

# EDITORIAL

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## Dental Erosion in Patients with Gastroesophageal Reflux Disease

### Erozja zębów u pacjentów z chorobą refluksową przełyku

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#### Abstract

Gastroesophageal reflux disease (GERD) is a common condition. In addition to esophageal alterations, there are several extra-esophageal symptoms, such as dental erosion. These areas of dental erosion have a characteristic localization and may sometimes be the first symptom of the GERD syndrome. Late recognition of these effects, or ignoring them, may cause irreversible dental lesions with a negative impact on esthetics, on masticator functions and hence on the digestive system. In this paper the effects of gastroesophageal reflux on hard dental tissues are reviewed (*Adv Clin Exp Med* 2013, 22, 3, 303–307).

**Key words:** dental erosion, gastroesophageal reflux, chemical dissolution of tooth structures.

#### Streszczenie

Choroba refluksowa przełyku (GERD) występuje często. Oprócz zmian w samym przełyku występują zmiany w innych narządach, np. erozja zębów. Te zmiany mają charakterystyczne umiejscowienie i czasem są pierwszym objawem GERD. Późne rozpoznanie dolegliwości lub ich zignorowanie może spowodować nieodwracalne uszkodzenia zębów, mające ujemny wpływ na estetykę, czynność żucia, a także układ pokarmowy. W pracy opisano wpływ refluksu żołądkowo-przełykowego na twardą tkankę zębów (*Adv Clin Exp Med* 2013, 22, 3, 303–307).

**Słowa kluczowe:** erozja zębów, refluks żołądkowo-przełykowy, chemiczne rozpuszczanie struktury zębów.

Gastroesophageal reflux disease (GERD) is a very common condition, with a prevalence of up to 10–20% in the general population [1]. The consequences of pathological gastroesophageal reflux are localized not only in the esophagus; extra-esophageal involvement has frequently been reported. GERD may involve damage to the oral cavity, and dental erosion may occur with a higher frequency. In this paper the evidence of dental erosion in GERD is reviewed [2].

## Dental Erosion: Definition and Pathogenesis

Dental erosion is defined as the loss of tooth structure through a physico-chemical process of dissolution of hard dental tissue in connection with environmental acidification in the oral cavity, without bacterial activity [3]. The etiology of dental erosion is multifactorial. The causes may consist of extrinsic acids (acidic foods, beverages or drugs) or intrinsic factors, the most common being gastroesophageal reflux disease with regurgitation of gastric acid into the oral cavity [2].

The mechanism producing dental erosion

starts at the surface of the dental tissue, where the decalcifying acid or chelating agents destroy the pellicle, followed by the dissolution of the tooth's organic substrate and the demineralization of the surface. The damaged dental surface is exposed to mechanical friction in connection with chewing, swallowing, mobilizing the soft tissues or brushing. These losses may affect hard tissues, the enamel and the dentin; they are lacunary and are most frequently localized in the cervical, vestibular or oral areas of the teeth. The erosion areas have a smooth, concave and lacunary appearance [4].

The critical pH below which erosive changes occur is 5.5. It is compensated by the permanent buffering action of calcium and phosphate ions present in saliva and in sulcular fluid. After surface demineralization, erosion continues and is exacerbated even further by minor mechanical stress such as the movement of food, lips and cheeks [5]. The diagnostic criteria for dental erosion are: loss of tooth structure of noncarious etiology, outside the areas of contact or occlusal guidance, and a glossy, smooth, rounded shape. In addition, negative gap areas at the edges of amalgam or composite fillings can also be observed [6]. Taking the patient's case history is a very important step towards identifying intrinsic or extrinsic etiological factors. Cases have been reported where the identification of areas of erosion during a routine dental examination had revealed early gastroesophageal reflux disease, with a minimum of expressed digestive symptoms (Figure 1) [7].



**Fig. 1.** Extreme erosion of the four maxillary incisors in a 32-year-old patient diagnosed with GERD

**Ryc. 1.** Silna erozja 4 górnych zębów siecznych u 32-letniego pacjenta, u którego rozpoznano GERD

The location of the erosive zones is specific to each etiologic factor. If lesions occur due to extrinsic factors then they are most frequently situated on the vestibular areas of the teeth. When the etiology is intrinsic in nature (the most common being gastroesophageal reflux disease), the areas of erosion occur on the palatal zones of the maxillary anterior teeth in the early stages, then they extend to the palatal areas of the lateral maxillary teeth, and in the advanced stages they extend to the lingual and occlusal surfaces of the mandibular teeth. In the early stages lesions are difficult to identify during a normal examination, but advanced ero-

sions are easily noticeable and have the characteristic appearance described above.

The severity of the erosion areas is quantified using different indices. The most common is the one proposed by Smith and Knight (Table 1) [8].

**Table 1.** The Smith and Knight Tooth Wear Index [8]

**Tabela 1.** Wskaźnik starcia tkanek zębów wg Smitha i Knighta [8]

Degree (Stopień)	Area (Obszar)	Criterion (Kryterium)
0	V/L/O/I/C	without loss of surface characteristics, without loss of contour
1	V/L/O/I/C	loss of surface characteristics, slight loss of contour
2	V/L/O I C	loss of enamel with exposed dentin surface <1/3 of surface, loss of enamel with dentin exposure, defect with depth <1 mm
3	B/L/O I C	loss of enamel with exposed dentin surface > 1/3 of surface, loss of enamel with no major loss of dentin, secondary dentin or dental pulp exposure, defect with depth of 1–2 mm
4	B/L/O I C	complete loss of enamel with exposure of secondary dentin or pulp chamber, secondary dentin or dental pulp exposure, defect with depth > 2 mm with secondary dentine and/or pulp chamber exposure

V – vestibular, L – Lingual, O – Occlusal, I – Incisal, C – Cervical, B – Buccal.

V – przedSIONKOWY, L – językowy, O – zgryzowy, I – sieczny, C – szyjkowy, B – policzkowy.

## GERD and Its Extraesophageal Complications

The main clinical presentations of GERD include heartburn and regurgitation. Heartburn is a burning sensation in the retrosternal area; regurgitation is the perception of a retrograde flow of gastric content into the bucco-pharynx.

Although reflux of acid gastric content is mainly responsible for the symptoms of GERD, the alkaline reflux produced by bile migrating in the esophagus may also be the cause of symptoms in some cases [9].

The clinical manifestations of GERD are very common; it has been reported that 20% of the adult population assert that they have heartburn weekly, and 40% report such symptoms at least once per month [10]. According to other data, the prevalence of GERD is estimated at 10–20% in Europe and North America and 5% in Asia [11, 12].

Some patients with GERD may present extraesophageal symptoms [13]. Thus, GERD is associated with pulmonary symptoms, i.e. lower airway diseases (asthma, chronic cough, bronchitis, aspiration pneumonia and idiopathic pulmonary fibrosis), otorhinolaryngologic complaints (hoarseness, laryngitis, subglottic stenosis, vocal cord granuloma and laryngeal carcinoma) and other extraesophageal manifestations (noncardiac chest pain, dental erosion, sinusitis, pharyngitis and sleep apnea) [14]. The relationship is not always obvious, and it has been shown that classic reflux symptoms are absent in around half of the patients with bronchial asthma, and in more than half of the patients with ENT conditions [15]. However, looking for GERD is recommended whenever patients complain of atypical respiratory or ENT symptoms [16].

The extraesophageal manifestations of GERD are displayed in Table 2.

**Table 2.** Extraesophageal manifestations of GERD

**Tabela 2.** Pozaprzelykowe objawy GERD

Bronchial asthma
Chronic cough
Aspiration pneumonia
Laryngitis and other laryngeal diseases
Pharyngitis
Glossitis
Dental erosion
Halitosis
Psychiatric disorders
Sudden infant death

## Dental Erosion in GERD

Since 1937, gastroesophageal reflux disease has been linked to dental erosion, first by Bargen and Austin [17].

Esophageal clearance is important to prevent gastric content from reaching the bucco-pharynx and causing dental erosion. Esophageal clearance is achieved by two mechanisms: esophageal peristalsis, and the buffering action of saliva, which neutralizes the acid. Peristalsis empties the esophagus of its contents, and this process is followed

by the neutralization of the acid environment of the esophageal lumen by the saliva [18]. Salivary flow has a buffering and protective role against the demineralizing effects of acids in the oral cavity. Bouchoucha et al. (1997) observed that the saliva of 17 patients with GERD had greater buffering capacity as compared with the saliva of 20 healthy volunteers, due to modifications in saliva composition resulting from an increased concentration of inorganic phosphates [19].

It has been observed that hyposialia leads to a fivefold increase in the risk of developing dental erosion. In a study that combined quantitative and qualitative analysis of saliva and reflux measured by pH meters, Moazzez et al. showed a significant decrease in salivary secretion in patients diagnosed with gastroesophageal reflux [20].

Refluxed acid first attacks the palatal surface of the upper incisors; in the secondary stage, if the condition continues, erosion of the occlusal surfaces of the posterior teeth in both arches occurs. The labial or the buccal surfaces are affected by erosion only if acid reflux persists for an extended period of time. The palatal surfaces of the maxillary teeth are the first affected due to the fact that they are protected from the major salivary glands, and the tongue maintains contact with the gastric acid. Researchers have concluded that the force of the regurgitation passing from the pharynx into the mouth may influence the severity of dental erosion. In the early stages the tongue protects the lower teeth, but if the condition continues, the occlusal and buccal surfaces of these teeth will be eroded (Figure 2) [21].

In chronic GERD the specific distribution of erosion has been found to be “perimolysis” (dental erosion by intrinsic factor) [5] (Figures 1 and 2). The oral and occlusal surfaces of maxillary teeth and the occlusal surfaces of mandibular teeth are the most affected.



**Fig. 2.** Enamel and dentin loss at the occlusal surfaces in mandibular premolars and molars in a 55-year-old patient with GERD

**Ryc. 2.** Utrata szkliwa zębiny na powierzchniach żujących dolnych zębów przedtrzonowych i trzonowych u 55-letniego pacjenta z chorobą refluksową przełyku

A study conducted by Holbrook et al. demonstrated a significant association between indicators of gastric reflux and presence of tooth erosion (odds ratio 2.772) [22].

A study by Oginni et al. noted that tooth wear index (TWI) scores were higher in patients with GERD than in control subjects. The frequency of regurgitation and duration of gastroesophageal reflux directly influence the severity of dental erosion. Patients with TWI scores of 3 or more have usually had symptoms for more than 10 years [23].

In a controlled study of 40 patients with pathological tooth wear, Bartlett et al. observed that 60% of them had pathological levels of reflux when assessed by ambulatory pH monitoring [21]. This study confirmed the findings of Schroeder et al. in a small study of 12 patients with tooth wear, among whom 80% were diagnosed with reflux [17]. Meurman et al. analyzed the dental status and salivary characteristics of patients presenting with GERD and reported that tooth wear and GERD were interrelated, but no statistical relationship was observed between salivary parameters and tooth wear [24]. The methods for assessing dental erosion are distinctive for different countries so the relationships observed between saliva, erosion and reflux may vary.

Alongside intrinsic factors, extrinsic ones in the etiology of dental erosion must also be kept in mind. Vinegar, pickles, carbonated beverages and acidic drinks (such as citrus juices) are frequent causes of dental erosion [25]. Moreover, a positive correlation between dental erosion and the con-

sumption of soft drinks and white wines (which are more acidic than red wines: pH 3.4 vs. pH 3.2) has also been observed [26–28]. At the same time, wine consumption of any kind is associated with GERD [29].

In the early stages of dental erosion, the loss of tooth structure is not as great, and in these cases restoration of the teeth is easier to achieve. In advanced cases severe complications may appear: exposure of the pulp chamber, the loss of the entire tooth crown, the loss of the vertical dimension, temporo-mandibular joint dysfunctions. In these situations complex rehabilitation is required.

There is a lack of awareness on the part of general physicians regarding the association between GERD and dental erosions. A study has shown that only 40% of them are aware of dental erosions in GERD [30], indicating that there is a need to disseminate this information through medical education.

Gastroesophageal reflux disease (GERD) affects all age groups. Dentists should consider the presence of this pathology when they observe significant loss of dental tissue. Identification is required in order to treat and eliminate etiological factors. The high prevalence of dental erosion in GERD that has been reported in the literature justifies giving GERD-related tooth structure loss more attention when examining patients. Management of GERD should include also a dental check-up and appropriate dental therapy.

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