Non ionising diagnostic technique in dentistry

Shaik Ali Hassan[1*], Sumit Bhateja[2], Geetika Arora[3]

[1]Dental Surgeon, [2]HOD, [3]Reader, [2]Dept. of Oral Medicine & Radiology, [3]Dept. of Public Health Dentistry, [1,2]Manav Rachna Dental College, Faridabad, Haryana, [3]Inderprastha Dental College, Sahibabad, Uttar Pradesh, India

***Corresponding Author: Shaik Ali Hassan**
Email: alishaikhassan@gmail.com

Abstract
There are many tools for diagnosis of oral & maxillofacial diorders, like electro-myography, thermography, sonography for the evaluation of joint sounds, vibration analysis. Now in new era there are use of computerized tomo-graphy (CT) scan, arthrography, magnetic resonance (MRI) radionuclide imaging. The use of the ultrasound gives a good image resolution and its use is not common in head & neck. The current article discusses various applications of this novel technique in dental sciences.

Keywords: Non ionising, Ultrasonography, Calculi, Head & Neck.

Introduction
William Roentgen discovered x-rays in 1895, which is now being used for the orofacial region which helped the dentistry a lot in diagnosing the hard tissue diseases like abscess, periodontitis, osteomyelitis, Tmj problem and many more. Recentlyare the use of Computed Tomography, Magnetic Resonance Imaging, Nuclear Medicine and Ultrasonography. All diagnostic ultrasound applications are based on detection and visualization of reflected acoustic energy of interfaces in the body.[1] With the mixing of 3D visualization developed the 3D ultrasound which has been used for diagnosis of disease and providing image guidance in minimally invasive therapy.[2] Ultrasound has been used in dentistry for salivary glands, cysts and tumors in the oral region and in diagnosis of temporomandibular joint disorders, midfacial fractures, fractures of mandibular condyle and ramus, cervical lymphadenopathy and swelling in oro-facial region. The USG is performed by placing the transducer in a extraoral place However, this method makes it difficult to obtain high quality images. Place the transducerdirectly to the surface of tumors of the oral cavity, combined with a lower frequency for deeper injuriesand a higher frequency of superficial lesions, as usedallows in this technique the evaluation of the thicknessand vascularization of lesions on doppler application.[3] Ultrasonic pulses of the type generated by the scannershave a frequency of 2 to 10 MHz. The duration of the pulse is approximately 1 microsecond and the pulses are repeatedapproximately 1000 times per second. The reflected ultrasound pulses are detected by the transducermust be amplified in the scanner. The echoes that comedeep in the body are more moderate thanmore superficial parts and therefore require more reinforcement Ultrasonic scanners are under controlthat can change the overall sensitivity, the "threshold" ofinstrument as well as strengthen change echoes of different depths for a balanced image.The main aim of this article is to show how the intraoral ultrasound is used in dentistry.

Intraoral Ultrasound Procedures in Dentistry
Examination of the salivary glands, parenchyma, and ductal systems
Patients feel uncomfortable during an examination of the sublingual area with a transducer. To find the sublingual gland, run the scanfrom the hole in the Wharton channel to the floor of the mouth. Inflammatory lesions, cysts or neoplasms can be clearly recognized. To know about the Wharton channel, the transducer must be slightly turned inward from the region of the sublingual gland. The classic transcutaneous approach, is more limited to visualize the Wharton line, which, in most cases, it is not easy to recognize when you are depressed when placing the probe. The intraoral USG can visualizethe submaxillary canal and recognize the presence of small calculations. In addition, the intraoral USG allows recognize the thickness of stones.[4,5] The submandibular gland is the most common site of calculi formation because it produces particularly viscous, mucous, and more alkaline saliva with a relatively high concentration of hydroxyapatites and phosphates. The opening of the main salivary duct of the submandibular gland is narrower than the diameter of the entire duct and its tortourous tract makes it more common for calculi foramation. Of the calculi, 30% are located near the opening of Wharton duct, and 20% are located in its mid-portion.[6] Although the conventional transcutaneous USG works wellin intraparenchymal stones, sensitivity decreasesfor duct stones, using conventional transcutaneous USG, stones near the opening of the canal or in the central part of the Wharton Channel can sometimes be demonstrates when additional pressure is exerted on the oral cavity during the USG exam.

Examination of the minor salivary glands, buccal mucosa, and lips
The small salivary glands are clearly visible, when the transducer is near the lip, andthe depth and size of an ulcer of lips can be accurately evaluated.A detailed analysis can be done throughout the rest of theOral cavity, because the patient feels minimal discomfort.A normal pattern of the oral mucosa consists ofhomogeneous echoes of hyperechoic appearance due to a thick cortical bone of the lower jaw, small superficial salivary glands, opening of stensen's canal

and any soft tissue lesions of the oral cavity and mucous membrane can also be detected.

Examining of periodontal structure

Periodontal changes can be more accuratelydone using new imaging techniques, such as cone-beam CT, optical coherence tomography, optical spectroscopy, and USG.[7,8] Periodontal USG is a reliable, non-invasive andcost effective method to identify anatomical elementsnecessary for an accurate periodontal diagnosis of the studied area.[9] Recent studies have shown that Validity and reliability of USG to the extent ofnot only the thickness of the gum, but also that of other periodontal structures that cannot be evaluated by inspection and Palpation.[10-12] Linear, small footprint, high frequency converters are used for periodontal USG. In the ultrasound image, the next micrometer level Measurements can be made: gingival groove depth, free gingival thickness, periodontal space widthin the most coronal position distance between edgeGums and alveolar crest, clinical crown height and anatomical crown height.[13] In addition, to the extent thatin implantology, bone level and soft tissue thickness the tissue around the implants is measurable by intraoral USG.

Examining the periapical diseases

Periapical cysts are viewed as hypoechoic, well-contoured cavities surrounded by reinforced bone walls and filledwith liquid, no signs of internal vessels for color and power Doppler exams. PeriapicalGranulomas are considered poorly defined solid lesions which are clearly calculated (hyperechoic / echogenic) or have corpuscular and hypoechoic areas andwho have a rich offer of boats in color and strength Doppler exams. However intraorally the study of USG is limited to aspects of the jaws because the currently available probes are not idealfor use in the posterior jaw in areas with thick crustPlates More development research is neededappropriate probes for the posterior jaw.[14,15]

Conclusion

Ultrasound is a non invasive and easy usable method. With the available technology like computed tomography (CT), magnetic resonance imaging (MRI), and many more the use of the ultrasound ca produce great impact in diagnosis of various diseases associated with oral cavity. It is also useful in diagnosis of TMJ disorders and also helpful in salivary caliculi finding as the use of x-ray causes multiple exposures and multiple angles have to be used. Thus, intraoral USG can be used to imaging of various oral cavity structures.

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Conflict of interest

None.

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