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Original Research Article

Diagnostic Role of Fine Needle Aspiration Cytology in Salivary Glandular Lesions- An Insight

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Abstract

Background: The lesions of salivary gland are commonly seen in clinical practice. The myriad of salivary glandular lesions could be because of inflammation, cysts or neoplasms which can be either benign or malignant. Among the various head and neck lesions, salivary glandular lesions accounts for 2-6.5%. Of the various investigations, the Fine needle aspiration cytology (FNAC) stands as most widely used diagnostic tool for salivary gland lesions. This is due to their superficial location and easy accessibility for the needling. FNAC have high sensitivity, specificity and accuracy. Prior cytodiagnosis by FNAC helps in delineating the heterogenous lesions occurring in salivary glands serves as an aid in the evaluation and planning of necessary management. In this context, the present study wasembraced to evaluate the diagnostic role of FNAC in salivary gland lesions.

Objectives of the study:

1. To analyze the various cytomorphological features of salivary glandular lesions.
2. To evaluate the role of FNAC and its diagnostic role in salivary glandular lesions.

Materials and Methods:FNAC of 102 salivary gland swellings together with corresponding histology tissues over a period of 5 years 6 months were studied. Various cytomorphological features of salivary gland lesions were noted and correlated with concomitted histopathologic diagnosis, wherever available. Data collected was analyzed by Statistical Package for the Social Sciences software version 22.0 and presented in terms of proportions or percentage. The parameters of diagnostic value of the cytological technique in terms of predictive values, specificity and sensitivity were evaluated.

Results: Hundred and two FNAC cases of salivary glandular lesions were studied. There were36 cases of non-neoplastic and 64 cases of neoplastic lesions. Pleomorphic adenoma, the benign and mucoepidermoid carcinoma, the malignant tumor were the commonest. Correlation with histology was available for 80 out of 102cytology cases. Statistical analysis showed sensitivity of 100%,89% of specificity, 100% of positive predictive value, 100% of negative predictive value and 98.7% of diagnostic accuracy.

Conclusion: Cytomorphological analysis through FNAC of salivary gland lesions is propitious to both the patient and the clinician. Since FNAC yields immediate diagnosis, accuracy, less cost and lacks complications. Prior cytodiagnosis of the lesions plays a key role in delineating the heterogenous cases thus helpsin better therapeutic management.

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Keywords: Salivary glandular lesions, Fine needle aspiration cytology, Pleomorphic adenoma

Introduction

Salivary glandular tissues are the exocrine glands whose main function is to produce saliva. The major salivary glands are submandibular, parotid, and sublingual glands which are in pairs. Numerous minor salivary glands are seen in the upper aerodigestive tract.[1-3] Mass lesions in salivary glands, always pose diagnostic challenges in routine clinical practice. The myriad of salivary gland lesions could be because of inflammation, cysts or neoplasms which can be either benign or malignant. [1-4] Amongst the various head and neck lesions, salivary glandular lesions accounts for 2-6.5%. [4, 5]

Of the various investigations, the Fine needle aspiration cytology (FNAC) stands as most widely used diagnostic tool for salivary gland lesions. This is due to their superficial location, easy accessibility for the needling, outpatient procedure and can be repeated. Prior cytodiagnosis by FNAC helps in delineating the heterogenous lesions occurring in salivary glands which serve as an aid in the better planning of necessary management.[5-10] In this context, the present study was embraced to evaluate the diagnostic role of FNAC in salivary gland lesions, to review the diversity of lesions in the patients attending our hospital and to correlate cytodiagnosis with histopathology.

Objectives of the study:

1. To analyze the various cytomorphological features of salivary glandular lesions.
2. To evaluate the role of FNAC and its diagnostic role in salivary glandular lesions.

Material & methods:

FNAC of 102 salivary gland lesions together with corresponding histopathology tissues over a period of 5 years 6 months from January 2010 to June 2015 were studied in the Department of Pathology, ESIC Medical College and PGIMSR and ESIC Model Hospital, Rajajinagar, Bengaluru. All the patients with salivary gland swellings irrespective of age and gender were included in the study. The study was started after attaining the institutional approval from ethical committee. Patientsarriving to the department of Pathology with salivary gland swellings, their clinical history, physical findings, imaging findings and probable clinical diagnoses were noted. FNA was performed after obtaining informedconsent from patient by a pathologist using a 22 gauge needle. Four direct smears were done, two of them were air dried and stained with Giemsa stain. The other two slides were fixed in alcohol and stained with Hematoxylin and Eosin. Spectrum of various cytomorphological features of salivary gland lesions was studied. Subsequent corresponding surgical specimens received into the department were studied. The cytomorphological features were correlated with concomitted histopathologic diagnoses.

Statistical analysis

Statistical Package for the Social Sciences software version 22.0 (SPSS Inc, Chicago) was used for statistical analysis and data was presented in terms of percentage. The parameters of diagnostic value of FNAC in terms of predictive values, specificity and sensitivity were evaluated. The association among various variables was studied by Chi-square test and it was considered significant, if p-value was < 0.05.

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Results

Present study included 102 cases of salivary glandular swellings. The patient's age varied from 4 years to 72 years and the highest number of lesions was seen in the age group of 31-40yrs (35.2%) with mean age of 39.2yrs. (Table 1) Male predilection was noted with 70 cases (68.6%) being males and 32 cases (31.3%) being females.

Table 1: Age-wise distribution in salivary glandular lesions

Age range in years	Number of cases	Percentage of cases (%)
<10	2	1.9
11-20	11	10.7
21-30	11	10.7
31-40	32	35.2
41-50	23	22.5
51-60	14	13.7
61-70	6	5.8
71-80	3	2.9
Total	102	100

In this study, the commonest glandular tissue involved was parotid (63 cases).
37 cases of submandibular glands and 1case each of sublingual and minor salivary glands were noted.(Table 2) All the patients presented were clinically manifested with evident swelling as the predominant sign.(Fig 1A & 1B)

Table 2: Site distribution pattern of various salivary glands

Site distribution	Cases in number	Percentage of cases %
Parotid glandular organ	63	61.7
Submandibular glandular organ	37	36.2
Sublingual gland	1	0.98
Minor salivary glands	1	0.98
Total	102	100

In the current study, the prevalent lesions were benign constituting to about 56(54.9%) cases as compared to non-neoplastic being 36 (35.2%) and 8(7.8%) were malignant lesions.(Table3) In 2 cases (1.9%) out of 102 cases, the aspirates were unsatisfactory and in them definitive diagnosis could not be given.

Table 3: Broad categorization of various salivary glandular lesions according to cytodiagnosis

Lesions	Cytodiagnosis	Percentage %
Non-neoplastic	36	35.2
Benign	56	54.9
Malignant	8	7.8
Inadequate	2	1.9
Total	102	100

Chronic sailadentis was the commonest non-neoplastic lesion. Among the benign and malignant tumors pleomorphic adenoma and mucoepidermoid carcinoma were the predominent respectively.(Table 4)(Fig 2,3 & 4)

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Table 4: **Cytodiagnosis of various salivary gland lesions**

Lesion	Cytodiagnosis	Number	Percentage %
Non-neoplastic	Chronic sialadenitis	24	24
	Sialadenosis	12	12
Benign	Pleomorphic adenoma	46	46
	Warthinstumor	9	9
	Oncocytoma	1	1
Malignant	Mucoepidermoid tumor	5	5
	Adenoid cystic tumor	2	2
	Acinic cell tumor	1	1
Total		100	100

Histopathological correlation was available in 80 cases. Of these, histological findings were concordant with cytological diagnoses in 93.7% (75 cases) and discordant findings were seen in 6.2 % (5 cases) (Table 5). Statistical analysis showed sensitivity of 100%, 89% of specificity, 100% of positive predictive value and 100% of negative predictive value. The diagnostic accuracy of FNAC in the study was 98.7%. The association between FNAC diagnoses and histopathological diagnoses showed p-value less than 0.05 and was significant statistically.

Table 5:Cyto -histological correlation of various salivary gland lesions

Lesion	Cytodiagnosis	Total cytological cases	Corresponding histological cases	Concordance	Discordance
Non-neoplastic	Chronic sialadenitis	24	15	15	-
	Sialadenosis	12	7	7	
Benign	Pleomorphic adenoma	46	42	39	3 (2- Basal cell adenoma,1-adenoid cystic tumor)
	Warthinstumor	9	7	6	1(lymphoepithelial cyst)
	Oncocytoma	1	1	1	-
Malignant	Mucoepidermoid carcinoma	5	5	5	-
	Adenoid cystic tumor	2	2	2	-
	Acinic cell tumor	1	1	-	1(salivary duct tumor)

Fig 1A & B: Clinical photograph showing parotid gland swelling and submandibular gland swelling

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Fig 2A: Chronic sialadenitis- FNAC showing lymphocytes, histiocytes and fibrous tissue fragments (H&E, 100x), 2B-Sialadenosis- showing hyperplasia of salivary glandular acinar cells clinging onto a thin fibrovascular stroma on FNAC (MGG, 10 x)

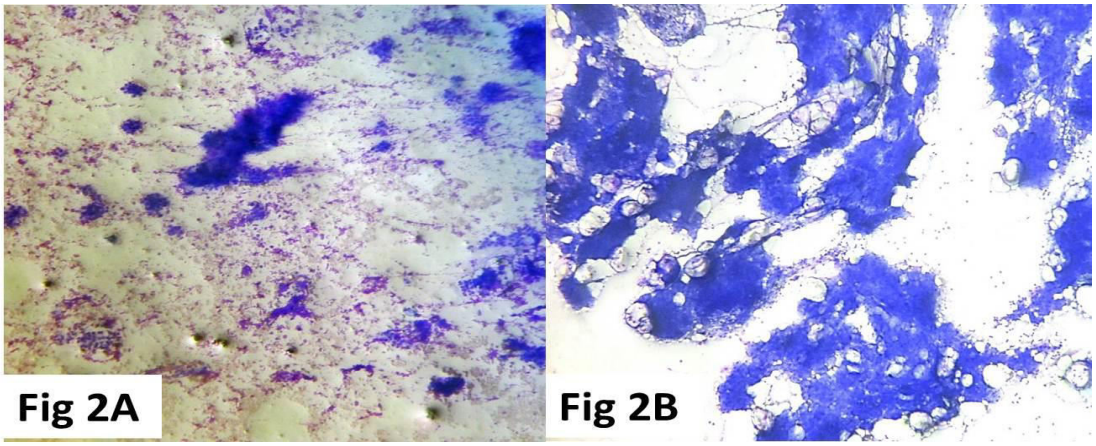

Fig 3A: Pleomorphic adenoma on cytology features epithelial and myoepithelial cells in the chondromyxoid matrix background on FNAC (MGG, 10 x), 3B- Warthin's tumour –cytology showing oncocytic cells admixed with lymphocytes in the background (H&E, 100x)

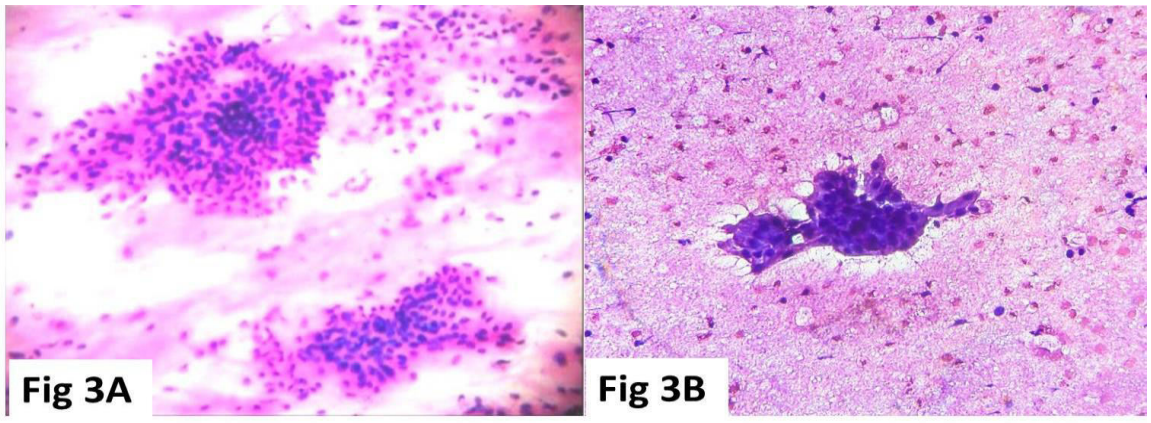

Fig 4A: Mucoepidermoid carcinoma-FNAC showing scanty cellular material consisting of predominantly mucin secreting cells in dirty background (MGG, 10 x), 4B- Adenoid cystic

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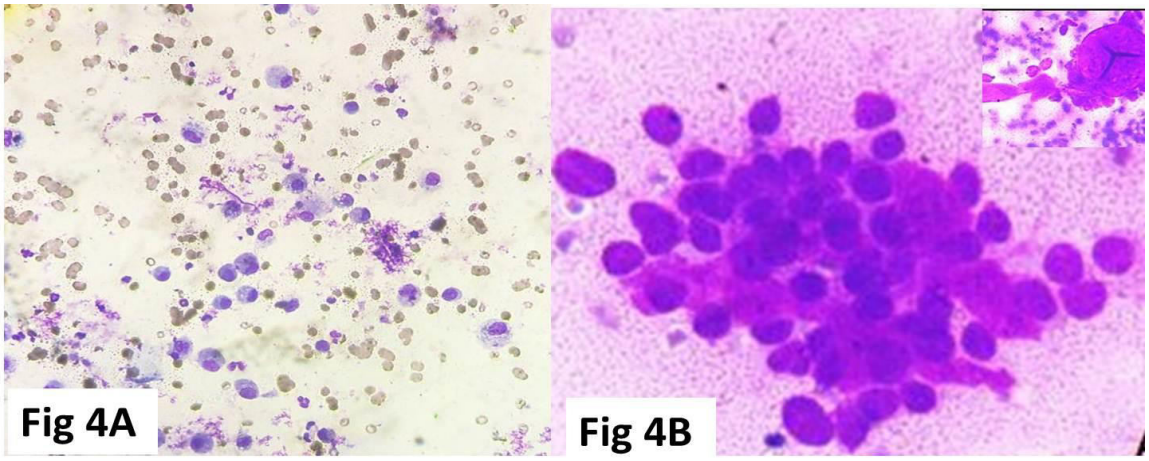
carcinoma showing small, uniform mild atypical tumor cells(Giemsa, 100x) and inset showing hyaline stromal globules (Giemsa, 100x).



Discussion

FNAC has become a popular procedure in the evaluation of various palpable swellings. Literature search reveals various studies having reviewed the utility and role of FNAC as one of the primary diagnostic tool in diagnosing various salivary glandular swellings.[5-10] Prime purpose of using FNA is, it will help in rendering prior specific cytodiagnosis which in turn helps in the better management of the cases.[5-10] In the current study, 102 cases of salivary glandular swellings were studies. The age range commonly affected was between 31 to 40 years. The mean age in the current study was 39.2years. Male predominance with M: F of 1.5:1was noted. The following data was compared with the other studies.[5-10] In contrast; a study done by Vaidya S et al[12] stated that there is no sex preponderance.

Out of 102 cases of FNAC of salivary gland lesions, 98.1% (100 cases) yielded satisfactory conclusive cytological diagnoses and 2 cases (1.9%) showed unsatisfactory results which was in accordance with study done by Arul P et al.[8] In contrast; little higher unsatisfactory values were noted in studies consummated by Diaz et al[10] as 7% and Nguansangiam et al.,[6] as 5.2%. The probable reasons quoted for inadequate results were smaller sized swellings, hemorrhagic aspirates probably vascular lesions, faulty technique and deeper locations. Few of the studies stated cystic lesions posing as a major difficulty for diagnosis.[6-10] In the present study unsatisfactory results attributed were due to smaller swellings and hemorrhagic aspirates.

Parotid gland (61.7%) was the common site for salivary gland lesions followed by submandibular (36.2%) and sublingual gland (0.98%). This was analogous with other studies wherein parotid glandular organ was involved in 60 -82.9% of salivary glandular lesions.[6-12] In the contemporary study, non-neoplastic lesions constituted to 35.2 % of all salivary gland aspirates in accordance with the other existing literature accounting to 11-66% .[6-12] Benign tumors in our study were reported in 54.9 % which were similar with most of the published studies varying from 49% to 82.9%.[6-12] In contradiction; Omhare et al.,[13] study showed lesser percentage of cases accounting to 31.5%. The malignant tumors in the current study was 7.8 % cases analogous to the study done by Nguansangiam et al,.[6] Contrasting, various other authors have reported higher incidence ranging from 15% to 32%. The quoted the probable reasons for this higher incidence as they were the tertiary care or the oncology units.[8,14-15]

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Among the non-neoplastic lesions chronic sialadenitis (24%) and sialadenosis (12%) were the commonly observed entities which were in concordance with other studies.[11-15] Few of the studies showed cysts and tubercular lesions which were not seen in the current study.[6-15] Histological correlation was obtained in 22 cases and all the cases showed concordant results saying hundred percent correct diagnoses on FNAC.

Pleomorphic adenoma (46%) was the most prevalent benign salivary glandular tumor. Overall most common salivary glandular tumor was also pleomorphic adenoma similar to other studies. Out of these 46 cases, 39 cases were confirmed by histopathology. In the remaining 3 cases, 2 cases were diagnosed as basal cell adenoma followed by 1 case as adenoid cystic carcinoma. The cytomorphological features of pleomorphic adenoma showed admixture of epithelial component comprising of bland ductal epithelial cells, myoepithelial cells and stromal component made up of chondromyxoid ground substance. [1-5]Cases with scant stromal component pose diagnostic difficulty, and are misinterpreted as pleomorphic adenoma which turns out to be basal cell adenoma on histology.[18] Similarly situation aroused in our study but since the management for both entities are same, exact distinction is not of much clinical significance.[1-5] Many studies reveal that cytodiagnosis among pleomorphic adenoma and adenoid cystic tumor may pose difficulty due to presence of similar features of myxoid matrix and hyaline globules.[19] A guaranteed diagnosis of adenoid cystic carcinoma should not be based only on the presence of hyaline globules, but diligent scrutiny for cellular and nuclear features should be considered.[1,19] Similar diagnostic dilemma was also encountered in our study, wherein histopathology aided in confirmatory diagnosis.

In our study, 9 cases were diagnosed as Warthinstumor on cytology. Out of these, 7 cases had histopathological correlation. One case, histodiagnosed as chronic sialadenitis and the other lymphoepithelial cyst. Cytodiagnosis of Warthins tumour needs three characteristic features comprising of oncocytes, lymphocytes and granular debris are required.[1] Similar misdiagnosis were encountered in a study done by Arul P et al.[8] Authors quoted the reason as chronic inflammatory lesions can accumulate fluid due to fibrosis and ductular obstructions, oncocytic cells and numerous lymphocytes can easily pose difficulty with Warthinstumor and misdiagnosed for chronic sialadenitis on cytology. Other studies also reveal diagnostic difficulties due to non-representative samples and cystic change.[6-11] Only One case of oncocytoma was encountered in our study which had histopathological correlation. Microscopy of the section showed oncocytes which were polygonal having abundant eosinophilic cytoplasm and central rounded bland nuclei. These results were in accordance to other studies.[1,6-11]

Among the malignant salivary gland neoplasms, 5 cases of mucoepidermoid carcinoma were the commonest followed by 3 cases of adenoid cystic tumor and single case of acinic cell tumor were reported in the present study similar to others studies.[6-9] Whereas a study done by Diaz et al., [10] have concluded, adenoid cystic tumor as the most prevalent malignant tumour accounting to 27.3%. In a study by Postema et al,[20] showed acinic cell carcinoma as the most commonest whilst it was adenoid cystic carcinoma in the studies done by Akhter et al[21] and Stewart et al.[22] All 5 cases of mucoepidermoid had histopathological correlation, wherein cytology showed three different cells comprising of mucous secreting cells, intermediate cells and squamoid cells in the dirty necrotic background. Many studies have found missed diagnosis or over interpretation of mucoepidermoid carcinoma.[6-10] At times ductal epithelium shows metaplastic changes like squamous, mucinous and oncocytic possibly due to

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inflammation and sialolithiasis. [1,6-18]Adenoid cystic carcinoma needs to fulfill the diagnostic criteria of presence of varying sizes of hyaline globules rimmed by tumor cells.[1] Out of 3 cases in the current study, 2 cases correlated with histopathology but one case was labelled as pleomorphic adenoma. Cellular pleomorphic adenoma with mild atypia and hyaline globules posed diagnostic dilemma and was labelled as adenoid cystic tumor on cytology which later on histology confirmed as pleomorphic adenoma.[1,6-18] One case of acinic cell tumor diagnosed in cytology was later confirmed as salivary duct carcinoma on histology. Acinic cell tumors on cytology showed pleomorphic cells having abundant fragile or vacuolated cytoplasm. These cells posed dilemma where they were malignant squamous cell having abundant cytoplasm. Similar statistics of cases and diagnostic dilemmas were also noted in various other studies.[1,6-18]

In the present study, histopathological correlations for various salivary gland lesions were available in 80 cases. Of which, 93.7% (75 cases) showed concordant results with cytological diagnosis whereas 6.2% (5 cases) showed discordant results. Similar ranges of concordant and discordant results were seen in various other studies conducted. [6-18] Statistical analysis showed sensitivity of 100%, 89% of specificity, 100% of positive predictive value and 100% of negative predictive value. The diagnostic accuracy of FNAC was 98.7% in the present study which was comparable to the values obtained in other similar studies conducted on salivary gland lesions. In contrast; a study done byStramandinchi et al[24] showed lower values of accuracy. The author concluded saying that these lower values were related to more of the unsatisfactory or inconclusive cytodiagnosis accounting to 26.1% due inexperience of the operator and the examiner.(Table 6)

Table 6: Diagnostic reliability of FNAC of salivary glandular lesions among other studies

Study	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy %
Stow et al[23] 2004	86.9	92.3	96.8	86.6	92.3
Postema et al[20] 2004	88	99	95	97	96
Stramandinchi et al[24] 2010	68.2	87.7	87.7	82.3	68.2
Nguansangiam S[6] 2012	81.3	99.1	92.9	97.5	97.0
Omhare et al[13] 2014	88.2	97.1	88.2	97.1	95.3
Diaz et al[10] 2014	94	100	100	100	99
Arul et al[8] 2015	86.6	94.6	88.3	94.6	94.6
Present study 2015	89	100	100	98.6	98.7

Conclusion:

Cytomorphological analysis through FNAC of salivary gland lesions is propitious to both the patient and the clinician. Since FNAC yields immediate diagnosis, accuracy, less cost and lacks complications. The specificity, sensitivity, predictive values, accuracy and good agreement among the cytological and histological correlation underscores the fact that FNAC

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is a valuable preliminary primary diagnostic tool for assessing the various salivary gland lesions. Prior cytodiagnosis of the lesions plays a key role in delineating the heterogenous cases and thus helps in better management and avoids unnecessary surgical interventions.

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