

# Clinical Applications of Ultrasonography in Dentistry - A Review Article

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**Abstract :**

Dentistry in the modern era is emerging with use of advance imaging modalities ultrasound is widely available , affordable and non- invasive requiring minimal training and can be used in the diagnostic or in the clinic.<sup>1,2</sup>Ultrasound imaging is one of the advanced imaging techniques which use sound waves for viewing the normal and pathological conditions involving bone and soft tissue of the oral and maxillofacial region. Ultrasound has been use from many years which is known for its diagnostic importance.<sup>2,3</sup>

**Keywords:** Ultrasound, Imaging modality, Dentistry.

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**Introduction**

The technology for producing ultrasound imaging and the characteristics of sonic waves has been known for many years. Though the first attempt of practical application of ultrasound imaging was to search the sunken titanic in 1912 and the medical application being used after World War II in late 1940s and early 1950s.<sup>1</sup> In day to day practice imaging plays a very important role in the diagnosis and treatment planning for various head and neck pathologies. Computed Tomography and MRI can yield much valuable information, but are not universally available and are expensive. Among all the imaging modalities used today, ultrasound has emerged as popular modality because it is non invasive and cost effective.<sup>2</sup> Ultrasound is defined by the American National Standards Institute as "sound at frequencies greater than 20 kHz."Ultrasound is recognized as one of the most risk free methods of evaluating any disease in the head and neck region.<sup>1</sup>

Ultrasound imaging high frequency sound waves are transmitted in to the body by a transducer and echoes from tissue interface are detected and displayed on a screen.<sup>3</sup> The transducers are designed to produce longitudinal waves hence only those waves can pass through tissues get reflected, audio-frequency of a sound wave is 20 KHz. Anything below this is called infrasonic and above this Ultrasound imaging. Medical Ultrasound imaging uses the frequency of 1-15 MHz (2.5, 3.5, 7.5 and 10 MHz). The transducer has a special property called piezoelectric effect i.e. they can convert sound waves in to electrical waves and vice versa.<sup>1,2</sup>

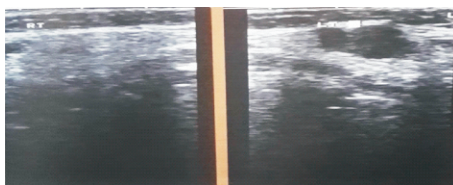
Ultrasound can also be used during FNAC, FNAB. Color Doppler ultrasound can be used for identify vascular supply and vascular lesions. In this paper we will discuss the applications of ultrasound in diagnosis of salivary gland disorders.<sup>3,4</sup>

**Application of Ultrasonography**

**1.Ultrasonography in Salivary Gland Tumors:**

They are rare and approximately 1 to 3% of all neoplasm's about 80% of salivary gland tumors arise from parotid gland, 60 to 80% of which are benign. In the small salivary gland, the ratio of benign to malignant tumors is higher. When the patient is presented with a palpable

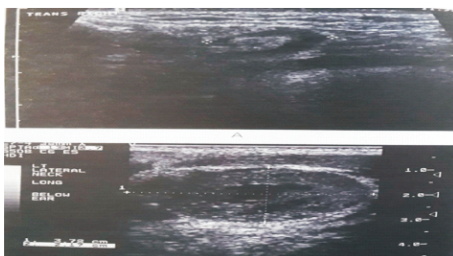
mass in the salivary gland or mass is suspected. Ultrasound imaging can successfully detect any salivary gland mass. Detection of even small lesions was easy, especially in the parotid where its sensitivity approaches 100%.<sup>1,4</sup>



**Fig-1.**Right figure show the normal parotid gland but left figure show Sharply defined, homogenous hypoechoic lesion indicates a benign tumor (pleomorphic adenoma)

**2.Ultrasonography in Neck and Cervical Lymph Nodes:**

High-resolution sonography has become a first line imaging modality for the evaluation of cervical space-occupying lesions including lymph nodes. The high resolution US images currently available can detect neck nodes, reveal changes in the architecture of cervical lymph nodes, and assess their characteristics and the degree of vascular invasion.<sup>2</sup>



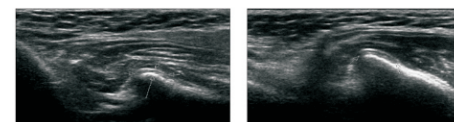
**Fig-2.**Normal lymphnode of the neck Healthy lymphnodes are generally hypoechoic apart from centrehyperechoic area( hilum of the node)

Metastatic lymphnode of the neck, apart from the large size also seen round shape and necrotic area shows hypoechoic, cystic in appearance lesions.

**3.Ultrasonography in Tmj Disorders:**

It could be a useful first level diagnostic instrument in the study of TMJ disc displacement. This is mostly valid while considering the value of US for the study of TMJ effusion. US have proved to be accurate in the detection of joints with effusion and to study

clinically painful joints.

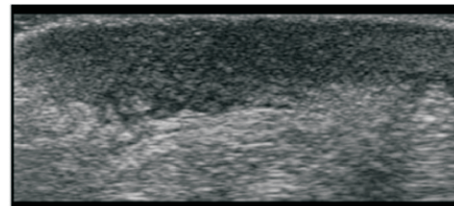


**Fig-3.**Head of the condyle and the articular eminence, is generally hypoechoic (low reflection of sound waves) and appears black in ultrasonography images Margin of the bone is hyperechoic (high reflection of sound waves) and appears white

**4. Ultrasonography in Soft Tissue Infections:**

Clinical diagnosis alone is difficult to differentiate between cellulitis and abscess; in such cases US provides accurate imaging of the superficial structures of head and neck region.

**Edema**

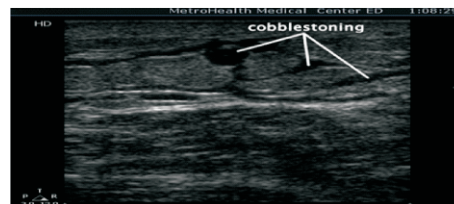


**Fig-4.**Isoechoic with internal thickening of subcutaneous layer

**Abscess**



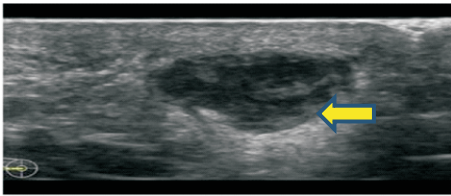
**Fig-5.**Anechoic with no internal echogenicity Cellulitis



**Fig-6.**Diffuse reticulated (cobblestone),

hyperechoic appearance with hypoechoic septa.

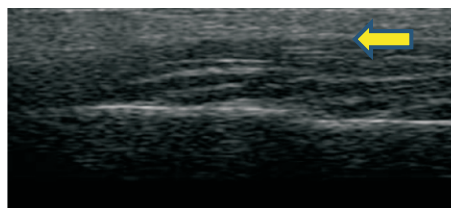
**Granuloma**



**Fig-7.**poorly defined hypoechoic area Cystic lesion

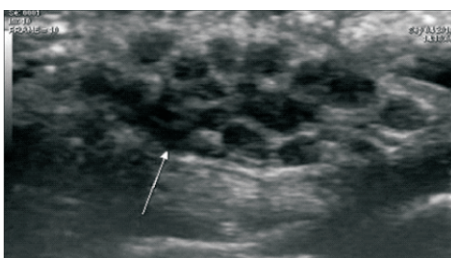


**Fig-8**Hypoechoic well-contoured cavity Inflammatory masseter muscle



**Fig-9.**Reduction of echo intensity with complete or partial absence of hyperechoic bands

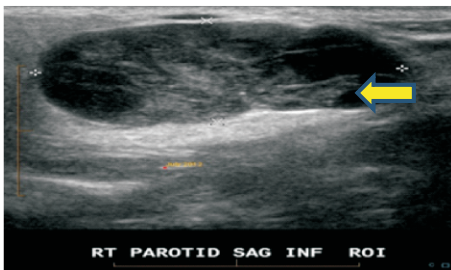
**Sjogren's syndrome**



**Fig-10.**Early stage - normal echogenicity.

Late features - heterogeneous echopattern with multiple round hypoechoic areas within the parenchyma

**Warthin's tumour**



**Fig-11.**Hypoechoic lesion with internal heterogeneity

**5.Ultrasonography in Oral Submucous Fibrosis (OSMF)**

It demonstrates the number, length, thickness of the fibrotic bands and pattern of overall vascularity in the affected area. Vascularity of mucosa overlying the bands was found to be decreased with reduced flow velocity and in between bands the flow was found to be normal.US demonstration of fibrosis and vascularity status during & post treatment period helps to monitor the efficacy of the treatment.

**Normal thickness of fibrous band**

**Advantages**

1. It is a dynamic and readily available technique.
2. It is widely available and relatively inexpensive.
3. It is a non-invasive technique.
4. It does not interfere with normal function.
5. Artifacts are few.
6. Images obtained are easy to read once the observer is trained.
7. Equipments are reportable.

**Disadvantages**

1. Technique is operator dependent.
2. Images can be difficult to interpret for inexperienced operators.
3. Real-time imaging means that the radiologist must be present during the investigation.

**Conclusion**

Ultrasound is non-invasive, inexpensive, readily available and does not pose any radiation hazard. Also it can save the patients from the ionizing radiation of CT and MRI also is well suited economically to the patients. Hence it can be concluded that its proper use and utilization can be of great use in the field of dentistry.

**References**

1. Dharti N1, Neerjesh P.2, Richa Wadhawan\* 3, Ultrasonography; A boon as a diagnostic & therapeutic aid in dentistry: A review, International Journal of Biomedical And Advance Research, (2014) 05 (10)
2. Dr. Reddy Lavanya 1\*, Dr. Nallan CSK Chaitanya 2 Diagnostic and Therapeutic Ultrasound in Dentistry, Journal of Dental & Oro-facial Research Vol 11, Issue 1. Jan-Jun 2015.
3. Shubham Sharma, 1 Deepali Rasila, 2 Mohit Singh, 3, Ultrasound as a diagnostic boon in Dentistry - A Review, International Journal of Scientific Study | May 2014 | Vol 2 | Issue 2
4. Aarathi S. Shenoy 1, Ajit D. Dinkar 2, Role of Ultrasonography in Salivary Gland Health and Disease - A Review IOSR Journal of Dental and Medical Sciences, Volume 15, Issue 1 Ver. V (Jan. 2016), PP 43-46
5. Dr. Jayant Palaskar, Dr. Sohey 1 Sheikh, Dr. Shambulingappa P., Dr. Amit Aggarwal, Role of Ultrasonography in Dentistry, Journal of Indian North-West Delhi Branch - Feb. 2015 Volume 1 Issue 1
6. Senthil KB, Nazargi MM. Ultrasound imaging in dentistry - a review. JIADS 2010
7. Cotti E. Advanced techniques for detecting lesions in bone. Dent Clin North Am. 2010;
8. Yoon MJ, Kim E, Lee SJ, Bae YM, Kim S, et al. Palpal blood flow measurement with ultrasound imaging doppler imaging. J Endod. 2010
9. Boruah LC, Bhuyan AC. Ultrasonography and color doppler as a diagnostic aid in differentiation of periapical lesions of endodontic origin: report of two cases. World J of Dentistry. 2010.