

## Original Research Article

# Ultrasound and Doppler evaluation of salivary gland pathology

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### ABSTRACT

**Background:** Lesions of salivary gland are very commonly encountered in clinical practice. Only by Clinical examination alone it is difficult to differentiate between them and know its exact cause and etiology. It would definitely benefit the patient as well as the doctor if they could get an idea of the exact type of lesion affecting the salivary gland. Hence, this study was undertaken to demonstrate as how high resolution ultrasound imaging and use of colour Doppler can be useful in evaluation of salivary gland lesions.

**Methods:** Duration of study was 1 year with sample size of 30 patients. This study has been conducted in the department of Radiodiagnosis JNMC, Sawangi, Wardha all cases irrespective of age and sex referred to the department were evaluated. Aloka Prosound Alpha 7 USG machine with a high resolution probe linear transducer was used. The lesions were evaluated by high resolution real time ultrasound and colour Doppler.

**Results:** Most of the patients were in the age group 41-50 years and had male preponderance. Most presented with unilateral swelling which was tender and firm in consistency. Amongst the study group sialadenitis was most frequent finding followed by pleomorphic adenoma and carcinoma. Pleomorphic adenoma was most common neoplasm having predilection for the parotid gland. Sialadenitis was most common in submandibular gland. The commonest histopathological finding was pleomorphic adenoma.

**Conclusions:** The study concludes that High resolution ultrasound can differentiate various salivary gland lesions. Addition with colour Doppler ultrasound can increase its diagnostic accuracy. High resolution ultrasound with colour Doppler sonography should be first line of imaging modality in suspected cases of salivary gland lesions.

**Keywords:** Colour Doppler, Salivary glands, Ultrasound

### INTRODUCTION

Salivary glands are exocrine glands in mammals that produce saliva. There are three paired major glands, namely parotid, submandibular and sublingual glands and numerous minor glands scattered throughout the oral cavity, nasopharynx and tracheobronchial tree.

A variety of disease processes affect the salivary glands, including inflammatory, systemic, obstructive and neoplastic. Salivary gland diseases are diverse ranging from the minor inflammatory conditions to a diverse

group of benign and malignant neoplasms. Many of these salivary gland diseases are rare and the investigative methods available are also minimal and less productive. Although diverse, most of the salivary gland disorders manifest themselves as the enlargement of the gland.<sup>1</sup> Inflammatory salivary gland lesions are usually of bacterial or viral in origin. In addition inflammation of salivary glands can also be seen in sialolithiasis, sialadenosis and autoimmune salivary gland disorders like Sjogren's syndrome.<sup>1,2</sup> The present study is designed to investigate the salivary gland enlargements by using the sonographic methods and to record the characteristics of

each lesion with reference to border, shape, distribution of internal echoes, acoustic enhancement.

The presence of vascularity and the presence of calcifications are also identified implications. MRI is expensive and cannot be easily used for many patients.<sup>3-5</sup> Under these circumstances ultrasonography can be an appropriate imaging technique for diagnosing salivary gland lesions. Pathological changes in salivary glands can be studied with ultrasonography. It is easy to use, less expensive, less time consuming, non-ionizing and suitable for peripheral location of the salivary gland enlargement.<sup>6</sup> In ultrasonography the electrical impulses are converted into high frequency sonic waves by transducer. Transducer is a device in the ultrasound scanner which can convert electrical energy into sonic energy.

These waves are transmitted into the tissues which are absorbed, reflected, refracted or diffused. As the sonic waves pass through the pathological tissue they produce different types of echoes. These echoes vary in different diseases and the echogenesity is recorded for variations. The echoes are broadly described as hypoechoic, isoechoic and hyper echoic. The results of these echo-changes are recorded and studied.<sup>7</sup> The sonographic features also help to identify the borders, shape, distribution of internal echoes, acoustic enhancements, presence of calcification and vascularity of the salivary glands.<sup>8,9</sup>

The grey-scale examination will be followed by the color Doppler sonography examination. The lowest wall filter value and highest color sensitivity available on the machine will be used to depict intratumoral blood flow. Depending on their vascularization, tumors will be divided into three groups: those with absent vascularization (in which cases no vessels could be identified, poorly vascularized tumors and well vascularized tumors. The poorly vascularized category includes all the tumors where only one or two vessels are identified, either in the periphery or in the centre of the mass. Tumors with more than two vessels are considered well vascularized.<sup>10</sup>

**METHODS**

The Study area was Acharya Vinoba Bhave Rural Hospital of Jawahrlal Medical college, Sawangi(Meghe). The Study subjects were Patients suffering from Salivary glands swelling

Consisting of Sample size of 30 patients with swelling/Lesions of salivary glands irrespective of age, sex duration of history and eitology referred to Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe). After giving informed consent and ethical clearance, patients underwent history recording, ultrasonography evaluation with histopathological sampling. The Duration of study was of 1 year starting from August 2015 to August 2016.

**Inclusion criteria**

- Clinically diagnosed pathology of the salivary glands
- All cases irrespective of age and sex referred to the department with suspected salivary gland lesion will be evaluated

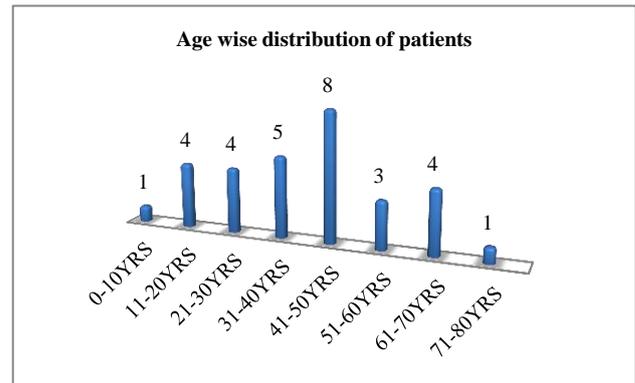
**Exclusion criteria**

Post-operative patients

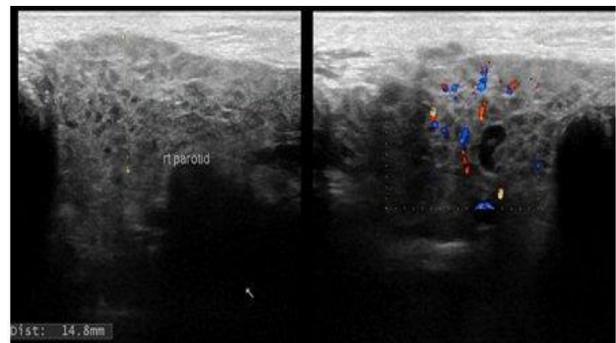
- Patients having coagulation disorders (as histopathology is not easily possible)
- This was a time bound prospective study in which patients presenting with clinical suspicion of Salivary glands lesion were evaluated
- The study was performed on AlokaProsound Alpha 7 USG machine with a high resolution probe having frequency ( 5-15 MHz) linear transducer

**RESULTS**

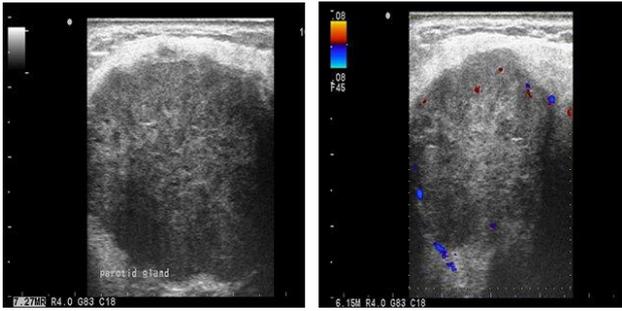
The present study comprised largely of patients to 41-50 years of age group i.e. 26.66% of the cases. Mean age in the study was 41 year, youngest being of 05 year and the oldest of 72 years (Figure 1).



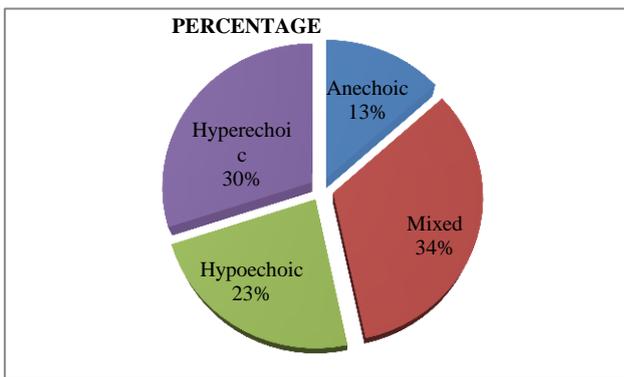
**Figure 1: Age wise distribution of the salivary gland pathologies commonest age group being 41-50 years.**



**Figure 2: Ultrasound and colour doppler images showing a case of saialdenitis of parotid gland showing bulky appearance of the gland and increased in the internal vascularity of the gland.**

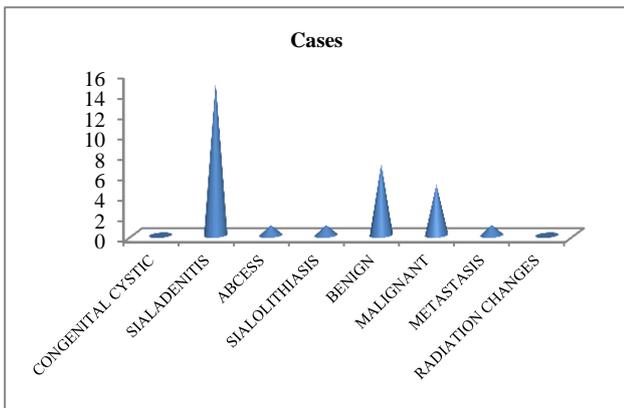


**Figure 3: Ultrasound and colour doppler image showing a case of pleomorphic adenoma of parotid gland appearing as solid, homogeneous, hypo echoic, well margined and multilobulated lesions within the substance of salivary gland with peripheral vasculit.**



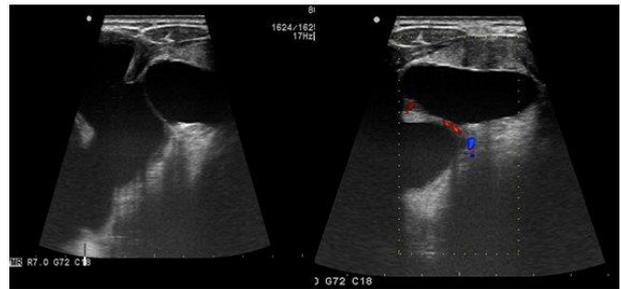
**Figure 4: Percentage wise appearance of the Salivary gland pathologies on Gray scale ultrasound. The most common being the mixed echotexture of the pathological lesion.**

Majority of the patients in the present study were males i.e. 16 patients comprising of 58% of cases. The study also showed that 86.6% of patients had a unilateral swelling of the gland involvement.



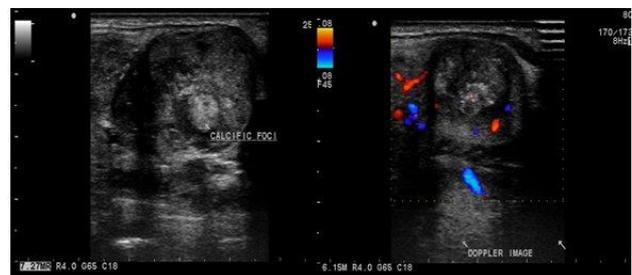
**Figure 5: Commonest lesion found on ultrasound evaluation of salivary gland lesions. Most common finding suggestive of Sialadenitis followed by benign lesion (most common-Pleomorphic Adenoma) followed by Malignancy.**

In 50% of cases the swelling was firm in consistency which was the largest group; the second largest group was of soft swelling which consisted of 25% of the cases. On Ultrasound the lesions showed hyperechogenicity (Figure 2 and Figure 3) in most cases followed by hypoechoicity (Figure 4). On colour Doppler the benign lesions like pleomorphic adenoma (Figure 3) showed peripheral vascularity and the inflammatory lesions had diffuse marked vascularity in the Gland. The malignant lesions had central vascularity on colour Doppler. Out of the 30 patients studied the benign lesions showed well-defined margins and the malignant lesions showing irregular margins on ultrasonography.



**Figure 6: Ultrasound and colour Doppler image of A case of Ranula of sublingual gland appearing a cystic anechoic lesion.**

The lesions which were undergoing degeneration i.e. 13% cases comprising malignant lesions showed cystic changes and calcifications within them. Commonest site of lymphnodes involvement was intraparotid and the benign lesions showed no lymphnode involvement. Pathological diagnosis was obtained in 16 out of 30 cases. the commonest pathological diagnosis was chronic non-specific sialadenitis which constituted 33.33% of cases, followed by that of pleomorphic adenoma which was found to be in 23.3% of the cases, Then followed by 16.6% cases of malignancy commonest being mucoepidermoid carcinoma.



**Figure 7: Ultrasound and colour Doppler image of squamous cell carcinoma showing and ill-defined lesion with increased intralésional vascularity and calcific foci within.**

## DISCUSSION

As the other modalities for diagnosis are not satisfactory the rightful thought to select ultrasonography and

Doppler and study its use for diagnosing salivary gland lesions. Though in the present study the sample is small it shows inflammatory, benign and malignant enlargements of the salivary glands. In the present study, a total of 30 cases of major salivary gland lesions were evaluated with ultrasonography and the results were compared with other similar studies.

In Zaleska Dorobisz U et al study the mean age of patients was 35 years with the mean age range being 14-70 years.<sup>11</sup> While in the present study the mean age was 41 years with the range being 01-72 years. The present study showed that the salivary gland lesions were more commonly affected were male as compared to the study conducted by Zaleska Dorobisz U et al.<sup>11</sup> In this study sialadenitis was the commonest lesion of the salivary gland in the present study followed by Neoplasms. Neoplasms were found to be the most common lesion followed by sialadenitis in the study done by Schurawitzki et al.<sup>12</sup>

The majority of the neoplasms of the salivary gland were found to be involving parotid gland which was similar to other study By Eneroth et al.<sup>13</sup> A number of ultrasonographic features are which are the typical features of pleomorphic adenomas: sharp borders, lobulations of the contour, homogeneous structure, poor vascularization, acoustic enhancement. This well correlates with the ultrasonographic pictures of our present study. Pleomorphic adenoma was the most common benign neoplasm found in present study correlating with the other study.<sup>14</sup>

This study also showed the use of colour Doppler is assessment for the lesions of the salivary glands. The Doppler showed patterns of colour flow such as increased vascularity in cases of sialadenitis. A “basket type” of pattern in pleomorphic adenoma and and diffuse vascularity patterns in cases of malignant lesions as accordance with study by Gandage SG et al.<sup>15</sup>

## CONCLUSION

The study concludes that High resolution ultrasound can differentiate various salivary gland lesions. Addition with colour Doppler ultrasound can increase its diagnostic accuracy. High resolution ultrasound with colour Doppler sonography should be first line of imaging modality in suspected cases of salivary gland lesions.

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