THE IMPORTANCE OF GASTROESOPHAGEAL REFUX DISEASE IN DENTISTRY

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ABSTRACT
Approximately one third of the population in industrialized countries has occasional or continuous upper gastrointestinal disorders. One such condition is gastroesophageal reflux disease (GERD), which may be evidenced by dental erosion. Dentists are often the first health care professionals to diagnose dental erosion in patients with gastroesophageal reflux disease (GERD). Gastroesophageal reflux (GER) is the passage of gastric contents into the esophagus, and GERD is defined as symptoms or complications of GER. Symptoms such as belching, unexplained sour taste and heartburn usually alert the patient to the condition. It is known that the acid regurgitated from the stomach into the mouth will erode teeth. Dental erosion is an irreversible process characterized by mineral loss unrelated to microbial involvement. Treatment of dental erosion resulting from GERD involves a multidisciplinary approach among family physician, dentist, prosthodontist, orthodontist and gastroenterologist. When possible, dental erosion should be treated with minimal intervention, and such treatment should include control of microflora, remineralization, adhesive restorations and use of biomimetic materials.

Introduction
Dentists are often the first health care professionals to diagnose a systemic disease through observation of its oral manifestations. One such condition is gastroesophageal reflux disease (GERD), which may be evidenced by dental erosion (2). Dental erosion is defined as the progressive loss of hard dental tissues caused by a chemical process not involving bacterial action (14,15,29). Chemical dissolution of tooth structure may be caused by diet, external sources common to industrial environments or internal sources such as regurgitation/reflux or vomiting (12,15).

GERD, is defined as involuntary muscle relaxing of the upper esophageal sphincter, which allows refluxed acid to move upward through the esophagus into the oral cavity (3,15). Although normal physiologic reflux of gastric fluid into the esophagus with rapid clearance occurs in both children and adults, it is usually of little clinical significance. However, symptoms may occur when larger volumes are refluxed frequently or when clearance is delayed. Reflux is considered pathological when it occurs more than normal or when complications arise (4,25).

In addition to causing dental erosion, undiagnosed and untreated GERD may also result in esophagitis, Barret’s epithelium, esophageal adenocarcinoma and aspiration pneumonitis of various degrees (2).

Substernal burning after eating, the most common symptom, is worsened by fatty or spicy foods, alcohol, or caffeine (30). Non-cardiac chest pain, chronic hoarseness, chronic cough, asthma, and idiopathic pulmonary fibrosis have all been associated with...
GERD (6). Additional signs of GERD include gastric juice in the mouth, laryngeal granuloma and ulcers, chronic laryngitis, laryngeal carcinoma, chronic sore throat, subglottic stenosis, vocal cord polyps, night-time cough and globus pharyngeus (2).

Reflux can be demonstrated with several diagnostic tests, such as barium esophagography, endoscopic examination, measurement of lower esophageal sphincter pressure, esophageal acid perfusion, mucosal biopsy, standard acid reflux test and radionuclide scintography. The most useful diagnostic tool currently available to diagnose GERD is 24-hour monitoring of esophageal pH (25,32).

Treatment of mild cases of GERD may involve life-style changes including modified diet, decreases in the volume of food or liquid, sleeping with the head of the bed raised 4 to 6 inches, weight reduction, and use of over-the-counter antisecretory agents (30).

The medical concern is that acid reflux in the esophagus may damage the mucosal lining. Reflux esophagitis can be mild, involving only microscopic changes in the cells of the mucosa, or erosive, causing bleeding and superficial linear ulcers. From a dental standpoint, acid reflux in the oral cavity causes the loss of coronal tooth structure by chemical erosion. It has been reported that patients experiencing vomiting 1 or more times a week, heartburn, belching, pain on awakening, acid taste, or stomach pain have dental erosion 31 times more frequently than controls (13).

Effects of gastroesophageal reflux disease on the oral cavity
The effects of gastroesophageal reflux on the oral cavity have just begun to be understood and extensively studied. Although the clinical appearance of dental erosion is well documented, we have little understanding of the soft tissue manifestations or of the interplay of salivary or other biologic factors that may modify the effects of refluxate in the mouth (16).

The effects of gastric acid reflux on oral tissues can be profound, ranging from minor soft tissue irritations to severe tooth destruction resulting in masticatory dysfunction and requiring extensive restorative treatment. Although reflux of gastric acid and pepsins into the lower esophagus can cause mucosal damage leading to erosive esophagitis and development of structures, extension of tissue injury to oral mucosa has not been shown but might be expected. No correlation between oral mucosal lesions or symptoms and gastroesophageal reflux disease has been documented, and only a few studies even mention such lesions. Reflux patients have complained of burning mouth sensation, tongue sensitivity, nonspecific itching and burning sensations of the mouth and pharynx, and/or painful oral ulcers, but pathognomonic oral mucosal lesions have not been noted, and subjective symptoms have not correlated with either the presence or severity of gastroesophageal reflux disease. The most prevalent adult dental disease, periodontal disease, has not been studied in reflux patients, but one study of patients suffering from anorexia nervosa and bulimia noted a higher incidence of gingivitis but no difference in periodontitis (16,25).

In contrast to oral soft tissue lesions, the hard tissue lesion termed dental erosion has been associated with the effects of acidic stomach contents and can be considered the predominant oral manifestation of gastroesophageal reflux disease. Tooth erosion has been recognized in the dental literature for >200 years, but an association between erosion and gastroesophageal reflux disease has only more recently been recognized (16).

Prevalence
Prevalence, distribution and clinical appearance of dental erosion may vary owing to regional, environmental and behavioral factors and are estimated to occur in 2 to 18 percent of the population. The finding of
TABLE 1

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No visible erosion</td>
</tr>
<tr>
<td>1</td>
<td>Small pits and slightly rounded cusps, flattened fissures, moderate cupping, preservation of occlusal surface morphology</td>
</tr>
<tr>
<td>2</td>
<td>Depression of cusps with severe cupping and grooving, restoration margins raised above level of surrounding tooth, flattening of occlusal surface morphology</td>
</tr>
</tbody>
</table>

TABLE 2

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No erosion</td>
</tr>
<tr>
<td>1</td>
<td>Loss of surface detail; change confined to enamel</td>
</tr>
<tr>
<td>2</td>
<td>Exposure of dentin affecting less than one-third of crown</td>
</tr>
<tr>
<td>3</td>
<td>Exposure of dentin affecting one-third or more of crown</td>
</tr>
</tbody>
</table>

enamel erosion is divided relatively evenly between the sexes (7). Schroeder and colleagues noted that 11 out of 20 patients who had GERD had dental erosion (31).

In a 5-year longitudinal study, 71% of children had erosive lesions of at least grade 1 affecting their primary dentition, and 26% had grade 2 erosions (Table 1). By 16 years of age, 12% had at least one permanent tooth with grade 1 erosion, and up to 0.2% of patients had at least one permanent tooth with grade 2 erosion (9). Other studies have reported a similar prevalence of erosion in adults (between 5% and 16%) (13,19).

Eccles and Jenkins identified dental erosion grade in Table 2 (8).

The mandibular molars in both the primary and permanent dentitions are the teeth most commonly subject to erosion (9). Patients exposed to extrinsic acids suffer more damage to the labial or occlusal surfaces of the upper anterior teeth, with severity decreasing posteriorly, whereas intrinsic acid causes more damage to the lingual surfaces of the teeth. Thinning of the enamel imparts an unesthetic yellowish hue to the teeth. Once dentin is exposed, the loss of dentin progresses faster than the loss of enamel, such that ‘cupping’ of lesions on the occlusal surfaces occurs. Exposure of the dentinal tubules results in hypersensitivity to cold, hot, tactile stimuli and sweet. Additional sequelae of dental erosion include compensatory eruption of eroded teeth, tipping and drifting of teeth, formation of diastemae, loss of vertical dimension, overclosure and bite collapse, all of which result in autorotation of the mandible and reduction of overjet toward or beyond an edge-to-edge incisal relationship. Therefore, it is important for dentists and physicians to evaluate patients with dental erosion for acid reflux (14,17,18).

Dental erosion causes and biological protective mechanisms

Several factors are known to contribute to enamel erosion (5). Causes of dental erosion are classified as extrinsic or intrinsic. Extrinsic causes include carbonated or acidic beverages, acidic foods, various medications, saliva substitutes, citric lozenges, oral hygiene swab sticks, recreational exposure to water in gas-chlorinated swimming pools and occupational exposure to corrosive agents such as battery acid fumes and industry aerosols.

Intrinsic causes of dental erosion include bulimia, rumination or voluntary reflux phenomenon, subclinical regurgitation due to chronic gastritis associated with alcoholism, malabsorption syndrome, xerostomia, chronic vomiting during pregnancy and GERD (1,11,17).

It is assumed that the dental effects of gastroesophageal reflux disease result from the propulsion of acidic gastric contents into the oral cavity. The critical pH at which dental enamel dissolves is approximately 5.5, whereas the pH of gastric refluxate has been shown to be about 2.0. In
vitro tooth erosion has been shown to occur with exposure to acidic products if pH <3.7 (16). Enamel erosion also has been corre-
lated directly with lowered salivary buff-
ering capacity (10). Normal salivary buffer
capacity may eliminate or at least mitigate
the effects of stomach acid in the oral ca-
vity of reflux patients. When buffer capac-
ity is impaired, acid exposure becomes
more injurious to oral tissues (2,15,16).

Prevention/Treatment
The immediate goal in the treatment of
dental erosion resulting from GERD is
formulation of the correct differential diag-
nosis and prompt referral to a gastroen-
terologist (2,25).

Treatment of the patient suffering from
oral problems secondary to gastric reflux
begins with comprehensive assessment of
the oral condition. Because of the possi-
bility of multiple contributing factors,
 thorough history review and examination
should be performed. Diet, environmental
factors, parafunctional habits, and salivary
parameters (stimulated and unstimulated
flow, pH, buffering capacity)should all be
assessed. Once the etiologic factors have
been identified, palliative treatment and
measures to prevent further erosion should
be instituted. Definitive restoration of the
dentition should not be attempted until the
underlying reflux disorder has been con-
trolled. Prophylactic measures to minimize
exposure to acid from any extrinsic or in-
trinsic source should be instituted. Patients
should be counseled to avoid excessive
consumption of acidic foods and drinks
(15,16).

Allowing the antacids to dissolve prior to
swallowing will help neutralize acid and
protect the teeth from erosion. Toothbru-
shing should be avoided immediately after
reflux episodes because it may damage
acid-weakened enamel. Use of sugarless
chewing gum to stimulate salivary flow and
buffer oral acid should also be encouraged
(16). To maximize the potential for remi-
neralization and minimize the potential for
demineralization, daily use of both a neu-
tral 0.05% fluoride mouth rinse and 1.1%
fluoride toothpaste is recommended (2).

Once preventive measures have been in-
stituted and the underlying disorder con-
trolled, definitive restoration of the denti-
tion can begin. Indications for restoration
may include protection of remaining tooth
structure, esthetic considerations, preven-
tion of dentinal sensitivity or food impac-
tion, severe vertical space discrepancies,
and temporomandibular joint dysfunction.
Treatment may range from simple to ex-
ceedingly complex, depending on the ex-
tend of tooth destruction and the ability of
the masticatory system as a whole to adapt
(2,16).

In view of the potential application of
biomimetic materials and techniques (22)
in the restoration of eroded teeth, and in
keeping with a modern, minimally invasive
approach to dentistry (27), the natural tooth
structure should be preserved whenever
possible. Cupped lesions on cuspal tips and
minor contour defects can be restored with
adhesive resins (28). Bonded porcelain
restorations can be used to restore exten-
sive loss of tooth structure in the anterior
teeth (21,33). There is some early evidence
that the biomimetic principles used to re-
store anterior teeth can also be applied to
the restoration of posterior teeth (23,24,26).
Posterior tooth can be treated with di-
rectly applied composite resins. When full
coverage of eroded vital posterior teeth is
indicated, indirect ceramic overlays may be
considered (20). In cases of advanced
breakdown, these traditional approaches
will in fact be necessary, and cemented
ceramo-metal or ceramic crowns may be
the treatment of choice (2).

Dentists play an important part in the di-
agnosis of GERD. It is important to resolve
the active medical condition before initia-
ting definitive dental treatment. After suc-
cessful medical intervention, the patient’s
dentition is necessary to restore correct
form, function, and esthetics with an expectation of a favorable long-term prognosis.

REFERENCES