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Relationship between dental erosion and respiratory symptoms in patients with gastro-oesophageal reflux disease

Geng-Ru Wang [a], *Hui Zhang* [b], *Zhong-Gao Wang* [c,d], *Guang-Shui Jiang* [a,*], *Cheng-Hao Guo* [e,**]

[a] *Department of Endodontics and Periodontics, School of Stomatology, Shandong University, Shandong Provincial Key Laboratory of Oral Biomedicine, Jinan 250012, China*
[b] *Department of Otorhinolaryngology, The Second Hospital of Shandong University, Jinan 250036, China*
[c] *Department of Cardiothoracic & Vascular Surgery, Xuanwu Hospital, Capital University of Medical Science, Beijing 100053, China*
[d] *Center for Gastro-oesophageal Reflux Disease, The Second Artillery General Hospital, Beijing 100088, China*
[e] *Department of Pathology, School of Medicine, Shandong University, Jinan 250012, China*

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ABSTRACT

Objectives: Both dental erosion and respiratory symptoms are extra-oesophageal manifestations of gastro-oesophageal reflux disease (GERD). The aim of this study was to determine whether dental erosion was correlated with respiratory symptoms in GERD patients.
Methods: 88 GERD patients were recruited and assigned to three groups mainly according to the frequency of respiratory symptoms: Group I: never; Group II: occasional (1–2 days a week or less); Group III: frequent (3–5 days a week or more). All patients underwent medical evaluations, including medical history, questionnaire answering and alimentary tract examinations. Dental examinations were carried out on these patients and 36 healthy controls. Dental erosions were measured by modified method of Smith and Knight Tooth Wear Index (TWI). Location and severity of dental erosion were recorded.
Results: The prevalence of dental erosion in Group III (64.52%) was higher ($p < 0.05$) than that in Groups I (36.67%) and II (44.44%). GERD patients were presented with dental erosion with TWI scores ranging from 1 to 4. Though proportion of dental erosion with Score 2 (7/20) in Group III was higher than that in Group I (2/11) and Group II (3/12), there was no statistical significance in the proportions of erosion scores among three patient groups. Correlation coefficient between airway symptoms and scores of dental erosion was 0.231 ($p < 0.05$). Palatal erosion of upper incisor was seen in 8 persons (72.7%) in Group I, 9 persons (75%) in Group II and 16 persons (80%) in Group III ($p > 0.05$). Labial erosion of upper incisors was found in 1 person in Groups I and II respectively and 4 persons in Group III. All patients with labial erosion on upper incisors had palatal erosion, except 1 patient in Group III.
Conclusions: In GERD patients, dental erosions are more prevalent in patients with frequent respiratory symptoms than those in patients with occasional and without respiratory symptoms. Palatal erosion of upper incisor is the main manifestation in patients. Acid reflux is the main causative factor of dental erosion in GERD patients with airway symptoms.

* *Corresponding author*. Tel.: +86 013969087012.
** *Corresponding author*. Tel.: +86 013953105171.
E-mail addresses: guangshuijiang@yahoo.com.cn (G.-S. Jiang), chenghaoguo@sdu.edu.cn (C.-H. Guo).
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1. Introduction

As a common medical condition, gastro-oesophageal reflux disease (GERD) develops when the reflux of stomach contents causes troublesome symptoms and/or complications. GERD can result into oesophageal symptoms such as regurgitation and heartburn. GERD can also be associated with many extra-oesophageal symptoms, including oral cavity, ear, nose, throat, trachea, bronchus and pulmonary manifestations. Among these extra-oesophageal symptoms, dental erosion (DE), chronic cough, asthma and laryngitis were proved to have significant correlations with reflux by the global evidence-based consensus in 2006.[1]

Dental erosion is an acid-induced loss of dental hard tissue without the involvement of bacteria. The etiological factors of dental erosion are often categorised into two groups: intrinsic and extrinsic factors. GERD is a significant intrinsic factor of dental erosion.[2,3] The regurgitated acid has a pH of approximately 1–2 which is much lower than the critical pH 5.5 of enamel dissolution. Direct contact of regurgitated gastric acid is considered to be the main mechanism of dental erosion in the patients with GERD.[4]

The severity of dental erosion appeared to be correlated with proximal reflux. The cumulative dental erosion scores were correlated with proximal upright reflux.[5] Increasing levels of palatal tooth were related to pharyngeal pH below 5.5 in GERD patients.[6] Another study showed a relationship between oral acid exposure time pH < 6 and the tooth wear index.[7]

Chronic cough, asthma and laryngitis are respiratory symptoms of GERD which can be caused by two main possible mechanisms: the direct contact or aspiration of gastric contents into respiratory tract (reflux theory), and vagally mediated reflex from distal oesophageal acid exposure (reflex theory).[4,8] The reflux mechanism has been consistently demonstrated in both human and animal studies. Airway symptoms can be caused by reflux through direct irritation and inflammation to pharynx and larynx mucosal. When reflux reaches trachea and bronchus by aspiration through laryngeal pharynx, it may provoke more severe respiratory symptoms.

Some researchers have suggested that nocturnal cough, asthma, obstructive sleep apnea syndrome, laryngotracheal irritation, spasm, and even suffocation were strongly associated with proximal oesophageal reflux.[9–12] Similarly, other studies have found greater amounts of proximal oesophageal and hypopharyngeal acid exposure in patients with reflux laryngopharyngitis.[13–16] Aspiration has been detected among patients with chronic respiratory disorders and symptoms of gastro-oesophageal reflux.[15,17,18] Many animal studies also supported the reflux hypothesis that direct contact of acid was a main cause for larynx and bronchospasm associated with GERD.[19,20]

Since both dental erosion and respiratory symptoms are related to proximal reflux in GERD patients, there might be some correlationship between them. The laryngeal pharynx is a critical position which serves as a passageway for food and air, and is connected with oesophagus, trachea, oral cavity and nasal cavity. When the reflux reaches this position, it gets a chance to go down to trachea and lungs by microaspiration to cause asthma, cough and relevant respiratory symptoms, or go higher into the oral cavity potentially to cause dental erosion. It has been previously shown that GERD patients with airway symptoms have more reflux to proximal oesophageal and laryngeal pharynx. Thus, GERD patients with airway symptoms may be at higher risk to develop dental erosion. However, little attention has been focused on the relationship between them from the aspect of reflux mechanism. Therefore, the aim of this study was to investigate the association between dental erosion and respiratory symptoms in patients with GERD.

2. Patients and methods

2.1. *Participants*

This study was conducted at Center for Gastro-oesophageal Reflux Disease (the Second Artillery General Hospital; Beijing; China). The study was approved by ethics committee at Shandong University and signed informed consent was obtained from each participant.

2.1.1. *Patients*

The study group consisted of 88 patients with GERD including 50 men (mean age: 45.3; range: 20–73) and 38 women (mean age: 46.3; range: 22–69). They were consecutively selected among outpatients and inpatients between October 2009 and February 2010. They came from different regions of China. All patients had GERD-related oesophageal symptoms, such as heartburn and regurgitation. Reflux was assessed by endoscopy, oesophageal 24-h double-probe pH-monitoring and oesophageal manometry. At least one test result suggested the existence of pathological reflux. All subjects had at least 20 uncrowned teeth except the third molar. Exclusion criteria were as follows:

1. patients with systemic concomitant diseases;
2. patients suspected of anorexia, bulimia nervosa, smoker or chronic alcoholism;
3. patients receiving medications that can cause hyposalivation including antidepressants, diuretics and narcotics;
4. patients with a history of bruxism, excessive intake of acidic juices, food and medicine, or excessive exposure to circumstance acid and
5. patients with behavioural habits that might be associated with tooth erosion.

All patients were assigned into three groups according to the scores of respiratory manifestations. Briefly, every patient completed a questionnaire about their extra-oesophageal symptoms, including occurrence frequency and severity of each symptom. Occurrence frequency of symptom was recorded between 0 and 5 (Score 0: never; Score 1: 1 day a month or less; Score 2: 2–3 days a month; Score 3: 1–2 days a week; Score 4: 3–5 days a week; Score 5: 6–7 days a week). Subjects also scored the severity of each symptom based on a graded scale of 1–3 (Score 1: slight symptoms, not affecting normal life; Score 2: moderate symptoms, affecting normal life