EDITORIAL

Modern Applications and Innovations of 3D Dental Imaging

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Recent improvements in imaging techniques have profoundly facilitated the diagnosis of pathologies of the maxillofacial district and provided all the information necessary to plan an adequate treatment plan. Three-dimensional (3D) radiographic diagnostic exams, reworked by specific software that allow easy viewing of images and various graphic reworkings, are frequently applied to maxillofacial district for the diagnosis of various pathologies, which, until a few years ago, required several radiographic examinations.[1,2] Cone-beam computed tomography (CBCT) represents today the most widespread and used 3D exam in dentistry, given its availability in dental offices, exam execution speed, and the ability to apply it to all branches of dentistry. In fact, the ability to modify the FoV while maintaining a very high images quality ranging from use in the smallest FoVs for a few teeth in endodontics to larger FoVs, for example, in orthodontics.[1] The use of reduced FoVs and greater resolution is also suggested, especially in endodontics for the understanding of the often-difficult root canal system anatomy with reduced FoV and greater resolution; for these reasons, this imaging technique is so widely used in dentistry.[3–6] This method allows to modify many parameters and different aspects allowing an easy use, speed, and optimization of radiation for diagnostic purposes, often decisive in differential diagnoses, and to facilitate surgical-endodontic treatment in aid of guided or navigated surgeries.[2,7,8] In this regard, the patient's exposure to repeated radiographic diagnostic examinations must be carefully evaluated, and for this reason, there is a growing interest in magnetic resonance imaging (MRI) and imaging techniques that use ultrasounds.

The clinical dental uses of both are increasingly investigated in the literature, although the ultrasound examination is operator dependent, and therefore needs a learning curve, unlike MRI, which today turns out to be a more complex examination due to the long data acquisition times for having particularly high resolutions.[4,8,9]

In this regard, recently published evidence shows that MRI is superimposable, in the planning of implant surgery, to the static or dynamic guided surgery planned using CBCT.[5,8] This represents a major step toward radiation-free diagnostics, which are repeatable in the follow-up and protective of the patient.[2,4]

There is a really growing interest in MRI, for imaging techniques that use ultrasound in their different clinical applications.[4,10,11]

The clinical dental uses of both are increasingly investigated. Recent literature highlights how it is possible to consider MRI as a complete dental diagnostic examination, which allows for both an investigation of the anatomy of the soft tissues at certain frequencies and the volumes and bone density.[4,8]

Regarding the ultrasounds and their physical characteristics, their application in dentistry is increasingly studied, in the past used exclusively in gnathology, considering the superficiality of the other structures to be studied, is extremely valid.[12] The mucous tissues of the oral cavity, or the supporting bone, with the appropriate probes, seem to be simple to apply, free of ionizing radiation, minimally invasive, and easily available in the office for constant use to solve different differential diagnoses during daily clinical practice.[11,13]

The margins of success in the development of this diagnostic examination are wide, guided by the noninvasiveness of these procedures, and by the absence of biological damage caused by ionizing radiation.[4]

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