Fine Needle Aspiration Cytology In The Evaluation Of Salivary Gland Swelling

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Abstract: Background: Fine needle aspiration cytology (FNAC) is accurate, simple, quick and cost-effective procedure with minimal risk of complications. FNAC has been utilized as an excellent primary method of evaluating lesions of the salivary glands. Salivary gland tumors are rare and account for only 2-6.5 % of all the head and neck tumors, with approximately 64-80% occurring in the parotid glands. Material And Methods: An observational study was done on salivary gland lesions received from various departments over a period of one and half years (June 2016 to October 2019) at the pathology Department of AMC MET Medical College, L.G. Hospital, Maninagar, Ahmedabad. The observations were analyzed, classified and compared with other studies using appropriate statistical tests. Results: A total of 103 patients were accumulated, of which majority of patients were in the age group of 20-29 years (n=24, 23.3%) with slight male preponderance (M:F = 1.34). Parotid glands were maximally involved (n=52, 50.49%). Majority of the lesions belonged to the neoplastic category (n=66, 64.08%) and benign neoplastic lesions (n=56, 54.37%) were more common than malignant lesions. Neoplastic lesions showed Pleomorphic adenoma, Warthin's tumor and Mucoepidermoid carcinoma as commonest lesions. Amongst the inflammatory lesions (n=26,25.24%), chronic sialadenitis (n=17, 16.50%) was the most common pathology. Conclusion: Salivary gland lesions are fairly common in occurrence and are amenable to FNAC analysis without any significant complications. Since FNAC is a low-cost procedure, it is preferred as the initial choice of investigation for salivary gland lesions. Neoplastic lesions were the most common variety of salivary gland swelling, with pleomorphic adenoma being the most common subtype.[Shah F Natl J Integr Res Med, 2020; 11(4):27-32]

Key Words: Fine needle aspiration cytology, salivary gland swelling, pleomorphic adenoma

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Introduction: Salivary gland tumors are a morphologically and clinically diverse group of neoplasms, which may present significant diagnostic and management challenges. Salivary gland tumors are rare and they account for only 2-6.5 % of all the head and neck tumors. Among the entire salivary gland lesion, 64-80% occur in the parotid glands, 7-11% occur in the sub-mandibular, less than 1% occur in the sublingual and 9-23% occur in the minor salivary glands[1].

Fine needle aspiration cytology (FNAC) is accurate, simple, quick and cost-effective for the patient. FNAC can be performed in any setting such as outpatient procedure and repeatable with minimal risk of complications[1]. FNAC has also been advocated as a useful method in comparison to more expensive surgical excision biopsies in developing countries with limited financial and health care resources[2]**.** Fine needle aspiration (FNA) cytology has been accepted by head and neck surgeons as an excellent, though challenging, primary method of evaluating space-occupying lesions of the salivary glands[3].

Material & Methods: An observational study was carried out at the department of Pathology, L.G. General Hospital & AMC-MET Medical College, Ahmedabad. Patients with salivary gland lesions referred from various clinical departments for a period of 28 months, from 1st June 2016 to 31st October 2018.FNAC was done as per standard protocol. Smears werefixed in 95% ethyl alcohol and stained with Haematoxylin & Eosin stain. The cytological diagnosis was then compared with the histopathological diagnosis, whenever available.

The recorded data was subjected to statistical analysis using various appropriate statistical formulas, and results were inferred.

Results: A total of 103 patients were accumulated over the span of 28 months(June 2016 to October 2018).

Demographic Data Of Salivary Gland Lesions: In the current study, majority of patients were in the age group of 20-29 years (n=24, 23.3%), followed next by the age group of 40-49 years (n=17, 16.5%). The mean age of presentation was 39.06 ± 19.36 years and median age was 38 years. Amongst the gender distribution, males were seen in majority (n=59, 57.28%) as compared to females (M: F = 1.34).

Site Distribution: Out of 103 cases of salivary gland lesions, parotid glands were maximally involved (n=52, 50.49%), followed by

submandibular glands (n=46, 44.66%). Only 4.85% (n=5) cases showed involvement of sublingual and other minor salivary glands.

Cytological Diagnosis Of Salivary Gland Lesions: The FNAC observations were analyzed into neoplastic and non-neoplastic groups. The non-neoplastic group included inflammatory, sialadenosis and cystic lesions, while the neoplastic group comprised of benign and malignant lesions. The neoplastic lesions were further subclassified as per the WHO classification of Salivary gland tumors (2017). [Table I]

fungal elements. In the neoplastic group, benign lesions (n=56, 54.37%) were more common than malignant lesions (n=10, 9.71%). The most common benign lesion observed was Majority of the lesions belonged to the neoplastic category (n=66, 64.08%) as compared to the non-neoplastic group (n=37, 35.92%). Overall, maximum number of lesions belonged to the benign neoplastic subgroup (n=56, 54.37%), followed by inflammatory subgroup (n=26, 25.24%).

In the non-neoplastic group, inflammatory lesions (n=26) were more common amongst which, chronic sialadenitis (n=17, 16.50%) was the most common pathology. The two cases of granulomatous sialadenitis were noted to involve the parotid glands. On special staining, they were negative for 20% AFB stain and PAS negative for pleomorphic adenoma (n=49, 47.58%).In the malignant subgroup, mucoepidermoid carcinoma (n=5, 4.85%) was the most common lesion.

Table I: Cytological Diagnosis Of Salivary Gland Lesions

Category	Number (%)	Site			Gender	
		P	SM	O	M	F
Inflammatory	26 (25.24%)	11	15	0	20	6
Acute Sialadenitis (As)	7 (6.80%)					
Chronic Sialadenitis (Cs)	17 (16.50%)					
Granulomatous Sialadenitis (GS)	2 (1.94%)					
Sialadenosis	4 (3.88%)	1	3	0	2	2
Cystic	7 (6.80%)	1	3	3	4	3
Benign	56 (54.37%)	37	17	2	27	29
Pleomorphic Adenoma (PA)	49 (47.58%)					
Warthin Tumor (WT)	3 (2.91%)					
Basal Cell Adenoma (BCA)	3 (2.91%)					
Oncocytoma (ON)	1 (0.97%)					
Malignant	10 (9.71%)	2	8	0	6	4
Mucoepidermoid Carcinoma (MEC)	5 (4.85%)					
Acinic Cell Carcinoma (ACC)	2 (1.94%)					
Adenoid Cystic Carcinoma (ADCC)	1 (0.97%)					
Adenocarcinoma (ADC)	1 (0.97%)					
Malignant Lymphoma (L)	1 (0.97%)					
Total	103 (100%)	52	46	5	59	44

(P=Parotid, Sm=Submandibular, O=Other, M=Male, F=Female)

Salivary Gland Lesions As Per Age& Gender Groups: Out of the 26 inflammatory lesions, maximum lesions were observed in the age group of 20-29 years (n=8). Majority of the cystic lesions (5 out of 7) were present in age less than 40 years. Two out of four cases of sialadenosis were noted in the age group of 20-29 years. In the benign lesions (n=56), the age group of 40-49 years showed the maximum number of cases (n=14). Amongst the malignant group (n=10), highest number of cases were present in 50-59 years (n=4) and 30-39 years (n=3) age groups. Overall, male predominance was observed (M: F = 1.34) in all the categories of lesions.

Salivary Gland Lesions As Per Site: The most common location for inflammatory lesions was submandibular glands (15 out of 26 cases). The cystic lesions were observed equally in submandibular and minor salivary glands (3 cases each). Amongst the benign lesions, majority of them were present in parotid glands (37 out of 56

cases). Meanwhile, the malignant lesions predominantly involved the submandibular glands (8 out of 10 cases).

Cytological And Histological Correlation: Of the total 103 cases, 60 patients underwent surgical intervention and histopathological analysis.

The histopathological diagnosis of these 60 patients was compared with their respective cytological diagnosis. The values of sensitivity, specificity and accuracy of FNAC for neoplastic pathology were inferred [Table II].

Hence, based on the following data, the following values for FNAC were calculated:

True Positives (TP) for neoplastic lesions on FNAC	49
False Positives (FP) for neoplastic lesions on FNAC	00
False Negatives (FN) for neoplastic lesions on FNAC	03
True Negatives (TN) for neoplastic lesions on FNAC	08

- Sensitivity For Neoplastic Lesions = TP/(TP + FN) = **94.23%**
- Specificity For Neoplastic Lesions = TN /(TN+ FP) = **100%**
- Accuracy For Neoplastic Lesions = (TP+TN)/ (TP+TN+FP+FN) = **95%**

TABLE II: Cytological Vs Histopathological Diagnosis

			Histopathology					Total
			Non-Neoplastic			Neoplastic		
			Inflammatory	Sialadenosis	Cystic	Benign	Malignant	
Cytology	Non-Neo plastic	Inflammatory	5	0	0	1	0	6
		Sialadenosis	0	0	0	0	0	0
		Cystic	0	0	3	1	1	5
	Neo plastic	Benign	0	0	0	38	1	39
		Malignant	0	0	0	0	10	10
Total			5	0	3	40	12	60

Discussion: Demographics: In our study, the mean age of presentation was 39.06 years (± 19.36 years) and median age was 38 years. The most common age groups belonged to the 2nd and 4th decades. In a study by Jain et al[4], the mean age of presentation was 35.3 years, while another study by Upasana et al[1]showed 20-29 years as the most common age group. Dalve et al[5] found 34.78% (32/92 cases) in the 2nd and 4th decade, which in our study was 39.8% (41/103 cases).

The most common age group for benign lesions in our study was 4th decade, while maximum malignant lesions presented in the 5th decade. This was comparable with the analysis of studies by Dalve et al[5], Sandhu et al[6], Williams et al[7] and Omhare et al[8].

In our study, there was overall male predilection for salivary gland lesions (M:F = 1.34:1). However, the ratio skewed in favour of male gender in non-neoplastic lesions (2.36:1) and was nearly equal with marginal female dominance in benign neoplasms (0.93:1). The ratio was 1.5:1, favouring male gender, in the malignant neoplasm subgroup. The comparison with gender predominance with other previous studies showed almost similar data[Table IV].

Site of Lesions: Overall, the parotid glands were the most common site of involvement, followed by submandibular glands in present study. There were only 5 cases in remaining glands, which included cystic and benign lesions. As per the review of literature[9–11] and prior studies in salivary gland lesions, parotid glands are the most common site of pathology [Table IV]. There was marginally higher number of submandibular gland involvement in our study (44.66%) concurred with that of Shaha et al[12](43.8%), as compared to most of the other studies (9-33%).

In case of benign neoplastic lesions as well, parotid glands were the most common site of involvement. This data was concurrent with studies by Sandhu et al[6] and Joshi et al[13].

An interesting observation in our study was that malignant neoplastic lesions were more commonly seen in submandibular glands (8 out

of 10 cases). In the study by Joshi et al[13], out of total 5 cases of malignant lesions, they observed 3 cases in parotid gland and the other 2 in submandibular glands. Sandhu et al[6] observed majority of the malignant lesions (9 out of 12) in the minor glands. Shemen[14]and Sandhu et al[6] made an interesting observation that likelihood of a salivary gland to be malignant is inversely proportional to the size of the gland. We suggest further larger scaled studies or meta-analysis to validate the site preponderance of malignant lesions in salivary glands.

Cytological Diagnosis Of Salivary Gland Lesions:
Out of the total 103 cases, majority of the lesions belonged to the neoplastic group (64.08%). This data was comparable to most of the prior studies, where neoplastic lesions comprise of The most common lesion in this study was pleomorphic adenoma (47.58%). Various studies in the past have observed similar findings, where pleomorphic adenoma overall emerges as the most common salivary gland lesion and also the most common salivary gland neoplasm[1,4,5,13,15,16,19].

The next most common lesion overall and the most common non-neoplastic lesion was chronic sialadenitis (16.50%), as concurred in studies by Gandhi et al[20], Sharma et al[15], Roy et al[21] and Upasana et al[1].

The next common benign lesion was Warthin's tumor (2.91%), similar to that seen in study of Jain et al[4]. Studies by Upasana et al[1] and Sandhu et al[6] showed similar proportions of Warthin's tumor (3.33% and 5% respectively). Basal cell adenoma was seen in 2.91% cases, similar to that around 50-65% of total lesions [Table III]. However, studies by Sharma et al[15] and Jain et al[4], showed significant proportions of neoplastic lesions, 87.4% and 90% respectively. On the other hand, study by Nanda et al[16] demonstrated non-neoplastic lesions in higher proportion than the neoplastic lesions (55.9% vs 44.1%).

According to various studies and literature, the benign neoplastic lesions in salivary glands are more common than the malignant lesions[17,18].

This finding was observed in our study as well, where 54.37% cases showed benign lesions and 9.71% showed malignant lesions. These numbers were very close to the observations of Joshi et al[13] and Dalve et al[5].

In the study of Joshi et al (2.63%)[13]. In this study, there was one case of oncocytoma (0.97%), which corroborated with the studies by Jain et al (2 cases, 2.5%)[4], Dalve et al (1 case, 1.09%)[5] and Shetty et al (1 case, 0.67%)[19].

In the malignant subgroup, mucoepidermoid carcinoma (4.85%) was the most common malignancy. The studies by Sharma et al[15], Joshi et al[13], Nanda et al[16], Dalve et al[5], Arul P et al[22], Shafkat et al[23] and Paik et al[24] showed mucoepidermoid carcinoma as the most common malignant lesion.

The other types of malignant lesions seen were 2 cases of acinic cell carcinoma and one case each of adenoid cystic carcinoma, adenocarcinoma and malignant lymphoma. Sandhu et al[6] also mentioned one case of malignant lymphoma in his study.

Table III: Gender Distribution, Site Of Lesion & Cytological Subtypes Across Various Studies

		Present Study	Jain et al4	Sharma et al15	Dalve et al5	Joshi et al13
Male : Female		1.34	1.1	2.2	1.35	1.53
Site	Parotid	50.41%	67.5%	87.5%	61.9%	51.6%
	Submandibular	44.66%	30%	9.38%	33.69%	31.4%
	Others	4.85%	2.5%	3.13%	3.3%	14.06%
Non-Neoplastic		35.92%	10%	12.5%	34.78%	40.6%
Neoplastic	Benign	54.37%	72.5%	71.8%	56.5%	51.56%
	Malignant	9.71%	17.5%	15.6%	8.7%	7.81%

FNAC For Neoplastic Lesions In Salivary Glands:
Over the years, FNAC has been considered and utilized as an important screening test for salivary gland mass. The literature mentions that for malignant lesions, FNAC has diagnostic accuracy ranging from 86-98%[25,26], sensitivity of 62-97.6%[9,27] and specificity of 94.3-100%[26,28].

Table IV: Sensitivity, Specificity & Accuracy Of FNAC For Neoplastic Lesions Across Various Studies

Studies	Sensitivity (%)	Specificity (%)	Accuracy (%)
Mihashi et al17	88.2	100	98.2
Cristillani et al9	97.6	98.45	97.9
Jayram et al29	80.9	94.3	87.7
Das et al30	94.6	75	91.1
Present Study	94.23	100	95

In our study, results of FNAC and histopathology differed in four cases. Two cases of cystic lesions were diagnosed on FNAC examination. Aspirated fluid in these two cases was poor in cells having degenerated epithelial cells, histiocytes and inflammatory cells. On postoperative histopathological examination, these two cases turned out to be low grade mucoepidermoid carcinoma and Warthin's tumor respectively. One case was that of chronic sialadenitis on FNAC examination. Postoperatively, this lesion was diagnosed as Warthin's tumor on histopathology.

In the neoplastic group, one case was diagnosed as pleomorphic adenoma, a benign lesion, in which FNAC smear showed mild atypical epithelial cellswith squamous metaplasia. However, on histological examination, it was diagnosed as mucoepidermoid carcinoma, a malignant lesion.

Conclusions: A careful cytological analysis helps the operating surgeon to have a pre-operative data regarding the nature of the lesion. This helps proper planning of treatment and reduces overall cost of treatment and need for hospitalization.

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