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Modern Methods For Diagnosing Periodontal Diseases And Analytical Assessment Of The Role Of Artificial Intelligence

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Abstract

Parodontal diseases remain one of the most common dental pathologies worldwide and represent not only a medical but also a serious social problem. The effectiveness of treatment depends directly on timely and accurate diagnosis, especially in the early stages of the disease. The article provides an analytical overview of modern methods for diagnosing periodontal diseases, including clinical, radiological, and laboratory approaches. Epidemiological data reflecting the prevalence of periodontal pathology, as well as a comparative analysis of various possible diagnostic methods, are presented. Particular attention is paid to the application of artificial intelligence technologies that allow for the streamlining of clinical and visual data, increasing the objectivity of diagnosis, and accelerating information analysis. It has been shown that the use of artificial intelligence is a promising direction for the development of modern periodontology as a narrow field.

Keywords: Periodontal diseases, diagnosis, periodontitis, epidemiology, radiography, artificial intelligence.

Introduction

Parodontal diseases are mainly chronic inflammatory processes that affect the complex of tissues surrounding and supporting the tooth, and are one of the main causes of premature tooth loss in the adult population. According to the World Health Organization and global epidemiological studies, various forms of periodontal diseases are detected in 60-80% of the world's population, while severe periodontitis is diagnosed in approximately 10-12% of the adult population.

According to Global Burden of Disease data, in 2021, there were approximately 950 million cases of periodontal diseases worldwide, which corresponds to approximately 17,000 cases per 100,000 people based on age standardization. This reflects the steady increase in the burden of the disease over recent decades - compared to 1990, the prevalence rate increased by almost 1.5% in absolute terms. In low- and middle-income countries, the progression of the disease is particularly pronounced, which is associated with limited access to preventive dental care. A similar situation is observed in Central Asian countries, including the Republic of Uzbekistan. Research conducted using the CPITN index showed that symptoms of periodontal diseases are detected in 18% of individuals aged 20–24 years and in more than 95–98% of patients over 65 years of age. The main risk factors are male gender, unsatisfactory oral hygiene, smoking, the presence of comorbidities, and socio-economic conditions.

In conditions of high prevalence of periodontal diseases, improving diagnostic approaches is of particular importance. Traditional methods remain the foundation of clinical practice, but in recent years, the active implementation of digital technologies and artificial intelligence systems is helping to expand the capabilities of the dentist.

Research objective

The purpose of this review article is to systematize and analyze modern methods for diagnosing periodontal diseases, as well as to provide a comparative assessment of their diagnostic effectiveness in various clinical forms of periodontal damage.

Material And Methods

The material for this review article was based on scientific publications by domestic and foreign authors, clinical recommendations, textbooks, and monographs on periodontology. During the work, sources from the electronic scientific databases PubMed, eLIBRARY, Google Scholar, as well as works by Uzbek, Russian, and other CIS authors, were analyzed.

Results And Discussions

Clinical examination is the first and mandatory stage in diagnosing periodontal diseases. It includes visual assessment of gum condition, determination of bleeding during probing, measurement of periodontal pocket depth, assessment of the level of clinical attachment of periodontal ligaments, and assessment of tooth mobility.

According to clinical research data, the presence of bleeding during probing and the depth of periodontal pockets exceeding 4 mm indicates the course of an active inflammatory process. At the same time, it is precisely clinical probing that allows for the identification of early signs of the disease that are not yet accompanied by pronounced loss of bone tissue.

Unfortunately, clinical methods have a number of limitations. Measurement results largely depend on the doctor's experience, the force of the probe pressure, and the patient's anatomical features. Studies have shown that the variability of pocket depth measurements can reach ±1 mm, which reduces the objectivity of diagnostics during dynamic observation.

Radiological diagnostics play a key role in assessing the condition of the bone tissue of the alveolar process. Targeted oral X-rays and orthopantomography are most widely used, allowing for the identification of horizontal and vertical bone resorption, lesions, and secondary changes.

According to clinical and radiological studies, combining clinical examination with radiography increases the accuracy of periodontitis diagnosis to 85-90%. At the same time, traditional two-dimensional methods do not allow for a full assessment of the volume of bone defects, which is why it is currently impossible to imagine a full-fledged diagnosis without computed tomography.

Conical-beam computed tomography (CLCT) provides three-dimensional visualization and significantly expands

diagnostic capabilities, especially when planning complex treatment. However, the higher radiation load and cost of the study limit its application as a screening method.

In recent years, laboratory methods for diagnosing periodontal diseases based on determining biomarkers in saliva and gum fluid have been actively studied. Research indicates that an increase in cytokines, matrix metalloproteinases, and enzymes (alkaline phosphatase, AST) correlates with the activity of the inflammatory process and the degree of periodontal tissue destruction.

The use of biomarkers allows for the detection of disease in preclinical stages, but these methods have not yet been widely implemented in practice due to the lack of unified standards and high cost.

The development of artificial intelligence technologies has opened up new opportunities in the diagnosis of periodontal diseases. Neural network algorithms are actively used for the automatic analysis of X-ray images, digital, and visual data.

According to systematic reviews, the accuracy of AI algorithms in detecting alveolar bone loss and classifying periodontitis stages is 80-95%, which is comparable to, and in some cases exceeds, the results obtained by dentists. The sensitivity of AI systems in individual studies has reached 90-100%, which is especially important for early diagnosis.

The advantage is the ability to combine various diagnostic data: clinical indicators, radiological images, and digital scans into a single analytical system. This allows not only to increase the objectivity of diagnosis but also to accelerate the information processing process, which is especially relevant in conditions of high workload in dental clinics.

Modern systems (such as PerioAI) combine CLCT and intraoral scan data, allowing for high-precision measurement of the distance between the gums and bone tissue. The error of such systems is approximately 0.04 mm, which is comparable to manual sounding.

At the same time, it should be noted that artificial intelligence does not replace a doctor's clinical thinking, but acts as a tool to support decision-making and organize data.

Conclusion

Parodontal diseases remain a widespread pathology that significantly affects the quality of life of patients. Modern diagnostics must be comprehensive in nature and combine various methods. Analysis of statistical data confirms the need for early disease detection and the implementation of new diagnostic technologies.

The use of artificial intelligence in periodontology represents a promising direction that allows for increased accuracy and objectivity in diagnosis, accelerated data analysis, and improved treatment planning. The combination of traditional methods with digital and intelligent systems contributes to the development of modern dental practice and the improvement of medical care quality.

References

1. Grudyanov A.I. Periodontal Diseases. - M.: Medical Information Agency, 2009.
2. Dmitrieva L.A. Periodontology: National Guide. - M.: GEOTAR-Media, 2018.
3. Orechova L.Yu., Loboda E.S. Diagnosis and treatment of periodontal diseases. - St. Petersburg, 2016.
4. Alimov A.A. Periodontology: a study guide. - Tashkent, 2017.
5. Rakhmatov N.A., Yusupov Sh.M. Modern aspects of periodontal disease diagnosis. - Тошкент, 2020.
6. Newman M.G., Takei H., Klokkavold P., Carranza F. Carranza's Clinical Periodontology. - Tashkent, 2021.
7. Lindhe J., Lang N.P., Karring T. Clinical Periodontology and Implant Dentistry. Wiley-Blackwell, 2015.
8. Slots J. Periodontitis: facts, fallacies, and the future. — Periodontology 2000.
9. Tonetti M.S., Jepsen S. Clinical efficacy of periodontal diagnostics. — Journal of Clinical Periodontology, 2018.
10. Papapanou P.N. Epidemiology of periodontal diseases. - Paris, 2000.