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EDITORIAL

Artificial Intelligence (AI) Shapes the Future of Dental Implant Education

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Evidence involving AI in implant dentistry has grown in the last decade. All AI models evaluated in the literature demonstrated high accuracy and clinical applicability. Further studies evaluating the clinical efficacy of AI models in implant dentistry are essential (1). However, AI in dentistry is primarily focused on digital diagnostic methods, such as radiology. AI implementation is expected to permeate all parts of the profession to varying degrees (2).

Digital technology used in implant dentistry includes intraoral scanners (IOSs), computer-assisted design (CAD) and planning software, computer-assisted manufacturing (CAM), 3D printing & milling, and static and dynamic computer-assisted implant surgery (CAIS) (2). AI in patient-centered dental implant care focused on personalized treatment plans, precision in patient care, competence, efficiency, and innovation in interprofessional education based on an interdisciplinary prosthetically driven treatment approach without ignoring critical thinking to assess scientific and technology-based research and use it in practice (3).

The main reasons of intraoral scanners being increasingly popular in dental schools and clinics are: they offer enhanced technology in a smaller, more portable scanner and offer faster digital records with automated design software and automated digital workflow. More restorative materials are available to achieve a more precise fit of the prosthesis and a superior accuracy outcome with AI support (4). According to the American Dental Association (ADA), 53% of dentists use digital technologies in their

practices for the reasons mentioned above, and 90% of them use these technologies for single-tooth/implant restorations (5).

For instance, predoctoral dental students are taught to use implant treatment planning software with an AI assistant to segment teeth and jaws and identify anatomical landmarks, such as nerves and the maxillary sinuses. Moreover, the AI assists in the patient coordination system and IOS alignment with the Cone Beam Computed Tomography (CBCT) scan. This step is crucial for an accurate implant placement procedure, because the planning software uses the CBCT scan for implant positioning and angulation, and the surgical guide is fabricated based on the IOS.

On the other hand, 3D implant positioning, virtual diagnostic tooth wax-up, and implant type selection in terms of diameter and length require more attention to improve the planning software development. The clinician must use his/her critical thinking and clinical judgment to review and approve the plan created with an AI assistant before proceeding with the implant surgery, whether static, dynamic, or robotic-assisted.

The current AI-based automated virtual implant placement technology is promising. AI demonstrated expert-quality and clinically acceptable single-implant planning, proving more time-efficient and consistent than the HI-based approach. Many clinical benefits have been reported in the literature for this technology. Presurgical implant planning often requires multidisciplinary collaboration among highly experienced specialists, which can be complex,

cumbersome, and time-consuming. AI-driven implant planning has the potential to deliver clinically acceptable results that are significantly more time-efficient and consistent than those of a human expert (6).

Dental educators and clinicians should benefit from

AI in implant dentistry for accuracy, efficiency, improved treatment planning and simulation, enhanced surgical procedures, precise optimal implant placement, cross-infection control, and improved patient outcomes.

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