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Alimentary Tract

# Dental and periodontal lesions in patients with gastro-oesophageal reflux disease

J.V. Muñoz[b], B. Herreros[a], V. Sanchiz[a], C. Amoros[a], V. Hernandez[a], I. Pascual[a], F. Mora[a], M. Minguez[a], J.V. Bagan[c], A. Benages[a,*]

[a]*Department of Gastroenterology, Clinic University Hospital, University of Valencia, Avda. Blasco Ibanez 17, 46010 Valencia, Spain*
[b]*Burjassot Centre, Valencian Health Service, Valencia, Spain*
[c]*Department of Dentistry, General University Hospital of Valencia, Valencia, Spain*

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**Abstract**

**Objective.** Dental erosion has been considered an extraesophageal manifestation of gastro-oesophageal reflux disease, but few reports have studied the relationship between this disease and other periodontal or dental lesions. The aim of this study was to investigate the prevalence of dental and periodontal lesions in patients with gastro-oesophageal reflux disease.

**Patients and methods.** A total of 253 subjects were prospectively studied between April 1998 and May 2000. Two study groups were established: 181 patients with gastro-oesophageal reflux disease and 72 healthy volunteers. Clinical assessment, including body mass index and consumption of tobacco and alcohol, was performed in all subjects, as well as a dental and periodontal examination performed by a dentist physician, blind as to the diagnosis of subjects. Parameters evaluated were: (a) presence and number of dental erosion, location and severity, according to the Eccles and Jenkins index [Prosthet Dent 1979;42:649–53], modified by Hattab [Int J Prosthes 2000;13:101–7]; (b) assessment of dental condition by means of the CAO index; and (c) periodontal status analysed by the plaque index, the haemorrhage index, and gingival recessions.

**Results.** Clinical parameters were similar in both groups ($p>0.05$). Age was statistically associated with the CAO index, presence of dental erosion, and gingival recession ($p<0.001$, Student's *t*-test). Compared with the control group, the percentage of dental erosion was significantly higher in the gastro-oesophageal reflux disease group (12.5 vs. 47.5%, $p<0.001$, $\chi^2$-test), as was the number and severity of dental erosions ($p<0.001$, Student's *t*-test). Location of dental erosion was significantly different between groups. Age was not statistically related to either the amount or severity of dental erosion. CAO and periodontal indices were similarly distributed between groups.

**Conclusions.** Dental erosion may even be considered as an extraesophageal manifestation of gastro-oesophageal reflux disease. The fact that the prevalence of caries and periodontal lesions is similar in patients with gastro-oesophageal reflux disease and in healthy volunteers suggests a lack of relationship with gastro-oesophageal reflux disease.


*Keywords:* Dental erosions; Gastro-oesophageal reflux disease

## 1. Introduction

Gastro-oesophageal reflux disease (GORD) refers to the varied clinical manifestations of reflux of stomach and duodenal contents into the oesophagus, although the clear demarcation between abnormal and 'physiological' reflux is not well defined [1]. GORD is a disease with a high prevalence (more than 40% of American adults have reflux symptoms on a monthly basis) [2]. Over the last three decades, many reports have implicated refluxed gastric acid as a cause or contributory factor in the development of a variety of acute/chronic extraesophageal disorders ('atypical' symptoms related to GORD) [3–6]. Extraesophageal reflux symptoms occur in up to one third of patients with classic symptoms of GORD (heartburn and/or acid regurgitation) and in a similar percentage of patients without classic symptoms [7]. GORD has been associated with a great variety of disorders, such as pulmonary diseases (asthma, bronchitis, fibrosis), ear, nose,

*Corresponding author. Fax: +34-96-386-4767.
*E-mail address:* benages@uv.es (A. Benages).

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and throat symptoms (hoarseness, chronic cough), non-cardiac chest pain, sinusitis, pharyngitis, laryngitis, or dental erosion [3–6].

Dental erosion was defined by Pindborg [8] in 1970 as 'the superficial loss of the hard tissues of the teeth by a chemical process that does not involve the action of bacteria'. According to the International Dental Federation, 'dental erosion is characterised by surface loss of tooth hard tissues. Although the aetiology is not fully understood, it has been associated with multi-factorial chemical or acid-dissolution processes. The appearance of dental erosion is not related to bacterial involvement, but may result from excessive exposure to acid from foods and beverages, extrinsic agents coming from the work environment or acid reflux and regurgitation of alimentary contents from the stomach' [9]. Therefore, many factors are implicated in the aetiology of dental erosion [10,11] and those related to acids that may damage the dental structure could be differentiated between extrinsic (environmental, workable and dietary agents) and intrinsic, in the case of the hydrochloric acid originating in the stomach. This situation is associated with some pathological disorders which may cause the passage of gastric acid to the oral cavity by vomiting or regurgitation, such as anorexia nervosa, bulimia, alcohol abuse or GORD [12,13].

The association between acid reflux and dental erosion was first described by Howden in 1971 [14] and confirmed in later studies, both in adults [15–20] and children [21–23]. However, little is known concerning a hypothetical relationship between GORD and periodontal or other dental lesions, i.e., caries [24]. Only one study, performed by Katunaric et al. [25], has analysed this relationship and concluded that, compared to healthy subjects, dental and gingival hygiene were worse in patients with acid reflux.

The aim of the present study was to investigate the prevalence of dental and periodontal lesions in patients with GORD.

## 2. Patients and methods

### 2.1. Inclusion criteria

The study was conducted prospectively between April 1998 and May 2000 in the Gastroenterology Department of the Clinic University Hospital of Valencia, Spain. All subjects were referred to our department from the same geographic area and none of them presented with eating disorders (anorexia nervosa or bulimia) or were exposed to harmful environmental agents in their work. Two study groups were established. The GORD group comprised of patients diagnosed with GORD on the basis of symptoms related to acid reflux (heartburn or acid regurgitation) for more than 6 months, plus oesophagogastroduodenoscopy and 24-h oesophageal pH monitoring findings. The most frequent symptoms were: heartburn (92.1%), regurgitation (67%), nocturnal coughing and/or episodes of asphyxia (31.4%), and dysphagia (27.5%). An abnormal oesophageal acid exposure reflux (% pH $<4$ and $>3.8$%) was found in 71.3% of patients. According to the endoscopic findings, 43.4% of patients did not reveal oesophageal mucosal disease (non-erosive GORD), and different degrees of mucosal lesions were found in the remaining patients (erosions in 48.6%, Barret's oesophagus in 7.2%, peptic stricture in 0.7%). With respect to medical therapy in the patients group, 75 of them (41.4%) used alkaline agents or sucralfate, whereas 106 (58.5%) were treated with proton pump inhibitor or histamine-receptor blocking agents. Patients with antecedents of surgery of the gastroesophageal junction or disorders of the salivary glands were excluded.

Healthy volunteers without symptoms of GORD constituted the control group. While all patients in the GORD group were treated with histamine-receptor, proton-pump blocking agents, or alcalines/sucralfate, none of the healthy volunteers consumed these medications. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

A total of 253 subjects were included: 71 male (39.2%) and 110 female (60.7%) in the GORD group (mean age of $47.8 \pm 14.1$ years, range: 18–75), and 22 male (30.6%) and 50 female (69.4%) in the control group (mean age of $44.43 \pm 13.42$ years, range: 21–75).

### 2.2. Clinical assessment

A questionnaire was developed to identify factors influencing the presence of dental lesions: obesity (body mass index (BMI) $>30$), presence or absence of tobacco consumption, and daily alcohol intake. Excessive alcohol intake was taken as $>60$ g/day in men and $>40$ g/day in women.

### 2.3. Dental and periodontal examination

All subjects included in the study underwent a dental and periodontal examination performed by the same faculty dentist (JVM), blind to the diagnosis of the subjects, in a normally equipped dental room. Parameters obtained from this examination were dental lesions (dental condition and dental erosion), periodontal lesions (plaque, haemorrhage and gingival indexes), and presence of false teeth. Subjects with complete false teeth (superior or inferior implants or removable prosthetic devices) were not included in the study.

Dental condition, i.e., caries, was evaluated by applying the carious, absent and obtured teeth index (CAO index), according to the criteria of the World Health Organization [26].

Dental erosion was evaluated by the Eccles and Jenkins index [27], modified by Hattab [28], taking into account the number and degree of severity of the erosion: grade 0

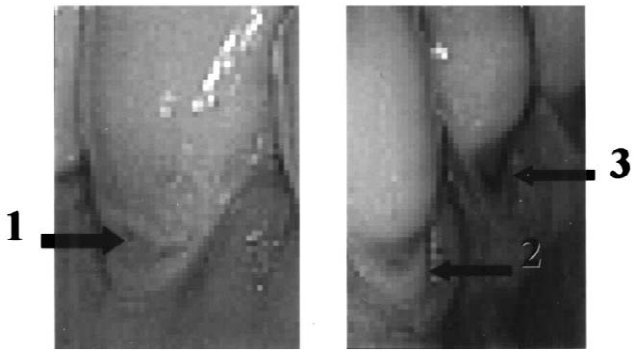


Fig. 1. Dental erosion. 1=grade 1; 2=grade 2; 3=grade 3.

(absence of erosion), grade 1 (loss of the enamel-like cream-coloured appearance), grade 2 (loss of the enamel surface features: smooth dull appearance, without dentin exposure), grade 3 (involvement of enamel and dentin), grade 4 (severe structural involvement with destruction of the tooth) (Fig. 1). The location of dental erosion was evaluated (vestibular vs. buccal mandibular and palatal vs. facial maxillary surfaces) as well as anterior vs. posterior location. Mild dental erosion was considered as grade 1 or 2 and severe erosion as grade 3 or 4. Third molar teeth, badly positioned teeth and false teeth (fixed or removable) were not evaluated.

To determine periodontal health [29], the plaque index, haemorrhage index, and gingival recessions (measured in mm) were used. Findings obtained from the plaque examination were differentiated into four groups according to the plaque index: grade 0 (absence of plaque), grade 1 (thinned plaque on gingival edge that can only be detected with the dental examination tube), grade 2 (moderate quantity of plaque on gingival edge with inter-dental spaces clean), and grade 3 (great quantity of accumulated plaque on both gingival edge and inter-dental spaces). The haemorrhage index evaluated the degree of inflammation in the gingival groove: grade 0 (absence of inflammation), grade 1 (gingival inflammation without bleeding), grade 2 (bleeding caused by the tube of examination), and grade 3 (spontaneous bleeding). The length of the gingival recessions was calculated using a tube inserted from the amelocementary junction to the bottom of the gingival groove and was classified as grade 0 (<3 mm), grade 1 (3–6 mm) and grade 2 (>6 mm). These periodontal parameters were classified as normal (grade 0) or pathological (grades 1, 2 and 3).

### 2.4. Statistical method

Statistical analysis was performed with the program SPSS version 9.0 (SPSS Inc. 1989–1999). The Kolmogorov–Smirnov test was used to test normality of the distribution of quantitative variables. Statistical differences between the two groups were compared using the $\chi^2$-test, with the Fisher test in the case of qualitative parameters and the Student's *t*-test for quantitative parameters. The Mann–Whitney *U*-test was used when quantitative parameters did not reveal a normal distribution. Correlation between quantitative parameters was analysed by the Pearson test. Those parameters obtained as significantly different between groups were assessed by a logistic regression analysis (forward stepwise method) to identify those parameters independently influencing the diagnosis of GORD. Values of $p<0.05$ were regarded as statistically significant.

## 3. Results

### 3.1. Relationship between clinical and dental/periodontal parameters

No statistical differences were found between the GORD and control group when age, gender, obesity, tobacco use, or alcohol intake were analysed (Table 1).

Of the 253 examinations performed, results of dental and periodontal parameters were: (a) CAO index (median: 28.57, range: 0–96.42); (b) presence of dental erosion in 95 subjects (40.4%); (c) pathological haemorrhage index in 163 subjects (69.3%); (d) pathological plaque index in 194 subjects (82.5%), and (e) pathological gingival recession in 124 subjects (52.7%).

Distribution of dental and periodontal lesions between groups (GORD vs. control) and between clinical variables, as well as the statistical differences of these parameters, is shown in Table 2. Age was codified into two groups, according to the mean obtained from the 235 subjects studied (one group less than, and the other more than 47 years), as well as CAO index (one less than, the other more than 28.57). Independently of the study group, age was

Table 1
Clinical features of control group (CG) and GORD group

| | Age (years) | Gender (M/F) | Tobacco use | Obesity | Alcohol use |
|---|---|---|---|---|---|
| CG ($n$=72) | 44.4±13.4 | 22/50 | 16 (22.2%) | 3 (4.2%) | 12 (16.6%) |
| GORD ($n$=181) | 47.8±14.1 | 71/110 | 40 (22%) | 19 (10.5%) | 25 (13.8%) |
| $p$ | 0.08* | 0.19** | 0.98** | 0.08** | 0.56** |

Figures are mean±SD or number of patients and (percentage). M/F: male/female ratio.
Significance ($p$): * Student's *t*-test; ** $\chi^2$-test.

Table 2
Relation between dental/periodontal lesions and clinical and diagnosis variables (statistical significance with Bonferroni correction, $p=0.0083$)

| | Gender | | Age (years) | | Tobacco | | Alcohol | | Obesity | | Diagnosis | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male ($n=93$) | Female ($n=160$) | <47 ($n=124$) | ≥47 ($n=129$) | No ($n=197$) | Yes ($n=56$) | No ($n=216$) | Yes ($n=37$) | No ($n=231$) | Yes ($n=22$) | CG ($n=72$) | GORD ($n=181$) |
| CAO index >28.57 | 40 (43%) | 80 (50%) | 47 (37.9%) | 73 (56.5%) | 101 (51.2%) | 19 (33.3%) | 109 (50.4%) | 11 (29.7%) | 111 (48%) | 9 (40.9%) | 32 (44.4%) | 88 (48.6%) |
| *p* | 0.297 | | 0.002 | | 0.020 | | 0.019 | | 0.510 | | 0.523 | |
| Dental erosion | 36 (38.7%) | 59 (36.8%) | 31 (25%) | 64 (49.6%) | 71 (36%) | 24 (42.8%) | 80 (37%) | 15 (40.5%) | 87 (37.3%) | 8 (36.3%) | 9 (12.5%) | 86 (47.5%) |
| *p* | 0.78 | | 0.000 | | 0.35 | | 0.71 | | 0.55 | | 0.000 | |
| Gingival recession | 43 (46.2%) | 81 (50.6%) | 46 (37%) | 78 (60.4%) | 96 (48.7%) | 28 (50%) | 102 (47.2%) | 22 (59.4%) | 114 (49.3%) | 10 (45.4%) | 32 (44.4%) | 92 (50.8%) |
| *p* | 0.51 | | 0.000 | | 0.88 | | 0.21 | | 0.45 | | 0.40 | |
| Haemorrhage index | 58 (62.3%) | 105 (65.6%) | 79 (63.7%) | 84 (65.1%) | 123 (62.4%) | 40 (71.4%) | 137 (63.4%) | 26 (70.2%) | 144 (62.3%) | 19 (86.3%) | 41 (56.9%) | 122 (67.4%) |
| *p* | 0.68 | | 0.89 | | 0.26 | | 0.46 | | 0.01 | | 0.14 | |
| Plaque index | 70 (75.2%) | 124 (77.5%) | 92 (74.1%) | 102 (80.9%) | 146 (74.1%) | 48 (85.7%) | 164 (75.9%) | 30 (81%) | 175 (75.7) | 19 (86.3%) | 51 (70.8%) | 143 (79%) |
| *p* | 0.75 | | 0.37 | | 0.07 | | 0.67 | | 0.19 | | 0.18 | |

CG: control group; figures are number of patients and (percentage).
Significance ($p$): $\chi^2$-test.

statistically associated with the CAO index, the presence of dental erosion, and the presence of pathological gingival recession. No differences between dental or periodontal parameters and gender, obesity, tobacco use or alcohol consumption were detected. Compared to the control group, only the presence of dental erosion was significantly higher in the GORD group (9/72, 12.5% and 86/181, 47.5%, $p<0.001$, $\chi^2$-test). The other dental and periodontal parameters were similarly distributed between groups.

### 3.2. Dental parameters

The CAO index was similar both in the control group (median: 26.78) and GORD group (median: 28.57) ($p>0.05$, Mann–Whitney *U*-test). Furthermore, the percentage of normal CAO index was also similar (4/72, 5.5% in the control group and 11/181, 6% in the GORD group, $p>0.05$, $\chi^2$-test). When the correlation between CAO index and age was analysed independently of the group, we found a positive correlation between these two variables ($r=0.34$, $p<0.001$, Pearson test).

Besides the relationship between the presence of dental erosion and GORD, the amount and severity of this lesion were significantly higher in the GORD group. All subjects with dental erosion in the control group ($n=9$) had less than five teeth affected, whereas 35 of 86 patients with reflux disease (40.6%) had a least five teeth affected ($p<0.05$, $\chi^2$-test). Furthermore, all subjects with dental erosion in the control group (nine of 72) had a mild degree of severity, whereas more than a third of patients with GORD and dental erosion had severe damage (29/85, 33.7%, $p<0.05$, $\chi^2$-test).

Compared to patients without dental erosion, acid exposure (% pH <4) was higher in patients with dental erosion (12.23±11.75 vs. 8.52±8.43, $p=0.015$, Student's *t*-test), but no significant differences were found when mild vs. severe dental erosion was compared (11.85±9.27 vs. 13.28±15.62, $p=0.50$, Student's *t*-test). Endoscopic findings (non-erosive GORD/mucosal lesions) did not relate to the presence/absence of dental erosion ($p=0.50$, $\chi^2$-test).

Antisecretory therapy (proton pump or histamine-receptor blocking agents) did not influence the presence of either dental or periodontal lesions, since the percentage of these lesions is similar in the group of patients treated with alkaline agents or sucralfate ($p>0.05$, $\chi^2$-test).

Location of dental erosion was different between the two groups. Whereas patients of the GORD group showed this lesion both in the mandibular area (35 patients) and in the maxillary location (39 patients), six control group subjects presented with it in the mandibular area and none of them in the maxillary location ($p<0.05$, $\chi^2$-test). No statistical differences between groups were detected with respect to the anterior vs. posterior location of the dental erosion.

Mean age of subjects was significantly related to the presence of dental erosion both in groups (control group: 56.3±15.2 years in subjects with dental erosion vs. 42.7±12.3 years in those without it, $p<0.05$; GORD group: 52.2±12.9 years with dental erosion vs. 43.7±13.9 years without it, $p<0.001$, Student's *t*-test). However, age was not associated with either the number of dental erosions in the GORD group (52.7±13.6, 52.1±12.6, and 50.5±13 years in patients with 1–3, 4–7 and 8–11 dental erosions, respectively, $p>0.05$) or with the severity

Table 3
Prevalence and severity of periodontal lesions in the control group (CG) and GORD group

| | CG ($n$=72) | GORD ($n$=181) | $p$ |
|---|---|---|---|
| Gingival recession | | | |
| <3 mm | 40 (55.6%) | 89 (49.2%) | |
| ≥3 mm | 32 (44.4%) | 92 (50.8%) | 0.35 |
| Haemorrhage index | | | |
| Normal | 31 (43.1%) | 59 (32.6%) | |
| Pathological | 41 (56.9%) | 122 (67.4%) | 0.11 |
| Plaque index | | | |
| Normal | 21 (29.2%) | 38 (21%) | |
| Pathological | 51 (70.8%) | 143 (79%) | 0.16 |

Figures are number of patients and (percentage).
Significance ($p$): $\chi^2$-test.

(52.6±12.3 years in mild vs. 51.3±14.4 years in severe erosion, $p>0.05$, Student's $t$-test).

### 3.3. Periodontal parameters

Plaque index, haemorrhage index, and gingival recession were similarly distributed between the GORD and control group (Table 3). Only gingival recession was statistically related to age in both groups. Mean age of healthy subjects with a normal gingival recession (<3 mm) was lower than in those with gingival recession >3 mm (40±12.4 vs. 49±8.8 years, respectively, $p<0.05$) and similarly in GORD patients (43±14.9 vs. 52.3±11.6 years, respectively, $p<0.001$, Student's $t$-test).

Independently of the presence or absence of GORD, the relation between all dental and periodontal parameters was analysed. Table 4 shows the analysis between CAO index and the presence of dental erosion and pathological periodontal indexes ($p>0.05$, $\chi^2$-test). On the other hand, when the relation between the presence of dental erosion and pathological periodontal indexes was analysed, it was observed that the presence of dental erosion was statistically associated with pathological gingival recession ($p<0.05$, $\chi^2$-test). Taking into account the subjects' diagnosis, this relation was only found in the GORD group ($p<0.05$). No statistical association was observed between the presence of dental erosion and plaque or haemorrhage indexes. All pathological periodontal parameters were statistically associated with each other ($p<0.001$, $\chi^2$-test).

Table 4
Relation between CAO index and periodontal parameters

| | CAO index | $p$ |
|---|---|---|
| Dental erosion | | |
| Absent ($n$=158) | 30.13±19.57 | |
| Present ($n$=95) | 35.03±23.70 | 0.09 |
| Haemorrhage index | | |
| Normal ($n$=90) | 30.69±21.17 | |
| Pathological ($n$=163) | 32.67±21.40 | 0.48 |
| Plaque index | | |
| Normal ($n$=59) | 33.09±20.99 | |
| Pathological ($n$=194) | 31.64±21.43 | 0.65 |
| Gingival recession | | |
| Normal ($n$=129) | 30.59±20.74 | |
| Pathological ($n$=124) | 33.39±21.86 | 0.29 |

Figures are mean±SD
Significance ($p$): Student's $t$-test.

Finally, from a logistic regression model, dental erosion was an independent variable that influenced the diagnosis of GORD (OR=6.3; C.I. 95%: 2.9–13.4, $p<0.001$).

## 4. Discussion

The detection of extraesophageal lesions related to GORD is important on account of the severity of these lesions, the difficulty in establishing their association with acid reflux, and the necessity for effective treatment in those cases without an accurate diagnosis of GORD. Most of these extraesophageal lesions are located near the upper oesophageal sphincter due to the passage of stomach acid through this area. Therefore, structures such as the pharynx, larynx, lungs, and oral cavity, including teeth, could be potentially damaged by the action of acid reflux.

Pulmonary involvement in GORD has been widely studied, asthma being the predominantly investigated disease due to the frequency of its association with GORD in clinical practice [30]. However, other extraesophageal disorders, i.e., ear, nose, throat, and oral disorders, are considered to be very prevalent in GORD as demonstrated in some recent reports [31,32].

A high percentage of patients with extraesophageal manifestations of GORD do not display typical symptoms of this disease (heartburn or acid regurgitation), which could retard both the diagnosis and, subsequently, the onset of the acid reflux treatment. On this point, it has been reported that 40–60% of asthmatic subjects, 57–94% of patients with ear, nose and throat symptoms, and 43–75% of subjects with chronic cough do not suffer typical symptoms of GORD [7]. Compared with these investigations, the presence of oral cavity lesions in patients with acid reflux has been less studied and only dental erosion has been associated with this disease [32]. Other dental lesions, such as caries and periodontal lesions, in patients with GORD have not been thoroughly investigated.

It is known that dental erosion evolves slowly over a period of years. Accordingly, we found a positive correlation between age and presence of dental erosion in patients with GORD, since the passage of acid from the stomach to the oral cavity may be longer in older patients. Previous reports of the prevalence of dental erosion in GORD vary widely which could be influenced by the diagnostic method or by individual factors such as differences in the defensive mechanisms to acid reflux (salivary features such as pH, flow rate and buffering capacity), or the presence of

Table 5
Prevalence of dental erosion in patients with GORD

| Study [Ref.] | No. adult patients | GORD diagnostic method | Prevalence (%) |
|---|---|---|---|
| Jarvinen et al. [14] | 20 | Endoscopy | 20 |
| Meurman et al. [16] | 117 | Endoscopy | 24 |
| Schoeder et al. [17] | 10 | 24 h pH-metry | 40 |
| Loffeld [18] | 198 | Endoscopy | 68 |
| Present study | 181 | Symptoms, endoscopy plus 24 h pH-metry | 47.5 |

other extrinsic sources of acids that could damage the dental structure. As is shown in Table 5, the prevalence of dental erosion in patients with GORD is not different from other studies but, in contrast with these studies, we established the diagnosis of GORD by means of symptoms and endoscopy plus 24-h pH-metry findings. It is important to note that the lack of agreement between GORD symptoms, endoscopic and pH-metry findings [33] could explain the differences between the prevalence of dental erosion, since it depends on the diagnostic criteria of GORD.

Compared with healthy subjects, we found in our patients both a higher number of teeth affected by erosion and a greater degree of severity, but these features are not associated with age in our study. It is thought that this discrepancy may be due to individual factors other than acid reflux, as mentioned previously, which could influence the evolution and severity of dental erosion. It is evident that a increased acid exposure (% pH $<4$) is associated with dental erosion in our patients, but neither with the number of teeth affected nor with severity. Therefore, it is thought that exposure to acid in GORD patients is a necessary condition to provoke dental erosion, whereas other factors (i.e., age) could influence the evolution of the lesion.

In the present study, the presence of caries, assessed by the CAO index, is similar in patients with GORD and in healthy subjects. Furthermore, the lack of correlation between dental erosion and periodontal lesions could suggest differences in the aetiologic and pathogenic mechanisms implicated in these lesions. In patients with acid reflux, only gingival status, assessed by gingival recessions, is associated with the presence of dental erosion. This finding suggests that the same mechanism (acid reflux) might damage both structures, because this correlation does not exist in healthy subjects, and is in agreement with the results of Katunaric et al. [25], who demonstrated more gingival damage in patients with GORD.

Besides the correlation between dental erosion and age, discussed previously, a similar finding was found for other dental (caries) and periodontal lesions. This is in agreement with other studies [34], which is not surprising since damage caused by acid agents are greater in those cases with longer exposure.

The present results suggest that dental erosion is the only oral lesion that could be considered as an extraesophageal manifestation of GORD, since caries and periodontal lesions are similarly prevalent in healthy subjects. Given the high prevalence of dental erosion in patients with acid reflux, collaboration between gastroenterologists and dentists is necessary to identify dental involvement in patients diagnosed of GORD. On the other hand, subjects with unexplainable presence of dental erosion should be referred to gastroenterologists to investigate the presence of a probable GORD. In fact, some studies have demonstrated a high percentage of subjects with dental erosion that presented an underdiagnosed GORD, $\leq$85% by Nostrant and Rabine [35], 64% by Bartlett et al. [36] and 83% by Schroeder et al. [18]. As reported, although subjects with dental erosion did not display symptoms of GORD, results of complementary studies (endoscopy and/or 24-h pH-metry) are usually pathological [37]. Follow-up studies including GORD patients with dental erosion are necessary to analyse the influence of medical therapy on the progress of dental lesions.

## Conflict of interest statement

None declared.

## List of abbreviations

CAO index, carious, absent and obtured teeth index; GORD, gastro-oesophageal reflux disease.

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