Application of Artificial Intelligence for the Management of Oral Diseases

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Artificial intelligence (AI) refers to the use of machines to mimic intelligent human behavior. It involves interactions with humans in clinical settings, and augmented intelligence is considered as a cognitive extension of AI. The importance of AI in healthcare and medicine has been emphasized in recent studies. Machine learning models, such as genetic algorithms, artificial neural networks (ANNs), and fuzzy logic, can learn and examine data to execute various functions. Among them, ANN is the most popular model for diagnosis based on image data. AI is rapidly becoming an adjunct to healthcare professionals and is expected to be human-independent in the near future. The introduction of AI to the diagnosis and treatment of oral diseases worldwide remains in the preliminary stage. AI-based or assisted diagnosis and decision-making will increase the accuracy of the diagnosis and render treatment more precise and personalized. Therefore, dental professionals must actively initiate and lead the development of AI, even if they are unfamiliar with it.

keywords: Artificial intelligence; Artificial neural networks; Diagnosis; Machine learning; Oral diseases; Treatment

Artificial intelligence (AI) refers to the use of machines to mimic intelligent human behavior. It involves interactions with humans in clinical settings, and augmented intelligence is considered as a cognitive extension of AI [1]. The importance of AI in healthcare and medicine has been emphasized in recent studies. Machine learning models, such as genetic algorithms, artificial neural networks (ANNs), and fuzzy logic, can learn and examine data to execute various functions [2-4]. Among them, ANN is the most popular model for diagnosis based on image data. AI is rapidly becoming an adjunct to healthcare professionals and is expected to be human-independent in the near future.

Oral disease is one of the most prevalent diseases worldwide, causing serious health and economic burdens and significantly reducing the quality of life of those affected.

The most prevalent oral diseases worldwide are dental caries, periodontal disease, stomatitis, recurrent aphthous ulcers, candidiasis, oral lichen planus, and oral cancer [5]. Although oral diseases are typically preventable, their prevalence remains high because of the complex etiologies, pathophysiological mechanisms, and related genetic factors [6].

In recent years, the application of AI to oral diseases and the dental field has increased. The most significant advantage of AI-based diagnosis and treatment is the comprehensive analysis of large data without any data loss. In addition, its algorithmic decision-making and diagnosis allow for the tasks to be performed quickly and accurately, resulting in reduced fatigue among dental professionals, a decrease in the number of diagnostic delays or errors, an

increase in the accuracy of the diagnosis or treatment, and standardization of the procedures used [7]. Thus, AI enables significant amounts of data to be acquired and computed for the rapid diagnosis and treatment of oral diseases.

In 2020, early detection of dental caries was attempted using an ANN based on dental X-ray images [8]. AI can be used to effectively classify periodontal diseases into aggressive and chronic types based on the immunologic parameters of the patient [9]. In addition, AI can be used as the gold standard for identifying patients at risk of developing oral precancers or cancers based on the images of the tissues and the clinical information obtained [10]. AI has been used to diagnose oral lichen planus (with 94.6% accuracy) and to identify and quantify monocytes and granulocytes within inflammatory lesions [11]. Researchers have attempted to predict the development of recurrent aphthous ulcers using genetic-algorithm-optimized neural networks based on clinical information and laboratory parameters [12]. Additionally, a machine learning approach was used to detect specific strains of *Candida albicans* [13]. An AI-based diagnosis of temporomandibular joint osteoarthritis has been performed using radiographic images obtained via cone beam computed tomography or panoramic radiography [14,15]. Nonetheless, a comprehensive multicenter study is required to validate these results and expand their application.

The introduction of AI to the diagnosis and treatment of oral diseases worldwide remains in the preliminary stage. AI-based or assisted diagnosis and decision-making will increase the accuracy of the diagnosis and render treatment more precise and personalized. Therefore, dental professionals must actively initiate and lead the development of AI, even if they are unfamiliar with it.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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