



## Original Research Article

## Utility of FNAC in salivary gland swellings with clinico-histological correlation in a tertiary care hospital

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## ABSTRACT

**Introduction:** Salivary gland lesions show cytomorphological heterogeneity with many overlapping features. FNAC is a common preliminary diagnostic tool for evaluation of the lesions of salivary glands. The main goal of FNAC is for proper initial diagnosis and its further management.

**Hypothesis:** This was a prospective study conducted over a period of two years from January 2018 to January 2020. Total 120 patients having salivary gland swellings were included in the study. The lesions were initially assessed by FNAC and subsequently correlated with histopathology wherever possible.

**Results:** Middle aged females (40-50yrs) were the common cases in the present study with parotid swelling the most common site. Chronic sialadenitis was the most common non-neoplastic lesion. Pleomorphic adenoma was the most common benign and mucoepidermoid carcinoma was the most common malignant neoplasm. The sensitivity, specificity, positive predictive value (PPV) and negative predictive values (NPV) of FNAC in our study were 77.8%, 98.11%, 87.5 % and 96.3% respectively with a diagnostic accuracy of 95%.

**Conclusion:** FNAC is an excellent preliminary diagnostic technique for planning the management of salivary gland lesions. However, due to overlapping cytological features and heterogeneity it should always be correlated with clinical and radiological findings along with histopathology for a definitive diagnosis.

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### 1. Introduction

Salivary gland lesions constitute about 2-6.5% of all head and neck lesions.<sup>1</sup> The annual incidence of overall salivary gland tumors worldwide is 0.4-13.5 cases per 100,000 populations. Incidence of malignant salivary gland tumors accounts for 0.4-2.6 per 100,000 populations worldwide.<sup>2</sup> FNAC is a rapid, reliable, safe, cost-effective and minimally invasive method for evaluating salivary gland lesions. It was first introduced in 1920 for assessment of parotid lesions and has gained popularity since then. Major salivary glands being superficial in location are easily accessible for FNAC. FNAC is the preliminary diagnostic tool which segregates non-neoplastic from neoplastic lesions and hence avoids unnecessary surgeries. However, due to heterogeneous and overlapping morphological features,

cytological diagnosis of salivary lesions is most often challenging and not definitive. Hence, clinical, radiological and histopathological study in conjunction with cytology can help us to arrive at a definitive diagnosis.

### 2. Aims and Objectives

1. To study the cytomorphological spectrum of salivary gland lesions in our institution
2. To assess the diagnostic accuracy of FNAC by cyto-histopathological correlation

### 3. Materials and Methods

This is a prospective study over a period of two years conducted at the Department of Pathology, Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha from January 2018 to January 2020. 120 patients with palpable

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salivary gland lesions attending the Cytology section of our department were included in the study. A detailed clinical examination was done and radiological findings noted wherever available. Written informed consent of the patient or attendant was taken. Patients with non-palpable salivary lesions, bleeding tendencies and unwillingness for the procedure were excluded from the study.

FNAC was performed by using 22-G needle attached to a 10ml syringe holder by a free hand technique. A minimum of two needle passes were made in each case. The air-dried smears were stained with Leishman's stain and wet ethanol fixed smears were stained by H&E. Special stains were used wherever needed. Some of the patients underwent surgery and our pre-operative cytological results were compared with histopathology wherever possible. Then the study was classified into four categories: True-negative (absence of malignancy correctly diagnosed), True-positive (presence of malignancy correctly diagnosed), False-negative (cytological specimen failed to diagnose a malignancy) and False-positive (cytological specimen was incorrectly considered or suspected for malignancy).

#### 4. Observations and Results

Total number of 120 patients with palpable salivary gland swellings underwent FNAC in the Cytology section. Maximum number of patients (21.67%) belonged to age group of 41-50 yrs [Table 1] with a range of 11 to 80 yrs. Majority of cases were female 66 cases (55%) [Table 2]. Parotid swellings constituted about 58% of the total salivary gland swellings followed by swellings of submandibular gland (30%) and then the minor salivary glands comprising of 12% [Table 3].

On cytological examination, out of 120 cases, 57 cases (47.5%) were non-neoplastic lesions and 63 cases (52.5%) were neoplastic lesions [Table 4,5]. The most common non-neoplastic lesion was chronic Sialadenitis constituting 18 cases (31.5%) [Table 4]. The common benign lesion was Pleomorphic adenoma comprising of 33 cases (55.3%) [Table 5]. Among the neoplastic lesions, 43cases (68.2%) were benign and 20 cases (31.8%) were malignant [Table 6]. Among malignant lesions, the most common tumor was Mucoepidermoid carcinoma constituting 8 cases i.e 12.7% of all neoplastic lesions and 40% of all malignant lesions [Table 5].

Out of 120 patients, 62 cases underwent surgery. Their histopathological examination was done and correlated with cytological diagnosis. Out of 57 cases of non-neoplastic lesions on FNAC, 19 cases underwent surgery of which 16 cases were confirmed non-neoplastic, one case was benign tumor and 2 cases were diagnosed as malignant tumors by histopathology. Among 63 cytologically diagnosed neoplastic lesions, 43 cases were benign and 20 cases were malignant. Out of 43 benign neoplasms, 35 cases underwent biopsy and showed concordance with FNAC

in 34 cases and discordance in 1case. Similarly out of the 20 malignant neoplasms diagnosed cytologically, only 8 patients underwent surgery; 7 cases turned out to be malignant and one case was discordant [Table 6].

In our study there were many concordant and discordant results in cyto-histology correlation. 29 cases of Pleomorphic adenoma in cytology were confirmed by biopsy [Figure 1 A,B]. . Out of 4 cases diagnosed by FNAC as suggestive of Warthin's tumor, 3 cases were confirmed histologically [Figure 2 A,B] and one was found to be salivary duct cyst on biopsy. 2 cases of Adenoid cystic carcinoma were proven by biopsy [Figure 3 A,B]. One case diagnosed as mucus retention cyst in cytology was low-grade mucoepidermoid carcinoma histologically [Figure 4 A,B]. One case which was diagnosed as sialadenitis cytologically came out to be Acinic cell carcinoma histologically [Figure 5 A,B]. Out of 15 cases diagnosed as chronic sialadenitis, one was Warthin's tumor, 13 were chronic sialadenitis and one was Kuttner's tumor on histology. Two cases diagnosed as monomorphic adenoma cytologically were basal cell adenoma and oncocytoma on histopathology. Out of two cases of mucoepidermoid carcinoma in cytology, 3 cases were confirmed and one case was Pleomorphic adenoma in histology. One case of metastatic deposit with differential diagnosis of carcinoma-ex-pleomorphic adenoma was confirmed to be carcinoma-ex-pleomorphic adenoma on biopsy. Another case of metastatic deposit in submandibular gland came out to be metastatic squamous cell carcinoma [Table 7].

**Table 1:** Distribution of cases according to age, n=120

Age group(yrs)	No. of cases	Percentage (%)
11-20	08	6.7
21-30	17	14.2
31-40	20	16.7
<b>41-50</b>	<b>26</b>	<b>21.7</b>
51-60	19	15.8
61-70	14	11.7
71-80	16	13.3
TOTAL	120	100%

**Table 2:** Distribution of cases according to gender, n=120

Gender distribution	No. of cases	Percentage (%)
Male	54	45
Female	66	55
Total	120	100

#### 4.1. Statistical Analysis

The sensitivity, specificity, positive predictive value (PPV), negative predictive value(NPV) and overall diagnostic accuracy of FNAC to discriminate benign from malignant

**Table 6:** (Incidence of cytological diagnosis and histopathological follow-up cases, n=120)

Cases	No of FNAC cases	Histological follow-up cases	Non-neoplastic	Benign neoplasm	Malignant Neoplasm
Non-neoplastic	57	19	16	01	02
Benign	43	35	01	34	0
Malignant	20	08	0	01	07
Total	120	62	17	36	09

**Table 7:** Incidence according to correlation between cytology and histopathology

FNAC diagnosis(No of cases)	Histopathology diagnosis(No of cases)
Mucus retention cyst(1)	Low-grade Mucoepidermoid carcinoma(1)
Chronic sialadenitis(15)	Warthin’s tumour(1) Chronic sialadenitis(13) Kuttner’s tumour(1)
Sialadenosis(1)	Acinic cell carcinoma(1)
Reactive hyperplasia (1)	Reactive hyperplasia(1)
Abscess(1)	Infected salivary duct cyst(1)
Suggestive of Warthin’s tumour(4)	Salivary duct cyst(1) Warthin’s tumour(3)
Monomorphic adenoma(2)	Basal cell adenoma(1) Oncocytoma(1)
Pleomorphic adenoma(29)	Pleomorphic adenoma(29)
Mucoepidermoid carcinoma(4)	Pleomorphic adenoma(1) Mucoepidermoid carcinoma(3)
Adenoid cystic carcinoma(2)	Adenoid cystic carcinoma(2)
Suggestive of Metastatic deposit D/D- Carcinoma-ex Pleomorphic adenoma(1)	Carcinoma-ex-Pleomorphic adenoma(1)
Metastatic deposit in submandibular gland(1)	Metastatic squamous cell carcinoma(1)

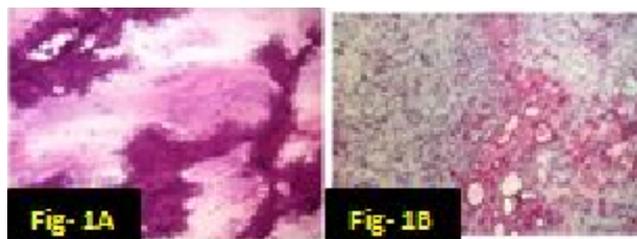
**Table 8:** Statistical analysis

FNAC diagnosis	H.P. diagnosis		Total
Malignant	7(TP)	1(FP)	08
Non-malignant	2(FN)	52(TN)	54
Total	9	53	62

TP=True positive, FP= False positive, TN= True negative, FN=False negative

**Table 9:** Comparison of present study with similar studies

Studies	No of cases	Diagnostic accuracy (%)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Stramandinoli RT et al.	79	82.3	68.2	87.7	68.2	87.7
Piccioni et al	176	97	81	99	93	98
Stow N.et al	104	92.3	86.9	92.3	96.8	86.6
Postema RJ et al	380	96	88	99	95	97
Rehman H et al	50	78	53.28	88.57	72.7	79.9
Present study	120	95.16	77.77	98.11	87.5	96.29



**Fig. 1:** (Pleomorphic adenoma): A) Cytosmeer showing clusters of epithelial cells and chondromyxoid stroma, B) Biopsy showing epithelial cells forming tubules and cords in a chondromyxoid stroma.



**Fig. 2:** Warthin’s tumor): A) Cytosmeer showing clusters of oncocytic cells and lymphocytes in a fluidy background. B) Biopsy showing cystic spaces lined by bilayered oncocytic epithelium and dense lymphoid stroma.

**Table 3:** (Distribution of cases according to site, n=120):

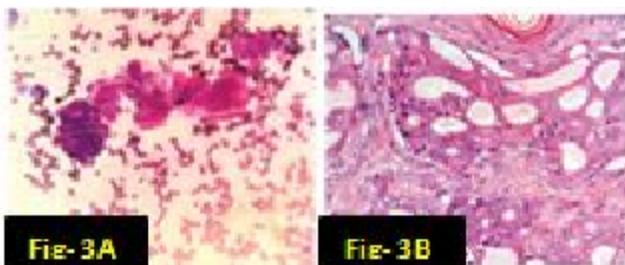
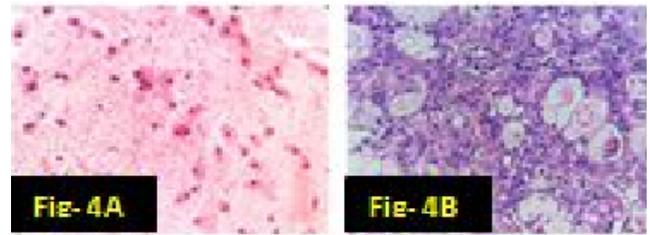
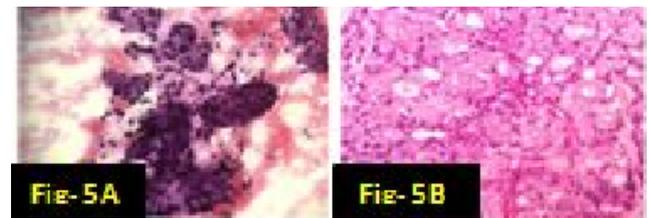
Site of FNAC	Number of cases	Percentage(%)
Parotid	70	58
Submandibular	36	30
Minor salivary glands	14	12

**Table 4:** Incidence of non-neoplastic lesions, n=120

Cytological diagnosis	No. of cases	Percentage (%)
Benign salivary aspirate	04	7.0
Sialadenosis	08	14.0
Acute sialadenitis	05	8.8
Chronic sialadenitis	18	31.5
Granulomatous inflammation	02	3.5
Cystic lesion	08	14.0
Reactive hyperplasia	05	8.8
Abscess	07	12.3
Total	57	100

**Table 5:** Incidence of neoplastic lesions, n=120

Cytological diagnosis	Number of cases	Percentage (%)
Pleomorphic adenoma	33	52.3
Warthin's tumour	08	12.7
Monomorphic adenoma	02	3.1
Mucoepidermoid carcinoma	08	12.7
Adenoid cystic carcinoma	05	7.9
Metastatic carcinoma	06	9.5
Suggestive of Carcinoma ex-Pleomorphic adenoma	01	1.6
Total	63	100

**Fig. 3:** (Adenoid Cystic Carcinoma): A) Cytosmeer showing bassloid cells in clusters and hyaline globules, B) Biopsy showing tumor cells arranged in cribriform pattern.**Fig. 4:** (Mucoepidermoid Carcinoma): A) Cytosmeer diagnosed as mucus cust showing plenty of muciphages over a dirty granular background, B) Biopsy Showing features of low grade mucoepidermoid carcinoma showing clusters of mucous, squamous and intermediate cells.**Fig. 5:** (Acinic cell carcinoma): A) Cytosmeer diagnosed as sialadenosis showing clusters of aciner cells adherent to thin fibrovascular stroma and few naked nuclei, B) Biopsy showing uniform looking serous cells having abundant vacuolated cytoplasm with basophilic granules

lesions were calculated by the following formulae of statistical analysis.

Sensitivity = True positive/ (True positive + False negative) x 100

Specificity = True negative/ (True negative + False positive) x 100

Positive predictive value = True positive/ (True positive + False positive) x 100

Negative predictive value = True negative/ (True negative + False negative) x 100

Accuracy = True positive + True negative / (True positive + False positive + True negative + False negative) x 100

In our study the sensitivity and specificity of FNAC was 77.77% and 98.11% respectively. The

Positive predictive value was 87.5% and Negative predictive value was 96.29% with a diagnostic accuracy of 95%.

## 5. Discussion

Our study included a total of 120 FNAC cases; of which 62 patients underwent surgery at our institution. Salivary gland lesions develop in a wide age range with maximum lesions belonging to age group of 41-50yrs (21.67%). In present study, benign tumours were prevalent between 31-40yrs and it correlated with studies by Ritu Jain et al<sup>3</sup> and Vidyadhara Rani et al.<sup>4</sup>

In the present study, 45 % ( 54 cases) were males and 55 % (66 cases) were females. There was female preponderance with male to female ratio(M:F ratio) of 1:22. Our finding is comparable to the studies of N.Sangeetha et al<sup>5</sup> and Vidyadhara Rani et al.<sup>4</sup>

Parotid gland involvement was seen in 58%(70cases) of total FNAC cases which correlates with studies of Ritu Jain et al.<sup>3</sup> Shilpa H.Gandhi et al<sup>6</sup> and Kacharu et al.<sup>7</sup> Submandibular gland involvement was seen in 30%(36cases) and it is comparable with results in studies by Ritu Jain et al<sup>3</sup> and Sonal Verma et al.<sup>8</sup> The patients in our study presented with unilateral salivary gland swellings and there was no single case of bilaterality.

The present study showed non-neoplastic lesions to represent 47.5% of total cases and rest 52.5% were neoplastic lesions. These findings were comparable with studies by Hilda Fernandes et al.<sup>9</sup> The most common non-neoplastic lesion diagnosed was chronic sialadenitis. Other non-neoplastic lesions were acute sialadenitis, sialadenosis, cystic lesion and abscess. These results showed consistency with studies by Mihashi et al and Ashraf et al.<sup>10,11</sup>

Among benign neoplasms, Pleomorphic adenoma was the most frequently encountered lesion in our study which is well documented by Mihashi and Ashraf et al.<sup>10,11</sup> Mucoepidermoid carcinoma was the most common tumor which was concordant with studies of Koirala S et al<sup>12</sup> and Panchal et al.<sup>13</sup>

On cyto-histopathological correlation, there were some discordant results. There were 7 true positive cases for malignancy which on biopsy comprised of Mucoepidermoid carcinoma (3cases), Adenoid cystic carcinoma (2cases), Carcinoma-ex Pleomorphic adenoma (1case) and Metastatic squamous cell carcinoma (1case). There was one false positive case of low-grade mucoepidermoid carcinoma on cytology which revealed pleomorphic adenoma on histopathology. The misdiagnosis in cytology was due to lack of typical features and presence of atypical looking squamous cells.

There were 52 true negative cases which revealed chronic sialadenitis(13cases), Kuttner's tumour(1case), reactive hyperplasia(1case), infected salivary duct cyst(1case), salivary duct cyst(1 case), Pleomorphic adenoma (29cases), Warthin's tumor (4cases), Oncocytoma (1case) and Basal cell adenoma(1case). Discordant result was seen in a parotid swelling diagnosed as suggestive of Warthin's tumor due to presence of clusters of benign looking ductal cells, fluidy background, lymphocytes and cyst macrophages which turned out be just an infected salivary duct cyst on biopsy. On the contrary, 2 cases of chronic sialadenitis on FNAC revealed Kuttner's tumor and Warthin's tumour respectively on biopsy.

There were two false negative cases in our study. One case of Mucoepidermoid carcinoma was missed in cytology due to aspiration of only mucoid paucicellular fluid showing only muciphages in a mucoid background

in FNAC. Similarly, a case of acinic cell carcinoma was misdiagnosed as sialadenosis as it showed clusters of normal looking acini.

The causes of non-diagnostic aspirate is most commonly due to sampling error which can be due to improper positioning of needle, cystic and haemorrhagic lesions.<sup>14,15</sup> Representative, meticulous sampling and careful clinic-radiological correlation can help to reach a correct diagnosis. Small, non-palpable and deep seated lesions can be approached correctly by image guidance.

The sensitivity, specificity, positive predictive value and negative predictive values of FNAC in our study were 77.8%, 98.11%, 87.5 % and 96.3% respectively [Table 9] with a diagnostic accuracy of 95%, which was comparable with other studies.<sup>16–20</sup>

## 6. Conclusion

FNAC is an excellent preliminary diagnostic technique for planning the management of salivary gland lesions. However, it can be challenging due to overlapping features and heterogeneity in salivary gland lesions. Therefore FNAC should always be correlated with clinical, radiological findings along with histopathology to reach a definitive diagnosis.

## 7. Limitation of our study

The limitation of our study is less number of cases for biopsy due to loss to follow-up resulting in lack of histopathological correlation in all cases.

## 8. Source of Funding

The researchers did not receive any grant from outside funding agencies. This was self funding.

## 9. Ethical Approval

Prior to FNAC, all participants were oriented about the technique and informed consents were obtained.

## 10. Conflict of Interest

The authors declare that they have no conflict of interest.

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