Dental manifestations of gastroesophageal reflux disease in children

Objawy stomatologiczne u dzieci z chorobą refluksową przełyku

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Słowa kluczowe: erozja zębów, choroba refluksowa przełyku, dzieci.

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Abstract

Introduction: Dental erosion (DE) is a common condition in both adults and children. Numerous studies involving confirmation of gastroesophageal reflux disease (GERD) and the assessment of dental erosions have shown a significant association between these conditions, but for some authors it is still not clear if GERD plays a significant role in dental pathological tooth wear.
Aim: To compare the dental health status of children with GERD and a healthy control group.
Material and methods: Dental examinations were conducted in 57 children aged 7-18 years (mean 12.4) with a definitive history of GERD and 57 randomly chosen healthy children of the same age and gender. Data were analyzed with Mann-Whitney *U*-test.
Results: This investigation has shown that GERD children were at an increased risk of developing dental erosions compared to healthy control subjects (66.7% vs. 26.3%).
Conclusions: The present study provides clear evidence of a significant association between dental erosions and GERD. Early erosive damage to the permanent teeth may compromise the dentition for the entire lifetime; therefore a pediatrician should routinely refer children and toddlers suffering from GERD to a pediatric dentist, to confirm the presence of erosions and if needed restore the damaged teeth.

Streszczenie

Wstęp: Erozja zębów (*dental erosion* – DE) jest częstym problemem zarówno u dorosłych, jak i dzieci. Mimo że liczne publikacje potwierdzają związek między chorobą refluksową przełyku (*gastroesophageal reflux disease* – GERD) a DE, dla wielu autorów ta współzależność nadal jest nieznana.
Cel: Porównanie stanu jamy ustnej dzieci z GERD z dziećmi zdrowymi.
Materiał i metody: Badania stomatologiczne przeprowadzono u 57 dzieci w wieku 7–18 lat (średnia 12,4 roku) z rozpoznaną GERD oraz u dzieci zdrowych. Grupy badana i kontrolna były zgodne pod względem wieku i płci. W analizie statystycznej użyto testu *U* Manna-Whitneya.
Wyniki: Wykazano, że u dzieci z GERD w porównaniu z dziećmi zdrowymi częściej występowała DE (66,7% *vs* 26,3%, $p < 0,0001$).
Wnioski: Uzyskane dane wskazują na istotną statystycznie zależność pomiędzy GERD a DE. Wczesna utrata tkanek twardych zębów stałych na skutek procesu erozyjnego może spowodować nieodwracalne zmiany w uzębieniu, dlatego też lekarz pediatra powinien rutynowo kierować dzieci i młodzież z GERD do lekarza stomatologa, aby potwierdzić obecność DE, a gdy istnieje potrzeba – odbudować zniszczone tkanki zęba.

Introduction

Erosive tooth wear is a common condition among children in many industrialized countries, occurring in a percentage varying from 14% to 87% [1]. Dental erosion (DE) is a chemical process without bacterial involvement, in which dissolution of tooth tissues is caused either by exogenous (extrinsic) sources, such as diet, or by endogenous (intrinsic) sources, such as gastroesophageal reflux disease (GERD), regurgitation or vomiting, or a combination of both. The DE was first associated with GERD in a case report by Howden [2] published over 40 years ago in the *British Dental Journal*. In recent years a number of reports have suggested a relationship

between DE and GERD in adults [3-9] but only a few articles have considered this problem in children [10-14]. A typical clinical sign of acidic gastric juice entering the oral cavity is dental erosion, which is located initially on palatal surfaces of the upper incisors. Later, if the condition continues, refluxed gastric acid attacks the occlusal surfaces of posterior teeth in both the lower and upper jaws. As the condition becomes chronic and is left untreated, it spreads and affects even buccal and labial surfaces of posterior teeth. It may compromise the primary and permanent dentition for the entire lifetime and may require extensive and expensive restorative treatment. In early stages the lower incisors are usually not affected, as the position of the tongue and increased flow rate of saliva provide some degree of protection.

According to the Montreal Criteria, which were published in 2006, "the prevalence of DE, especially on the lingual and palatal tooth surfaces, increases in patients with GERD" [15].

In spite of this statement, a few authors have denied a positive correlation between GERD and DE [12, 16].

Aim

The aim of the present study was to assess the prevalence of DE in a group of 7-18-year-old children with proven GERD, compared to a healthy control group.

Material and methods

The study comprised 114 schoolchildren aged 7-18 (mean age 12.4) years. The study group consisted of 57 GERD patients: 33 girls and 24 boys selected among pediatric gastroenterology patients of the Clinic of Pediatrics, Hematology and Oncology of the Pomeranian University of Medicine in Szczecin, Poland. Gastroesophageal reflux disease diagnoses were firmly established with the clinical symptoms, esophagogastroduodenoscopy and histological examination. The control group consisted of 57 healthy, randomly chosen subjects of the same age and gender, attending various schools in Szczecin and of patients registered with the Pediatric Dentistry Department of the Pomeranian University of Medicine in Szczecin for routine dental examinations. Dental examination was performed by one dentist, at a normally equipped dental clinic, using dental mirrors and explorers under artificial light in the Pediatric Dentistry Department of the Pomeranian University of Medicine in Szczecin, Poland. The degree of dental erosion was based on clinical presentation and it ranges from a score of 0 to 3, according to the Eccles and Jenkins index (Table I) [17]. Because of age-related specific conditions such as mixed dentition and typical localization for tooth erosion in GERD patients, dental examinations were performed only on the most susceptible group of teeth: upper incisors and canines.

Statistical analysis

The Mann-Whitney *U*-test was used for comparison between study and control groups. The statistical level of significance was set at $p < 0.05$.

Results

As shown in Figure 1, 38 (66.7%) of 57 examined children with GERD had dental erosions. Evidence of erosion tooth wear in the healthy children group was seen in 15 out of 57 patients (26.3%). The difference in the prevalence of tooth erosions between the groups was statistically significant ($p < 0.0001$). Dental erosion in the study group was detected on 154 teeth of all examined teeth (50.6%). The severity of teeth erosions in children with GERD was as follows: grade I – 113 teeth

Table I. Index for the measurement of tooth erosion according to Eccles and Jenkins
Tabela I. *Indeks występowania erozji zębów według Ecclesa i Jenkinsa*

Grade 0	No tooth erosion present
Grade I	Tooth erosion restricted to enamel
Grade II	Tooth erosion involves dentin but for less than 1/3 of the area of the tooth surface
Grade III	Exposure of dentin affecting 1/3 or more of the area of the tooth surface

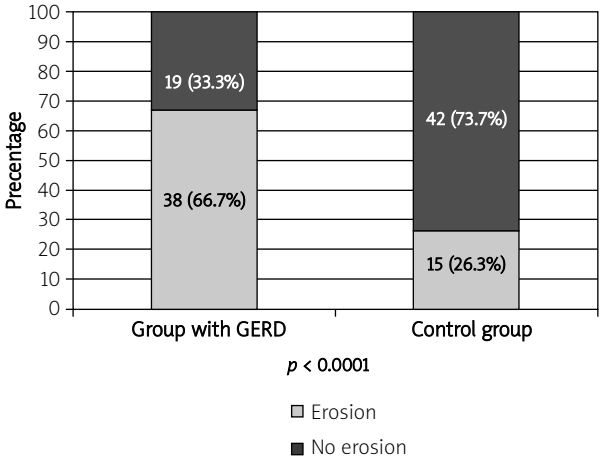

Fig. 1. Erosion tooth wear in upper incisors and canines in both groups
Ryc. 1. *Występowanie erozji zębów w obrębie siekaczy i kłów górnych w obu badanych grupach*

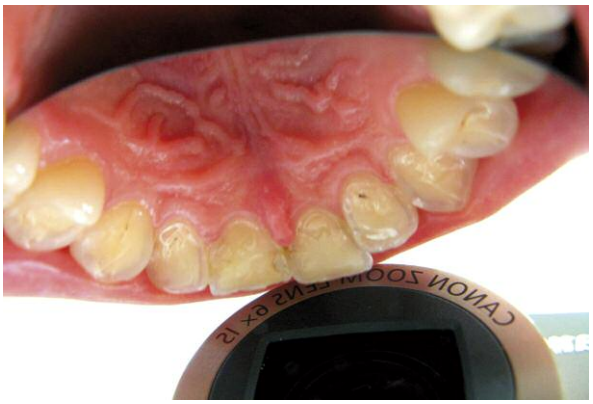

Fig. 2. Patient 17 years old, maxillary arch showing severe palatal erosions of incisors and canines
Ryc. 2. *Pacjentka, lat 17, w obrębie łuku górnego widoczne zaawansowane zmiany erozyjne powierzchni podniebiennych siekaczy i kłów*

Fig. 3. Patient, 17 years old, erosion tooth wear of incisive edges of upper incisors
Ryc. 3. *Pacjentka, lat 17, erozyjna utrata brzegów siecznych w obrębie siekaczy górnych*

(73.4%), grade II – 33 teeth (21.4%), and grade III – 8 teeth (5.2%). In healthy children dental erosions were found in 53 (16.2%) of all examined teeth. The severity of teeth erosions in the control group was as follows: grade I – 34 teeth (64.2%), grade II – 19 teeth (35.8%) and grade III – 0. Taking into consideration the duration of contact between teeth surfaces and the acidic fluid, the results of this study showed that the mean time for developing dental erosions in the GERD children group was respectively: 2.4 years for grade I, and 2.7 years for grade II. Dental erosions were significantly more common in GERD children ($p < 0.0001$). Erosion tooth wear was more pronounced on palatal surfaces of maxillary incisors (Figures 2 and 3).

Discussion

In spite of its common occurrence, little is reported in the literature on the oral health status of children and toddlers with GERD. The major problems in oral cavity of GERD patients are dental erosion, fetor ex ore, xerostomia, dental sensitivity and oral burning sensation [4, 10, 12, 18]. The present study focused on the prevalence of erosion tooth wear in children and toddlers with GERD and showed a positive association between both conditions. Of the few surveys that have been published recently, only five authors deal with children. In the study published by Dashan *et al.* [10], 83% of 24 examined children aged 2-18, with GERD confirmed by endoscopic examination, had dental erosions. Similar results were found in the study done by Aine *et al.* [11]. A group of 17 children, aged from 22 months to 16 years old, who were found to have pathological reflux at 24-hour esophageal pH monitoring, underwent dental examinations. The prevalence of DE was high (87%). Unfortunately, no control group was investigated. In the study published by Linnet *et al.* [14], dental examinations were conducted for 52 children, aged from 18 months to 15 years old, with a definitive history of GERD. The prevalence of teeth erosion was found to be statistically higher in the GERD group than in healthy subjects (14% vs. 10%). In the study done by Ersin *et al.* [13], dental erosions among 38 GERD subjects (mean age 6.5) were found also to be significantly higher than for healthy control children ($p < 0.05$). Different results were reported by O'Sullivan *et al.* [12]. The results of the study showed that the prevalence of DE in GERD subjects was low (17%). Fifty-three children with moderate to severe gastro-oesophageal reflux, defined by pH monitoring, and with a mean age of 4.9 years, underwent dental examinations. These authors suggested that dental erosion may not be as great a problem in children with GERD as in adults. The differences in results among the studies may be due to differences in age, type of dentition and sample sizes. But the most important factor is the time of exposure of the teeth to gastric acid. There are several factors modifying the erosion process. These include diet, swallowing habits, general diseases, buffering capacity of saliva, time of contact with the teeth and the surface that come into contact with acidic fluid. According to Hellström [19], it is highly likely that erosive tooth wear will become clinically evident after a period of 2 years of gastric acid exposure to the teeth surfaces. Similar observations were found in the present study. The mean time for developing DE in the GERD children was 2.4 years for grade I, and 2.7 years for grade II. Many authors confirm the statement that the palatal surface is the most typical localization for DE in GERD patients, and there are also many reasons why this localization is

so specific. Firstly, children and toddlers with GERD tend to avoid acidic food and carbonated drinks, because they often aggravate unpleasant symptoms. Soft drinks and acidic snacks are potentially erosive because of their low pH. Improper diet plays a significant role in the tooth wear process, but those lesions are situated mostly on buccal and occlusal teeth surfaces. Secondly, it has been found that the saliva buffer capacity in GERD patients is significantly lower than in healthy subjects [3, 12]. Saliva plays an important protective role against dental erosion not only by its buffer capacity and flow rate, but also by forming the pellicle that protects enamel from acidic demineralization. Saliva properties characteristic for GERD may reduce natural saliva protection from intrinsic and extrinsic acids. Future research in this area is needed to assess the oral modifying factors in the erosion tooth wear process and methods of its prevention and control.

Conclusions

This study concluded that there is a clear relationship between GERD and DE in children. An examination of the oral cavity should be an integral part of the medical examination of GERD-suspected children. Coordinated medical and dental management of patients with GERD is strongly recommended, which is why each patient with asymptomatic dental erosion should also be evaluated for GERD. Children with GERD should be targeted for increased preventive oral care. Additionally, more research should be initiated to observe progression of dental erosion or its regression following gastric acid suppression therapy in children and toddlers with confirmed GERD.

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