

Applications of Ultrasonography in Dentistry

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In addition to conventional intraoral and panoramic radiographic techniques, most commonly utilized advanced imaging techniques for a variety of tasks in the dentomaxillofacial region are Cone Beam Computerized Tomography (CBCT), Computerized Tomography (CT), and Magnetic Resonance Imaging (MRI). Scientists have been searching for safer and comparable alternative imaging modalities to X-ray imaging due to increasing concerns regarding radiation dose and economic limitations. Recent development of the Ultrasonography (US) equipments enables the visualization of fine detail of the surface structure of the oral and maxillofacial tissues without the use of ionizing radiation [1]. This promising technology is based on the reflection of ultrasound waves (echoes) - sent toward the area of interest using a piezoelectric transducer - at the interfaces of tissues that have different acoustic properties [2,3].

In the field of dentistry, US technique can be used in clinical practice for bone and superficial soft tissue examination, major salivary gland or duct stone and salivary gland lesion detection, temporomandibular joint imaging, detection of fractures and vascular lesions, lymph node examination, measurement of the thickness of muscles and visualization of vessels of the neck including the carotid for atherosclerotic plaques [4-6]. More recently, development of three-dimensional US imaging allowed multi planar reformatting, volume rendering and Color Power Doppler (CPD) [5,6]. In endodontics, CPD is used in the evaluation of periapical lesions and follow up of periapical bone healing [6] and for differentiation between vital and root filled teeth [7]. US imaging is also used to guide Fine-Needle Aspiration Biopsy (FNAB) in the neck with the advantage of low cost, ease of usage and radiation safety [1]. US imaging of teeth revealed promising results for early caries detection [8] and for the evaluation of the periodontal pocket depth and to determine gingival thickness for implantology [9]. Another application of US studied is the visualization of foreign bodies in soft tissues. The best sensitivity and specificity results were achieved with US among other imaging modalities with the advantage of visualization of the size and form of well shaped materials such as wood, composite, amalgam and glass [10].

Ultrasound provides a number of advantages for dentomaxillofacial imaging when compared to other advanced imaging modalities such as; absence of harmful ionizing radiation, portability, possibility of

dynamic and repeated examinations and relatively low cost [11]. On the other hand, main drawbacks which need to be further studied include limited penetration into bone and gas filled structures, less spatial resolution at deep tissues and lack of expertise [12].

Ultrasonography is an innovative and evolving imaging technology with plenty of research continuing to be done in medical field. Further studies should be directed towards clinical applications of the system in the dentomaxillofacial region.

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