it has on dental structures as a result of the combination of chemical and biological substances and habits.

## ETIOLOGY.

It is fundamental to recognize the etiology of dental erosion before planning the treatment to follow<sup>2</sup>.

The etiology of dental erosion is multifactorial<sup>10</sup> and is conditioned by elements such as non-bacterial acids present in the food and drinks. This constitutes the main source of the erosion process.

Acids are classified into extrinsic and intrinsic. Among the extrinsic ones, there are carbonated soft drinks, sports drinks, energy drinks, juices, citrus fruits, medications which cause overproduction of saliva, foods such as salad dressings or vinegar, and bleaching agents as well<sup>6</sup>. On the other hand, gastroesophageal reflux is recognized among the intrinsic factors as the main source since it has been found that the mucosa of patients with this disorder is more acidic compared with those who do not have it. The eroded surfaces are more commonly found in the

palatal face of the anterior teeth<sup>11,12</sup>.

## Behavioral Factors

Lifestyle has a crucial role in the occurrence of erosion. Eating habits and increased consumption of beverages and foods with a high acid content have been strengthened in the last decades. By 2000, there was an increase in the intake of acidic food and beverages in the United States, showing a rise of 500% compared to the estimated rate from 50 years ago<sup>13</sup>.

## Biological Factors.

Saliva, acquired pellicle, the relationship of the tooth in relation to oral tissues and dental composition are the most relevant biological components.

Saliva plays a primary role among the biological elements because of its capacity to dissolve, neutralize and resist the changes that the acid agents present.

The acquired pellicle has a protective role by acting as a barrier to prevent contact between dental tissues and fatty acids with the purpose of delaying erosion of the enamel<sup>6</sup>.

Establishing the etiology of the disease is essential to define the treatment to follow. Erosion is mainly caused by the acid component of food or beverages consumed, but biological factors such as saliva or habits are also involved.

## DIAGNOSIS.

Since the prevalence of this condition has had a marked increase in today's society, establishing a correct diagnosis is critical to prevent irreversible teeth damage<sup>14,15</sup>.

Arriving at a reliable diagnosis of dental erosion in teeth is a challenge for the dentist, because, currently, there are not available devices to help detect it. Then, clinical appearance becomes decisive to establish the diagnosis<sup>16-19</sup>.

The usually affected areas are predominantly in the upper jaw. The incisal edges, palatal faces and occlusal faces including the lower first molars are the more evident. As an early sign, there is a silky, smooth and shiny surface. In a later stage, there is a loss of tooth morphology. The enamel becomes thinner and there are areas without enamel which can be perceived with a probe. In a

more advanced stage, the cusps are rounded and the incisal edges show grooves or furrows with dentine exposure.

Another sign is the fracture of the incisal edges as a result of the loss of structure and as the condition progresses, the teeth suffer from chromatic alteration as a response to the exposed dentine. Another clinical characteristic is that restorations are above the level of the surfaces of adjacent teeth.

In later stages, the occlusal surface morphology could disappear or show communication with the pulp<sup>6</sup>. On the other hand, dental sensitivity caused by the dentine exposure is the main symptom in patients with this condition<sup>2</sup>.

As a means of measurement, numerous indices to standardize diagnostic clinical criteria have been used for more than twenty years. Some of them are the Eccles Index in 1979, the Smith and Knight Tooth Wear Index (TWI) in 1984, the index by Linkosalo and Markkanen in 1985, the erosion Index modified by Lussi in 1996, among others<sup>20</sup>. However, there is no agreement on a standard index to assess the current status and progress of the dental erosion<sup>21</sup>. Currently, the Basic Erosive Wear Examination (BEWE) has been developed with the purpose of establishing, validating and standardizing the criteria internationally<sup>22</sup> (Table 1).

Diagnosis is the foundation to properly plan and execute the treatment. The erosion rates are a method to analyze the status and progress of the dental erosion and thus achieve a reliable diagnosis.

## TREATMENT.

Prior to any treatment, it is essential to identify the etiology of erosion<sup>2</sup>. In the least affected cases, the treatment aims at preventing further damage. In cases where the

dental erosion has reached a severe degree, it will be necessary to use more complex restorative procedures mainly because of the reduced amount of tooth substance available and the compensatory eruption<sup>16,18,23,24</sup>.

The therapy of choice is influenced by various factors such as the extent and severity, the symptoms and the type of dentition. The treatment provided will be guided by the principles of minimal invasive treatment<sup>6-25</sup>.

**Treatment for primary dentition:** In case of not presenting symptoms, restorative treatment is not recommended. Small areas of erosion with sensitivity can be restored with resin. In larger areas of eroded surfaces, stainless steel crowns are the choice. If there are severe symptoms, removal may be indicated.

**Treatment in permanent dentition:** Evaluation of the vertical dimension is essential to define the type of treatment to choose. The therapy to choose can vary from direct restorations with resin for localized and small areas, until metal or ceramic inlays, veneers or crowns for more severe cases<sup>6-9</sup>.

The treatment of choice depends entirely on the degree of affection, symptomatology and the type of dentition in which it is presented. The long-term success of the treatment will depend entirely on the elimination of the cause.

## EFFECT ON DENTAL MATERIALS.

One of the main qualities of dental materials is their resistance to biodegradation. This can be altered by interaction with continuous or intermittent acid agents present in the saliva, food and drinks which cause an alteration in its functioning<sup>26</sup>. According to various studies, it is been proved that when exposed to acids factors, materials undergo changes in their properties and structure. In relation to ceramics, its hardness and main composition, which consists of silicon, aluminum, and potassium, is whittled down after being submerged in acid agents<sup>27</sup>.

In comparison with the resin-modified glass ionomer, compomers and resin, glass ionomer has proved to be the material which is mostly affected by acid components especially by fruit juices, going from roughness to complete

**Table 1.** BEWE INDEX (Basic Erosive Wear Examination).

SCORE	CRITERION
0	Without surface loss.
1	Initial loss of surface texture.
2	Distinctive defect. Loss of hard tissue < 50 % of the surface area.
3	Loss of hard tissue ≥ 50% of the surface area.

dissolution<sup>28</sup>. Due to an increased consumption of acidic foods and drinks, the surfaces of the restorations become rough and opaque contributing to their deterioration.

The resins have proved to be the restorative material which presents less alteration when exposed to acids presenting less surface roughness. The negative effect of the acid agents in relation to the dental materials most commonly used is clear, glass ionomer being the most affected material and the more resistant the dental resin<sup>26, 28-29</sup>.

## CONCLUSIONS.

Dental erosion is a condition in which the hard tissue of the tooth is lost due to various factors and it has increased in recent years. As a result, teeth lose their occlusal morphology exposing the pulp tissue. As dental erosion is a disease in which multiple factors are involved and the repercussions are clearly significant in oral health,

### **Erosión dental: causas, diagnóstico y tratamiento.**

**Resumen:** A pesar de ser un tópico altamente examinado, es difícil encontrar estudios que esclarezcan la problemática de la erosión dental. En este trabajo se analizó en la literatura los agentes que desencadenan la erosión dental, los principales métodos de diagnosis, los tratamientos más empleados en la actualidad y la interrelación con los materiales dentales. La etiología de la erosión es multifactorial incluyendo elementos ácidos, desórdenes alimenticios y reflujo gastroesofágico. Sin embargo, los factores biológicos como la saliva o los hábitos también intervienen en el establecimiento de la afección. Para establecer un diagnóstico fiable, la apariencia clínica se vuelve decisiva. Un auxiliar diagnóstico para evaluar el estado y progreso de la erosión es el índice Basic Erosive Wear Examination (BEWE) establecido en el 2008. La terapéutica deberá estar ligada a la erradicación del

it is necessary to identify the etiologic agents in order to establish strategies to reduce or prevent the development of the condition.

The acids, mainly from food, are the primary cause of dental erosion.

Prior to any treatment, there must be a reliable diagnosis based on a dental erosion index to decide the therapy of choice. The Basic Erosive Wear Examination (BEWE) is an option to certify international standards. Treatment will vary from simple observation to restorative therapy such as resins, restorations with glass ionomer, inlays and veneers or total crowns in more serious cases. It has been demonstrated that restorations with resin show lower dissolution in contact with acid agents.

The selection and duration of the treatment is directly linked to the properties of the material to use, its interaction with the acids and the elimination of the causative element.

agente causal y consistirá desde simple observación hasta coronas totales en los casos más severos, pero esta dependerá totalmente de la extensión, severidad, sintomatología y tipo de dentición presente. Dentro de los materiales dentales empleados en el tratamiento de piezas erosionadas, se encuentran el ionómero de vidrio y el composite; siendo este último quien presenta mayor resistencia a la biodegradación al interactuar con elementos ácidos. El ionómero de vidrio constituye el material más vulnerable mientras que la resina se posiciona como la más resistente. La erosión dental se ha vuelto una cuestión de gran importancia en el ámbito odontológico por las graves repercusiones que se producen en las estructuras dentales, posicionándola como uno de los desordenes dentales con mayor trascendencia en la actualidad.

**Palabras clave:** *Erosión, acidez, hipersensibilidad dental, materiales dentales.*

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