INNOVATIVE DIAGNOSTIC AND TREATMENT METHODS IN MODERN DENTISTRY

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Abstract: *This scientific article analyzes innovative diagnostic and treatment methods used in modern dentistry. In particular, the practical significance of digital radiology, computed tomography, intraoral scanning, laser technologies, and artificial intelligence systems is highlighted. Additionally, the role of minimally invasive approaches and modern biomaterials in dental practice, their effectiveness, and the convenience they provide for patients are substantiated. The results of the study show that the use of innovative technologies is an important factor in early disease detection, improving the quality of treatment, and achieving long-term positive outcomes.*

Keywords: *Dentistry, innovative technologies, diagnostics, treatment methods, digital dentistry, laser therapy, computed tomography, intraoral scanner, artificial intelligence, implantology, minimally invasive treatment, biomaterials*

Introduction. Modern dentistry is one of the rapidly developing fields of medicine, in which diagnostic and treatment processes are continuously improving. In recent years, advances in science and technology have been widely introduced into dental practice, significantly increasing the accuracy, speed, and effectiveness of disease detection and treatment. In particular, innovative approaches such as digital technologies, artificial intelligence systems, laser equipment, and 3D modeling have marked a new stage in the development of dentistry.

Early detection of oral diseases and accurate diagnosis are key factors for successful treatment. Therefore, modern diagnostic methods, including radiovisiography, computed tomography, and intraoral scanning technologies, provide dentists with the opportunity to obtain precise and detailed information. This, in turn, plays an important role in developing individualized treatment plans[1].

Moreover, the development of minimally invasive and painless treatment methods in dentistry enhances patient comfort and increases trust in the treatment process. With the help of innovative materials and technologies, dental restoration, prosthetics, and implantation procedures now provide higher quality and longer-lasting results.

This study examines innovative diagnostic and treatment methods used in modern dentistry, as well as their advantages and practical significance[2].

The improvement of diagnostic and treatment methods in modern dentistry is closely linked to technological advancement. Traditional examination methods largely relied on the dentist's experience and visual assessment. Today, however, digital diagnostic tools enable the detection of diseases at much earlier stages with high accuracy. This not only improves treatment effectiveness but also reduces the risk of complications[3].

Digital radiography systems, particularly radiovisiography, are widely used in dental diagnostics. The images obtained through this technology are clearer and involve lower radiation levels compared to conventional radiographs. Furthermore, computed tomography provides three-dimensional images of jawbones and tooth roots, allowing for in-depth analysis of complex clinical cases. Studies show that 3D diagnostic methods significantly reduce the likelihood of errors in implantation and surgical procedures[4].

Intraoral scanners have introduced a new era in dentistry. They allow precise digital modeling of the patient's oral cavity, eliminating the discomfort associated with traditional impression-taking methods. Research indicates that

prosthetics produced based on digital scans demonstrate higher accuracy and better adaptability than those made using conventional techniques.

Innovative approaches are also essential in the treatment process. The concept of minimally invasive dentistry is becoming increasingly widespread. This approach focuses on preserving as much healthy tissue as possible while treating only the affected areas. For example, laser technologies enable precise and painless removal of carious lesions. Analyses show that laser-assisted treatment reduces the spread of infection and accelerates the healing process[5].

In addition, biomaterials used in dentistry play a crucial role. Modern composite materials closely resemble natural teeth in aesthetics and possess high durability. Their application not only restores the functional condition of teeth but also improves their appearance. Scientific studies confirm the longevity and resistance of these materials.

Significant progress is also observed in implantology. Dental implants have reached a high level of effectiveness in restoring missing teeth. 3D planning and navigation-guided surgical technologies allow precise placement of implants. According to statistical data, the success rate of modern implantation methods is between 95–98%, demonstrating their reliability.

Innovations are also rapidly developing in orthodontics. Transparent aligners (invisible braces) have made the process of teeth alignment more aesthetic and comfortable. This reduces psychological discomfort for patients and increases their motivation for treatment. Studies show that aligner systems are effective in treating mild to moderate dental misalignments.

The introduction of artificial intelligence into dentistry is also of great importance. AI-based software can automatically analyze radiographic images and assist dentists in diagnosing diseases. This reduces human error and speeds up the diagnostic process. Research indicates that in some cases, AI systems can perform with accuracy comparable to experienced specialists.

Furthermore, innovative approaches play an important role in preventive dentistry. Smart devices for monitoring oral hygiene, mobile applications, and individualized preventive programs serve as effective tools for disease prevention. Statistical analyses show that regular preventive measures significantly reduce the incidence of dental diseases.

Overall, these analyses demonstrate that innovative diagnostic and treatment methods in modern dentistry not only improve disease detection and treatment but also enhance patients' quality of life. As technology continues to evolve, dentistry is expected to become even more precise, efficient, and personalized[6].

Conclusion. The introduction of innovative diagnostic and treatment methods in modern dentistry has led to a new qualitative stage in the development of this field. Digital technologies, 3D modeling, laser methods, and artificial intelligence systems have expanded the possibilities for early disease detection, accurate diagnosis, and effective treatment. As a result, the safety, speed, and accuracy of treatment processes have significantly improved.

Moreover, minimally invasive approaches and the use of modern biomaterials contribute to preserving healthy tissues and improving both aesthetic and functional outcomes. Advances in implantology, orthodontics, and therapeutic dentistry play a key role in enhancing patients' quality of life.

In conclusion, modern dentistry is a dynamically evolving field based on innovation, characterized by high efficiency and a patient-centered approach, and it is expected to continue improving in the future.

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