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Editorial

Cone-Beam Computed Tomography and the Related Scientific Evidence

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Cone-beam computed tomography (CBCT) is the most common three-dimensional (3D) imaging technique used in dentistry. CBCT has been available in the market since the 1990s for medical imaging, particularly for angiography [1]. Its introduction in dentistry has revolutionized dental diagnostics and treatment planning. In recent years, technological advances allowed CBCT scanners to have smaller footprints, produce images with higher quality, reduce the patients' radiation dose, and obtain images in a considerably shorter period of time, as compared with the earlier CBCT scanners. A comprehensive study in 2020 provided a list of 279 models of CBCT scanners manufactured by 47 companies based in 12 countries. These scanners have wide variations in features and technical specifications. For instance, the fields of view of available CBCT scanners vary from 20 mm × 20 mm to 300 mm × 300 mm, while the voxel sizes of the devices are in the range of 0.05 to 0.6 mm. Additionally, the range of exposure parameters of CBCT scanners are from 50 to 120 for kVp, from 1 to 32 for mA, and from 1 to 55 s for exposure/scanning time [2].

In addition to the technical improvements of CBCT scanners, the modern interactive features of CBCT analysis software have made it one of the main components of the digital workflow in dentistry [3]. CBCT data can be merged with intra-oral and facial optical scans as a part of dental rehabilitation and surgical reconstruction procedures [4–6]. Park et al. suggested a method for integrating CBCT, intraoral scan, and 3D facial scans to create a digital virtual patient for improved treatment planning, patient communication, and final treatment outcomes [7]. Additionally, 3D information obtained by CBCT can be used for static and dynamic surgical guidance and navigational surgeries in different fields such as endodontics, implantology, and maxillofacial surgery [8–11].

Improvements in technical features and applications of CBCT scanners have been followed by an increasing number of articles investigating different aspects of CBCT imaging: from technical specifications and dose considerations to its applications within the field of dentistry or in subjects beyond the dental scope [12–16]. A PubMed search until 8 July 2022 using "cone beam computed tomography" or "cone-beam computed tomography" or "dental volumetric tomography" and "dentistry" or "dental" or "oral" as keywords revealed a total of 157,453 articles. According to Gaêta-Araujo et al., a large number of these studies focus on clinical applicability and diagnostic accuracy, which address the second level of efficacy suggested by Fryback and Thornbury [17,18]. There is a paucity of data concerning the higher levels of efficacy studies, including its effects on clinical decision making, patient outcome efficacy, and societal cost-effectiveness. Of course, level 2 studies are more interesting for many researchers, as they can provide a basis for the development of further guidelines on applications of CBCT for different diagnostic purposes. On the other hand, studies belonging to levels 3 to 6 are more challenging to conduct and require more resources because they need to be performed with the cooperation of dental specialists in different fields as well as patients and health policy makers. Nevertheless, their findings can further confirm the role of CBCT imaging in clinical scenarios and clarify how different factors such as resolution, added benefits,

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radiation dose, and costs can affect its applicability as an effective imaging modality in dentistry [19,20].

In the present Special Issue, several articles focusing on the applications of CBCT in dentistry have been published. In conclusion, CBCT is an indispensable 3D imaging modality in dentistry, which has revolutionized dental diagnostics and treatment planning. An increasing number of studies have been performed on the efficacy of this imaging technique for different applications, while there is a paucity of information regarding the societal cost-effectiveness of CBCT and its effects on direct patient outcomes.

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