REVIEWS

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Tamara Pawlaczyk-Kamieńska[1, A, B, D, F], Agata Osińska[2, B, D], Renata Śniatała[1, B, D]

Dental Implications of Eating Disorders

Zmiany w uzębieniu w przebiegu zaburzeń odżywiania

[1] Department of Paediatric Dentistry, Poznan University of Medical Sciences, Poznań, Poland
[2] Department of Child and Adolescent Psychiatry, Poznan University of Medical Sciences, Poznań, Poland

A – research concept and design; **B** – collection and/or assembly of data; **C** – data analysis and interpretation; **D** – writing the article; **E** – critical revision of the article; **F** – final approval of article

Abstract

Eating disorders are nowadays a grave and, unfortunately, growing social problem. Their etiology is multifactorial with complex psychological, biological, familial and socio-cultural mechanisms playing a role. Socio-cultural factors are becoming more and more relevant, including the impact of mass media which provides socially accepted standards of attractiveness. They set the socially valued norms of appearance and show the impact of complying or failing to comply to these norms. Eating disorders lead to numerous anomalies in the oral cavity. They affect both the teeth and soft tissues. Although dry mouth, oral mucosa injuries, diseases of periodontium, dental decay are observed in patients, still the most common findings are non-carious lesions. Dental treatment is multipronged, mainly conservative and prosthetic. However, a crucial element of problem management is the prevention of further formation of erosive lesions. For such treatment to be effective, simultaneous implementation of psychological therapy is needed. Therefore, it is necessary to provide comprehensive health care to patients suffering from eating disorders (**Dent. Med. Probl. 2016, 53, 4, 524–528**).

Key words: tooth erosion, eating disorders, non-carious lesion.

Słowa kluczowe: erozja zębów, zaburzenia odżywiania, ubytki niepróchnicowego pochodzenia.

Eating disorders are a group of symptoms resulting from somatic, psychological and social interactions. *Anorexia nervosa*, *bulimia nervosa* and atypical eating disorders, not meeting anorexia and bulimia classification criteria are included in these disorders. Their etiology is multifactorial with complex psychological, biological, familial and socio-cultural mechanisms playing a role. Socio-cultural factors are becoming more and more relevant, including the impact of mass media which provides socially accepted standards of attractiveness. They set the socially valued norms of appearance and show the impact of complying or failing to comply with these norms [1–3]. A slim, well-shaped body is promoted, believed to be the sign of easy success in life [4].

In the recent 40 years, an increase in the prevalence of eating disorders has been noted. *Anorexia nervosa* takes the first place in the statistics. The disorder symptoms appear most frequently between 14 and 18 years of life, although there are many case reports of *anorexia nervosa* in children aged 8 to 13 years. After 25 years of age the prevalence of anorexia drops [5–7]. Globally, *anorexia nervosa* affects 0.5–1% of women and 0.05–0.1% of men. In Poland, it has been assessed to affect 0.8–1.8% of the girls population aged < 18 years. The percentage increases to 3.7% if the forms of the disease not meeting all diagnostic criteria are included [4, 5].

Anorexia nervosa is a disease characterized by limiting food intake, refusal to maintain proper body mass, accompanied by intensive physical exercise, vomiting and application of laxative and diuretic drugs. The chief symptom is misperception of one's body image, of its shape and size. A significant discrepancy is observed in patients between the real and ideal picture of their bodies. It may concern either the general appearance (body mass and figure) or particular body parts (the abdo-

men, hips, thighs). Severe fear of weight gain and the need to control it is present. It is accompanied by somatic complications. *Anorexia nervosa* is a disease of a persistent character and a diversified course; it is also fraught with a high risk of death. It has been estimated that mortality indices among anorectic patients are at least 5 times higher than expected [2, 3, 8, 9].

The prevalence of bulimia is estimated to amount to 2% (1–4%) [5]. In men, it is more frequent than anorexia and amounts to 0.1–0.7% [10]. Bulimic symptoms appear later than those of anorexia – between 18 and 25 years of age [4, 6, 7]. Chief symptoms are episodes of binge eating followed by provoked vomiting or other forms of purging and constant, excessive care about one's body mass and size [11, 12]. The body mass of bulimic patients is usually normal, although binge-eating episodes may lead to obesity. Similarly to *anorexia nervosa*, bulimia causes many somatic complications likely to be life threatening. Studies show higher mortality of those affected compared to the general population, especially if the deaths were due to suicide [6, 7, 13].

The issue of eating disorders is interdisciplinary in character because of their systemic complications and it is an issue that requires the cooperation of various medical specialists, including those representing dentistry, as patients' disordered behaviors lead to damaged teeth.

In eating disorders numerous deviations from the norm are observed in the body, including those found in the mouth. The anomalies, which might affect both the teeth and soft tissues, depend on the disorder type, its duration, diet, frequency of vomiting and the way they are provoked. Labial, buccal and palatal mucosa injuries, injuries to the tongue, periodontal disease, dental decay as well as non-carious lesions are observed [14–16]. These signs do not result from the disorder itself but mostly are the effect of various factors affecting the tissues, not always related to a given disease [17, 18].

In many patients suffering from eating disorders, diseases of hard dental tissues are observed. A characteristic sign includes non-carious lesions due to the erosion of teeth *(erosio dentinum)*. Johansson et al. [15] showed that eating disorders 8.5 times increase the risk of such erosion. Hermont et al. [19] found erosion in 45% of the people affected, contrary to the healthy individuals in whom 8.8% had such lesions. Still, Uhlen et al. [20] noted erosion in nearly 70% of patients affected with eating disorders. It must be emphasized that the incidence of erosion varies in the group of patients with such an entity and is related to the type of a disorder. Johansson et al. [15] proved a 5.5 times higher risk of erosion in people who repeatedly vomit, as an accompanying symptom of the disease, compared to the non-vomiting patients. Otsu et al. [16] noted erosive lesions in 86% of the vomiting patients. However, no case of dental erosion was found in the patients showing eating disorders who did not vomit. The quoted data leads to the conclusion that erosive lesions are more frequent in patients with eating disorders than in the rest of population. Still, some patients do not show erosion of teeth despite long-term presence of the disease, where one of the symptoms is repeated vomiting [15, 16, 20]. Moreover, it was proved that the average time needed for the first visible signs of dental erosion to appear is two years from the disease onset [21, 22].

Physio-chemical integrity of the teeth enamel depends on the chemical composition of the fluids which wash it in the mouth, i.e. saliva and gingival fluid, on its pH and the content of calcium, phosphate and fluoride ions. Teeth erosion is produced through dissolving mineral compounds of the hard tissues by the acids acting directly on a tooth deprived of an acquired film or dental plaque [23]. Such acids may be endo- or exogenic. Gastric juice falls into the former category. One of its components is hydrochloric acid responsible for an acidic pH (pH 1). The acids contained in foods fall into the latter category. Destructive impact of the diet is related to a pH value of a consumed product, the content of calcium and phosphate ions in it, and the way sour foods are consumed [15, 20, 23].

Pathomechanism of erosion involves the direct impact of acids on enamel apatites. With a decrease in pH below 4.5 in the oral cavity, both enamel apatites (hydroxyapatites and fluoroapatites) begin to disintegrate. This results in the release of calcium, fluoride and phosphate ions into the fluid environment of the oral cavity. The more hydrogen protons in the fluid oral environment, the bigger is the loss of inorganic compounds. The result of the reaction is enamel softening, its gradual disintegration and an irreversible loss of its subsequent layers. Clinically, it appears as a tissue loss without subsurface demineralization, characteristic of a carious spot. Formation of an erosive lesion, its extent and depth is related to the amount of acids, their pH as well as the frequency and time hard dental tissues are exposed to them. It has been confirmed that in patients suffering from eating disorders, especially those accompanied by vomiting, the extent and depth of erosive lesions is directly proportional to the disease duration and to the frequency of vomiting episodes [15, 20, 23]. However, not all vomiting patients exhibit hard dental tissue lesions. Otsu et al. [16] did not note dental erosion in 14% of the vomiting patients. The above data

shows that erosive lesions are due to numerous factors and the cavities are a consequence of the interactions between them all [14, 20].

Apart from acids, classified as chemical factors, there are biological and habitual factors. The former include the amount and composition of saliva and its buffer qualities, the presence or absence of dental plaque protecting hard dental tissues from the direct impact of acids, teeth anatomical structure and their chemical composition (mainly fluoride content) and occlusal contacts between teeth, and the anatomical structure and function of the surrounding soft tissues. Habitual factors include dietary and hygienic habits as well as vomiting in the patients with eating disorders [18, 23]. An erosive lesion will appear when an imbalance between protective and damaging factors takes place.

The location of erosive lesions depends on the etiological factor. If they are due to vomiting in the course of bulimia and bulimic anorexia, the lesions are mainly observed on the palatal surfaces of the upper front teeth [18, 20]. This deformity is known as *periomylolysis* (*perimylolysis*) and is treated as a pathognomonic sign of the disease [24, 25]. Formerly mentioned Otsu et al. [16] noted *periomylolysis* in 81% of the studied patients who had vomiting as one of the disease signs. With time, erosion may appear on other dental surfaces such as the occlusal ones of both upper and lower teeth and palatal ones of the remaining upper teeth [14, 16, 20, 26]. Otsu at al. [16] observed such a location in 50% of the vomiting patients; in almost 35% of the studied patients they classified the lesions on the occlusal surfaces of the mandibular teeth as advanced (also affecting dentine) or very advanced (complete loss of dental tissue and morphology).

Erosion is a chemical phenomenon resulting in dental tissues softening thus making them prone to mechanical damage, such as abrasion *(abrasio dentinum)*, i.e. pathological tooth wear due to contact with exogenic materials. In eating disorder sufferers, abrasion type lesions may be observed which are caused by tooth brushing immediately after a vomiting episode. Brushing may lead to the removal of the decalcified outermost layer of dental hard tissues. Abrasive lesions are mostly located in the cervical area of the front teeth [15, 16, 20]. Schlueter et al. [27] showed such lesions in 83% of patients who had the habit of tooth brushing immediately after vomiting. And Otsu et al. [16] also studied the extent of the lesions. In their studies, 37% of the patients who admitted to tooth brushing immediately after vomiting exhibited erosive lesions involving the enamel only, and in 69% of such patients the lesions also involved the dentine or – due to the lesions extent – caused a complete loss of teeth contour.

In patients who developed restrictive anorexia, with no vomiting, the loss of hard dental tissues is related to chewing hard (grainy) foods, to the habit of prolonged chewing as well as to a diet rich in acids and to holding these acidic foods in the mouth for a prolonged time. The so-called healthy diet, including much fruit, fruit juice or fruit teas, may cause the erosion of teeth. The lesions are most commonly found on the vestibular and chewing surfaces [14, 20]. Moreover, patients suffering from restrictive anorexia show abrasion due to tooth brushing after acidic foods consumption and the so-called demastication, i.e. tissue abrasion due to excessive chewing of food. Demastication is chiefly noted on the working surfaces of both upper and lower teeth. Tooth brushing immediately after vomiting is harmful. The superficial tooth surface, softened by acids from food, is more vulnerable to damage by tooth brushing, especially when a person uses an abrasive toothpaste and/or has an improper, over-zealous brushing technique or the frequency of brushing is too high. To avoid dental erosion it is recommended to replace post vomiting tooth brushing with rinsing with water or other liquid. Also after consuming acidic food or drinks it is recommended to rinse with water to help neutralize the acids [28].

There is a higher risk of erosion in patients with eating disorders, who are undergoing fixed orthodontic treatment. The excess acids from foods form around the brackets, increasing the risk of enamel decalcification. Also, the acid has a negative effect on bracket retention, which, in effect, provides significantly lower bond strength values [29, 30].

In restrictive anorexia patients, erosion may also result from intense exercise. Physical exercise leads to body dehydration and a decrease in salivary flow, which has a harmful effect on the hard tissues of teeth, as saliva exhibits protective properties in normal conditions. Thirst following exercise is often quenched with energy or isotonic drinks of low pH (below 3.0) [16, 23]. The location of non-carious lesions is due to a specific etiological factor, such as vomiting, dietary or hygienic habits [16, 31]. The studies revealed erosive lesions to appear more often in anorectic patients (with restrictive anorexia) than in bulimic ones or those with bulimic anorexia, i.e. in those patients who vomit, but at the same time more often than in healthy individuals [14, 16, 31].

Early erosive lesions are manifested by tooth morphology loss and enamel smoothing. Silky, smooth, shiny pits and depressions appear. A characteristic feature is a preserved healthy enamel margin near the gum line on the palatal, buccal and labial surfaces. This phenomenon is explained

by the presence of a gingival fluid which neutralizes acids. In a more advanced stage (enamel loss < 50%), clinical examination reveals a yellowish dentine that is visible from under a thin layer of enamel or is completely exposed in some areas. Loss of crown contour and shape is observed. Chewing surfaces of the molars and premolars are flat, with fissures and cusps leveled. If the enamel loss is very advanced (> 50%), dentine is also involved in the erosive process and the pulp may be visible from underneath. If an affected tooth has been filled, after some time the filling protrudes above the surrounding dental tissues [23].

Acids have an impact on hard dental tissue loss, which may lead to a patients complaining of teeth hypersensitivity [23, 32]. In the studies by Jugale et al. [32] 56% of patients with eating disorders reported such complaints and only 21% did so in the control group. Johansson et al. [15] showed 22% of eating disorders sufferers to complain of teeth hypersensitivity a few times per week and 13% to experience it every day. In the control group the values were 7% and 6%, respectively. In the studies conducted by both authors these differences were statistically significant.

Dental decay belongs to the diseases affecting hard tissues of teeth in patients with eating disorders. In the studies by Jugale et al. [32] the percentage of patients with eating disorders affected with dental caries amounted to 78%, while in the control group the result was 55%. Similar numbers were reported by Hermont et al. [19]. In their studies the incidence of caries in eating disorders sufferers was 80%, and in the control group 51.3% [19]. In both cases these differences were statistically significant.

Caries severity expressed as the average DMF value in the studies by Ohrn et al. [33] in patients with eating disorders was 15.3 and significantly statistically exceeded the values obtained from healthy individuals, where it amounted to 10.9. Philipp et al. [34] obtained different values. In their studies the average DMF number was significantly statistically lower in patients with eating disorders and amounted to 11.3, 14.2 and 15.3 in anorectic, bulimic and healthy individuals, respectively [34]. However, Johansson et al. [15] did not note statistically significant difference in the values of DMFt and DMFs between people with eating disorders and the healthy ones. The quoted data shows the development of caries to be multifactorial. Dietary and hygienic habits, the amount and quality of secreted saliva, and applied drugs are important factors. The susceptibility of hard dental tissues is also a contributing factor [31, 33, 34].

In people presenting eating disorders hard dental tissue diseases, especially dental erosion, result in changes in teeth morphology – their shape, size, color. Moreover, due to tissue loss the teeth become thinner and more transparent.

Erosion etiology is multifactorial; repeated vomiting as well as hygienic and dietary habits have to be considered, too. Dental treatment requires a multipronged approach, including conservative and prosthetic measures. Still, the essential element of management is prevention aimed at maintaining full and healthy dentition. Prevention of erosion involves, on the one hand, professional prophylactic procedures, and, on the other, education and promotion of proper health behaviors, especially in patients prone to disease. It has to be emphasized that dental treatment alone, unsupported by psychiatric therapy, will not bring about the desired effect. Therefore, implementation of health care of patients combined with eating disorders seems necessary.

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Address for correspondence:

Tamara Pawlaczyk-Kamieńska
Department of Paediatric Dentistry
Poznan University of Medical Sciences
Bukowska 70
60-812 Poznań
Poland
E-mail: tamara_pawlaczyk@wp.pl

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