Fine Needle Aspiration Cytology: Accurate And Reliable Tool For Primary Diagnosis Of Salivary Gland Lesions.

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Abstracts Background: Management of salivary gland lesions is greatly influenced by preoperative or intraoperative diagnosis of malignancy. Fine needle aspiration cytology (FNAC) is used as a primary diagnostic tool since long. **Objective:** The objective of study was to evaluate usefulness and diagnostic accuracy of FNAC in primary diagnosis of salivary gland lesions. **Methods:** Study includes 75 cases suspected of salivary gland lesions evaluated by FNAC from January 2010 to August 2012. Whenever possible follow up histopathology also studied. **Results:** Out of total of 75 cases of salivary gland lesions 30 cases (40%) were nonneoplastic, 30 cases (40%) were benign and 15 cases (20 %) were malignant. FNAC showed satisfactory sensitivity and specificity with about 91% diagnostic accuracy for benign lesions and for malignant lesions**. Conclusions:** Study concludes that FNAC has proven to be simple, easy, minimally invasive method with satisfactory accuracy for initial diagnosis of Salivary gland lesions especially benign and malignant neoplasms. It almost accurately type benign tumors like pleomorphic adenoma and showed fair accuracy and reliability. FNAC is vital for management primarily to exclude need of surgery as nonneoplastic lesions are managed conservatively and planning preoperative chemoradiation like in cases of Mucoepidermoid carcinoma arising in odd locations like palate.[Shah M NJIRM 2014; 5(3) :11-17]

Key Words: FNAC, Salivary gland lesions, Histopathology.

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Introduction: It was the series of papers from the Karolinska Institute, Sweden [1-3] by the influence of which the practice of fine needle aspiration cytology (FNAC) of the salivary glands was established between 1964 and 1971. It offers many advantages to both clinicians and patient. It is safe, economical, and in many instances provides rapid diagnosis with minimal inconvenience or pain. As a primary investigation wide variety of masses in the head and neck, including those in the major salivary glands, can be easily approached by FNAC. [4]Superficial location and easy accessibility makes it amenable for FNAC. [5] However, the role of FNAC in the diagnosis of salivary gland neoplasm is still controversial owing to its diverse morphological pattern and overlapping features between benign and malignant lesions, which makes distinction between two challenging, require expertise and skills. [6] For many salivary tumours diagnosis is straight forward but the wide range of morphological diversity between and within tumour type means that a diagnosis may not be possible on small incisional biopsies and careful consideration of the clinical and pathological features together is essential. So in the salivary glands, where Trucut and incisional diagnostic biopsy are not upto the mark, FNAC can frequently provide a preoperative diagnosis to guide the surgeon about further management especially on the degree of urgency, necessity of admission, allow planning of the surgical approach and permit informed preoperative discussion with the patient. FNAC can also helpful for definitive diagnosis of malignancy in patients who are clinically unsuitable for radical surgery or who have suspected recurrent or metastatic disease. [7] As there is possibility of errors while sampling 'negative cytology' doesn't always means exclusion of malignancy but in such cases it should be interpreted taking into consideration all clinical, radiological and other data. First step is to confirm that the lesion is of salivary gland origin, second step to identify neoplasm from non-neoplastic lesions so that the need for the surgery can be obviated. After confirming it as neoplasm whether it is benign or malignant is the next concern. So by stepwise approach FNAC can be a useful guide for primary investigation of salivary gland lesions. More studies and experience are required for grading malignant lesions like Mucoepidermoid carcinoma because in lesions like this grading is required for further management for deciding to

give or not to give preoperative or postoperative radiotherapy. Also few lesions like polymorphous low grade adenocarcinoma, salivary duct carcinoma, epithelial-myoepithelial carcinoma and others are difficult to interpret. The goal of the current study was to review our FNA cytology experience and diagnostic accuracy in salivary gland lesions at a tertiary referral medical center. Considering all the pitfalls and advantages we can consider FNAC is very useful primary investigation for salivary gland lesions with fair accuracy and reliability.

Material and Methods: The study includes 75 cases suspected salivary gland lesions reffered to Cytopathology section of department of pathology in the Government Medical College, Surat between the periods of July 2010 and August 2012. Appropriate details regarding history, clinical examination, clinical diagnosis, radiological findings, and previous significant findings were noted down. The data were analysed in simple statistical tables. Procedures were done by cytopathologist in all the cases. Prior to procedure, a physical examination was carried out to note size, location by superficial or deep, relation to surrounding structures like muscle, nerves, vessels and other vital structures, any enlarged cervical lymph node. The procedures were performed using 22-24 gauge needles, with aspiration by a 10 ml disposable syringe. Prior informed consent was also taken after explaining the whole procedure, its advantages and complications. No anaesthetic medication was used during the procedure. Whenever required help of imaging to guide the FNA been taken especially the swellings in location like deep seated tumors and in tumor with cystic and necrotic changes. No major complications were reported like hematoma, injury to underlying vital structures and others. Only slight pain was reported. The aspirated contents of the needle are expelled on to glass slides and processed for cytological examination. Minimum four slides smear were made. Slides were fixed by both air dried and wet fixed in 95% methanol. The slides were stained with MayGrunwald Giemsa (MGG) especially for cytoplasmic details and highlighting background materials, PAP stain and Haematoxylin and Eosin (H&E) especially for nuclear details respectively and examined with light microscope. Special stains like periodic acid Schiff stain (PAS) were performed whenever required. The microscopic diagnosis was interpreted after correlating all the data including the clinical, radiological, cytomorphological and other findings. Diagnostic interpretation was done primarily in the form of Neoplastic or Non-neoplastic. Neoplastic lesions were further classified as Benign and malignant lesions and possible subtyping were given. The cytological results were correlated with clinical outcome & whenever possible by histopathological examination.

Statistical analysis used defined as follows: Sensitivity (for neoplastic lesions) was defined as the percentage of patients who were correctly diagnosed to have neoplasm.

Specificity (for excluding neoplasm) was defined as the percentage of patients who were correctly diagnosed to have non-neoplastic lesions on FNAC.

Diagnostic accuracy (for neoplastic lesions) was calculated as the number of lesions which were correctly diagnosed on FNAC with histopathological confirmation.

Histologic non-concordance was defined as an FNAC diagnosis was not completely accurate when compared with the final histological diagnosis.

Result: Total 75 cases of salivary gland lesions out of which 30 cases (40%) were non-neoplastic and 45 cases (60%) were neoplastic which includes 30 cases (40%) benign tumors and 15 cases (20%) malignant tumors. Maximum cases were found in the age range of 20-60 years. It was noted that the most common benign neoplastic lesion in the present study was pleomorphic adenoma especially in the age group of 3rd decade of life 9 cases (12%) followed by 5th decade with 5 cases(6.67%). Most common malignant lesions Mucoepidermoid carcinoma in age group of 6th decade of life 4 cases (5.33%). Sex wise distribution showed male predominance with 49 cases (65.33%) in males and 26 cases (34.67%) were females and Male: Female ratio was 1.89: 1 which is 1.42:1 for benign neoplastic lesions & 2.75:1for malignant tumors. About involvement of site it was apparent that in 34 cases (45.33%) lesions were of

parotid gland origin, 36 cases (48%) of submandibular gland origin and in 5 cases (6.67%) from minor salivary glands of different locations.

Figure 1 : Adenoid cystic carcinoma

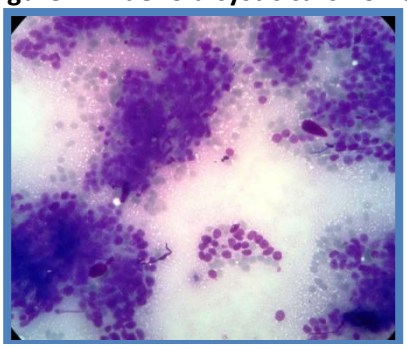


Figure 2 : Pleomorphic Adenoma

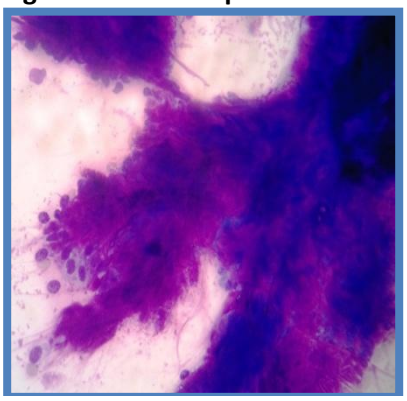
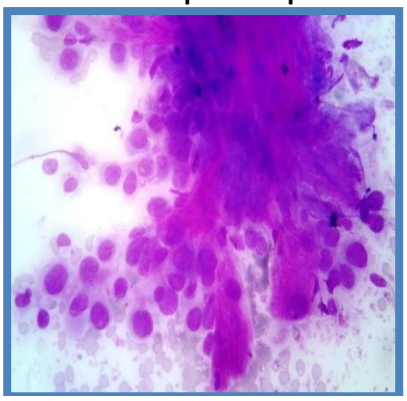


Figure 3 : Carcinoma ex pleomorphic adenoma



Neoplastic Lesions: Benign Category: Out of total 30 cases of benign lesions it includes 27 cases (90%) of pleomorphic adenoma &1 case (3.33%) each of Warthins tumor, Oncocytoma and Canalicular adenoma.

Malignant Category: Out of total 15 cases of malignant lesions it includes 8 cases (53.33%) of Mucoepidermoid carcinoma, 4 cases (26.67%) of carcinoma ex pleomorphic adenoma, 2 cases (13.33%) of Adenoid cystic carcinoma and 1 case (6.67%) of Acinic Cell Carcinoma.

Non-Neoplastic: Non-neoplastic category comprised of 30 cases (40%) cases out of total 75 cases. It includes lesions like acute Sialadenitis, chronic Sialadenitis, retention cyst, lymphoepithelial cyst, Oncocytic Metaplasia, Abscess, which frequently creates confusion and need to be distinguished from the neoplastic ones.

Table 1: Site Wise Distribution Of The Cases (FNAC) Under Study.

Site	No. of cases		Total no. of cases	%
	Benign	Malignant		
Parotid gland	28	06	34	45.33
Submandibular gland	29	07	36	48
Minor salivary gland	02	03	05	06.67
Total	59	16	75	100

Table 2: Age wise distribution of the salivary gland lesion.

Lesions	0-10	11-20	21-30	31-40	41-50	51-60	61-70	>70	Total
Non-neoplastic*	2	4	1	9	7	7	0	0	30
Pleomorphic adenoma	1	03	09	02	05	05	02	00	27
Canalicular Adenoma	00	00	00	00	00	00	01	00	01
Warthin's tumor	00	00	00	01	00	00	00	00	01
Oncocytoma	00	00	00	00	00	00	01	00	01
Carcinoma Ex Pleomorphic Adenoma	00	00	00	00	01	01	02	00	04
Adenoid cystic carcinoma	00	00	00	00	00	01	01	00	02
Acinic cell carcinoma	00	00	00	00	00	01	00	00	01
Mucoepidermoid carcinoma	00	01	01	00	00	04	01	01	08
Total	03	08	11	12	13	19	08	01	75

*Non-neoplastic lesions include Acute Sialadenitis, Chronic Sialadenitis, Retention Cyst, Lymphoepithelial Cyst, Oncocytic Metaplasia, Abscess.

Table 3: Sex wise distribution of salivary gland lesions.

Lesion	No. of males	No. of females
Non-neoplastic*	22	08
Pleomorphic adenoma	14	13
Canalicular Adenoma	00	01
Warthin's tumor	01	00
Oncocytoma	01	00
Total(benign)	17	12
Carcinoma Ex Pleomorphic Adenoma	01	03
Adenoid cystic carcinoma	02	00
Acinic cell carcinoma	01	00
Mucoepidermoid carcinoma	07	01
Total(malignant)	11	04
Total	49 (65.33%)	26(34.67%)

*Non-neoplastic include Acute Sialadenitis, Chronic Sialadenitis, Retention Cyst, Lymphoepithelial Cyst, Oncocytic Metaplasia, Abscess.

Discussion: The majority of series evaluating usefulness of salivary gland FNAC are based on a mixture of pathologies, including benign neoplasms, malignancies, and inflammatory lesions. [8-15]Although the salivary gland tumors account for less than 3% of all head and neck tumors, that superficial location, easy accessibility and high diagnostic accuracy make FNA a popular method for evaluating salivary gland tumors. As clinically it is very difficult to differentiate the types of lesions; FNAC is quite effective, cheap and easier in the pre-operative evaluation of salivary gland masses. FNAC has become worldwide accepted, nonhazardous, practically noninvasive and diagnostically fairly accurate method for primarily evaluation of salivary gland lesions also it is vital mode of investigation in the era of noninvasive /or least invasive treatment, excluding the need of radical surgeries and for planning the preoperative chemotherapy or radiotherapy which can be guided well after this simple procedure especially in case of salivary gland lesions in which other alternatives as Trucut biopsy and incisional biopsy has no value.

Table 4: Accuracy of FNAC of various Salivary Neoplasm

Lesion	No. of cases diagnosed on FNAC	HPE diagnosis	Accuracy
Pleomorphic Adenoma	10	10	100%
Mucoepidermoid Carcinoma	06	05	83%
Adenoid Cystic Carcinoma	02	02	100%
Acinic Cell Carcinoma	01	01	100%
Carcinoma ex Pleomorphic Adenoma	04	03	75%
Total	23	21	91%

Table 5: Studies with site wise distribution of salivary gland lesions.

Study name	Total	Parotid (%)	Submandibular (%)	Minor salivary gland (%)
Shaha et al[17]	160	84(52.5)	70(43.75)	6(3.75)
Shafkat et al[19]	100	70(70)	18(18)	12(12)
Das DK et al[20]	712	323(45.3)	343(48.17)	07(0.98)
Stewart et al[21]	341	212(62.17)	124(36.36)	5(1.46)
Our study	75	36(48)	34(45)	05(07)

It has been proven by the Karolinska's group in 1976-77 that the reliability and accuracy of FNAC is very high; furthermore, in most series, lymphomas, sarcomas, metastatic parotid tumors, and recurrent malignancies also are included in the group of malignancies, improving the accuracy of FNAC in some studies. In the recent literature, the accuracy in detecting malignant tumors has ranged from 84–97%, the sensitivity has ranged from 54–95%, and the specificity has ranged from 86–

100%.[8-11, 14, 15, 16]In the current series, the sensitivity was almost 100% nondiagnostic smears.

Comparision of various studies with current study. Site wise distribution of salivary gland tumors: In our study, among the salivary gland lesions parotid gland is most commonly involve in 48% of cases, consistent with the study of Shaha et al. [17] and Das DK et al [20]Among benign tumors, Pleomorphic Adenoma is the commonest and among malignant tumors Mucoepidermoid carcinoma is common in our study. These findings are consistent with study of GC Fernandes et al. [18]

Age wise distribution: In current study, peak incidence for benign tumor is in 3rd decade of life, while peak incidence for malignant tumor is 6th decade of life, consistent with the study of GC Fernandes et al [18] and Shafkat et al. [19]

Male: Female ratio : In Current study, male: female ratio in all salivary gland neoplasm is 1.65:1 suggesting of male preponderance. These finding are consistent with studies done by Shaha et al [17], Das DK et al [20] and Erik G et al [22]which shows Male: Female ratio of 1.17:1, 1.28: 1 and 1.18: 1 respectively with male preponderance. In our study, Male: Female ratio for benign tumor is 1.42:1 and for malignant tumor 2.75:1. Female has slight preponderance for benign conditions while males are slightly more affected in malignant cases. These results are consistent with the study of Foote and Frazell et al [23]

As shown in the table 6 above, diagnostic accuracy ranged from 80% to 98% in different studies carried out worldwide and in our country. Our study shows diagnostic accuracy of 91.00% which correlates with the various studies. The sensitivity ranges from 73% to 93% in different studies and our study shows sensitivity of 100.00% which correlate with the studies carried out by Cristallini EG[96] et al. The specificity ranged from 80% to 100% in different studies and our study shows sensitivity of 100.00% which correlate with the studies carried out by Younget al [28] and Bonoet al. [29]

Diagnostic accuracy, sensitivity and specificity : Diagnostic accuracy for malignant lesions of salivary gland by FNAC ranges from 91.1% to almost 99% as shown in various studies in table 6. Diagnostic accuracy for malignant lesions in current study is 91% which is comparable with the study of Stewert et al [21], Shafkat et al [19], Das DK et al [20]and Jan IS et al [24] with one out of 6 cases which was diagnosed as Mucoepidermoid carcinoma on FNAC was squamous cell carcinoma on histopathology and one out of 4 cases diagnosed as carcinoma ex pleomorphic adenoma on FNAC was squamous cell carcinoma on histopathology.

Table 6: showing comparison with other studies for sensitivity, specificity and diagnostic accuracy of salivary gland tumors by FNAC.

Study	No. of cases histologically confirmed	Diagnostic accuracy	Sensitivity	Specificity
Shintani [24]	43	93.00%	88.90%	94.10%
Jayram [25]	57	87.70%	80.90%	94.30%
Qizilbash[26]	146	98.00%	87.50%	--
Cristallini EG [27]	63	97.90%	97.60%	98.45%
Young [28]	59	96.60%	87.50%	100.00 %
Bono[29]	79	80.40%	85.70%	100.00 %
O'Dwyer [30]	341	90.00%	73.00%	94.00%
GC Fernandez [18]	32	87.50%	90.30%	80.00%
Our study	23	91.00%	100.00 %	100.00%

Conclusion: FNAC is a very valuable diagnostic adjuvant to the clinician in the diagnosis of various tumors. The technique is accurate and highly reliable in the detection of malignancy. Current study also suggest fair sensitivity, specificity and accuracy rate of FNAC in salivary gland lesions which was comparable to previous studies done by other authors. Many clinicians have gradually accepted the fact that FNAC is a very useful diagnostic tool for superficial palpable tumors as of salivary gland. It is the safe, simple, minimally invasive with low cost routine OPD procedure. In addition to standard cytological evolution, the aspirate can also provide ultrastructural information rapidly. It can also be used for in situ hybridization, HPE and Immunocytochemistry procedures to detect some viral etiology in some

lesions. So it should be used as a primary mode of investigation.

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