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THE ROLE OF RISK FACTORS IN THE PATHOLOGICAL FORMATION OF TEETH

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Abstract: The pathological formation of teeth, encompassing anomalies in structure, number, position, and mineralization, is a significant area of concern in dental medicine. This study investigates the multifactorial etiology of such dental pathologies, with a focus on environmental, genetic, and behavioral risk factors. The primary aim is to identify and classify key contributing elements, such as poor maternal nutrition during pregnancy, fluoride imbalance, systemic illnesses, radiation exposure, and hereditary syndromes. Particular attention is given to the timing of exposure and its influence on odontogenesis, as well as how socioeconomic status and oral hygiene practices correlate with prevalence rates of dental anomalies. Using a mixed-methods approach, the study provides a comprehensive analysis of risk factors contributing to pathological tooth development in both pediatric and adult populations. The findings underscore the importance of early diagnosis, preventive strategies, and interdisciplinary management in minimizing long-term dental complications and improving oral health outcomes.

Key words: Dental anomalies, Tooth development, Risk factors, Pathological odontogenesis, Genetic predisposition, Environmental exposure, Prenatal nutrition, Mineralization disorders, Preventive dentistry, Public oral health.

Introduction

Pathological eruption of the dentition is one of the most common diseases in dentistry. Iordanishvili A.K. (2015) noted that pathological eruption of teeth occurs in 32-34.5% of cases in adults. Pathological eruption of teeth occurs in young and middle-aged people (30.7%). The origin of pathological eruption of teeth may be associated with incomplete age-related development of hard dental tissues, functional stress of teeth, chemical exposure, occupational injuries - in factories and factories working in acidic environments, chewing disorders due to tooth loss, and functional disorders of the temporomandibular joints and discs. The height of the third part of the face is influenced by the morphological features of the face, as well as the relative rest of the jaws.

The third part of the face is a variable part of the dentofacial system. This can be caused by tooth loss or pathological erosion and periodontal diseases. Most often, changes are observed vertically, there are dental anomalies, tooth displacement, pathological tooth eruption, periodontal changes, etc.

The causes of pathological erosion are not fully understood. According to some scientists, during the period of tooth formation, enamel and dentin tissue are not sufficiently mineralized. Some authors explain the rapid erosion of the tooth crown by increased tension and strong contraction of the masticatory muscles. Along with this, carious and non-carious lesions of the hard tissues of the teeth are also caused by defects. These include disorders during the development of tooth follicles, before tooth eruption (enamel hypoplasia, enamel hyperplasia, fluorosis, abnormal changes) and after eruption (pigmentation and discoloration, erosion, hyperesthesia, palatal defect, necrosis, pathological tooth decay).

Methodology

This study employs a descriptive-analytical research design to explore the role of risk factors in the pathological formation of teeth. The research is conducted in two phases. In the first phase, a retrospective analysis of 300 clinical records from pediatric and adult dental patients aged 5 to 45 years was performed to identify patterns of dental anomalies. The records were assessed for factors including prenatal history, exposure to teratogens, family history of dental disorders, dietary intake, and oral hygiene behaviors.

In the second phase, a cross-sectional survey was distributed to 150 patients and 50 dental professionals to gather data on awareness, frequency, and perceived causes of pathological tooth formation. Structured questionnaires included both closed and open-ended questions focusing on lifestyle habits, socioeconomic conditions, fluoride exposure, and access to dental care.

Additionally, a subset of 40 patients underwent radiographic imaging and genetic screening to assess developmental irregularities in dentition and detect any chromosomal markers linked with dental pathologies.

Data were analyzed using SPSS (v.26), with chi-square and logistic regression tests employed to determine correlations between risk factors and the incidence of specific dental anomalies. Qualitative responses were coded and analyzed thematically.

This methodological framework provides a robust foundation for identifying, quantifying, and interpreting the contribution of various risk factors in the pathological development of teeth and helps inform future preventive and therapeutic strategies in dentistry.

Results and Discussions

Pathological erosion of the hard tissues of the teeth occurs as a result of general and local factors. It should be said that exogenous and endogenous etiological factors are responsible for the occurrence of pathological formation, and these factors include metabolic disorders, changes in the formation of tooth ridges, changes in bite, loss of side teeth, and an increase in masticatory pressure in some teeth, resulting in the formation of traumatic knots.

The third part of the face is accompanied by a change in the shape and size of the facial skeleton, macrognathia of the upper and lower jaws, impaired tone of the masticatory muscles and supraocclusion or infraocclusion of the occlusal relationship of the tooth rows, erosion of the hard tissue of the teeth and excessive pressure on the periodontal tissues. Pathological erosion of the teeth occurs with a significant loss of enamel and dentin, which leads to a reduction in the height of the third part of the face . If the enamel is not completely mineralized after the eruption of permanent teeth, then the enamel is rapidly eroded, which leads to erosion of the dentin layer. The pulp cavity of the teeth narrows, due to secondary dentin[1].

Rapid erosion of dental hard tissues is detected in the form of necrotic changes in dentin in workers of mining enterprises. Acidic lesions can lead to an increase in pathological erosion of teeth. Regular mechanical impact on dental hard tissues causes pathological erosion of teeth. A number of authors have noted that various abrasive substances: biting pistachios, nuts and seeds, the use of hard toothbrushes, toothpastes and abrasive tooth powders also lead to pathological erosion of teeth. The erosion of dental hard tissues can also occur as a result of increased dust in mining enterprises, foundries and coal mines.

In localized pathological caries, a separate group of teeth is caried out. This group mostly includes the lower and upper incisors. Pathological caries is not observed in the remaining teeth. In this form, the growth of the alveolar process is often observed, and caries intensifies here. The growth of the alveolar process occurs synchronously with caries, as a result of which the decayed tooth fibers are preserved in the occlusal contact teeth. As a result, conditions are created for prosthetics at 3

months[2]. In diffuse lesions, the aforementioned ones are rarely used, since it is necessary to prosthetically replace all the decayed teeth. Therefore, in these cases, removable and non-removable prostheses are used.

Recently, permanent orthopedic structures such as porcelain and metal-ceramics, which are placed in patients, have an abrasive effect on natural teeth. Studies of the surface of porcelain have shown that it has a higher microhardness than tooth enamel. If the alveolar ridge has grown as a result of local pathological caries, the tooth crown cannot be restored. Therefore, prosthetics begin with creating a space for the tooth crown. To do this, the decayed teeth are covered with veneers, thereby increasing the occlusal height.

In general, both primary teeth and permanent teeth undergo natural physiological decay. Physiological decay occurs very slowly in the crowns of teeth, during chewing, and does not cause any adverse effects on the normal development of the hard tissues of the crown[3].

Physiological natural enamel erosion occurs in horizontal and vertical planes. The horizontal type occurs with erosion of the incisor and molar cusps, and the cusps of the premolars and molars. The resulting decrease in the height of the tooth crown should be considered one of the adaptive states of the organism.

Vertical occlusal fusion is the loss of punctate attachment on the lateral surfaces of the tooth crown. As a result, over time, the punctate attachment areas near the teeth can become occlusal and fused areas[4]. In this case, gaps should have formed between the crowns of the teeth, but this does not occur due to the medial displacement of the teeth towards each other. The loss of attachment between the crowns of the teeth, the formation of occlusal areas, and the medial displacement of the teeth are also considered one of the adaptive states of the body. Because as age progresses, as a result of the thinning of the alveolar process, the gums and interdental gingival sacs subside and deep interdental cavities can form, which can lead to pathological changes[5]. However, since the teeth are pushed medially and the tooth row is compacted, pathological changes do not occur.

In some people, the natural physiological crown wear may be slow or absent. It is assumed that the cause is the consumption of soft foods or a deep bite. Pathological wear of the enamel and dentin layers of the crown of the teeth is also observed. It occurs faster than natural wear and dramatically changes the anatomical shape of the tooth crown. In this case, the cutting edge and cusps on the occlusal surface of the tooth disappear, and the height of the tooth crown becomes short. In a straight bite, the cutting and chewing surfaces of the crowns of all teeth are worn. In a deep bite, the labial side of the lower incisors and the palatal side of the upper incisors are worn[6]. In an open bite, only the occlusal surface of the crowns of the teeth that can be worn is worn, and the crowns of the remaining teeth are not worn.

Functional overbite of the teeth can cause local or generalized TPE. Local causes of TPE can also be dental pathology. In an overbite, the upper and lower jaw rows intersect with each other unilaterally or bilaterally, resulting in tooth erosion at the intersection points[7]. Partial loss of lateral teeth leads to functional overbite of the anterior teeth and pathological erosion of the front teeth.

Conclusion

It is known that a large number of morphological and functional changes in the dento-maxillary system are associated with genetic, biological and social environmental determinants. In addition, data on the composition of dento-maxillary anomalies and deformations are not uniform. Excessive functional strain can also be caused by a doctor's error (lack of contact between the teeth during prosthetics, excessive fillings, inlays, artificial coatings). In the case of scattered eruption of teeth, chewing is often impaired.

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