Bulimia and Oral Erosion: Dental and Periodontal

Emi See[1] and Jalyn Huang[2#]

[1] William G. Enloe High School
[2] Irvine High School
[#] Advisor

ABSTRACT

This article discusses the eating disorder bulimia nervosa, characterized by alternating behaviors of binging and purging, and its relation to dental and periodontal erosion. Bulimia can cause a multitude of consequences, such as reproductive issues, GI tract issues, and more widely established dental issues. Vomiting is the most common method of purging and involves exposure of multifunctional appendages (teeth) to highly corrosive and acidic gastric acid. Both dental and periodontal erosion are a result of oral tissue, such as enamel and dentin, wearing down from contact with acidic substances. Additionally, erosion can occur from the consumption of highly acidic foods, abrasive tooth brushing behavior, and improper cleansing after emesis. Erosion can increase dental hypersensitivity which impacts eating and drinking. Emphasizing oral health among bulimic patients can allow bulimic patients, friends, family, and health care providers to understand the weight of the consequences of this disorder. Patients need to be encouraged to seek remission and those that are close should aid them in doing so to remind them they don't have to struggle alone. Bulimia doesn't just aggravate mental health, it deteriorates an individual's physical well-being and quality of life as well.

Introduction

Eating disorders are a mental health disorder characterized by a series of disturbances in eating behavior that adversely affects an individual's physical, psychological, and social function. Impacting over 9% of the United States population (Bunnell), anyone of any sex, ethnicity, race, and age can develop an eating disorder. Tragically, they are typically common among women aged 12 to 35 (Guarda). However, there isn't a definitive cause for developing an eating disorder. It is believed that genetics, other mental health conditions such as anxiety or depression, and biological factors could contribute to the development of this disease (Mayo Clinic). Symptoms present themselves in several different ways including: anorexia nervosa, binge eating disorder, avoidant restrictive food intake, pica, rumination disorder, and bulimia, which this article focused on. Common indications of eating disorders are skipping meals and making excuses to not eat, strange diets not prescribed by any healthcare professional, eating in secret, social withdrawal, feeling guilt or shame when talking about eating habits, and tooth enamel problems.

Bulimia, also known as bulimia nervosa, is an eating disorder that involves repeated intake of large amounts of food, then forcefully purging immediately after (Cleveland Clinic). Individuals have a hard time controlling their eating habits, binge uncontrollably, and then feel extremely guilty afterwards. This disorder has significant negative effects on body image/dysmorphia, self-esteem, and physical health. Accounting for 1%-2% of the population, bulimia is a more common occurring disorder. Common symptoms include being unable to control binges, being scared of gaining weight, and extreme mood swings. Additionally, forceful purging takes a large toll on physical health. The reason for this is the desire to get rid of all the calories from the binge. Purging is often done through induced vomiting, abuse of laxatives/diuretics, or excessive exercise.

Along with poor mental health, bulimia causes other complications that affect daily life. Poor dental health is a major complication, as it is a result of recurrent vomiting from purging. Vomit is known to be extremely acidic and can eventually degrade the tooth enamel due to frequent exposure (Paryag and Rafeek). Dental erosion is the loss of enamel caused by acidic substances not involved bacterial origin (ADA). Periodontal erosion is the degradation of the periodontium: tooth socket, periodontal ligament, cementum, and gums–all components essential to tooth structure and health. These effects combined can lead to a numerous amount of oral diseases and poor oral health in general. This review will establish the specific consequences and relationship of periodontal and dental erosion in bulimic patients, and further complications that may occur. Addressing the multitude of complications resulting from bulimia may help develop therapies to help individuals overcome this mental disorder and encourage patients to seek help and recovery.

Bulimia and the Mouth

Bulimia Nervosa, more commonly known as bulimia, is an eating disorder characterized by a series of binging and purging right after. Purging consists of self-induced vomiting and can have large impacts on dental health. This disease and bodily structure are interrelated in which the progression of one helps with the degradation of the other.

Evaluation of Bulimia

According to the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders) from the American Psychiatric Association, bulimia is diagnosed as a recurrent episode of uncontrollable binge eating along with the compensatory behavior of purging to prevent weight gain. This differs from another eating disorder: anorexia. Patients are prone to fluctuating weight more often than being underweight due to alternating between binging and purging (Harrington et al.). The severity of bulimia is determined by the amount of episodes that occur per week: mild (1-3 episodes), moderate (4-7 episodes), severe (8-13 episodes), and extreme (14 or more episodes) (Hay and Claudino). The lifetime prevalence, or amount of individuals that have experienced this disorder in their lifetime, of bulimia nervosa ranged from 0.3% to 4.6% in females and 0.1% to 1.3% in males in 2018. Moreover, there has been a decline in incidence for bulimia as well (Van Eeden et al.). Bulimia has been associated with obesity that can be linked to heredity, overvaluation of shape and weight, and psychiatric comorbidities and psychopathologies (Wilfley et al.). However, bulimia is often more difficult to identify because patients are typically at a normal weight and hide their binging and purging behavior (Hay and Claudino). Bulimic patients sometimes have a history of anorexia, or alternate between anorexia and bulimia (Hay and Claudino). Additionally, its prevalence in communities are often underestimated because of a lack of patients attempting to receive help influencing methodological problems regarding epidemiological research of eating disorders (van Eeden et al.).

Dental Anatomy

As emesis occurs, the teeth are always and immediately exposed to the acidic stomach contents. Understanding the anatomy of teeth can help them understand the severity of the consequences, conceptualize the impact it might have on the individual's daily life, and treatment of the resulting exposure.

Teeth are calcified structures found in the oral cavity and are multifunctional appendages (Morris and Tadi). However, they are not classified as bones solely because they do not have marrow; they lack osteoclasts and osteoblasts that aid in bone regeneration (Dimitriou et al..). Consequently, natural teeth regeneration of adult teeth is not possible, however there have been attempts to overcome this by stimulating dental pulp and using biologically based therapy methods (Zhang and Yelick).

Humans have two generations of teeth: 20 primary teeth and 32 adult teeth. The teeth are attached to the upper jaw (maxilla) and the lower jaw (mandible), characterized by four different tooth classes: incisors, canines, premolars, and molars. The anatomy of the tooth is divided into the crown and root. The crown is the visible portion of the tooth. The crown has five surfaces: facial surface for incisors and canines or buccal surface for premolars and

molars; palatal in the maxilla and the lingula in mandible; mesial, closer to the midline of the face, and distal, away from the midline; occlusal which is the biting surface. The enamel, the hardest tissue in the body, is a protective covering for the crown. The root of the tooth is embedded into the alveolar process, the bony ridge in each jaw that contains sockets, and attached by the periodontal ligament. The roots of the tooth are different depending on the type of tooth. For example, molars have three roots: lingual, mesiobuccal, and distobuccal. Cementum, a mineralized tissue layer, covers the root of the tooth.The gingiva, the tissue that surrounds the teeth, covers the border of the alveolar process. The cementoenamel junction is the boundary between the enamel and cementum. The tooth is made of layered specialized tissue: enamel, dentin (makes up the core), pulp (specialized tissue at the core that contains neurovascular structures), and the cementum (Morris and Tadi).

Not only do teeth play a vital role in the digestive system (Cleveland Clinic), they aid in speech and facial aesthetics (Morris and Tadi). Deterioration of these appendages from dental diseases can impair the ability to gain proper nutrients as well as decrease confidence. Oral health tends to be neglected by those with mental health conditions as well (Kisely).

Other implications/clinical signs

As mentioned previously, bulimia nervosa can result in a multitude of complications, including oral health conditions. Mehler and Rylander's article includes the implications, as well as the consequences, that gave rise to them. Self-induced vomiting gives rise to many of the complications. First, cutaneous manifestations. This is often initiated by forcefully stimulating the gag reflex with the fingers. This repetitive action of the hands into the mouth is evident through trauma and skin abrasions on the hand, forming calluses known as Russell's sign. Another sign resulting from recurrent episodes of self-induced vomiting is subconjunctival haemorrhage, where red patches are visible on the whites of the eyes. Acid reflux damages areas in the throat which include the esophageal sphincters and the laryngopharyngeal reflux. Moreover, throat examinations of eight bulimia patients demonstrated the following: "post cricoid edema, vocal fold edema, thick mucus covering the larynx, posterior commissure hypertrophy, ventricular obliteration, telangiectasia and polypoid changes" (Mehler and Rylander). Patients who induce vomiting will also experience gastrointestinal issues such as gastroesophageal reflux (GERD), when stomach acid flows back up into the esophagus causing heartburn (Mayo Clinic); dysphagia, difficulty swallowing; and odynophagia, painful swallowing. Repeated abnormal exposure to acidic gastric contents can cause microtrauma to the esophageal epithelium. Other conditions include esophageal erosion and ulcers; Barrett's esophagus, a change in mucosal lining type; Boerhaave's syndrome, esophageal rupture, though it is a very rare and acute consequence of self-induced vomiting. Repetitive vomiting can lead to dehydration and chloride depletion, which can result in another phenomenon known as pseudo-Bartter's syndrome (Bahia et al.). Those who vomit excessively will have abnormal serum electrolytes. Dehydration can also result in exertional sinus tachycardia, fast heartbeat; hypotension, low blood pressure; orthostasis, sudden hypotension. Bulimia has also been associated with an increased risk of miscarriages (Mehler and Rylander).

The use of laxatives is the second most commonly used way of purging and can give rise to similar symptoms. The medical complications resulting from laxative abuse can be separated into two main categories: effects on the gastrointestinal system and hypovolemia and effects due to electrolyte disturbances. Gastrointestinal impacts include melanosis coli, dark mucosal pigmentation in the inner lining of the colon (Cleveland Clinic) which is thankfully not an indication of significant pathophysiological consequences, cathartic colon, a significant condition that involves the loss of normal colonic peristalsis, and functional impairment. The hypovolemia and electrolyte disturbances develop as a result of the diarrhea and the body's compensatory mechanisms from laxative abuse.

Erosion

One of the significant and typically first observed indicators of bulimia is poor oral health, which can be specifically attributed to the erosion of the teeth and other anatomical aspects of the mouth (Nijakowski et al.). Oral health

providers play a unique role in identifying and treating patients with eating disorders (Rangé et al.). Using this as an indicator can prevent the further and more severe progression of these eating disorders.

Periodontal Erosion

Periodontal erosion, or more commonly known as gum recession, is when the gum tissue pulls away from the teeth, exposing the root (Seong et al.). The cementum, dental tissue that is much weaker than enamel, is quickly denuded when vulnerable to the oral environment. Dentin is subsequently exposed and may become sensitive to an acidic environment which is described as sharp pains. Gingivitis and periodontal disease may result from repeated exposure to gastric acid as well (Mehler and Rylander). In bulimic patients, this is exacerbated from the exposure of gastric acid through induced-emesis (Rosten and Newton). This can have a negative impact on quality of life, and affects eating and drinking (Seong et al.). Individuals with dental hypersensitivity and gingival recession are susceptible of tooth wear as well, with 29% of individuals experiencing this (Seong et al.). Individuals with eating disorders experience periodontal diseases more often than healthy patients likely due to an unbalanced diet, traumatic habits, hyposalivation, and poor oral hygiene (Rangé et al.). Vitamin C deficiency may result in marginal gingivitis and periodontal health may be affected by a micronutrient deficiency (Hasan et al.).

Periodontal erosion or gingival recession occurred among 43% of patients with eating disorders (Rangé et al.). Rangé et al. also states that periodontal impact is due to abrasive behavior related to compulsive teeth brushing after purging, which indicates some evidence towards bulimic patients. Brushing after vomiting is not recommended as it can result in acid erosion and strips the tooth's outer layer (Nijakowski et al.). They also establish a relation between dental and periodontal erosion: repeated episodes of vomiting initiates gingival recession on the palatal surfaces on the maxillary teeth by aggravated dental erosion.

Unfortunately, there has yet to be conclusive studies done to confirm the relationship of periodontal erosion explicitly to bulimic patients. This does not mean to completely disregard periodontal lesions as a consequence of bulimia, but further evidence and research must be put in to verify these claims. Moreover, many of these reviews and studies often did not differentiate anorexia and bulimia making it difficult to determine whether a consequence is a hallmark of bulimia or anorexia.

Dental Erosion

On the contrary, dental erosion is more widely associated among patients with eating disorders. It is the progressive loss of hard dental tissues, such as enamel, by chemical processes not involving bacterial action (Paryag and Rafeek). Erosions are typically localized to the palatal surface of the incisors (Rangé et al.), as the mandibular teeth are somewhat protected by the tongue from gastric acid exposure (Mehler and Rylander). Paryag and Rafeek's etiological overview of dental erosion state that erosion occurs from exposure to acidic substances. Frequent vomiting often results in higher odds to manifest erosive lesions (Nijakowski et al.). They list three types of erosion and their respective causative factors. First, regurgitation erosion which is an occurrence from gastrointestinal problems. It involved the regurgitation of hydrochloric acid from the stomach, a very strong and corrosive acid (NIH). These problems can be involuntary, voluntary, or patient-induced as seen in bulimia nervosa. Second, dietary erosion from the high consumption of a variety of acidic food and drinks. Foods such as soft drinks, pickles, dressings, and preserves can contribute to dietary erosion. This is prevalent among bulimic patients, as they tend to binge on foods of high caloric content (Mehler and Rylander). Third, environmental erosion from acidic environments for work or leisure. Dietary erosion can be attributed to environmental erosion as well. Bulimic behaviors from purging and binging produce a synergistic effect that exacerbates the severity of dental erosions and oral health issues (Mehlher and Rylander).

A study by Uhlen et al. found that out of a study among 66 patients that were or had experienced self-induced vomiting, 19 had enamel lesions and 27 had both enamel and dentine lesions. They also found that intrinsic erosion from gastric acid has greater erosive potential than dietary erosion. It has a pH of 1.5 (Rangé et al.). However, one-third of the participants in this study did not show any erosive lesions despite regular puring. This goes to show that dental erosion is a sign of bulimia nervosa, but is not a direct consequence. However, another

study found that there was a lower incidence of erosion among bulimic patients than anorexic patients because they were more likely to adopt proper dental hygiene practices (Nijakowski et al.).

Many of the studies addressing bulimic dental erosion reiterate the same information, which provides little room for nuance. However, this goes to show how well established dental erosion is in relation to bulimia nervosa and consider an indicator to look out for when examining possible patients of bulimia.

Treatment

Addressing treatment methods for bulimia can emphasize which options are more effective than others and allow rethinking of other treatment options.

Therapy

Cognitive behavior therapy (CBT), a type of therapy that guides patients into addressing unhealthy behaviors or thoughts that are contributing to their current condition (APA), is currently the top choice for treatment of eating disorders; among a study with 1828 patients CBT was found to be the most effective at achieving remission (Slade et al.). Another study found that 44% of bulimic patients stopped purging after two years from CBT while only 15% stopped from psychotherapy (Stig et al.). Subsequently, another study found that psychotherapy is more effective than behavioral therapy for bulimia and leads to a more favorable outcome (Hay et al.). Psychotherapy is another form of therapy where the patient is encouraged to communicate with a professional where their problems are identified (Cleveland Clinic).

Self-management

Some may not have access to a health care provider. Self-practices can be implemented to decrease the severity of tooth erosion. However, it is better to seek recovery rather than using methods that may promote bulimic behavior. To prevent dental erosion after vomiting, patients should rinse their mouths with water to neutralize the newly created acidic environment. Additionally, patients should neutralize their stomach acid with water or antacids after vomiting (Nijakowski et al.).

Dental

Treatment includes addressing dental sensitivity, tooth loss from erosion, and consultation of proper brushing techniques (Rangé et al.).

A study follow-up on anorexic and bulimic female patients 22 years later found that ⅔ of them recovered (Keel et al.). A more holistic approach may need to be taken to ensure recovery for more individuals.

Conclusion

Periodontal and dental erosion can be a direct consequence of the exposure to highly corrosive gastric acid in bulimic patients as a result of purging. The acidic environment is shown to degrade essential tissue layers such as enamel and dentin, exposing vulnerable layers of the tooth to the acidic environment. However, erosion isn't always a direct result of bulimia or self-induced vomiting. Though closely related to one another, future studies need to distinguish the consequences of anorexia and bulimia. Additionally, different methods of gathering and studying cohorts of bulimic patients need to be established to gather accurate results and encourage more research on oral repercussions from eating disorders.

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