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DEMINERALIZATION OF DENTAL ENAMEL

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Abstract: Teeth help a person use their mouth to eat, speak, smile and shape their face. Each type of tooth has a name and a specific function. Teeth are made up of different layers – enamel, dentin, pulp and cementum. Enamel, which is the hardest substance in the body, is on the outside of the tooth. The second layer is dentin, which is softer than enamel, and the deepest layer of the tooth is the pulp, which consists of nerves and blood vessels. Cementum is at the root of the tooth and is below the gums. Dental demineralization, also known as premature tooth aging, is a process characterized by the loss of calcium from the tooth. This mineral, which constitutes it, is responsible for giving hardness to the outermost layer of the structure, the tooth enamel. Dental demineralization is a condition that can occur in patients of all ages, whether children or even the elderly. The objective of this work is to review the literature on Dental Enamel Demineralization, emphasizing the etiology, consequences, and reporting how the process occurs, and possible interventions that serve to stop and slow down the process.
Keywords: aging, etiology, pulp.

INTRODUCTION

Dental enamel consists of a rigid, calcified tissue that protects and covers the teeth. It has its origin in the cellular activity of ameloblasts, which during the development period have a high metabolic sensitivity (DOS SANTOS, 2014). Tooth enamel is an unusual tissue that, once formed, does not undergo remodeling like other hard tissues. It is known that the formation of tooth enamel can be divided into three stages: the matrix formation stage, in which the proteins involved in amelogenesis are produced; the calcification stage, in which the mineral is deposited and most of the original proteins are removed; and the maturation stage, in which the newly mineralized enamel undergoes the final process of calcification, and the remaining proteins are removed (BARZOTTO; RIGO, 2018).

Enamel is a semi-permeable tissue, whose permeability decreases with age (NANCI, 2012). The cumulative presence of aggressive agents throughout life, capable of inducing macroscopic and/or microscopic changes in dental structures, culminates in the appearance of tooth wear, also evident in the enamel layer, which loses thickness, allowing more of the dentin color to show through, and causing teeth to gradually darken as we age.

Dentin is isolated from the external environment at the coronal level thanks to the enamel and, at the root level, by the dental cementum, and its function is to cover and protect the dental pulp. This dentin presents throughout its thickness a series of tubules that house the cytoplasmic extension of the cells responsible for its formation: the odontoblasts (SIMANCAS, 2019).

Enamel hypoplasia can then be defined as an incomplete or defective formation of tooth enamel, that is, a deficiency in the quantity and quality of enamel. It can range from white spots to discoloration of the teeth, ranging from yellow to dark brown (SOUZA, 2009).

Therefore, the present work aims to elucidate a literature review, in addition to bringing out the characteristics of changes in tooth enamel, highlighting the importance of the knowledge of the dentistry professional in the differential diagnosis of these, so that they can carry out appropriate treatment. Thus contributing to the quality of dental elements.

METHODOLOGY

The present work is a literature review study related to the topic of tooth enamel demineralization, with the aim of demonstrating how to diagnose, prevent and treat cases of tooth enamel demineralization. For this, articles published between 2008 and

2023 were used, using the Scielo and Google Scholar databases, in addition to the use of some bibliographies on the topic and dental reference websites. The key words used for the search were: "premature oral aging", "non-carious lesions", "bruxism", "gastroesophageal reflux trauma", "eating habits" "psychiatric disorders", references were selected in relation to their titles and their relevance to the topic, therefore, after a detailed analysis of these references, those with full text and greater relevance in relation to Dental Enamel Demineralization were chosen. Where 46 references were selected, which fit the requirements for this work.

LITERATURE REVIEW

WHAT IS PREMATURE AGING OF TEETH

Oral Premature Aging Syndrome "SEPB" is a multifactorial disease that has been affecting many people around the world. As it is a disease free from carious bacteria, the dentist needs very comprehensive knowledge and must avoid the dental box and not check only what happens in the patient's oral environment but analyzing it as a whole. The main factors that dentists must evaluate are: non-carious lesions, occlusal trauma, psychiatric trauma, bruxism, provoked or unprovoked gastroesophageal reflux, smoking, diet, eating habits, among others. Therefore, the dentist must evaluate the patient in general, collecting data on how he lives, how he eats, how he sleeps, among others. Therefore, the diagnosis must involve several areas of the patient's health and personal health and not just the dental area (SOARES et al., 2023).

The syndrome causes the individual to have an oral age greater than their chronological age, this can bring an aged appearance not only to the teeth, but also, often to the patient's face as a whole, which can also cause other oral diseases and extraoral, such as poor articulation and psychological damage (RIBEIRO, 2021).

Dental aging is natural for human beings, due to the natural aging of the body, but when there is premature oral aging we have a syndrome, which must be diagnosed and treated for the cause, not only of the teeth, this must occur as soon as possible. possible (CARVALHO et al., 2022). Always remember that it is not enough to just treat teeth but to identify and treat the causes of premature oral aging, otherwise it is very likely that dental treatment will not be effective in the long term (SOARES et al., 2023).

ETIOLOGICAL FACTORS OF PREMATURE AGING OF TEETH

NON-CARIOUS CERVICAL LESIONS

According to KINA et al., 2015, cervical lesions are characterized by the gradual loss of mineralized tissue in the cervical region of the tooth, as long as it is associated with some factors involving bacteria, in addition, its etiology is multifactorial and can originate from mechanical actions and chemical corrosion that affect enamel or dentin. These lesions do not have a correct predilection, they can affect young and old people due to their etiology being multifactorial, generally manifesting mainly on the cervical third of the buccal surface of all teeth, being mostly found on the buccal surface of the posterior and lower teeth..

According to AMARAL et al., 2012, anyone who has natural teeth can develop signs of dental wear, but many patients are unaware of its consequences until an advanced stage is reached. Most researchers believe that the prevalence of tooth wear is increasing due to greater awareness among clinicians and the maintenance of natural teeth due to an acidic diet. (AMARAL et al., 2012; MALTAROLLO

et al., 2020).

The authors KINA et al., 2015, comment that one of the best treatments is to use composite resin restoration, due to its good cost-benefit, physical properties, adhesion, aesthetics and ease of manipulation. It is worth mentioning that to obtain a good prognosis, an appropriate restoration protocol with quality materials must be followed, carefully following the entire procedure step by step.

There are four types of non-carious cervical lesions, which are classified as Abrasion, Attrition, Abfraction and Erosion (MODENA et al., 2016), so it is important to correctly diagnose this lesion so that the dentist can indicate the correct treatment for the cause of the problem, as each injury has a different etiology.

ABRASION

The main related etiological factors are oral hygiene procedures, in addition to those related to the patient, which involve technique, frequency, time and force applied during the brushing process. This injury is due to friction from abnormal functional activity generally associated with mechanical factors, such as hard toothbrush bristles, incorrect brushing technique, abrasive toothpastes, incorrect use of interdental brushes and dental floss. The lesion area appears in the shape of a "V", with a smooth and shiny appearance (GONÇALVES, 2011).

ATTRITION

It is defined as the physiological wear of the tooth surface or restoration caused by the contact of one tooth with another during the chewing process or for function and can occur in both primary and permanent dentition. Most frequently we find the occlusal, incisal and lingual surfaces of the upper anterior teeth and the buccal surfaces of the lower teeth (NEVILLE et al., 2009).

ABFRACTION

Abfraction is an injury to the cervical region of one or more sharp wedge-shaped teeth. The main etiological factor is the great eccentric occlusal effort with consequent flexion of the tooth structure, fatigue of the hydroxyapatite crystals and the appearance of the lesion. The main cause of abfraction can be attributed to occlusal overload (malocclusion) which most of the time causes the tooth to flex at the cementoenamel limit (DE SOUSA, 2018).

Abfraction shows a greater incidence in the lower teeth and this can be justified by their cervical diameter. This pathology requires restorative treatment, which in turn can lead to hypersensitivity and an additional loss of hard tissue in the tooth in question. Therefore, the choice of restorative material becomes an important step, as well as critical for the success of your treatment (AMARAL, 2012).

EROSION

Dental erosion has stood out in recent years, mainly due to its high and growing prevalence (Murakami et al., 2016), transforming it into one of the main oral health problems in childhood, youth and adulthood (MARRÓ et al., 2019; RACKI et al., 2020).

Erosive tooth wear, also known as dental erosion, is considered an oral health problem, which affects the mineral tissue of the teeth, caused by the chemical action of acids that leads to the loss of tooth structure, this process occurs without the participation of bacteria (SALAS et al., 2015; MARTINEZ et al., 2019).

Its etiology is multifactorial, caused by acids when they reach the oral cavity and attack tooth surfaces. These acids can be of intrinsic or extrinsic origin. This chemical process does not involve bacterial involvement (CARVALHO et al., 2016).

The intrinsic factors of dental erosion are related to acids from the digestive system that reach the oral cavity. This event occurs due to

gastrointestinal disorders, which can cause vomiting and reflux (MARSICANO et al., 2013).

There are also extrinsic factors that occur when acidic substances found in the external environment come into contact with the tooth surface. They are mainly related to the acidic diet and also some medications and drugs (WHATERHOUSE et al., 2008; HELLWING and LUSSI, 2014).

The increase in the intake of acidic drinks such as soft drinks and artificial juices generates great concern, as they are often related to the advertisement of being "healthy" (LI et al., 2012).

NON-CARIOUS LESIONS

The etiology of non-carious lesions can be multifactorial, influenced by extrinsic factors (diet, medication), intrinsic factors (gastroesophageal reflex, frequent vomiting typical of bulimia), dental mechanical wear resulting from an association of traumatic brushing associated with abrasive toothpastes and substance consumption acids, use of legal or illegal drugs, in addition to mechanical processes resulting from harmful habits such as frequent use of abrasive substances, teeth whitening without professional supervision, habits of placing pencils between teeth, toothpicks, pipe handles, hairpins, biting nails, cutting threads, improper use of toothbrushes and dental floss (AMARAL et al., 2012).

The process of teeth weakening due to the action of acid is normally mitigated by the action of saliva, due to the presence of calcium, but frequent and prolonged contact with acidic substances leaves little time for remineralization. In this weakened state, the enamel is prone to wear from the abrasive action of toothpastes and brushing (TORRES et al., 2010). A decrease in the pH of the liquids that bathe the dental elements can be caused directly by the consumption of acidic fruits and drinks or indirectly by the ingestion of fermentable carbohydrates that allow the production of acids by the bacteria in the plaque. As the pH drops, the solubility of enamel apatite increases dramatically.

OCCLUSAL TRAUMA

In the current context, occlusal trauma injury is known by the synonyms occlusal trauma, traumatic occlusion, traumatogenic occlusion, periodontal trauma and occlusal overload (CONSOLARO, 2012).

Occlusal trauma can be defined as periodontal injury induced by pressure from opposing teeth, whether directly or indirectly. Occlusal trauma can also be defined as the injury induced in the dental insertion tissues resulting from excessive occlusal forces (CONSOLARO, 2008).

Another categorization, specific to occlusion trauma, is that which classifies it as primary and secondary. The primary lesion occurs under a healthy periodontium of normal height around a tooth structure. The secondary lesion, in turn, affects a periodontium with reduced height due to pre-existing periodontal disease (LINDHE et al., 2010).

Occlusal changes can result from various conditions, such as dental number anomalies, tooth migration, variations in occlusal parameters, musculoskeletal and joint disorders, excessive occlusal forces, among others, which can serve as a trigger for the onset of occlusion trauma (DRAGOMIR 2013).

PSYCHIATRIC TRAUMAS

Psychiatric disorders are factors for Oral Premature Aging Syndrome and the main symptoms are: anxiety, stress and depression.

Anxiety can be characterized as an unpleasant sensation, an internal restlessness, an exaggerated concern about the future,

accompanied by bodily sensations such as dizziness, dryness in the mouth, feeling of emptiness in the stomach, tightness in the chest, accelerated heartbeat, sweating, chills, tremors, tingling, cramps, urgency to urinate and abdominal cramps. In fear, there is the presence of a triggering object. In this sense, fear is a reaction to a specific, observable danger. Fear and anxiety are very common feelings. Pathological anxiety occurs when this emotion becomes dysfunctional, that is, it brings socio-functional losses and/or significant suffering to the individual (BERNIK; STELLA, 2012).

Talking about stress means talking about the interaction of an organism with its environment, having on the one hand, stimuli that require change and adaptation and, on the other, the organism's responses to such stimuli. Stimuli that produce stress are not necessarily aversive, however, the duration of the stimulus and individuals' responses to stressful situations can have different psychological repercussions, leading to psychological distress and psychiatric disorders (CORCHS et al., 2012).

Stress has become a widely used word nowadays, becoming a constant word in common sense language. Its use, often indiscriminate, both by the media and by the population, ends up causing some confusion. In popular language, for example, stress has come to have different meanings, being the cause or synonym of many problems that plague contemporary life (SANTOS, 2012).

Depression is a mental illness characterized by an impairment of the individual's physical and psychological state. Its main symptoms are: persistent sadness, lack of energy, irritability, anxiety, loss of interest in activities that normally generate pleasure, low self-esteem, changes in sleep and appetite. The feeling of sadness is natural in adverse moments in life, therefore, to be diagnosed with depression, the symptoms described above must be mostly present and last for a minimum of two weeks (VISMARI et al., 2008)

In short, anxiety, stress and depression are common psychological disorders around the world and are being worsened by the constant pressure of modern life. When we return to this topic in dentistry, we have a series of factors that affect oral health, with the main symptoms being tooth wear due to bruxism and clenching, linked to psychiatric disorders. These changes can negatively affect the occlusion pattern during chewing and cause significant impacts on the stomatognathic system.

BRUXISM

Sleep bruxism is an oral habit that occurs while a person sleeps, and is characterized by movements of the temporomandibular muscles, forcing contact between the tooth surfaces. The consequences of this disorder include excessive tooth wear, tooth fractures, muscle pain, gum inflammation and recession, temporomandibular joint pain, increased risk of periodontal problems, implant overload, tooth loss and sleep disturbances (NAKATA, 2008).

Sleep bruxism is a complex and multifactorial disorder whose etiology is not completely understood. Possible etiological factors can be divided into peripheral (morphological) and central (pathological and psychological). It is currently understood that morphological factors, related to the bone anatomy of the orofacial region and occlusal discrepancies, have a minor role in the etiology of sleep bruxism and pathological and psychological factors have greater importance (NEKORA et al., 2010; KARA at al, 2012)

Sleep bruxism is among the dental clinical conditions that motivate the search for dental treatment, and is often the main complaint.

The parafunctional habit negatively impacts the patient's quality of life, compromises the sleep period, in addition to being associated with other changes.

GASTROESOPHAGEAL REFLUX

Gastroesophageal reflux is the passage of gastric contents into the esophagus without nausea or vomiting. If it reaches the upper portion of the esophageal sphincter, gastric juice can reach the oral cavity. Therefore, continuous exposure to acid can result in dental erosion and soft tissue injuries. Erosions caused by gastric reflux mainly affect the palatal surface of the maxillary teeth. Diseases that cause chronic gastroesophageal reflux, such as hiatal hernia, ulcers and gastritis, bulimia and anorexia nervosa and chronic alcoholism, are some organic disorders of particular interest to dentistry professionals (DE AQUINO, 2009).

SMOKING

Smoking causes health problems, since tobacco contains many cytotoxic substances, such as nicotine, which can penetrate the soft tissue of the oral cavity, adhere to the tooth surface or enter the bloodstream (ARORA; MISHRA; CHUGH, 2014).

Smoking is an important environmental factor associated with accelerated periodontal destruction and, the more its use is intensified in youth, the more preventive strategies must be developed to avoid diseases arising from this addiction (MONTEIRO, 2013). Smoking generates an inflammatory cell response and insufficient cellular functions, which is why it is associated with several diseases, including periodontal disease (BERNARDES, 2013).

Therefore, emphasizing the issue of smoking is preponderant and when recognized as an environmental risk factor, it becomes a generator of diseases, especially oral diseases, such as periodontitis and gingivitis. It must be noted here that periodontal diseases are a dynamic phenomenon with cyclical patterns of progression that can generate serious illnesses (BORBA et al., 2016).

DIETS AND EATING HABITS

Food and nutrition are basic requirements for the promotion and protection of health and allow human growth and development with quality of life and citizenship21, however, given the above, they can be harmed by inadequate oral health. Whether due to difficulty chewing and processing the food ingested or limited choice, the absence of teeth or poorly adapted dentures have a negative impact on nutritional status. Tooth loss has been associated with changes in food choices and nutritional deficiency in the elderly and young people, as it impairs chewing and consumes less foods with a high fiber content and abstains from essential nutrients (DE ALMEIDA, 2018).

PREVENTION AND TREATMENT

For treatment against premature aging of teeth, there is agreement in studies that prevention is the best way to avoid the progression of established lesions or their appearance, carrying out treatment in situations of hypersensitivity and significant loss of tooth structure (PEREIRA et al., 2021). Therefore, prevention begins with dietary advice based on the observation in the anamnesis of the prevalent intake of acidic foods by patients, with the aim of reducing the frequency and volume of consumption, as well as its mode, since when consumed ice cream with a straw and without swishing, there is a reduction in erosive effects (XAVIER et al., 2012).

Non-carious dental lesions are commonly associated with each other, aggravating biocorrosion, therefore occlusal factors that generate tension, such as mechanical friction

due to traumatic brushing, must also be diagnosed followed by guidance (GRIPPO et al., 2012).

Referral to other health professionals such as nutritionists, nutritionists and psychologists, expanding these guidelines, prevents the development of pathological wear and tear or the advancement of already established ones (ALMEIDA et al., 2020).

Salivary flow and its quality must be observed in the clinical examination, since its minerals present, its buffering capacity and the formation of the acquired film help in the dissolution of dietary acids and in the remineralization of the teeth, acting as a preventive and therapeutic agent. Diseases that cause damage to saliva production, such as xerostomia, increase the risk of developing premature aging (PEREIRA et al., 2021; GRIPPO et al., 2012).

FINAL CONSIDERATIONS

Based on the facts presented, it is concluded that the relationship between the causes that affect oral health, thus causing Oral Premature Aging Syndrome. Where such exposed factors significantly and negatively affect oral health. Therefore, the diagnosis must be established by the dentist, through the clinical signs and symptoms presented by the patients.

It is reported in the present work that the dentist must have knowledge and insight into the etiological factors that cause the disease. So that care can be planned efficiently, monitored together with other health professionals. Providing information regarding prevention and treatment of this syndrome. Emphasizing that knowledge about aspects of oral health must be known to the dentist, such as: non-carious lesions, bruximus, gastroesophageal reflux, psychiatric disorders, occlusal trauma, smoking, diet and eating habits.

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