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AI-ASSISTED OBTURATION QUALITY ASSESSMENT

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ABSTRACT

The quality of root canal obturation plays a decisive role in ensuring long-term success of endodontic treatments; improper filling can cause the entrance or retention of bacteria, thus leading to the failure of the treatment and retreatment if necessary. Earlier, the methods of assessing the quality of obturation included the judgment of the clinicians, tactile feel, and two-dimensional (2D) radiographs. A lot of subjectivity could be involved, and the radiographs also have their limitation. The recent application of artificial intelligence (AI) systems, in particular machine learning (ML) and deep learning (DL) algorithms, have transformed dental diagnoses, and this has permitted objective, reproducible, and very accurate evaluation of the outcomes of the obturation process. An AI-assisted system can detect voids, underfilling, overfilling, and other technical issues with radiographic and cone-beam computed tomography (CBCT) datasets and thus minimize the variability of diagnosis. These systems can provide real-time decision support; ensure workflow optimization; and develop predictive models to improve treatment planning. This paper aims to discuss the principles, applications, and clinical integration of AI-assisted obturation quality assessment towards its radical influence in the modern endodontic sciences as well as the hurdles that still cluster its widespread use.

KEYWORDS: *Artificial Intelligence; Endodontics; Root Canal Obturation; Quality Assessment; Deep Learning; Cone-Beam Computed Tomography; Dental Radiology; Machine Learning*