



FINE NEEDLE ASPIRATION CYTOLOGY (FNAC) OF SALIVARY GLAND LESIONS WITH HISTOPATHOLOGY CORRELATION

Pathology

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ABSTRACT

Objectives: To correlate the cytological findings of different salivary gland lesions with histopathological findings and subsequently explore the diagnostic accuracy of FNAC. **Methods:** The study was carried out in the department of pathology, over a period of 2 years. All patients with salivary gland swellings who underwent FNAC procedure were selected. Standard procedure for FNAC was followed under aseptic conditions. Detailed clinical history and relevant investigations were obtained. Standard procedure was followed for histopathological specimens as well. Subsequently, correlation between the cytological findings and histopathological findings were done. Statistical analysis was done on the results obtained and sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated by suitable formulas. **Results:** A total of 45 FNAC samples were received from patients who presented with salivary gland swellings. Out of these, 28 were cytologically diagnosed as salivary tumors (Neoplastic) accounting for 62.2% and 12 were diagnosed as tumor-like lesions (Non-neoplastic) accounting for 26.7%. Out of the 45 cases for whom FNAC aspirates were received, 31 of the them had subsequent histopathology done and reports made available which enabled correlation study. For FNAC for Pleomorphic adenoma, it was observed that sensitivity was 86.7% and specificity was 100%. Positive predictive value (PPV), negative predictive value (NPV) and accuracy were 100%, 88.9% and 93.5% respectively. Similarly for Warthin's tumor and malignant lesions, it was 100% for all measures of diagnostic accuracy. **Conclusion:** In conclusion, FNAC is a rapid, simple and reliable procedure that can be utilized for the initial evaluation of salivary gland swellings, even in the outpatient setup. It is also cost effective and minimally invasive and helps the clinician not only in the early detection of lesions but also in formulating an early plan of treatment.

KEYWORDS

INTRODUCTION

Salivary gland lesions form about 2-6.5 % of all head and neck neoplasm in adults¹. They encompass a heterogeneous group of disorders and are broadly classified into neoplastic and non-neoplastic lesions. A swelling involving the salivary gland may be a result of inflammation, cyst or neoplasm.

The nature of the lesion cannot be determined solely by clinical examination and therefore pathological examination is required for definite diagnosis in suspected cases of neoplastic disease.

Induction of fine needle aspiration cytology (FNAC) of salivary gland lesions by Stewart et al gained popularity as reliable yet economically effective mode of diagnosis. The added advantage of avoidance of fistula formation, tumor implantation and recurrence following capsular disruption, which are common with incisional or core needle biopsy makes it a perfect tool for initial assessment.

Cytology can clearly distinguish between benign and malignant lesions, and also specific and non-specific inflammations. Thus, it provides decisive direction for therapeutic management of the patient. FNAC is a utility tool for subtyping of salivary gland lesions with variable specificity and sensitivity.

FNAC in conjunction with clinical and radiological assessment forms the best base possible for selection of effective management. However, histological examination is still the **gold standard** for establishing the final diagnosis and staging of salivary gland lesions.

The present study was undertaken to evaluate and analyze salivary gland lesions by FNAC and correlate the cytologic findings with histopathology. Diagnostic accuracy, specificity and sensitivity were also evaluated. Diagnostic pitfalls of FNAC of salivary lesions were identified and the possible ways to rectify the misdiagnosis were proposed.

Materials and Methods

The study was carried out in the department of pathology, MGM medical college and hospital, Aurangabad, a tertiary care centre from the period of October 2018 to September 2020. All patients with salivary gland swellings who underwent FNAC procedure were selected. A detailed clinical history and relevant investigations were

obtained from the patient's case files and other relevant sources. Cytology and Histopathology reports from the dept. of pathology were documented and recorded in the case record forms.

The standard procedure for FNAC was followed under aseptic conditions. Aspiration was done using 23-24 gauge needle with 5-10 ml disposable syringes. Smears made were fixed with alcohol followed by Papanicolaou and/or fields stain.

Standard procedure was followed for histopathological specimens as well. The tissue samples were received in the form of specimens and biopsies in our department in 10% formalin filled containers. Gross findings were studied and representative sections were obtained from the specimen. The sections were then subjected to routine tissue processing, blocks prepared and sections stained with haematoxylin and eosin (H&E) stain and subjected to histopathological examination.

Correlation between the cytological findings and histopathological findings were done. Statistical analysis was done on the results obtained and sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated by suitable formulas.

RESULTS

The study was conducted over a period of two years from October 2018 to September 2020 in the department of pathology, MGM Medical College and Hospital, Aurangabad. During this period a total of 45 FNAC samples were received from the patients who presented with salivary gland swellings to the ENT department.

Out of the 45 cases, 28 were cytologically diagnosed as salivary tumors (Neoplastic) accounting for 62.2% and 12 were diagnosed as tumor-like lesions (Non-neoplastic) accounting for 26.7%.

5 samples were acellular, hemorrhagic aspirates and were deemed inconclusive. Out of the 45 cases for whom FNAC aspirates were received, 31 of the them had subsequent histopathology done and reports made available which enabled correlation study.

On histopathological scrutiny of the 31 cases, 19 were diagnosed as salivary tumors, 11 were diagnosed as tumor like lesions and 1 was reported as having no specific pathology.

Table 1: Distribution of cases according to gender

Sex	No. of case (N)	Percentage (%)
Male	26	57.8
Female	19	42.2
Total	45	100

The above table shows distribution of cases according to sex. It was observed that out of the 45 cases, majority were male (57.8%).

Table 2: Age wise distribution of patients who presented with salivary gland lesions and underwent FNAC procedure.

Age group (yrs)	No. of patients	Percentage (%)
0-20	6	13.3
21-40	15	33.3
41-60	16	35.6
>60	8	17.8
Total	45	100

The above table shows the distribution of patients according to age. It was observed that majority of patients were in the age group of 41-60 years (35.6%) followed by 21-40 years (33.3%).

Table 3: Distribution of Neoplastic lesions (tumors) by cytological diagnosis:

FNAC Diagnosis		No. of cases	Percentage (%)
Benign	Pleomorphic Adenoma	21	75
	Warthin tumor	3	10.7
Malignant	Mucoepidermoid carcinoma	2	7.1
	Adenoid cystic carcinoma	1	3.6
	Adenocarcinoma	1	3.6
Total		28	100

The above table shows the distribution of salivary gland neoplasms (tumors) among the cases. Benign neoplasms accounted for 85.7% cases and malignant 14.3%. Pleomorphic Adenoma was the most common tumor noted at 75%, followed by Warthin tumor at 10.7%. Among the malignant neoplasms, mucoepidermoid carcinoma was the commonest, occurring in 7.1% of the cases.

Table 4: Distribution of Non-neoplastic lesions by cytological diagnosis

Lesion	No. of cases	Percentage (%)
Benign cystic lesion	6	50
Chronic sialadenitis	4	33.3
Abscess	2	16.7
Total	12	100

The above table shows the distribution of non-neoplastic lesions. Out of the 12 cytologically diagnosed cases, most of them were classified as benign cystic lesion (50%), followed by Chronic sialadenitis (33.3%).

Table 5: Distribution of cases according to histopathological diagnosis

Histopathological diagnosis	No. of cases	Percentage (%)
Pleomorphic Adenoma	13	41.9
Warthin tumor	2	6.5
Mucoepidermoid carcinoma	2	6.5
Adenoid cystic carcinoma	1	3.2
Metastatic Squamous carcinoma	1	3.2
Mucus retention cyst	3	9.7
Chronic Sialadenitis	7	22.6
Parotid abscess	1	3.2
No specific pathology	1	3.2
Total	31	100

The above table shows the distribution of cases according to the histopathological diagnosis. Neoplastic lesions were most common and accounted for 61.3 %. Overall the most common lesion was Pleomorphic adenoma with an incidence of 41.9%. Among the malignant tumors the most common was Mucoepidermoid carcinoma (6.5%). Among the non-neoplastic lesions, Chronic sialadenitis was the commonest (22.6%).

Correlation between cytological and histopathological diagnosis

In the present study, out of the 45 cases for whom FNAC aspirates were received, 31 of the them underwent surgeries and subsequent

histopathology specimens were received which enabled correlation study.

Out of these 31 cases, 15 were cytologically diagnosed as Pleomorphic adenoma. Among them 13 were subsequently confirmed on histopathology. Among the rest of the 2 cases, one was reported as Chronic sialadenitis and the other as unremarkable salivary gland without any specific pathology.

2 cases, which were reported as Warthin's tumor on cytology were later confirmed by histopathology.

2 cases, which were reported as Mucoepidermoid carcinoma on cytology were confirmed by histopathology. One case reported as Adenoid cystic carcinoma on cytology was confirmed to be the same by histopathology.

Among the non-neoplastic lesions, 4 were reported as Benign cystic lesions, 3 of which were later confirmed on histopathology and reported as Mucus retention cysts. One remaining case was reported as Chronic Sialadenitis. 3 cases were reported as Chronic Sialadenitis on cytology, all of which were later confirmed on histopathology. One case reported as Parotid abscess was also confirmed on histopathology.

Among the 3 unsatisfactory smears, one was found to be a Metastatic squamous cell carcinoma and the other 2 as Chronic Sialadenitis on histopathology.

Statistical analysis

For FNAC for Pleomorphic adenoma, it was observed that sensitivity was 86.7% and specificity was 100%. Positive predictive value (PPV), negative predictive value (NPV) and accuracy were 100%, 88.9% and 93.5% respectively. Similarly for Warthin's tumor and malignant lesions, it was 100% for all measures of diagnostic accuracy.

For FNAC of non-neoplastic lesions, it was observed that sensitivity was 87.5% and specificity was 100%. Positive predictive value (PPV), negative predictive value (NPV) and accuracy were 100%, 95.8% and 96.8% respectively.

DISCUSSION

The present study was conducted to elicit the diagnostic accuracy of FNAC for salivary gland lesions, by comparing the cytological diagnoses with that of histopathological diagnoses and in turn detect parameters like sensitivity, specificity, positive and negative predictive values.

Age incidence

Most cases in our study were in the age group of 41-60 years followed by 21-40 yrs. He Y et al¹ and Jayaram et al¹ in their studies had higher incidence of cases in the 6th decade.

Mean age of incidence for benign and malignant tumors were 41.6 years and 53.4 years respectively. This roughly correlated with the study of AFIP registry which showed 46.1 years and 47.1 years as the average age for benign and malignant tumors respectively.

Sex incidence

In the present study there is a male preponderance with a Male:Female ratio of 1.37:1. Similar results were seen in studies by Das DK et al¹ and Anjali et al⁵ which also showed male preponderance. Although the incidence of particularly Pleomorphic adenoma was higher in females. The incidence of other neoplastic and non-neoplastic lesions were higher in males.

Anatomical Distribution

In the present study, most of the salivary gland tumors are found in the parotid region (75.6%) followed by submandibular region (22.2%). Only one case (2.2%) was found in the minor salivary glands.

This is comparable to other studies done. For eg in the study by Boccato P et al⁶ the incidence of salivary gland lesions were higher in the parotid at 87.63%, followed by submandibular at 10.11% and minor salivary glands at 2.26%.

Pleomorphic Adenoma

Pleomorphic adenoma was the commonest lesion overall in our study. It was also the most common benign tumor. The criteria that were used

to diagnose pleomorphic adenoma were varying combinations of epithelial and mesenchymal elements and a chondromyxoid background.

In our study the incidence of pleomorphic adenoma among neoplastic lesions was 75%. This is comparable to a study done at Seth GS Medical college, Bombay⁷ which had an incidence of 64%.

Another notable finding in our study was that the incidence of pleomorphic adenoma was higher in females compared to males with a Male: Female ratio of 1:1.63. This was correlating with the study done by Everson et al⁸ which had a M:F ratio of 1:1.9.

The sensitivity of FNAC in diagnosing pleomorphic adenoma in our series is 86.7% while the specificity is 100%. In the study by Viguer et al⁹ the sensitivity and specificity were 92.6% and 98.4% respectively. The reason for slightly lower sensitivity in our study was due to 2 false negative cases.

Sampling and interpretation errors are the main reasons for this. This can be avoided by taking adequate samples and aspirations from multiple sites. The cytologic variations in FNAC of pleomorphic adenoma must be considered in order to avoid important errors in reporting salivary gland lesions.

Warthin tumor

Out of the 45 cases, 3 were diagnosed as Warthin tumor based on cytology. Out of these 3, for 2 cases subsequent histopathology specimens were received which allowed correlation study. Both of these were confirmed to be Warthin tumor on histopathology with a diagnostic accuracy of 100%.

The incidence of Warthin tumor in our study was 10.7% among the neoplastic lesions. In the study by Jesus Souza et al¹⁰ the incidence of Warthin tumor was 8%.

Malignant tumors

Out of the total 45 cases, 4 were diagnosed as malignant tumors on cytology. They included two cases of mucoepidermoid carcinoma and 1 each of adenocarcinoma and adenoid cystic carcinoma. Out of these 4, for 3 cases (2 mucoepidermoid carcinoma and 1 adenoid cystic carcinoma) subsequent histopathological specimens were received which enabled correlative study. All 3 of them were confirmed by histopathology, yielding a value of 100% on all measures of diagnostic accuracy.

Among the malignant neoplasms, mucoepidermoid carcinoma was the commonest, accounting for 7.1% of all tumors. One case each of adenoid cystic carcinoma and adenocarcinoma were noted accounting for 3.6% each. In the study done at Seth GS Medical college, Bombay⁷ the incidence of Mucoepidermoid carcinoma was 5% of all tumors. One case was diagnosed as Adenocarcinoma on cytology but subsequent histopathology specimen was not received.

Non-neoplastic lesions

In total, out of the 45 cases, 12 were diagnosed cytologically as non-neoplastic or tumor like lesions. Most of them were classified as benign cystic lesions (50%), followed by Chronic sialadenitis (33.3%). The remaining 16.7% cases were diagnosed as parotid abscess.

Out of these 12 cases, 8 of them received subsequent histopathological specimens which enabled correlative study. Out of the 4 cases that were diagnosed as Benign cystic lesions on cytology, 3 were later confirmed on histopathology as mucus retention cysts. One case turned out to be chronic sialadenitis.

The 3 cases that were diagnosed as chronic sialadenitis on cytology were later confirmed on histopathology to be the same. One case which was given as abscess on cytology was later confirmed on histopathology.

In our study the overall incidence of non-neoplastic lesions on the basis of cytology was 26.6%, out of which the commonest was benign cystic lesion. In the study by Boccatto P et al⁶ the incidence of non-neoplastic lesions was 30%. In the study by Jayaram et al³ the incidence of non-neoplastic lesions was 27.53%.

In our study the overall sensitivity and specificity of FNAC in

diagnosing non-neoplastic lesions is 87.5% and 100% respectively.

Out of the 45 cases, 5 of them were reported as unsatisfactory and repeat aspirates were not received. For 3 out of these 5, subsequent histopathological specimens were received in our department. Out of these 3, 2 were reported as Chronic sialadenitis and the other as Metastatic squamous cell carcinoma.

CONCLUSION

In conclusion, FNAC is a rapid, simple and reliable procedure that can be utilized for the initial evaluation of salivary gland swellings, even in the outpatient setup. It is also cost effective and minimally invasive.

It helps the clinician not only in the early detection of lesions but also in formulating an early plan of treatment.

In an era where advances in technology have added enormously to the burden of healthcare costs and facilities like ultrasound, sialography, CT sialography and immune markers are available to aid the diagnosis of salivary gland tumors, the continued and accelerated use of the FNA cytology has reduced the costs and has released significant resources for alternate uses, a matter, that the pathologist can feel justifiably proud of.

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