

# A STUDY OF CYTOLOGICAL AND HISTOPATHOLOGICAL CORRELATION IN SALIVARY GLAND LESIONS

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### Abstract:

**Introduction:** The salivary glands, both major and minor, are subject to many tumors and tumor-like conditions. Even though imaging techniques, needle biopsies and frozen sections are available for confirming the diagnosis prior to surgery; fine needle aspiration offers fairly good pre-treatment diagnosis. The present study is done to correlate the cytological features of salivary gland lesions with histopathological findings.

**Materials and methods:** The materials for this study included 42 fine needle aspiration smears and 31 biopsies of surgical specimens sent for salivary gland lesions to Department of Pathology in a tertiary care hospital.

**Results:** Data regarding age, sex, site and laterality of salivary gland lesion were documented for each case. Salivary gland lesions were classified into 3 diagnostic classes: Non-neoplastic lesions 9 (29.03%), benign lesions 18 (58.06%), and malignant lesions 4 (12.90%). The case distribution was as follow: True positive cases (20); false positives cases (0); True negative cases (9); and false negative cases (2) [From these 2 cases, 1 case was of salivary duct carcinoma and the other of monomorphic adenoma]. The present study revealed sensitivity 90.90%, specificity 100%, diagnostic accuracy 93.54%, positive predictive value 100%, and the negative predictive value 81.81%.

**Conclusion:** The present study revealed the diagnostic role and reliability of fine needle aspiration cytology in salivary gland lesions. Re-aspirations and image-guided techniques, coupled with immunohistochemistry, will certainly enhance the diagnostic accuracy.

**Keywords:** Salivary gland lesions, cytodiagnosis, histodiagnosis, discordance, diagnostic accuracy

### Introduction:

The main goal of any diagnostic procedure is to assist the clinician in the management of patients. The salivary glands, both major and minor, are subject to many tumors and tumor-like conditions. Even though imaging techniques, needle biopsies and frozen sections are available for confirming the diagnosis prior to surgery; fine needle

aspiration (FNA) offers fairly good pre-treatment diagnosis. The procedure is safe, rapid, economical, and easy to perform.

The present study is done to correlate the cytological features of commonly encountered salivary gland lesions with histopathological findings in order to achieve higher degree of diagnostic accuracy by giving specific diagnosis whenever possible.

## Materials and methods:

The materials for this study included FNA smears and biopsies of surgical specimens sent for salivary gland lesions at Department of Pathology in a tertiary care hospital. In this study FNA was performed for 42 cases. Patients of all the age group presenting with enlargement of either parotid, submandibular, sublingual and minor salivary glands in the oral cavity were selected and FNA performed. All the smears were stained by Papanicolaou (Pap), Hematoxylin & Eosin (H&E) and May Grunwald Giemsa (MGG) stains. Out of 42 cases of salivary gland lesion, 31 cases underwent surgery and the biopsy specimens were processed for histopathological examination. Correlation of cytological and histological diagnosis was done in all the cases.

## Results:

The patients under study were of age group ranging from 15-76 years. Maximum numbers of patients were in the age group of 31-40 years 11 (35.48%). According to sex females were 16 (51.61%) and males were 15 (48.39%). (Table 1)

In the present study out of 31 lesions, 21 (67.74%) were more common in the parotid gland. Amongst the parotid gland lesions 14 (45.16%) were in the right and 7 (22.58%) in the left. These were followed by right submandibular gland 8 (25.81%) and out of these 6 (19.35%) in the right and 2 (6.45%) in the left. Two cases (6.45%) occurred in the minor salivary glands.

Salivary gland lesions were classified into 3 diagnostic classes: Non-neoplastic lesions 9 (29.03%), benign lesions 18 (58.06%), and malignant lesions 4 (12.90%).

Salivary gland lesions 23 (74.19%) were more common in the age group of 21-50 years. Non-neoplastic lesions 5 (55.55%) were common in the age group of 21-40 years. Benign lesions 15 (83.33%) were common in 21-50 years age group. Malignant lesions 2 (50%) were common in 41-50 years age group. (Table 2)

Among the non-neoplastic (9) lesions of salivary glands, chronic sialadenitis 7 cases (77.78%) were the most common and of these 5 (55.55%) seen in the submandibular gland and 2 (22.22%) in the parotid gland. Two cases (22.22%) of mucocele were seen in the minor salivary glands.

Amongst benign neoplastic lesions (18), pleomorphic adenoma 17 (94.44%) was most commonly encountered in the parotid gland comprising 14 (77.77%) and 3 (16.67%) in the submandibular gland. One case (5.55%) of monomorphic adenoma was seen in the parotid gland.

Amongst the total 4 cases of malignant neoplastic lesions, 2 (50%) cases were of polymorphous low grade adenocarcinoma, 1 (25%) case of mucoepidermoid carcinoma and 1 (25%) case of salivary duct carcinoma. Out of 4 cases, 1 (25%) case of polymorphous low grade adenocarcinoma was seen in the submandibular gland and the rest 3 cases were seen in the parotid gland.

All the 7 cases (70%) of chronic sialadenitis showed cytopathological and histopathological correlation. Two cases (20%) of mucocele also showed cytopathological and histopathological correlation. One case (10%) suggestive of infected cystic lesion on FNAC was diagnosed as salivary duct carcinoma on histopathology and revealed cytopathological and histopathological discordance.

Out of total 18 benign neoplastic lesions 17 (94.44%) cases were of pleomorphic adenoma and these revealed cytopathological and histopathological correlation. (Figure 1,2,3 & 4) One (5.55%) case suggestive of benign cystic lesion on FNAC was diagnosed as monomorphic adenoma on histopathology.

Out of total 4 malignant neoplastic lesions, 1 case of mucoepidermoid carcinoma (Figure 5 & 6) and 2 cases of Polymorphous low grade adenocarcinoma revealed cytopathological and histopathological correlation. One case of salivary duct carcinoma showed cytopathological and histopathological discordance.

The case distribution was as follow: True positive cases (20); false positives cases (0); true negative cases (9); and false negative cases (2) [From these 2 cases, 1 case was of salivary duct carcinoma and the other of monomorphic adenoma). (Table 3)

The present study revealed sensitivity 90.90%, specificity 100% and diagnostic accuracy 93.54%. In the present study, positive predictive value was 100%, and the negative predictive value was 81.81%.

**Table 1: Age and sex distribution**

Age group (years)	Females n (%)	Males n (%)	Total n (%)
1 – 10	-	-	-
11-20	1 (6.25)	1 (6.67)	2 (6.45)
21-30	4 (25)	3(20)	7 (22.58)
31-40	6 (37)	5 (33.33)	11 (35.48)
41-50	4 (25)	4 (26.67)	8 (25.81)
51-60	-	1 (6.67)	1 (3.22)
61-70	1(6.25)	-	1 (3.22)
71-80	-	1 (6.67)	1 (3.22)
Total	16 (51.61)	15 (48.39)	31 (100.00)

**Table 2: Age-wise distribution of salivary gland lesions in 3 diagnostic classes**

Age group (years)	Non-neoplastic n (%)	Benign n (%)	Malignant n (%)	Total n (%)
1 – 10	-	-	-	-
11-20	1 (11.11)	1 (5.55)	1(25)	3 (9.68)
21-30	3 (33.33)	4 (22.22)	-	7 (22.58)
31-40	2 (22.22)	7 (38.89)	-	9 (29.03)
41-50	1 (11.11)	4 (22.22)	2 (50)	7 (22.58)
51-60	1 (11.11)	1 (5.55)	-	2 (6.45)
61-70	-	1 (5.55)	1(25)	2 (6.45)
71-80	1 (11.11)	-	-	1 (3.22)
Total	9 (29.03)	18 (58.06)	4 (12.90)	31 (100)

**Table 3: Diagnostic accuracy of salivary gland lesions**

Cytodiagnosis	Histopathological Diagnosis		
	Positive for neoplasm	Negative for neoplasm	Total
Positive for neoplasm	True Positive: 20	False Positive: 0	20
Negative for neoplasm	False Negative: 2	True Negative: 9	11
Total	22	9	31

**Table 4: Comparative study of age, sex and site of salivary gland lesions (n = No. of cases)**

	Ashraf <i>et al.</i> <sup>[20]</sup> n=100	Edda <i>et al.</i> <sup>[21]</sup> n=268	Present study n=31
Age (years)	21-40	31-40	31-40
Females	60 (60%)	148 (55.20%)	16 (51.61%)
Males	40 (40%)	113 (42.20%)	15 (48.39%)
Parotid gland			
Submandibular gland	68.00%	34.00%	67.74%
Minor salivary gland	30.00%	33.20%	25.81%
	2.00%	32.80%	6.45%

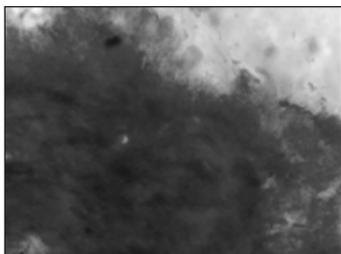
**Table 5: Comparative study of non-neoplastic and neoplastic salivary gland lesions**

Lesions	Jayaram <i>et al.</i> <sup>[10]</sup> N=53	Erosz <i>et al.</i> <sup>[12]</sup> N=151	Akther <i>et al.</i> <sup>[13]</sup> N=24	Das <i>et al.</i> <sup>[23]</sup> N=45	Present Study N=31
Chronic Sialadenitis	2/6 (33.33)	18/22 (81.81)	2/4 (50)	2/3 (66.66)	7/7 (100)
Mucocele	-	8/10 (80)	-	-	2/2 (100)
Cystic lesions	-	1/2 (80)	3/3 (100)	-	0/1 (0)
Pleomorphic adenoma	22/23 (95.65)	46/69 (66.66)	9/12 (75)	25/28 (89.28)	17/17 (100)
Mucoepidermoid carcinoma	1/2 (50)	2/16 (12.50)	1/1 (100)	1/2 (50)	1/1 (100)
Polymorphous low-grade adenocarcinoma	1/2 (50)	-	-	2/2 (100)	2/2 (100)
Salivary duct carcinoma	-	1/2 (50)	-	-	0/1 (0)
Other lesions [not comparable]	27	7	4	15	-
Total	*26/33 (78.78)	*76/121 (62.80)	*15/20 (75)	*30/35 (85.71)	*29/31 (93.55)

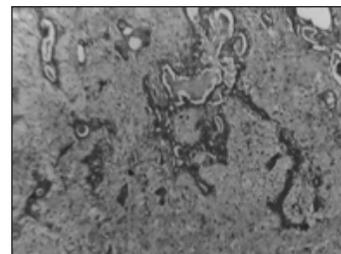
\*Correlated Cases/Total number of cases (%)

**Table 6: Comparative study of diagnostic accuracy of salivary gland lesions**

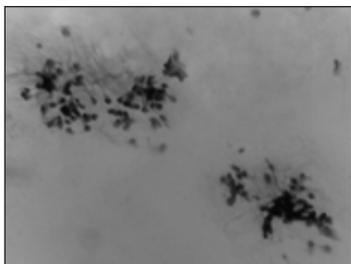
Authors	No. of cases	Sensitivity (%)	Specificity (%)	Diagnostic accuracy (%)
Jayaram <i>et al.</i> <sup>[10]</sup>	53	90	95	73.60
Erosz <i>et al.</i> <sup>[12]</sup>	151	94	100	-
Akther <i>et al.</i> <sup>[13]</sup>	24	90	100	96.43
Das <i>et al.</i> <sup>[23]</sup>	45	94.6	75	91.1
Present study	31	90.90	100	93.54



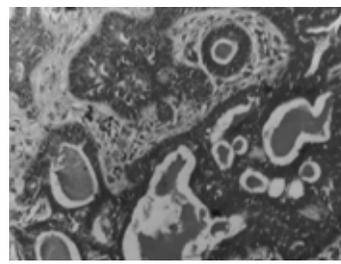
**Figure 1: Pleomorphic adenoma: Smear (40X) shows occasional myoepithelial cells admixed in abundant fibrillary chondromyxoid stroma**



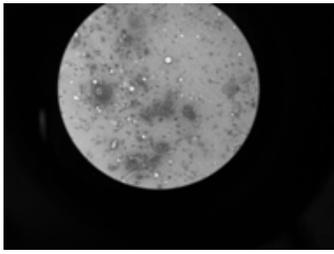
**Figure 3: Pleomorphic adenoma: Photomicrograph (10X) showing squamous epithelial cells, mucin-filled areas and chondromyxoid stroma**



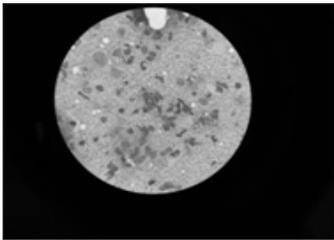
**Figure 2: Pleomorphic adenoma: Smear (40X) shows poorly cohesive cell clusters of round, ovoid and spindle cells embedded in stromal matrix**



**Figure 4: Pleomorphic adenoma: Photomicrograph (40X) showing squamous epithelial cells, mucin-filled areas and myxoid stroma**



**Figure 5: Mucoepidermoid carcinoma: Smear (10X) shows a dirty appearance of mucus, debris, and few inflammatory cells**



**Figure 6: Mucoepidermoid carcinoma: Smear (40X) shows scattered intermediate cells against a dirty background of debris and mucus**

## Discussion:

Fine needle aspiration cytology (FNAC) of salivary gland tumors was developed in the early 1950 in Europe by Antoine Zajdela at the Institute Curie and Joseph Zajicek's at the Karolinska Institute.<sup>1</sup>

In 1960 Zajicek, father of modern cytology was the first pathologist who adapted the technique of FNAC along with Franzen at Karolinska hospital. Practice of FNAC of salivary glands was established between 1964 and 1971 in Sweden.<sup>2</sup> Zajdela *et al.* introduced fine needle sampling without aspiration and successfully used in salivary gland tumors.<sup>1</sup>

Layfield *et al.* study showed sensitivity of 91% and specificity of 98%.<sup>3</sup> Cramer *et al.* studied FNAC of salivary glands with a sensitivity of 90% and specificity of 95%.<sup>4</sup> Zurrada *et al.* study revealed sensitivity of 62%, specificity of 100% and diagnostic accuracy of 87%.<sup>5</sup>

Fernandes & Pandit study showed sensitivity of 90%, specificity 80%, diagnostic accuracy of 87%.<sup>6</sup> Cajulis *et al.* study had sensitivity 91% and specificity 96%.<sup>7</sup> Shintani *et al.* studied the value of FNAC as preoperative diagnostic procedure and showed sensitivity of 88.9%, specificity 94.1%, diagnostic accuracy of 93%.<sup>8</sup> Stewart *et al.* study showed sensitivity, specificity, and accuracy of 92%, 100%, and 98%, respectively.<sup>9</sup>

According to Jayaram *et al.* diagnostic accuracy of FNAC for neoplastic lesions was 91%, sensitivity for malignant tumors was 87.8%, for benign tumors 100% and specificity of 98%.<sup>10</sup> Postema *et al.* study revealed sensitivity, specificity, and diagnostic accuracy of FNAC for salivary gland lesions as 88%, 99%, and 96%, respectively.<sup>11</sup>

Erosz *et al.* study showed sensitivity 94% and specificity 100%.<sup>12</sup> Akther *et al.* have published cytohistopathological correlation of 91.7% among the salivary glandular lesions.<sup>13</sup>

Khandekar *et al.* studied sensitivity of 94% and specificity of 80.95% for neoplastic salivary gland lesions.<sup>14</sup>

Elagoz *et al.* proposed sensitivity & specificity for benign and malignant salivary gland tumors as 72% & 100%.<sup>15</sup> Diagnostic sensitivity for all neoplastic and non-neoplastic lesions was 84% and specificity was 92%. Christensen *et al.* study obtained a sensitivity of malignant cases as 83% and specificity of 99%. The positive predictive value was 98%, and the negative predictive value was 97%, the overall accuracy was 93%.<sup>16</sup> In the present study, positive predictive value was 100%, and the negative predictive value was 81.81%.

Dhanalaxmi *et al.* studied histopathological correlation and the accuracy rate of FNAC was 94.7% for non-neoplastic lesions, 76.8% for benign neoplasms and 100% for malignant neoplasms.<sup>17</sup>

Stramandinoli *et al.* studied salivary gland tumors and analyzed a sensitivity of 68.2%, specificity 87.7%, diagnostic accuracy was 82.3%.<sup>18</sup>

Jayaram *et al.* study found pleomorphic adenoma and acinic cell carcinoma as the most common benign and malignant lesions. The overall diagnostic accuracy of FNAC was 73.6%, sensitivity 90% and specificity 95% respectively.<sup>10</sup>

Akther *et al.* study revealed female patients comprised 22 (55%) and male patients were 18 (45%). There were no false positive cases, 4 cases of false negative were seen, and the overall sensitivity and specificity was 90% and 100% respectively.<sup>13</sup>

Nettle and Orell study revealed that 94% cases prior to surgery were correctly assessed cytologically as benign or malignant. The specific diagnosis was made in 95% of benign neoplasm and in 68% of malignant neoplasm with

an overall accuracy of 88%. The study revealed specificity of 99%, sensitivity of 80% and overall accuracy of 94%.<sup>19</sup>

In the present study 42 FNACs were performed from these 31 cases were followed up by histopathological confirmation.

Erosz *et al.* had an age range of 4-80 years with a mean of 47 years. The female and male distribution was in the ratio of 1.2:1.<sup>12</sup>

In the present study the age of the patients ranged from 15 to 76 years. The oldest case (76 years) and the youngest (15 years) was seen. Maximum number of patients belonged to the age group of 31-40 years (35.48%) with almost equal distribution in females 16 (51.61%) and males 15 (48.39%) The female and male distribution was in the ratio of 1.07:1.

The parotid gland (67.74%) was most commonly involved followed in decreasing order of frequency by submandibular gland (25.81%) and minor salivary glands (6.45%). Most of the salivary gland lesions were seen in the right parotid gland 14 (45.16%) followed by right submandibular gland 6 (19.35%). (Table 4)

Non neoplastic lesions were common in the age group of 21-40 years (55.55%). Benign lesions were common in the age group of 21-50 years (83%). Malignant lesions were common in the age group of 41-50 yrs (50%).

Ashraf<sup>20</sup> and Edda<sup>21</sup> reported the same findings with the sex distribution and site of salivary gland lesions, distribution of females & males were almost equal.

In our study the lesions were divided into non-neoplastic, benign and malignant. The cytological diagnoses of 31 FNA were reviewed, and the lesions were classified into 3 categories such as non-neoplastic 9 (29.03%), benign 18 (58.06%) and malignant 4 (12.90%). (Table 5)

In the present study, cytohistologic correlation was 100% for chronic sialadenitis, 100% for mucocele when compared with Erosz which was 81.81% for chronic sialadenitis, 80% for mucocele.

Two cases of cystic lesions were infected & benign cystic lesion which were not correlated when compared to Erosz (80%) & Akther (100%).

Salivary duct carcinoma was diagnosed as infected cystic lesion on FNAC due to scant cellularity & abundant necrotic material, probably obtained from the comedo necrotic areas of the tumor. Monomorphic adenoma was misdiagnosed as benign cystic lesion on FNAC due to scant cellularity and abundant necrotic material.

Jan *et al.* described reasons for incorrect interpretation of cytological diagnosis as: inadequate sampling with insufficient cellularity of the aspirate, marked cellular degeneration, erroneous labelling of specimens, cytologist unfamiliar with morphology of rare salivary gland lesions.<sup>22</sup>

Postema *et al.* explained the reason for misdiagnosis in case of cystic lesions due to poor cell yield or due to aspiration of non representative material. So, repeated FNAC & USG-guided FNAC from representative area is indicated.<sup>11</sup>

Amongst benign neoplastic lesions, pleomorphic adenoma was most common and seen in the parotid gland comprising 17 cases (94.44%). Cytohistologic correlation was 94.44% which was comparable with Gita Jayaram (78.78%).

Amongst malignant neoplastic lesions, cytohistologic correlation was (100%) for polymorphous low grade adenocarcinoma and mucoepidermoid carcinoma (100%).

Das *et al.* had 100% cytohistologic correlation for polymorphous low grade adenocarcinoma when compared with mucoepidermoid carcinoma which was 50%.<sup>23</sup>

Jayaram *et al.* had 50% cytohistologic correlation for polymorphous low grade adenocarcinoma & mucoepidermoid carcinoma.<sup>10</sup>

In the present study, no false positives were observed similar to study done by Akther. Study done by Orell had one false positive case. False negatives were 2 (7.69%) cases in the present study. The false negative cases seen in the study done by Orell and Akther showed 5 (5.05%) and 4 (1.64%) respectively.

The present study revealed sensitivity 90.90%, specificity 100% and diagnostic accuracy 93.54%. (Table 6)

## Conclusion:

The present study has indicated the diagnostic role of

FNAC in salivary gland lesions and its reliability. Re-aspirations and image-guided techniques, coupled with immunohistochemistry, will certainly enhance the diagnostic accuracy.

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