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REVIEW

Dental attrition: Importance, diagnosis, prevention, and management: A review

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Abstract

Background: The primary objective of this article was to provide a comprehensive overview of the recognition, diagnosis, and management of dental wear, a condition often overlooked in both public and professional discussions.

Materials and Methods: The PubMed (MEDLINE) database was used to identify full-text articles published over 10 years (2015-2025). Tooth wear OR tooth attrition were used as keywords. Finally, 31 articles with full text and the most relevant topics were selected and studied.

Conclusion: As tooth wear is common in both primary and permanent dentition, it is essential to emphasize the need for early diagnosis and comprehensive management through systematic monitoring, effective preventive measures, and targeted treatment interventions when required.

Keywords: Enamel, attrition; bruxism; prevention; tooth surface loss; tooth wear

Introduction

Tooth wear is a major cause of damage to hard dental tissues. While caries rates are declining, tooth wear is becoming more frequent and severe (1).

Tooth wear can compromise tooth structures through several mechanisms of enamel destruction. First abrasion, which is the process of enamel destruction through external factors, such as toothbrush bristles and abrasive foods. The second mechanism is attrition. Attrition is the natural process of tooth wear occurring from normal tooth contacts during chewing. Erosion is another process which is in fact the chemical dissolution of enamel caused by acids in sugary and acidic beverages and fruits. The last mode of wear is called abfraction, which is related to the flexing forces on teeth. These mechanisms contribute to the deterioration of tooth structure over time. They are often examined as separate categories, but they frequently interact. For example, attrition occurs from tooth-to-tooth contact during chewing, and abrasive materials can worsen enamel loss. Erosion and abrasion can further damage already compromised dentin. Tooth structure can also degrade due to influences beyond caries or trauma, affecting the enamel, dentin, or cementum surfaces (2-9).

Attrition is an age-related dental phenomenon that results in the gradual loss of tooth structure in both primary and secondary dentition due to contact between opposing teeth during normal chewing (10). It is characterized by irreversible, cumulative surface loss of mineralized tooth structure due to physical or chemo-physical processes unrelated to dental caries

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(3). A very common example of attrition among communities is bruxism, or involuntary teeth grinding, where mouthguards and stress management techniques can help preserve tooth structure (1,9).

Normal levels of attrition do not require any therapeutic intervention. However, if attrition progresses to a pathological degree, intervention is necessary (10,11). Thus, the awareness of dentists regarding the etiology, epidemiology, treatment, and preventive measures of tooth attrition is crucial for early diagnosis and prompt action, which are essential for preserving the integrity and function of the permanent dentition (7,8).

This article aimed to provide a review of tooth attrition, including its clinical and epidemiological aspects, the demographic groups most affected, prevention strategies, and management practices. Additionally, it will address the challenges in this field, drawing on insights from prior research to formulate effective approaches to dental care.

Method and materials

The PubMed (MEDLINE) search engine was used to retrieve information from full-text articles published over 10 years (2015-2025). The keywords “tooth wear” and “tooth attrition” were used for the search. Articles that had full text available and were deemed most relevant were selected for study.

Results

Finally, 31 articles with full text and the most relevant topics were selected and studied.

Attrition of Tooth Enamel

Attrition typically becomes more pronounced with advancing age, as enamel wears down over time from habitual use. When the extent of tooth wear becomes significant enough to compromise aesthetic appearance or impair functional efficacy, such as biting, chewing, or speaking, the process is deemed pathological and warrants clinical attention (12-15).

Etiology

Tooth structure can be lost after its formation by a variety of influences beyond caries or traumatic fractures (2). Several environmental and behavioral factors may accelerate attrition and contribute to the deterioration of dental structures. Examples of environmental and hereditary conditions are enamel hypoplasia, dental fluorosis, dentinogenetic imperfecta, and occlusal discrepancies such as edge-to-edge occlusion and premature contacts. Among Behavioral factors, excessive use of intraoral abrasives, such as certain toothpastes or dental hygiene practices, can also accelerate enamel erosion. Moreover, grinding habits, known as bruxism, can contribute significantly to tooth wear, leading to increased attrition rates (16). In a study by Kapagiannidou et al. (17), no association was found between sleep bruxism and attrition (17).

Some chemicals and medications can also accelerate dental wear. Acidic dietary substances and gastrointestinal reflux can further compromise enamel health. Certain medications may also have side effects that contribute to dry mouth, increasing the risk of tooth wear. Carvalho et al. noted that tooth demineralization caused by bacterial acids or acids in food can be inhibited by saliva bicarbonate, which increases saliva pH and buffering capacity. (18). Each of these contributing factors can profoundly impact oral health, leading to complications that necessitate professional intervention and management strategies to preserve tooth structure and maintain overall dental integrity under occlusal forces, which can lead to enamel loss, particularly in the cervical region. (3-8)

Epidemiology

A recent consensus among dental researchers indicates

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a concerning rise in tooth wear prevalence in the population. (9,12) This can be attributed to several factors, including increased awareness of the condition among dental professionals and a growing number of adults successfully retaining their natural teeth into advanced age, due to improvements in dental care and preventive measures. A notable increase in tooth surface loss has been documented among younger individuals, and it shows a positive relationship with body mass index and age, which experts attribute to dietary shifts toward more acidic foods and beverages (13).

Clinical features:

Both deciduous and permanent teeth are affected by attrition. It primarily impacts the surfaces of teeth that come into contact with opposing teeth during activities such as chewing. Most commonly, the incisal surfaces of anterior teeth and the occlusal surfaces of posterior teeth are prone to wear. While occlusal wear is physiological in the primary dentition, excessive tooth structure loss in the permanent dentition can cause aesthetic and functional impairment and is considered pathological (17).

Additionally, the lingual surfaces of the upper front teeth and the labial surfaces of the lower front teeth can also show signs of attrition. Wear caused by attrition results in large, flat, smooth, and shiny facets that reflect an individual's specific occlusal pattern. Interproximal contact points—where adjacent teeth meet—can be affected by the vertical movements of the teeth during functional activities like biting and chewing. Researchers believe men experience the highest severity of occlusal wear and have more affected teeth than women, possibly because they have stronger masseter muscles and generate higher bite forces. In a study conducted by Schmid et al. (19), molars showed approximately four times greater volumetric wear than premolars. This could be due to the higher morphological complexity of molar surfaces, along with the two times larger analyzed occlusal molar surface (19-22).

Symptoms

Physiological tooth wear is a gradual process that generally does not elicit subjective symptoms. However, if this condition progresses, it may develop into a pathological state with various signs and symptoms (1). In a study by Warreth et al. (23), it was noted that attrition may be associated with symptoms such as tooth hypersensitivity and functional impairment, and may lead to changes in the morphology of the affected tooth. However, it may also be asymptomatic, meaning the patient may not be aware of it. In this instance, the dentist is encouraged to inform the patient of this issue.

Over time, significant wear in interproximal areas can reduce dental arch length, potentially affecting overall dental alignment and aesthetics. Fortunately, pulp exposure and dentin sensitivity are uncommon with attrition, primarily because the gradual nature of tooth structure loss allows the pulp chamber to form reparative secondary dentin, providing additional protection to the nerves and blood vessels inside the tooth. In general, normal levels of attrition do not require any therapeutic intervention. However, should the attrition progress to a pathological degree resulting in substantial tooth loss or discomfort, intervention may be necessary. Early diagnosis and prompt action are essential for preserving the integrity and function of the permanent dentition, helping prevent further complications and maintain optimal oral health (23). Kalsi et al. (13) believe tooth wear has emerged as a prevalent condition affecting a growing number of individuals, leading to significant physical, mental, and emotional implications. Kanaan et al (24) and Daly et al (25) believe that although the prevalence of tooth wear was reported to be high, its severity and

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impact on quality of life were limited. Although Sambeek et al. showed that patients with tooth wear reported significant improvements in their quality of life and perception of orofacial aesthetics after restorative treatment (26).

Deepak et al. (14) have indicated that dental attrition is a significant clinical concern due to its pronounced association with temporomandibular joint (TMJ) disorders. The results of this study showed that although attrition is not a 100% reliable sign of TMJ dysfunction, a finite association was established between attrition and signs and symptoms of TMJ dysfunction. The repetitive trauma caused by habitual clenching and grinding, often referred to as bruxism, can lead to alterations in muscle activity and structural remodeling of the joints. Such changes may initiate a degenerative process that can adversely affect an individual's overall oral health. In the same study, no association was found between attrition with scalloped tongue, tooth chipping, or restoration fracture, and ridging of the buccal mucosa (14). But a consistent correlation of attrition with tooth sensitivity, pain in mouth opening, and masticatory muscle tenderness was revealed (14).

Prevention and Treatment

By recognizing and addressing the etiologic factors, maintaining regular dental check-ups, and using protective agents, it is possible to help prevent further enamel loss. Individuals can take meaningful steps to enhance their dental health and ensure the long-term resilience of their teeth (2). Before initiating any definitive interventions, it is imperative for clinicians to recognize that tooth wear is almost invariably attributed to multiple interrelated factors. Failure to identify the complex interplay among these pathologies may lead to inappropriate therapeutic strategies and unsuccessful repairs. Interventions should be oriented towards comprehensive diagnosis, the establishment of preventive measures, and the implementation of long-term monitoring protocols (27,28).

Treatment strategies focus first on tooth sensitivity and pain; however, it is equally important to identify the etiological factors contributing to tooth structure loss and secure the integrity of the remaining dentition. Warreth et al. (23) believe that a comprehensive social, medical, and dental history for the patient, along with a meticulous clinical examination, is necessary. Additional assessments, such as salivary flow rate measurements and radiographs, should complement this examination. Such thoroughness is essential for clinicians to gain an accurate diagnosis and an effective treatment plan. In certain cases, it may be prudent to conduct long-term monitoring before initiating invasive procedures. It is critical to ascertain whether the lesions are active, what the rate of progression is, and if the patient is symptomatic or concerned regarding the aesthetic aspects of their teeth. These considerations are of paramount importance and must be addressed before treatment. Sometimes referrals and collaboration with physicians may be imperative to identify and develop management strategies for underlying medical conditions related to dental wear (23,29).

Discussion

This review aimed to provide a review of existing articles on tooth attrition, including its clinical and epidemiological aspects, the demographic groups most affected, prevention strategies, and management. The early signs of dental wear can be quite subtle, leading to a general lack of awareness among patients and dental care professionals. Based on a thorough review of relevant literature, it is strongly recommended that all patients receive regular assessments by an oral health professional to identify early signs of tooth wear (30-32). These assessments

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should include documentation of findings and, when appropriate, the use of clinical imaging techniques to capture the extent of wear and facilitate informed treatment decisions. To evaluate the severity of these signs and symptoms, indices such as the Tooth Wear Index (TWI), the Basic Erosive Wear Examination (BEWE), and the Tooth Wear Evaluation System (TWES) have been proposed (1). In addition, educating patients about the potential causes and consequences of tooth wear plays an important role in effectively controlling and preventing severe tooth loss. In cases where patients have developed symptoms of sensitivity, pain, difficulty in mastication, or problems with appearance, restorative treatments become essential (33). These treatments aim not only to restore function and comfort but also to improve the overall appearance while preventing further loss of hard dental tissues and existing restorations (1). Although potential drawbacks associated with restorative procedures of tooth wear exist. Common complications include failure or fracture of dental restorations and the risk of damage to the underlying teeth. These factors must be carefully considered when discussing treatment options with patients, ensuring that they are fully informed about the possible outcomes and the need for ongoing maintenance.

Conclusion

Tooth wear, the gradual loss of tooth structure, is due to various factors, including mechanical abrasion, chemical erosion, and prolonged exposure to dietary acids (34-37). Therefore, it is essential to emphasize the necessity of early diagnosis and comprehensive management of tooth wear through systematic monitoring, effective preventive measures, and targeted treatment interventions when required.

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