EDITORIAL

Technology in Endodontics: How is it Improving Quality of Treatments?

Edit Xhajanka[1], Massimo Giovarruscio[2], Almira Isufi[3], Luciano Pacifici[4], Orlando Donfrancesco[5], Andrea Pacifici[6], Shilpa Bhandi[7], Federico Valenti Obino[8]

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In the last decades, technology has improved dentistry and endodontics significantly, providing useful tools for better diagnosis and root canal treatment.[1,2] In the first decade of the millennium, microscopy has been the game-changer in endodontics, while in the second decade, three-dimensional radiography (CBCT) has played this role. CBCT has proved to be clinically useful not only by improving diagnosis and treatment planning, especially in the most difficult cases, but also by the clinical visualization and understanding of anatomic complexities.[3] In addition, CBCT is a fundamental device providing images for guided endodontics. Static guides and dynamic navigation proved to be effective in the treatment of calcified canals, and also helpful in more conservative access cavities both in non-surgical and surgical endodontics.[4,5] Ultimately, CBCT has been thoroughly used to evaluate and compare different materials used in the therapies that involve dental pulp, such as dental pulp-capping agents and materials for regenerative endodontics, or the efficiency of novel procedures that could be introduced in the ordinary clinical practice.[6–8]

Moreover, in the last decade, other two new manufacturing technologies have been changed root canal instrumentation and obturation: the heat treatment of nickel-titanium rotary instruments,[9,10] and the introduction of new obturation materials, including bioceramic endodontic sealers, providing new products aiming at improving performance, safety, and simplicity of endodontic treatments.[11–13]

Endodontics has been a "2-dimensional" specialty for nearly 100 years, due to the fact that traditional 2D radiographs only allowed a partial visualization of anatomy and canal trajectories. This was related to the buccal-lingual direction of the X-rays and the superimposition of different structures.[14,15] Using CBCT, and ideally using dedicated software for 3D reconstruction, the real anatomy of each case can be visualized by the endodontist, including hidden curvatures, hidden confluences, calcifications, etc.[3,16] This is a huge advantage not only in terms of proper diagnosis and treatment planning but also to reduce iatrogenic errors during instrumentation procedures. Hidden curvatures which always lead to increased instrumentation stress, if not properly recognized, may easily result in intracanal separation.[3] According to this, the knowledge of the intracanal anatomy is crucial to ideally predict the combination of stresses acting on the instruments and to better select the more appropriate ones to reduce the probability of intracanal failure.[17–19] For >25 years, endodontists have been fearing sudden, unexpected breakage of nickel-titanium rotary instruments.[1,20,21] Nowadays, we can tell that the great majority of those failures were related to the poor clinical understanding of anatomy, and consequently unproper choice and use of the instruments in very stressful, usually hidden, complexities.[22] Clinical understanding of anatomy in three dimensions, commonly defined as "3D endodontics", is, therefore, a breakthrough in the clinical approach to improving the safety and simplicity of instrumentation procedures. In surgical endodontics, a 3D approach does the same, allowing a less invasive procedure, and reducing risks of iatrogenic errors.

[1]Department of Faculty of Medical Dentistry, Medical University of Tirana, Albania

[2]Department of Endodontics, Faculty of Dentistry, Oral and Craniofacial Sciences, Guy's Dental Hospital, London, UK; Institute of Dentistry, IM Sechenov First Moscow State Medical University, Moscow, Russian Federation

[3,4,6,8]Department of Oral and Maxillo Facial Sciences, 'Sapienza' University of Rome, Rome, Italy

[5]Department of Oral and Maxillo Facial Sciences, 'Sapienza' University of Rome, Rome, Italy; Department of Anatomy, Histology, Forensic Medicine and Orthopaedics, Sapienza University of Rome, Rome, Italy

[7]Department of Restorative Dental Sciences, College of Dentistry, Jazan University, Jazan, Kingdom of Saudi Arabia

Corresponding Author: Almira Isufi, Department of Oral and Maxillo Facial Sciences, 'Sapienza' University of Rome, Rome, Italy, Phone: +39 3287353196, e-mail: almiraisufi@yahoo.it

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