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ABSTRACT

Aim: To review the main psychological and mental conditions that are manifested dentally in the form of tooth wear. These conditions include depression, eating disorders, and alcohol and drug use disorders. The paper will also review the comorbidity of these conditions and the relevance of other medical conditions and lifestyle factors, such as gastro-esophageal reflux disorder, smoking and diet, in the expression of tooth wear. Conclusion: A holistic, multidisciplinary, healthcare approach is required in management of tooth wear patients with underlying mental health disorders. Dentists and Dental Care Professionals can have an important role in identifying these mental disorders through the observed tooth wear. They can also play a key role in monitoring patients' response and compliance to medical treatment through the monitoring of tooth wear progression and expression.

KEY WORDS: depression, eating disorders, alcohol abuse, addiction, tooth wear, bruxism, erosion

The psychology of tooth wear

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Introduction

Tooth wear, also referred to as tooth surface loss (TSL) or non-carious TSL, has been defined as the "pathological loss of tooth tissue by a disease process other than dental caries".[1] The etiological factors of tooth wear include attrition, erosion and/or abrasion. Attrition is tooth structure loss due to tooth–tooth contact, while erosion is TSL due to chemical/acid action from intrinsic and/or extrinsic factors and abrasion is caused by physical wear from factors other than tooth–tooth contact.[2-8] It is estimated that the percentage of adults presenting with severe tooth wear increases from 3% at the age of 20 to 17% at the age of 70.[9,10]

Although tooth wear can have detrimental dental effects, yet it can also serve as an important screening and diagnostic criteria for identifying a number of mental and psychological conditions and disorders.[11-15] Mental health is a serious issue, with stress, anxiety and depression accounting for the loss of 56 million working days in the UK due to sickness absences at an estimated cost of £4.1 billion.[16] Across Europe, the UK has the highest prevalence rates of common mental disorders among general practice attendees, at 18.8% for men and 18.2% for women.[17] Furthermore, according to the 2007 Adult Psychiatric Survey of England, covering 13,171 households, 15.1% of interviewed adults demonstrated clinically significant neurotic symptoms in the week prior to the interview.[18] Dentists and Dental care professionals (DCPs) have a key role in identifying certain mental conditions and managing/referring them to the appropriate healthcare professional/s. This role can be achieved through the successful diagnosis of the etiology underlying the observed tooth wear, which in many cases is mentally or psychologically derived.

The aim of this paper is to review the main psychological and mental conditions that are manifested dentally in the form of tooth wear. The paper will also review the comorbidity of these conditions and the relevance of other medical conditions and lifestyle factors, such as gastroesophageal reflux disorder (GORD), smoking and diet, in the expression of tooth wear.

Depression

The World Health Organization (WHO) in the International Classification of Diseases (ICD-10) defined depression as a mental disorder characterized by a depressed mood, loss of interest and enjoyment, and reduced energy leading to increased fatigability and diminished activity.[19] Other common symptoms of depression include: reduced self-esteem and self-confidence, ideas of guilt and unworthiness, ideas of acts of self-harm or suicide, disturbed sleep and diminished appetite. On the other hand, stress is defined as any threat to the homeostasis of an organism, whether it is physical, psychological, environmental, or derived from within the individual.[20] Moreover, stress can be a predisposing factor of depression through depletion of serotonin, dopamine and norepinephrine.[21,22]

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It is estimated that 9% of British adults suffer from mixed anxiety and depression; making it the most commonly diagnosed mental disorder in the UK.[18,23] Eleven percent of the Scottish population aged 15 and overuse antidepressants on a daily basis.[24] Depression has a high recurrence rate with 50% of depression patients suffering from a second major episode.[25] Furthermore, 50% of patients initially diagnosed with depression had a persistent diagnosis of the condition 1 year later.[26] There is also evidence to support an association between stress, depression and GORD. A study of 4600 participants demonstrated a significantly higher prevalence ($p < .001$) of anxiety, depression and hostility in participants with GORD symptoms versus those without.[27] The results of this study agree with those obtained by others.[28-31] Furthermore, 30% of people with depressive episodes experience lifetime alcohol use problems[32] and are twice as likely to smoke compared to those without any neurotic disorders.[33]

Tooth wear and depression

Studies have demonstrated an association between depression, stress, anxiety, and tooth wear. A cross-sectional survey of 13,057 participants in the UK, Germany, and Italy reported that participants who suffered from anxiety, stress, smoking, and heavy alcohol drinkers were at a higher risk of reporting sleep bruxism with 8.2% of participants grinding their teeth at least weekly.[34] Another study involving 1784 participants, aged between 30 and 55 years, examined the relationship between reported bruxism and stress experience using questionnaires.[35] The study demonstrated a significantly positive association between bruxism and severe stress experiences. Psychosocial job stress, low social support from supervisors or colleagues and high-depressive symptoms demonstrated a significantly increased risk of bruxism in a study involving 2680 participants.[36] These findings tend to agree with those of other studies demonstrating a significant association between tooth wear, depression, stress, and emotional stability.[14,37-42]

Table 1. Main mental health disorders, potential comorbidity factors and resultant signs of tooth wear expected.

Mental Disorder	Comorbidity	Tooth wear signs
Depressive disorders	• GORD	◦ Primary: attrition
	• Alcohol	◦ Secondary: intrinsic and extrinsic erosion
	• Smoking	
Eating disorders	• Depression	◦ Primary: intrinsic erosion
	• Alcohol	◦ Secondary: attrition and extrinsic erosion
	• Smoking	
	• Drug use	
	• Acid-rich diet	
Alcohol use disorders	• Depression	◦ Primary: extrinsic erosion
	• GORD	◦ Secondary: attrition and intrinsic erosion
Drug use disorders	• Depression	◦ Primary: attrition
	• Alcohol	◦ Secondary: extrinsic erosion
	• Acid-rich diet	

There is an evident comorbidity between depression, GORD, alcohol abuse and smoking, with tooth wear being one of the main dental manifestations of such disorders (Table 1).

GORD is often first diagnosed by dentists through observation of tooth wear.[43,44] A systematic review of the existing literature was carried out to assess the relationship between GORD and dental erosion.[45] The review concluded that dental erosion was present in 5–47.5% of GORD patients. Research has also demonstrated that nocturnal bruxism can be secondary to acid reflux episodes.[46-48] There is also some evidence supporting an association between GORD, alcohol intake and smoking.[49,50] Furthermore, nicotine-intake is significantly associated with bruxism, with bruxers twice as likely to report heavy smoking.[51,52]

Eating disorders

The two main eating disorders (ED) of importance to dentistry are anorexia nervosa and bulimia nervosa. According to the ICD-10, anorexia nervosa is a disorder characterized by deliberate weight loss, induced and/or sustained by the patient and occurring most commonly in adolescent girls and young women.[19] The ICD-10 further states that one of the definitive diagnostic criteria for anorexia nervosa is the presence of a body-image distortion in the form of a specific psychopathology. There may be associated depressive or obsessional symptoms, as well as features of a personality disorder. On the other hand, bulimia nervosa is a syndrome characterized by repeated bouts of overeating and an excessive preoccupation with the control of body weight, leading the patient to adopt extreme measures to mitigate the "fattening" effects of ingested food. Bulimia nervosa shares the same psychopathology, age and sex distribution as anorexia nervosa, but the age of presentation tends to be slightly older.[19]

In the UK, anorexia nervosa is reported to affect 1.9% of women and 0.2% of men, and 0.5% and 1%, respectively, for bulimia nervosa.[53] The most common comorbid psychiatric condition in ED is major depression.[54-56] Moreover, the average number of weekly vomits of 371 ED patients was reported to be between 5.13–9.17 times per week, with 26.3–35.2% of ED patients reporting drug/substance abuse.[57] High rates of alcohol use disorders, smoking and

nicotine dependence are prevalent among ED patients.[58-62] Furthermore, a study of 78 ED patients and 32 healthy controls demonstrated that ED patients consumed on average between 16.3–39.5 cans of diet beverages per week compared to 7.4 cans for healthy controls.[63]

Tooth wear and eating disorders

Dental erosion can be frequently encountered in ED patients. It is estimated that between 35–38% of ED patients suffer from tooth erosion.[64,65] A matched case-control study comparing the oral health of 54 ED patients and 54 healthy participants, matched for gender and age, demonstrated that the prevalence of severe tooth wear was significantly higher (p = .005) in ED patients at 38% compared to 11% of controls.[66] Tooth wear is particularly evident on the palatal surfaces of anterior and posterior teeth[67,68] and is caused by the purging behavior of gastric acidic contents[69,70] and the elevated consumption of acidic carbonated drinks to boost energy or decrease the reflex hunger stimulus.[71-73] The association between ED, alcohol consumption, drug use and smoking can further exacerbate tooth wear. The psychological stress, high comorbidity of depression in ED and smoking can trigger bruxism, as previously discussed.[14] The association between alcohol, drug use and tooth wear will be discussed later in this paper.

The chances of dentists and DCPs coming across ED patients are quite high,[74] hence they have a crucial role in identifying ED patients and appropriately managing them. On the other hand, a study involving 202 dentists and 367 dental hygienists, demonstrated low scores concerning knowledge of oral and physical cues of anorexia and bulimia among study participants.[75] More dental hygienists than dentists correctly identified oral manifestations of ED (p = .001). Additionally, female dentists tend to have greater knowledge of oral manifestations of ED compared to male dentists (p = .001).[76] Eighty six percent of dentists reported that they needed more training in dental management of patients with ED, according to a study involving 258 dentists.[77]

Alcohol use disorders

The WHO adopted the term '*alcohol use disorders*' to denote mental, physical and behavioral conditions of clinical relevance associated with the use of alcohol.[78] Alcohol use disorders include acute intoxication, harmful use, dependence syndrome, withdrawal syndrome, psychotic disorders and amnesic syndrome. Disorders of special interest are: harmful use and dependence syndrome. Harmful use is defined as a pattern of use that causes damage to health whether physical or mental. On the other hand, dependence syndrome is a cluster of psychological, behavioral and cognitive phenomena in which substance use (such as alcohol or psychoactive drug use) takes a higher priority than other behaviors despite harmful consequences.[19]

According to the Prime Minister's Strategy Unit interim analytical report of 2003, it is estimated that in Britain there are 1.8 million people who are very heavy consumers of alcohol, at 50 units for men and 35 units for women per week.[79] The report also estimated that 7% of Britain's adult population is alcohol dependent. A quarter of British adults (26%) were assessed as being harmful/hazardous alcohol drinkers.[23]

Furthermore, alcohol dependency was associated with neurotic symptoms, major depression and GORD. Neurotic symptoms are present in 30% of those with an alcohol dependency syndrome.[33] The presence of an alcohol use disorder doubled the risk of presence of major depression.[80] Similarly, GORD symptoms are present in patients with alcohol dependency.[50,81]

Tooth wear and alcohol use disorders

Dental erosion is prevalent amongst patients with alcohol dependency and individuals with high wine consumption.[11,82] A study demonstrated that 49.4% of alcohol dependency patients undergoing rehabilitation suffered from enamel and/or dentine erosion lesions.[83] The tooth wear risk of alcohol use disorders arises, not only from the acidic erosive potential of alcohol, but also from the high comorbidity between alcohol, depression, GORD and smoking, as previously discussed.

Current practices and intentions to provide alcohol-related health advice in primary dental care were examined in a study that involved 175 General Dental Practitioners (GDPs) randomly selected from across Scotland.[84] The results of the study demonstrated that GDPs had relatively poor knowledge on recommended alcohol consumption guidelines and associated risk. Furthermore, GDPs demonstrated a low intention to provide alcohol related advice and exhibited a lack of positive attitude and efficacy towards delivering such advice.

Drug use disorders

The definition of drug use disorders have been previously discussed in reference to harmful use and dependency syndrome definitions, present in the WHO's ICD-10.[19]

In Britain, between 3.7–4% of the population is considered to be drug dependent.[23,33] The 2003, Prime Minister's Strategy Unit's Drugs report stated that the UK had over three million drug users.[85] The report estimated that, in England and Wales alone, there were over one million amphetamine and ecstasy users in the previous year, with half of them reporting use in the past month. Amphetamines, methamphetamines (MAP) and ecstasy (3,4-methylenedioxymethamphetamine, MDMA) are psychostimulant drugs possessing hallucinogenic and excitatory properties caused by their dopaminergic, serotonergic and adrenergic systemic effects.[86] Moreover, MDMA is frequently used in-combination with cannabis (71%), amphetamine (29%) or cocaine (25%).[87]

The comorbidity of drug and alcohol abuse, depression and EDs is well

documented. Psychiatric disorders are present in 45% of drug dependents.[23] The use of psychostimulants is significantly higher in EDs patients ($p < .001$) compared to healthy controls, at 17.2 and 6.2%, respectively.[88] MDMA users are at higher risk (53% of users) of developing psychopathological disturbances, with depression reported as the most frequent disturbance.[89] Furthermore, a study including 3503 participants reported that 66% of ecstasy users consumed alcohol in combination with MDMA.[87] Another study reported that 93% of MDMA users consumed a mean of three cans of carbonated drinks per "trip".[90]

Tooth wear and drug use disorders

A study of 301 MAP dependents demonstrated that 22% of them have been aware of bruxing behavior and tooth erosion for the past 6 years.[91] Furthermore, MAP users who snorted the drug had a significantly higher prevalence of tooth wear ($p = .005$) in their anterior maxillary teeth, when compared to users who injected, smoked or ingested the drug. MDMA users had a higher prevalence and severity of tooth wear (60%) when compared to nonusers (11%), with 93% of MDMA users reporting xerostomia and 89% of them reporting clenching or grinding after taking the drug.[90] The high consumption of carbonated drinks and alcohol (to combat dehydration) and bulimic episodes associated with drug use further compound the present tooth wear through the introduction of an erosive element.

Dental disease may provide a stable and specific medical marker for identifying MAP users, with dentists capable of participating in collaborative care of MAP users through early detection of drug-related oral/dental cues.[91]

Discussion

Patients with mental health disorders comprise a significant cohort of society that dentists and DCPs will frequently encounter in practice. The management of this patient cohort can be challenging, both medically and dentally. Dentists and DCPs can have an important contribution towards the well being of these patients through early identification of present oral manifestations, appropriate management of the patient and successive oral state monitoring.

Early identification emanates through knowledge and understanding of physical and oral/dental signs, with tooth wear being one of the major ones, of potentially underlying medical conditions. On the other hand, management of patients with mental health disorders can be challenging. Attempting to obtain an accurate patient history, to assist in identifying the underlying etiology, can be elusive and requires training. Hence, referral to an appropriate healthcare professional (General Medical Practitioner, Clinical Psychologist, Hypnotherapist, Psychiatrist, etc.) might be necessary for a definitive diagnosis and appropriate medical care. Furthermore, dental management can present its own challenges. Assessing and managing tooth wear falls under Primary Care provision as stated by the UK's General Dental Council's learning outcomes for registration, published in May 2011.[92]

On the other hand, patients with mental and psychological conditions can also fall under the provision of Special Care Dentistry according to the Joint Advisory Committee of Special Care Dentistry, as patients who have "*a physical, sensory, intellectual, mental, medical, emotional or social impairment or disability or, more often, a combination of a number of these factors*".[93]

Further complicating matters, many of these patients present with severe/advanced tooth wear requiring complex treatment plans and potentially a full-mouth rehabilitation approach. With the shortage of present dental literature related to rehabilitation of tooth wear of suitable scientific quality to be included within critical reviews, and the absence of documented outcomes of various tooth wear rehabilitation approaches,[94] a definitive treatment plan can be challenging and referral to Secondary/Specialist Care becomes inevitable. As a result, a clear and definitive dental care pathway for tooth wear patients with mental health disorders seems to be lacking.

Finally, dentists and DCPs can assist in monitoring patients' response and compliance to undergoing medical treatment/therapy through routine monitoring of tooth wear progression. This can be accomplished through the use of dental casts and intraoral clinical examination to identify the rate of progression of tooth wear. Moreover, recent advances in 3D scanning technology can offer an early and accurate means of monitoring tooth wear.[95]

Conclusion

A holistic, multidisciplinary, healthcare approach is required in management of tooth wear patients with underlying mental health disorders. An understanding of these disorders would enable dentists and Dental Care Professionals (DCPs) to identify them through the observed tooth wear and diagnosis of the wear's underlying aetiology. Appropriate management of this significant patient cohort, through treatment and/or referral, requires clarification. Dentists and DCPs can further play a key role in monitoring patients' response and compliance to medical treatment through the monitoring of tooth wear progression.

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Declaration of interest

The author declares that there was no conflict of interest present at the time of the undertaking of this review.

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