

FINE NEEDLE ASPIRATION CYTOLOGY OF SALIVARY GLAND LESIONS WITH HISTOPATHOLOGICAL CORRELATION- A TWO-YEAR STUDY

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ABSTRACT

BACKGROUND

Salivary gland neoplasms are an interesting, diverse group of tumours with many associated factors that make their diagnoses and management challenging. The long natural history of these lesions, wide spectrum of biological activity they exhibit, the difficulty in diagnosis and high rate of recurrence attribute to difficulty in management of these lesions. Since the lesions of major and minor salivary gland lesions are easily accessible, they can be readily subjected to examination by fine needle aspiration cytology studies which help in predicting the nature of the lesions and thereby helpful in management of these lesions.

The present study aims to determine the diagnostic accuracy of FNAC in categorising the salivary gland lesions and possible sources of errors.

MATERIALS AND METHODS

Study Design- Descriptive study. The study was conducted on 250 patients who underwent fine needle aspiration cytology of salivary glands at Government Medical College, Trivandrum over a period of two years. Histopathological data was obtained in 115 cases. The study examines the sensitivity, specificity and diagnostic accuracy of FNAC of salivary gland lesions in comparison with histopathology.

Inclusion Criteria- All patients with clinically palpable lesions in salivary glands- parotid or submandibular region.

Exclusion Criteria- 1. Acute inflammatory lesions of salivary glands; 2. Patients with other comorbidities.

RESULTS

Of the 250 patients who underwent FNA, 151 patients were males (60.4%) and 99 were females (39.6%). Age of patients ranged from 2 - 77 years. Most common salivary gland involved was the right parotid gland. Neoplasms were more common (66.96%) than non-neoplastic lesions (33.04%). The sensitivity of FNAC in detecting malignancy was 64.3%, specificity 75.25%, accuracy 73.91%, positive predictive value 86.36% and negative predictive value 86.36%.

CONCLUSION

Fine needle aspiration cytology is a simple, cost effective, sensitive and specific technique for diagnosis of most salivary gland lesions. Hence, it may be used as a diagnostic modality in predicting the nature of salivary gland lesions pre-operatively and hence helpful in management of these lesions.

KEYWORDS

Salivary Gland Tumours, Fine Needle Aspiration Cytology, Non-Neoplastic Salivary Gland Lesions.

HOW TO CITE THIS ARTICLE: Priya MG, Sheela KM. Fine needle aspiration cytology of salivary gland lesions with histopathological correlation- a two-year study. J. Evolution Med. Dent. Sci. 2017;6(53):4021-4024, DOI: 10.14260/Jemds/2017/869

BACKGROUND

Salivary gland lesions constitute 2 - 6.5% of all head and neck lesions in adults.¹ Clinical history and physical examination play an important but limited role in evaluation of these lesions.² It may be clinically difficult to distinguish nodular inflammatory fibrosis from a neoplastic process and little information regarding nature of tumour can be obtained short of biopsy. Moreover, many supposed salivary gland masses are not salivary gland lesions at all.³

FNAC has gained wide clinical acceptance as a direct approach to morphological diagnosis of salivary gland lesions. Most salivary gland lesions being superficially located

are easily accessible to FNAC and in most cases diagnostic material is readily obtained. Hence, FNAC should be a part of initial evaluation of patients with a mass lesion in the region of major salivary glands.

FNAC of salivary glands was standardised by Berge and Soderstrom (1959).⁴ They described appearance of acinar cells and ductal epithelium in aspiration smears from normal salivary glands and also patterns obtained in chronic sialadenitis and pleomorphic adenoma.⁴

Since it is possible to offer pre-operative diagnoses by FNAC, the surgeon can plan the time of surgery, i.e. immediate in case of malignancy or may be delayed in cases if the tumour is benign cytologically. If the salivary gland lesion is benign cytologically, surgery may be avoided in elderly and in high-risk surgical patients.⁵

Among the Questions FNAC can Answer are-

- Is the mass in head and neck region a salivary gland lesion?
- If it is, is it inflammatory, neoplastic or non-neoplastic?
- If neoplastic, is it benign or malignant?
- What is the specific diagnosis?

Financial or Other, Competing Interest: None.

Submission 23-05-2017, Peer Review 21-06-2017,

Acceptance 27-06-2017, Published 03-07-2017.

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DOI: 10.14260/Jemds/2017/869



- Based on FNA diagnosis, would surgery, radiation therapy or antibiotics be appropriate?
- Would pre-operative radiotherapy be useful?
- If surgery is needed, how urgent and extensive?
- If radical surgery is needed, both patient and surgeon can be prepared in advance.^{6,7,8,9}

MATERIALS AND METHODS

Study Design

Descriptive Study-

The study was conducted by a prospective analysis of 250 patients who underwent fine needle aspiration of salivary gland lesions during a period of two years in cytology laboratory, Government Medical College, Trivandrum.

FNAC was done using 10 cc of disposable syringe fitted with 22G or 23G needle. A minimum of two smears were taken for each case. The smears were fixed in 95% alcohol and was stained by Papanicolaou stain. Giemsa staining was also performed in air dried smears when required.

Of the 250 patients who underwent FNA, surgery was performed on 115 cases. The specimens were examined grossly and representative tissue sections were processed and stained with haematoxylin and eosin stain and examined. Special stains and immunohistochemistry were performed when needed. The results of FNAC and final histopathological diagnoses were compared and accuracy of FNAC diagnosis was determined.

RESULTS

Salivary gland FNAs constituted only 1.71% of total FNAs performed during the period of this study. Male: female ratio - 1.5: 1. The lesions occurred over a wide age range- 2 to 77 years. Of the 250 cases diagnosed by FNA, 113 cases (45.2%) were diagnosed as neoplastic lesions and 137 cases were diagnosed as non-neoplastic (54.8%).

Histologic Type	No. of Cases	% of Total
Chronic Sialadenitis	35	30.43%
Benign Tumours	63	54.79%
Malignant Tumours	14	12.17%
Others	3	2.16%

Table 1. Frequency of Salivary Gland Tumours (Histopathology)

Frequency of Benign Tumours

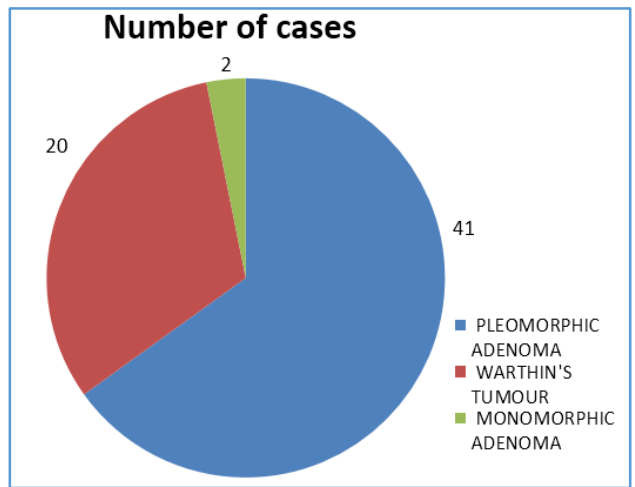


Figure 1. Frequency of Benign Tumours

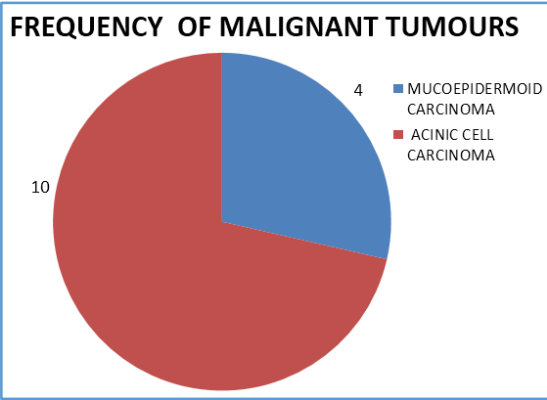


Figure 2. Frequency of Malignant Tumours

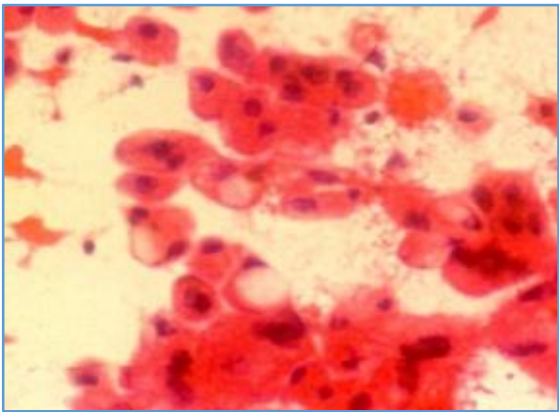


Figure 3. Cytology Smear- Mucoepidermoid Carcinoma: Intracytoplasmic Mucin Vacuoles (PAP, 400x)

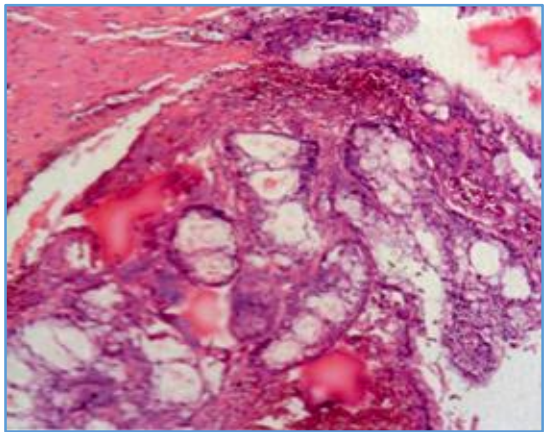


Figure 4. Histopathology of Mucoepidermoid Carcinoma (H & E, 100x)

Lesion	Total Cases	Correctly Diagnosed by FNAC
Pleomorphic adenoma	41	32 (78.26%)
Chronic sialadenitis	35	27 (78.37%)
Warthin's tumour	20	15 (75%)
Mucoepidermoid carcinoma	10	8 (80%)
Acinic cell carcinoma	4	1 (25%)
Monomorphic adenoma	2	2 (100%)
Haemangioma	1	0 (0%)
Lymphangioma	1	0 (0%)
Mucinous cystadenoma	1	0 (0%)

Table 2. Accuracy of FNAC in Diagnosing Lesions

Accuracy of FNAC in the Series

The different parameters for accuracy were calculated on statistical basis. Fourteen malignancies and 101 benign lesions were diagnosed histopathologically in this series. Of these 101 benign lesions, 63 cases constituted benign tumours and 38 were non-neoplastic and inflammatory lesions.

Of 14 malignant tumours, 9 were correctly diagnosed by FNA (True positive).

Of the 101 benign lesions, 76 were correctly diagnosed (True negatives); 88 cases were predicted as benign (Predicted negatives); 9 cases were predicted as malignant (Predicted positives) by FNA.

Sensitivity, specificity, accuracy, negative predictive value and positive predictive values were calculated as follows:

Calculations

$$\begin{aligned}\text{Sensitivity} &= \frac{\text{TRUE POSITIVE IN FNA} \times 100}{\text{NO. OF MALIGNANT LESION}} \\ &= \frac{\text{TP}}{\text{TP} + \text{FN}} = \frac{9 \times 100}{9 + 5} = \frac{9 \times 100}{14} = 64.3\%\end{aligned}$$

$$\begin{aligned}\text{Specificity} &= \frac{\text{TRUE NEGATIVES IN FNA} \times 100}{\text{NO. OF BENIGN LESIONS}} \\ &= \frac{\text{TN}}{\text{FP} + \text{TN}} = \frac{76 \times 100}{101} \\ &= 75.25\%\end{aligned}$$

$$\begin{aligned}\text{Accuracy} &= \frac{\text{TRUE POSITIVES} + \text{TRUE NEGATIVES} \times 100}{\text{TOTAL NO. OF PATIENTS}} \\ &= \frac{9 + 76}{115} = \frac{85}{115} = 73.91\%\end{aligned}$$

$$\begin{aligned}\text{Negative Predictive Value} &= \frac{\text{TRUE NEGATIVES} \times 100}{\text{PREDICTIVE NEGATIVES}} \\ &= \frac{76 \times 100}{88} = 86.36\%\end{aligned}$$

$$\begin{aligned}\text{Positive Predictive Value} &= \frac{\text{TRUE POSITIVE} \times 100}{\text{PREDICTED POSITIVE}} \\ &= \frac{9 \times 100}{9} = 100\%\end{aligned}$$

The sensitivity of FNAC for detecting malignancy was 64.3%, specificity 75.25%, accuracy 73.91%, negative predictive value 86.36% and positive predictive value 100%. There are altogether 19 errors in FNAC; 7 were errors in interpretation, 12 were errors of sampling. Errors of interpretation and errors of sampling led to false negatives in diagnosis of malignant neoplasms.

DISCUSSION

The aim of FNAC of salivary glands was to determine the nature of the lesion, render a specific preoperative diagnosis which enables the surgeon to plan a correct treatment modality for the patient. When compared to other diagnostic methods the technique of FNAC is inexpensive, efficient, fast, safe, well tolerated and does not require use of any sophisticated equipments.^{10,11}

Non-Neoplastic Lesions

27 out of 35 chronic sialadenitis (78%) cases were diagnosed correctly by FNAC. Two cases were mistaken for Warthin's tumour due to misinterpretation of oncocytic change in acinar cells as oncocytes. Six cases showed inadequate smears in FNA, which was attributed to extensive interstitial fibrosis and atrophy of acinar and ductal tissue. Orell et al⁵ have stated that late stages of chronic sialadenitis smears show scanty cellularity and yield only few ductal or acinar cells and a few inflammatory cells. Adequate cellularity of smears, accurate interpretation and correlation with clinical history is essential in eliminating errors in diagnosis.

Benign Tumours

The most common neoplasm encountered in this series was pleomorphic adenoma. Of the 41 cases histologically diagnosed as pleomorphic adenoma, 32 cases were correctly diagnosed in FNAC. All 32 cases showed cellular smears with round and plasmacytoid cells with well-defined cytoplasm and eccentrically placed bland nuclei, spindly myoepithelial cells in a background of fibrillary chondromyxoid stroma which stained purple in MGG and orange in PAP smears. The findings were similar to those obtained by May K M Chan et al (1992)¹² and Kline et al.¹³

Cystic degeneration has been described in pleomorphic adenoma (Orell et al 2005).⁵ Three cases of pleomorphic adenoma with extensive cystic degeneration were diagnosed only as cystic lesions in FNAC. As histological pattern of pleomorphic adenoma varies considerably between different parts of same tumour, multiple sampling is important to overcome diagnostic problems. Moreover, strict adherence to diagnostic criteria is important to avoid the mistake of overdiagnosis and underdiagnosis. The differential diagnosis of pleomorphic adenoma in cytology are adenoid cystic carcinoma and mucoepidermoid carcinoma.^{5,14}

The second most common benign tumour encountered in our study was Warthin's tumour. All correctly diagnosed Warthin's tumours cytologically showed cohesive, monolayered sheets of oncocytic cells with round central nuclei and bland chromatin. Four cases were diagnosed only as cystic lesions due to lack of oncocytes and aspirate yielded only fluid and macrophages. Orell et al⁵ states that obtaining diagnostic material may be difficult in predominantly cystic tumour.

Malignant Tumours

Mucoepidermoid carcinoma was the commonest malignant tumour encountered in the present study. A definitive diagnosis of mucoepidermoid carcinoma requires co-existence of mucous secreting vacuolated cells, intermediate cells and squamoid cells.⁵ In spite of distinctive diagnostic criteria, diagnosis of mucoepidermoid carcinoma on an FNA smear is not always easy.^{5,13,15,16} Low grade mucoepidermoid carcinoma is one of the most difficult entities to diagnose cytologically and is a frequent source of false negative diagnosis.^{5,17} Four histologically proven cases of low-grade mucoepidermoid carcinoma were tentatively diagnosed as cystic lesions in cytology in present study with an additional word of caution stating that possibility of a low-grade mucoepidermoid carcinoma cannot be excluded.

Main Reasons for Diagnostic Failure were-

1. Inadequate sampling from cystic lesions.
2. Total lack of cellular atypia in low-grade tumours.
3. Recognition of only one cell type mainly in cystic lesions where fluid aspirate dilutes and reduces cell yield.^{5,13,17}

Of the four cases of acinic cell carcinoma diagnosed histopathologically, only one was diagnosed correctly by FNAC. Two cases diagnosed incorrectly as cystic lesions as the tumour was predominantly cystic and hence sampling error occurred. Orell et al⁵ has stated that acinic cell carcinoma can be predominantly cystic and FNA may yield only hypocellular fluid with little or no diagnostic cells.

CONCLUSION

Fine needle aspiration cytology is widely recognised, useful, inexpensive and practical test for preoperative tissue diagnosis of salivary gland lesions. FNAC is a reliable method in distinguishing neoplastic and non-neoplastic inflammatory lesions as well as benign and malignant neoplasms of salivary glands. However, FNAC has its own limitations in the form of sampling errors and misinterpretations. This could be minimised by meticulous technique, repeated aspirations if possible under ultrasound guidance if cell yield is poor, adequate sampling, awareness of diagnostic pitfalls and adherence to stringent criteria in diagnosing neoplasms.

REFERENCES

- [1] Auclair PL, Ellis GL. Major salivary glands. In: Silverberg SG, Dellis RA, Frable WJ (eds). Principles and practice of surgical pathology and cytopathology. 3rd edn. Churchill Livingstone 1997:1461-505.
- [2] Phillips DE, Jones AS. Reliability of clinical examination in the diagnosis of parotid tumours. J R Coll Surgery Edinburgh 1994;39(2):100-2.
- [3] Demay RM. The art and science of cytopathology. American Society for Clinical Pathology 1996.
- [4] Berge T, Soderstrom N. Fine-needle cytological biopsy in diseases of the salivary glands. Acta Pathol Microbiol Sc 1963;58(1):1-9.
- [5] Orell SR, Sterret GF, Walters MI, et al. The salivary glands. In: Manual and atlas of fine needle aspiration cytology. Churchill Livingstone 2005.
- [6] Behzatoğlu K, Bahadır B, Kaplan HH, et al. Fine needle aspiration biopsy of the parotid gland. Diagnostic problems and 2 uncommon cases. Acta Cytol 2004;48(2):149-54.
- [7] Orell SR. Diagnostic difficulties in interpretation of fine needle aspirates of salivary gland lesions: the problem revisited. Cytopathology 1995;6(5):285-300.
- [8] Boles R, Patow CA, Guillaumondegui OM. Recurrent pleomorphic adenoma of the parotid gland. Head & Neck 1990;12(6):524-8.
- [9] Cardillo MR. Ag-NOR technique in fine needle aspiration cytology of salivary gland masses. Acta Cytol 1992;36(2):147-51.
- [10] Nanda SKD, Mehta A, Nanda J. Fine-needle aspiration cytology: a reliable tool in the diagnosis of salivary gland lesions. J oral pathol med 2012;41(1):106-12.
- [11] Karthikeyan CT, Kumar MJ, Babu PS, et al. An observational study of efficacy of FNAC in diagnosing benign and malignant salivary neoplasm. J Evolution Med Dent Sci 2016;5(104):7690-3.
- [12] Kline TS, Merriam JM, Shapshay SM. Aspiration biopsy cytology of the salivary glands. Am J of Clin Pathol 1981;76(3):263-9.
- [13] Geisinger KR, Weidner N. Aspiration cytology of salivary glands. Sem in Diag Pathol 1986;3:219-26.
- [14] Jayaram N, Ashim D, Rajwanshi A, et al. The value of fine-needle aspiration biopsy in the cytodiagnosis of salivary gland lesions. Diagn Cytopathol 1969;5(4):349-54.
- [15] Lindberg LG, Akerman M. Aspiration cytology of salivary gland tumours: diagnostic experience from six years of routine laboratory work. The Laryngoscope 1976;86(4):584-94.
- [16] Edwards PC, Wasserman P. Evaluation of cystic salivary gland lesions by fine needle aspiration: an analysis of 21 cases. Acta Cytol 2005;49(5):489-94.
- [17] Kumar N, Kapila K, Verma K. Fine needle aspiration cytology of mucoepidermoid carcinoma. A diagnostic problem. Acta Cytol 1991;35(3):357-9.