# Ultrasonography: Waves to the disease

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## Abstract
Ultrasonography, Nuclear medicine, Computed tomography, Cone beam computed tomography, Magnetic resonance tomography have been the new-fangled diagnostic modalities in medical as well as the dental diagnostic protocols. The high rate of specificity and sensitivity of ultrasonography for salivary glands has made it the preferred choice of diagnostic modality for the diagnosis of the salivary disease process.

**Keywords:** Ultrasonography, Hypoechoic, Isoechoic, Hyperechoic, Neoplasm, Duct, Glands.

## Introduction
The advent of x-rays in 1895 by William Roentgen opened the gateway for the growth of radiology. Even though x-rays play a critical role in diagnosis, yet its limitations always screeched for the need for other diagnostic modalities. Ever since then the advent of other diagnostic modalities including Ultrasonography(US), Nuclear medicine, Computed tomography (CT), Cone beam computed tomography (CBCT), Magnetic resonance tomography (MRI) have been the new-fangled diagnostic modalities in medical as well as the dental diagnostic protocols.[1]

Ultrasonography detects & displays the acoustic energy which is echoed from interfaces inside from various tissues/organs of the body.[2] Over the years the technological progress in combination with (2D ultrasonography), proficient of quantitatively conserving the amplitude data termed gray scale ultrasonography, helps in diagnosis as well as treating the disease process with minimal destructive process.[3,4] The use of contrast agents in addition to ultrasonography helps enhance the blood echo pattern also further delineate the other structures of the body.[1,5,6] The speed of Ultrasonographic waves is highest in solids and lowest in gases whereas it is intermediate in liquid.

The main application of ultrasonography in dentistry is for the investigation of the salivary glands, which has a very good sensitivity and specificity rate. Other uses of ultrasonography in the head and neck region is TMJ disorders, fractures in the midfacial region and the mandible, cysts and tumors in the oral region and cervical lymphadenopathy of the oro-facial region.

Ultrasonography has been found to be a superior diagnostic tool than CT and even sialography. Ultrasonography helps in the detection of sialoliths, tumors and further unfolding the structural as well as the vascularity of the lesions.[7]

The major salivary glands include the parotid, submandibular and sublingual salivary glands. They may be affected by infections, salivary stones, benign and malignant neoplasms.

Different disease processes are manifested in different patterns which help in identifying the disease process and their extensions. The pattern may be hypoechoic, isoechoic, hyperechoic or anechoic.

In case of acute stage, the salivary glands appear to be enlarged and reveal small multiple hypoechoic oval patterns with an increased blood flow. Further, we may also observe, enlarged lymph nodes with increased central blood flow.

Chronic inflammation shows non-uniform, hypoechoic, but no increased blood flow can be appreciated.[8] In chronic sclerosing sialadenitis, multiple small hypoechoic foci across an heterogeneous area of salivary gland tissue can be appreciated.[9]

Anechoic focal zones within a cavity may be appreciated in the parenchymal tissue of tuberculosis affected tissue.[9]

Abscess on the other hand may show a hypoechoic or anechoic echo pattern in the lesions with enhanced posterior acoustic enhancement and indistinct borders.[10] In case of a well-defined hyperechoic halo, it is suggestive of an organized abscess whereas hyperechoic foci may be appreciated due to microbubbles of gas otherwise, generally.[9]

Sialolithiasis shows strong hyperechoic lines or points with distal acoustic shadowing. Further, USG examination helps to distinguish the presence of stone in the submandibular gland, especially between the glandular parenchyma or in the Wharton duct. A point to remember is that, when air bubbles get mixed with saliva it may appear hyperechoic in USG and may impersonate the stones in the Wharton's duct.[11]

Sialosis depicts enlarged, hyperechoic salivary glands with a poorly visible deep lobe but without focal lesions or increased blood flow.

In, Sjogren's syndrome we can appreciate multiple hyperechoic areas with multiple hypoechoic spots surrounded by hyperechoic lines, which helps to differentiate the patients with Sjogren's syndrome from negative controls.[12]

Cysts show an anechoic content with posterior acoustic enhancement and well defined borders with no evidence of internal blood flow at color doppler imaging.[9,13]

Pleomorphic Adenoma are benign neoplasms which are well-defined, lobulated tumors which show an hypoechoic pattern with posterior acoustic enhancement, further sometimes they may also reveal calcification.[7]

Warthin's tumor is another common benign neoplasm of the salivary glands which is usually oval and well-defined in shape, with a hypoechoic pattern but may also reveal multiple anechoic areas.[7]

The most common malignant neoplasms arising within the salivary glands include mucoepidermoid carcinoma, adenoid cystic carcinoma, squamous cell carcinoma, acinic cell carcinoma, and adenocarcinoma.[7] In case of malignant neoplasms, USG shows an irregular shape with irregular borders and blurred margins. A hypoechoic inhomogeneous structure can be appreciated in case of malignant neoplasms.[14]

## Conclusion

Ultrasonography over the time has gained a lot of popularity as it is non-invasive, economical, and easily available. The high rate of specificity and sensitivity of ultrasonography for salivary glands has made it the preferred choice of diagnostic modality for the diagnosis of the salivary disease process.

**Conflict of Interest:** None.

## References

1. Douglas L. Miller, Michalakis A. Averkiou, Andrew A. Brayman et al. Bioeffects considerations for diagnostic ultrasound contrast agents. *J Ultrasound Med 2*008;27:611-32.
2. Rumack CM, Wilson SR, Charboneau JW. Diagnostic ultrasound. 1; edition 3rd.
3. W.F. Sample. Gray scale ultrasonography. *Western J Med* 1976;124(5):403.
4. Aaron Fenster, Donal B Downey and H Neale Cardinal. Three-dimensional ultrasound imaging. *Phys Med Biol* 2001;46(5):R67-R99.
5. P.A.Dijkmans, L.J.M Juffermans, R.J.P Musters, et al. Microbubbles and ultrasound: from diagnosis to therapy. *Eur J Echocardigraphy* 2004;5:245-56.
6. Paul G. Newman and Grace S. Rozycki. The history of ultrasound. *Surg Clin North Am* 1998;78(2):179-95.
7. Yousem DM, Kraut MA, Chalian AA. Major salivary gland imaging. *Radiol* 2000;216:19-29.
8. Ching AS, Ahuja AT, King AD, Tse GM, Metreveli C. Comparison of the sonographic features of acalculous and calculous submandibular sialadenitis. *J Clin Ultrasound* 2001;29:332–338.
9. Bradley MJ. Salivary glands. In: Ahuja AT, Evans RM, eds. Practical head and neck ultrasound. London, England: *Greenwich Med Media* 2000;19-33.
10. Thiede O, Stoll W, Schmal F. Clinical aspects of abscess development in parotitis [in German]. HNO 2002;50:332-8
11. Lin DT, Coppit GL, Burkey BB, Netterville JL. Tumors of the accessory lobe of the parotid gland: a 10-year experience. *Laryngoscope* 2004;114:1652–5.
12. Shimizu M, Okamura K, Yoshiura K, Ohyama Y, Nakamura S, Kinukawa N et al. Sonographic diagnostic criteria for screening Sjogren's syndrome. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2006;102:85-93.
13. Matalon TA. Silver B. Ultrasound guidance of interventional procedures. *Radiol* 1990;147(3):43-47.
14. Cvetinović M, Jović N, Mijatović D. Evaluation of ultrasound in the diagnosis of pathologic processes in the parotid gland. *J Oral Maxillofac Surg* 1991;49(2):147-50.

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