



## A Study on Cytological Spectrum of Salivary Gland Lesions with Emphasis on Diagnostic Pitfalls in Interpretation of Cystic Lesions

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### Abstract

**Background:** *Fine needle aspiration cytology has gained wide clinical acceptance as a direct approach to morphological diagnosis of salivary gland lesions. Salivary gland neoplasms are a heterogenous diverse group of tumours with many associated factors that make their diagnosis by cytology difficult. Limited cellularity and morphological lesion heterogeneity can pose diagnostic challenges, although many of the salivary gland lesions can be diagnosed with ease on fine needle aspiration cytology.*

**Materials and Method:** *This descriptive retrospective study was undertaken at Pathology Department, Government Medical College, Thiruvananthapuram over a period of 18 months. The study was conducted on 250 patients who underwent fine needle aspiration cytology of salivary glands at Government Medical College, Thiruvananthapuram. Histopathological data was obtained in 115 cases.*

**Results:** *Parotid gland was the most commonly involved salivary gland. Age group ranged from 2-77 years. Out of 250 patients who underwent fine needle aspiration cytology, 151 patients were males (60.4 %) and 99 were females (39.6 %). Neoplasms were common (66.9 %) than non neoplastic lesions. Diagnostic accuracy of fine needle aspiration cytology was 73.91 %, Sensitivity 64.3 %, Specificity 75.25 %, Positive predictive value 86.36 % and Negative predictive value 86.3 %.*

**Conclusion:** *Fine needle aspiration cytology is useful, quick, cost effective, reliable diagnostic modality for rapid diagnosis of salivary gland lesions.*

**Keywords:** *FNAC, salivary glands, cytologic spectrum, diagnostic pitfalls, mucoepidermoid carcinoma, cystic salivary gland lesions.*

### Introduction

Fine needle aspiration cytology (FNAC) is a well established and widely used tool for the evaluation of superficially located lesions due to easy accessibility of the procedure. Salivary gland tumours constitute 2 -6.5% of all head and neck lesions in adults.<sup>1</sup>

Fine needle aspiration cytology helps to diagnose whether a salivary gland lesion is inflammatory, benign or malignant allowing the surgeon for proper planning for management. Hence fine needle aspiration cytology should be a part of initial evaluation of patients with a mass lesion in the region of major and minor salivary glands.

Fine needle aspiration cytology of salivary glands was standardised by Berge and Soderstorm (1952)<sup>2</sup>. This technique gained greater importance considering each of characteristic clinical and radiological features which suggest a particular diagnosis. Most of the salivary gland lesions cannot be differentiated from their benign counterpart on clinical criteria alone though few symptoms and signs may suggest malignancy<sup>3</sup>. These also exist cytologic pitfalls and overlapping features that make an accurate diagnosis difficult in some cases. The objective of our study was to evaluate varied cytological spectrum of salivary gland lesions and to correlate with age, gender, anatomical site and histopathology.

**Aims of the Study**

1. To elucidate the cytomorphological patterns in the spectrum of non neoplastic and neoplastic salivary gland lesions
2. To find out the causes of discordant cytopathological and histopathological diagnosis in certain lesions.

**Materials and Methods**

Aspiration of the salivary glands were done under aseptic precautions using 22 or 23 guage needle and 10 ml syringe .Minimum of 2-3 smears were taken out of which one was air dried for Giemsa staining when required and others were fixed in 95 % ethyl alcohol for Papanicolaou staining .

Histopathology of the excision biopsy specimen was studied and final histopathology report was compared with fine needle aspiration cytology report to assess accuracy of cytodiagnosis.

According to the proforma developed for the study, all data were entered and statistical analysis was done using Epi- info software.

This descriptive retrospective study was undertaken at Department of Pathology, Government Medical College Trivandrum over a period of 1½ years. Out of 250 salivary gland aspirations received in our cytology department a total of 115 cases were identified and included in

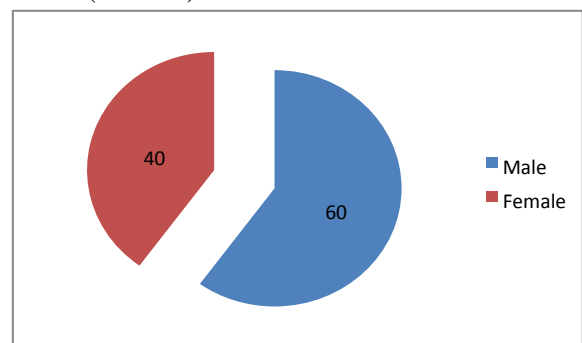
the study where both cytology and biopsy materials were available for review.

The cases were collected at random with no preference for age, sex or any other criteria. Fine needle aspiration cytology of the salivary gland lesions was compared with histopathology. The specimens were examined grossly and representative tissue sections were processed and stained with Haematoxylin and eosin stain and examined.

A positive cytopathological correlation was taken as true positive (TP). Cytopathological disagreement was either false positive (FP) ie cytology positive and histopathology negative or cytology negative but histopathology positive as false negative (FN). Cases were cytological smears were negative and corresponding biopsies also did not reveal any pathological lesions were taken as true negative. Histopathology was taken as gold standard in diagnosis.

**Results**

Out of 250 salivary gland lesions in the study, 113 cases (45.2 %) were neoplastic and 137 cases were non neoplastic (54.8 %). Age of the patients ranged from 2-77 years. Male:female ratio 1.5 :1. 151 patients were males (60.4%) and 99 were females (39.6 %).



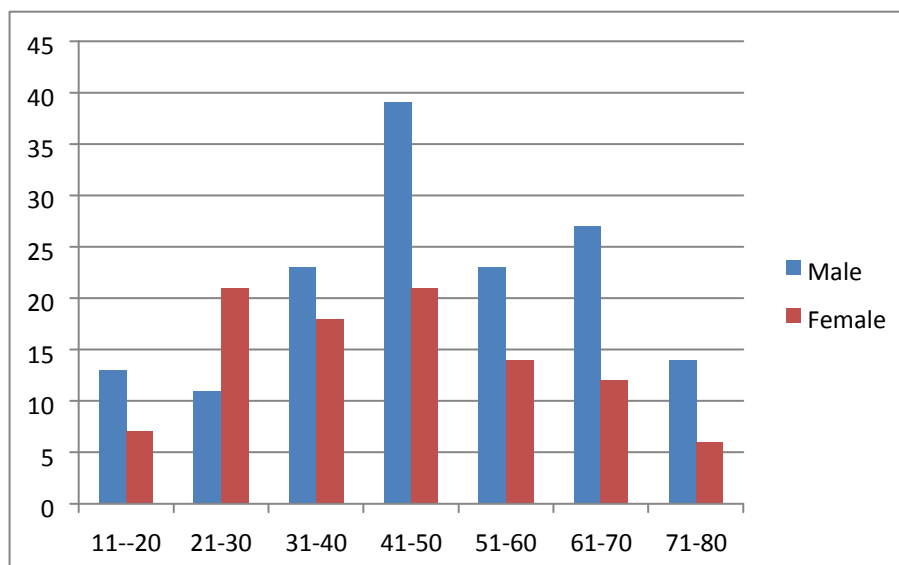
**Table -1:** Distribution of patients according to sex

Sex	Number of patients	Percentage of total
Males	151	60.4 %
Females	99	39.6%

In our study distribution of patient according to age revealed that most of the patients who underwent fine needle aspiration over the age of 30 years

**Table -2:** Age and Sex distribution of patients

Age	Males	Females
0-10	2	-
11-20	13	7
21-30	11	21
31-40	23	18
41-50	39	21
51-60	23	14
61-70	27	12
71-80	14	6
Total	151	99



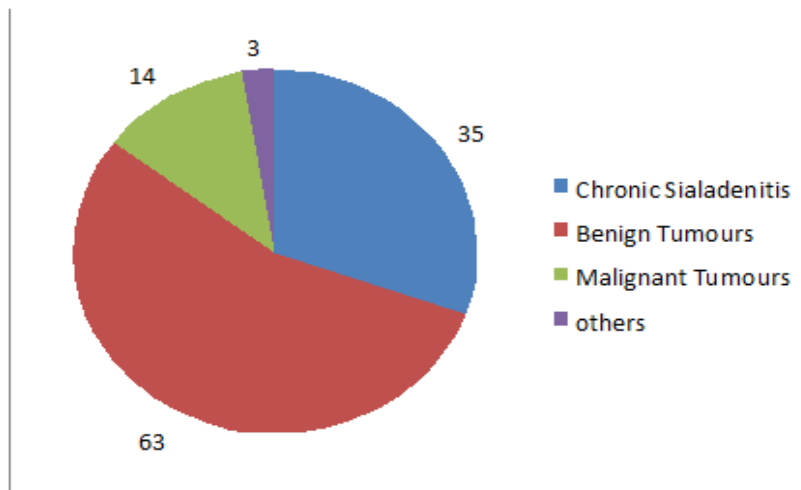
**Table -3:** Distribution of salivary gland lesions (Fine needle aspiration cytology results)

Cytological diagnosis	No. of cases	Percentage of total (250)
Chronic sialadenitis	65	26%
Pleomorphic adenoma	64	25.6%
Acute sialadenitis	33	13.2%
Cystic lesion	24	9.6%
Warthins tumour	32	12.8%
Mucoepidermoid carcinoma	12	4.8%
Monomorphic adenoma	2	0.8%
Acinic cell carcinoma	1	0.4%
Squamous cell carcinoma	1	0.4%
Lymphoma	1	0.4%
Inadequate	15	6%
total	250	100%

Out of 250 patients who underwent fine needle aspiration cytology histopathological correlation was obtained in 115 cases

Frequency of salivary gland lesions (Histopathology)

Histologic Type	No. of cases	% of total
Chronic Sialadenitis	35	30.43%
Benign Tumours	63	54.79%
Malignant Tumours	14	12.17%
others	3	2.61%



The category of ‘others’ included on case each of haemangioma, lymphangioma and a mucinous cystadenoma.

**Table 4:** Frequency of Benign Tumours

Histologic Type	No. of cases	% of benign tumours
Pleomorphic adenoma	41	65.08
Warthin's tumour	20	31.74
Monomorphic adenoma	2	3.18
Total	63	100

There were 63 benign tumours which were classified as in Table 4.

**Table 5:** Percentage of malignant tumours

Histologic type	No of cases	% of malignant tumours
Mucoepidermoid carcinoma	10	71.43%
Acinic cell carcinoma	4	28.57%
Total	14	100%

In our study 14 tumours were histopathologically classified as malignant as on Table 5.

The different parameters for accuracy were calculated on statistical basis. 101 benign tumours and 14 malignant tumours were diagnosed histopathologically in this series. Out of 101 benign lesions, 63 were benign tumours and 38 cases were non neoplastic and inflammatory lesions.

Out of 101 benign lesions, 76 were correctly diagnosed (true negatives). 88 cases were predicted as benign (predicted negatives). 9 cases were predicted as malignant (predicted positives) by FNAC.

The sensitivity of FNAC for detecting malignancy was 64.3%, specificity 75.25% accuracy 73.91% , negative predictive value 86.3% and positive predictive value 100%.

**Discussion**

The aim of pre operative FNAC of salivary gland lesions is to distinguish neoplastic lesions from non-neoplastic lesions which enables the surgeon to plan appropriate treatment ranging from follow up or conservative surgery for non neoplastic lesions, wide local excision for benign lesions and radical surgery for malignant lesions.

Cytologic interpretation of salivary gland lesions are extremely challenging due to significant overlap in the morphologic patterns in many benign and malignant neoplasms and histologic pattern heterogeneity within the same tumour.<sup>4</sup>

Our study explains the role of this procedure in our set up to diagnose salivary gland lesions and spectrum of disease pathology of salivary glands in our population.

During the study period out of 250 patients who underwent fine needle aspiration cytology of salivary gland lesions, 115 patients underwent

surgery and subsequent histopathological examination. The age range in this study varied from 2 to 77 years.

Out of 250 patients who had undergone fine needle aspiration cytology, 151 (60.4%) were males and 99 (39.6%) were females. Salivary gland neoplasms in general are however more common in females<sup>5</sup>. Chronic sialadenitis and pleomorphic adenoma were the common non neoplastic and benign lesions. Mucoepidermoid carcinoma was the most common malignant lesion in our study<sup>6</sup>

Most common salivary gland affected in our study was the right parotid gland.

The most common neoplasm encountered in our study was pleomorphic adenoma. 32 out of 41 cases were correctly diagnosed by FNAC. The smears were cellular with round and plasmacytoid cells with well defined cytoplasm and eccentrically placed bland nuclei, spindly myoepithelial cells in a background of fibrillary chondromyxoid stroma. Three cases of pleomorphic adenoma with extensive cystic degeneration were only diagnosed only as cystic lesions in cytology. Plasmacytoid cells and fibrillary chondromyxoid matrix are considered as pathognomonic features by Orell et al<sup>7</sup> and May KM Chan<sup>8</sup> which clinches the diagnosis of pleomorphic adenoma.

The cytologic diagnosis of pleomorphic adenoma is not usually difficult in typical cases. Since the pattern can vary considerably between different parts of same tumour multiple sampling should be done to overcome diagnostic problems.

Warthins tumour was the next common benign neoplasm in our study. Out of 20 cases, 15 (75%) were correctly diagnosed. Cytological features in all cases were monolayered flat sheets of oncocyctic cells with round central nuclei and bland chromatin with a background of numerous lymphocytes and mucoid, murky debris. In our study, 4 cases were diagnosed as cystic lesions because of lack of oncocytes and aspirate yielded mainly fluid and macrophages only. The differential diagnosis include oncocytoma,

squamous cell carcinoma, mucoepidermoid carcinoma (in presence of atypical squamous cells) and acinic cell carcinoma<sup>9</sup>.

The most common malignant tumour encountered in the present study was mucoepidermoid carcinoma. Mucoepidermoid carcinoma is histologically composed of a mixture of squamous cells, mucous secreting cells, intermediate cells and occasional goblet cells.

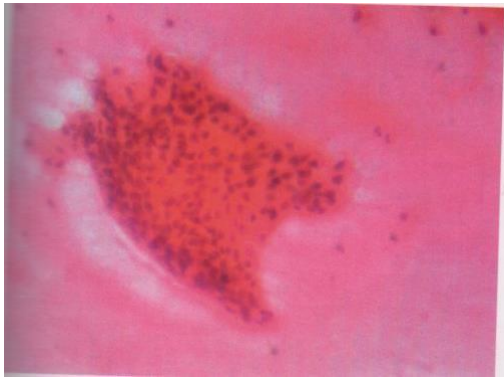
In the present study, 10 cases were diagnosed histopathologically as mucoepidermoid carcinoma of which 2 were high grade tumours and one belonged to intermediate grade.

Discordant diagnosis between cytology and histopathology is common in mucoepidermoid carcinoma which occurs due to various factors. Of the ten histopathologically proven mucoepidermoid carcinomas, only four were unequivocally diagnosed as mucoepidermoid carcinoma in FNAC. The diagnostic error in cytology was mainly due to sampling error with aspirates taken only from cystic areas of the tumours. Three cases of mucoepidermoid carcinoma confirmed histopathologically were underdiagnosed as pleomorphic adenoma with metaplastic squamous cells in cytology. It is evident that strict and stringent criteria must be adhered to in diagnosis of these tumours and multiple repeat aspirates with ultrasound guidance if possible should be taken to obtain cells from solid areas in predominantly cystic lesions.

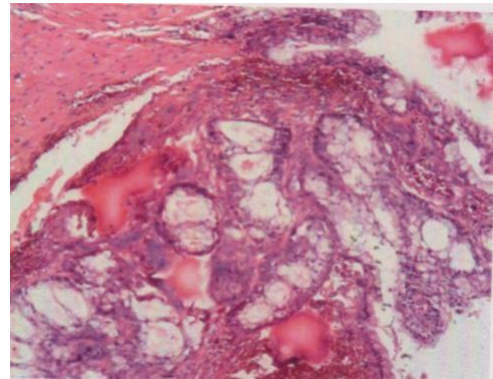
Four histopathologically proven low grade mucoepidermoid carcinoma were diagnosed as cystic lesions in cytology in our study stating the possibility of a low grade mucoepidermoid carcinoma cannot be ruled out.

Reasons for diagnostic failure were inadequate sampling from cystic lesions, as low grade mucoepidermoid carcinoma tend to be predominantly cystic. Total lack of cellular atypia or pleomorphism in low grade tumours and recognition of only one cell type mainly in cystic lesions where the fluid nature of aspirate reduces and dilutes the cell yield.





**Fig. 1:** Cytology smear with bland ductal cells in a background of abundant mucoid material (Pap 100x)



**Fig. 2:** Histopathology of Fig. 1 mucoepidermoid carcinoma low grade with cystic areas (H & E 200x)

Comparison between results of this study and former studies

Study	No:of cases	Sensitivity	Specificity	PPV	NPV
Picconi et al <sup>10</sup>	176	81	99	93	98
Zerpa et al <sup>11</sup>	93	57.1	95.1	50	96.3
Ali et al <sup>12</sup>	129	84	98	93	96
Arul et al <sup>13</sup>	146	86.6	94.6	88.3	94.6
Munoz Palza et al <sup>14</sup>	40	71	91	62.5	93.7
Present study	115	64.3	75.25	86.36	100

Out of four cases of acinic cell carcinoma, only one case was diagnosed correctly by FNAC. Two cases were diagnosed as cystic lesions as the tumour was predominantly cystic and it was due to sampling error<sup>20</sup>. This finding again emphasizes the need for repeated thorough sampling if possible under ultrasound guidance in suspicious cystic lesions of salivary glands.

Two cases of monomorphic adenoma were diagnosed correctly by cytology. Differentiation from pleomorphic adenoma is by absence of mesenchymal chondromyxoid matrix and fibrillary background<sup>15</sup>.

Non neoplastic inflammatory conditions like acute and chronic sialadenitis were rather easy to diagnose in cytology smears. Out of 35 cases of chronic sialadenitis 27 cases, (78%) were correctly diagnosed by FNAC. Two cases were mistaken for Warthins tumour due to misinterpretation of oncocytic change in acinar cells as oncocytes, six cases showed inadequate smears in FNA which was attributed to interstitial fibrosis and atrophy of acinar tissue. In our study, sensitivity was 64.3%, specificity 75.25%,

positive predictive value 86.36% and negative predictive value 100% and accuracy was 73.91%.

**Conclusion**

FNAC is a highly reliable technique for pre operative diagnosis of salivary gland tumours. It is a reliable method in distinguishing between non neoplastic lesions and neoplastic lesions and more importantly to distinguish between benign and malignant neoplasms. Problems and pitfalls may be avoided if reported with caution. Multiple sampling helps in avoiding misinterpretation. However, there still remains a possibility of inaccurate diagnosis in cytology due to overlapping cytological features of various salivary gland lesions and heterogeneity of tumour and in such cases, caution must be exercised in cytological diagnosis and histopathology is the gold standard in final diagnosis of such lesions.

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