

Fine-needle aspiration cytology of salivary gland lesions

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Abstract

Background: Fine-needle aspiration cytology (FNAC) is a sensitive, specific, cost-effective tool and has been widely used as a diagnostic tool for the management of various head-and-neck lesions. Salivary gland lesions constitute the most common head-and-neck lesions. These lesions can range from inflammatory to neoplastic, which can be either benign or malignant.

Materials and Methods: The study was performed on 104 patients who presented with salivary gland swelling to the department of pathology at a tertiary care center from January 2016 to June 2020. FNAC was performed using a 22–24G needle, and smears were stained with Giemsa, hematoxylin and eosin and Papanicolaou stain. Histopathology was assessed on routine hematoxylin- and eosin-stained paraffin sections. The cytological and histopathological slides were studied, analyzed and correlated. Sensitivity, specificity, positive predictive value and negative predictive were calculated.

Results: The study included 104 cases in the age range of 10–70 years and a mean of 45 years (± 16 standard deviation). There was a male preponderance with a male-to-female ratio of 1.6:1. The parotid gland was the most common site 91 (87%). On cytology, 71 (68%) were neoplastic, of which 58 (81%) were benign and 13 (19%) were malignant. Histopathological correlation was available in 36 cases (50%), 24 (67%) of which were benign and the remaining 12 (33%) were malignant. The sensitivity, specificity, positive predictive value and negative predictive value of the present study are 95%, 85%, 91% and 92%, respectively.

Conclusion: FNAC of the salivary gland is a safe, reliable and cost-effective technique which can be used as the first line of investigation in evaluating salivary gland lesions.

Keywords: Fine-needle aspiration cytology, salivary gland lesions, sensitivity, specificity

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Submitted: 06-Dec-2020, **Accepted:** 20-Feb-2021, **Published:** 31-Mar-2022

INTRODUCTION

Salivary gland lesions constitute 2%–6% of all head-and-neck tumors.^[1] Fine-needle aspiration cytology (FNAC) is a useful tool for evaluating suspicious salivary gland lesions because it is simple, cost-effective, reliable and minimally invasive with a high specificity and sensitivity.^[2]

Clinical examination and imagining alone without FNAC cannot distinguish benign from malignant lesions.^[3] The added advantage is avoidance of fistula formation and recurrence following capsular disruption, which are common with incisional and core-needle biopsy, thus making FNAC as an initial tool of assessment in suspected salivary gland lesions. However, diverse morphological patterns and overlapping features make it difficult to give a precise diagnosis, at times.^[4]

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How to cite this article: Rameeza A, Hemalata M. Fine-needle aspiration cytology of salivary gland lesions. *J Oral Maxillofac Pathol* 2022;26:52-6.

Access this article online

Quick Response Code:



Website:

www.jomfp.in

DOI:

10.4103/jomfp.jomfp_496_20

Objectives

We aimed to study the utility of FNAC in the diagnosis of salivary gland lesions and also study the cytomorphological features of various salivary gland lesions using FNAC.

MATERIALS AND METHODS

This prospective observational study was carried out in the pathology department of a medical college and hospital after obtaining approval from the institutional ethical committee.

Source of data

Fine needle aspirates from all the patients with salivary gland lesions and the surgically resected specimen sent for histopathology.

Study period

This study was conducted from January 2016 to June 2020.

Method

- Informed consent was taken from all patients coming for FNAC of salivary gland lesions
- Detailed clinical history and local examination were recorded
- The swelling was palpated and fixed and FNAC was done from different sites of the salivary gland under aseptic precautions using a 10 cc syringe and 22–24G needle
- All air-dried FNAC smears were Giemsa stained and wet smears were stained by Pap and hematoxylin and eosin stain
- Histopathology specimens were fixed in 10% formalin, grossed, routinely processed and cut. The slides were stained using hematoxylin and eosin stain
- Gross and microscopic examinations were noted
- Special stains such as periodic acid–Schiff (PAS) stain and immunohistochemistry (IHC) were done in one case
- FNAC smears were examined, diagnosed and classified according.

RESULTS

FNAC was performed on 104 patients who presented with salivary gland swelling. Of these, 65 were male and 39 were female with a male:female ratio of 1.6:1. The mean age of the patients was 45 years (± 16 standard deviation), a range of 10–70 years; the most were in the age group of 40–50 years ($n = 39$, 37%).

The parotid gland was the most common site of aspiration ($n = 91$, 87%), followed by submandibular

gland ($n = 38$, 13%). No lesions were found in any of the minor salivary glands or in the sublingual gland.

The cytological diagnosis of the lesions demonstrates that among 104 cases, 33 (32%) were nonneoplastic and 71 (68%) were neoplastic [Table 1]. The common nonneoplastic lesions were chronic sialadenitis ($n = 19$, 57%), followed by sialadenosis ($n = 14$, 42%). Aspirate smears of chronic sialadenitis were hypocellular and showed cohesive clusters of ductal cells with background of lymphocytes, plasma cells, histiocytes and a few neutrophils. The smears in cases diagnosed as sialadenosis showed numerous benign acinar cells with few ductal cells [Figure 1]. Among the 71 neoplastic cases, 58 (81%) were benign and 13 (19%) were malignant. Pleomorphic adenoma was the most common benign lesion ($n = 48$, 83%), followed by Warthin's tumor ($n = 10$, 17%). Cytologically, the smears in pleomorphic adenoma showed epithelial cells admixed with ovoid myoepithelial cells and chondromyxoid stroma [Figure 2]. The smears of lesions diagnosed as Warthin's tumor on FNAC showed sheets of oncocytic cells and polymorphous population of lymphocytes in a dirty granular background [Figure 3]. Among the 13 malignant lesions, 12 (92%) were mucoepidermoid carcinoma (MEC) and 1 (8%) was adenoid cystic carcinoma. Cytologic smears

Table 1: Cases diagnosed on fine-needle aspiration cytology

| Lesions | Number of cases (%) |
|-----------------------------------|---------------------|
| Nonneoplastic ($n=33/104$; 32%) | |
| Sialadenosis | 14/33 (42) |
| Chronic sialadenitis | 19/33 (57) |
| Neoplastic ($n=71/104$; 68%) | |
| Benign ($n=58/71$; 81%) | |
| Pleomorphic adenoma | 48/58 (83) |
| Warthin's tumor | 10/58 (17) |
| Malignant ($n=13/71$; 19%) | |
| Mucoepidermoid carcinoma | 12/13 (92) |
| Adenoid cystic carcinoma | 1/13 (8) |

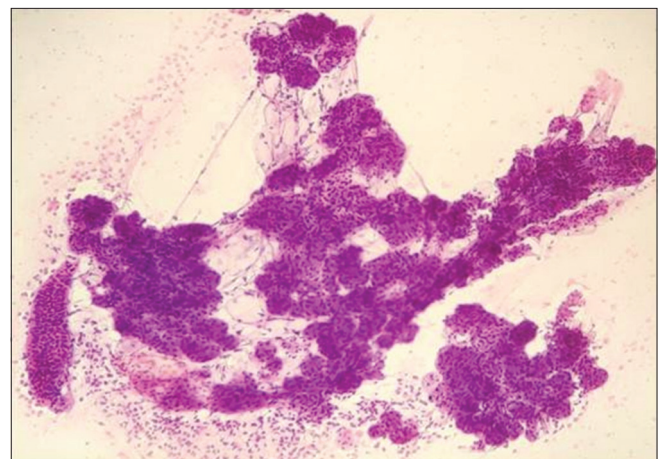


Figure 1: Cytomorphology of sialadenosis showing benign salivary acini with few ductal cells (H&E, $\times 100$)

of MEC were sparsely cellular and showed cohesive clusters of intermediate cells in a background of mucus and debris [Figure 4]. The cytologic smears of a case diagnosed as adenoid cystic carcinoma on FNAC showed small uniform epithelial cells with hyperchromatic nuclei and coarse chromatin adhering to a large, hyaline stromal globule [Figure 5].

The cytologic diagnosis was later correlated with histopathological diagnosis [Table 2]. Of the 71 neoplastic cases, histological correlation was available for 36 (50%), among which 24 (67%) were benign and 12 (33%) were malignant. The remaining 33 (32%) nonneoplastic and 35 (33%) neoplastic cases did not have histopathology correlation.

Twenty (92%) of the cases diagnosed as benign on cytology were correlated histopathologically. In this, there were twenty cases of pleomorphic adenoma and two cases of Warthin's tumor. However, two (8%) cases which were reported as pleomorphic adenoma and Warthin's tumor on FNAC turned out to be MEC and secretory carcinoma, respectively, on histopathological examination.

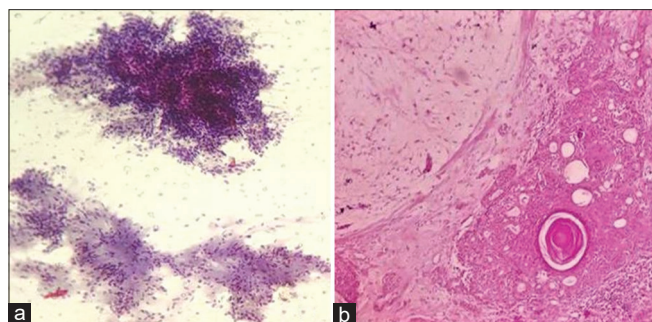


Figure 2: (a) Cytomorphology of pleomorphic adenoma showing epithelial cells admixed with ovoid myoepithelial cells and chondromyxoid stroma (H&E, x100); (b) Histomorphology of pleomorphic adenoma showing admixture of epithelial, myoepithelial and chondromyxoid stroma (H&E, x100)

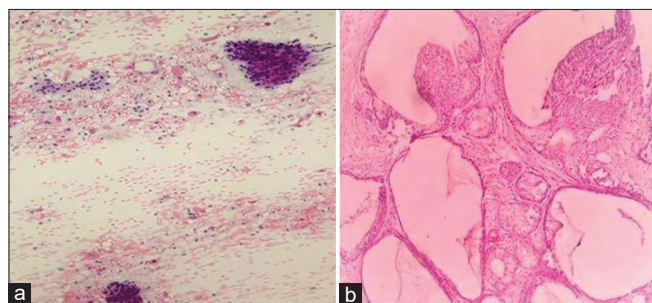


Figure 4: (a) Cytomorphology of mucoepidermoid carcinoma showing cohesive clusters of intermediate cells in a background of foamy macrophages, mucus and debris (H&E, x100). (b) Histomorphology of mucoepidermoid carcinoma showing cystic and solid areas. Cysts are lined by mucus-secreting columnar epithelium and solid areas showing intermediate squamous cells (H&E, x100)

Among the malignant group, 12 (100%) cases diagnosed as MEC on FNAC were confirmed as the same even on histopathological examination.

The sensitivity, specificity, positive predictive value and negative predictive value of the present study are 95%, 85%, 91% and 95%, respectively.

DISCUSSION

FNAC is found to be a simple, cost-effective and rapid diagnostic tool for assessing various salivary gland lesions.^[2] Preoperative cytological diagnosis of benign or malignant neoplasm will guide the surgeons to select an appropriate surgical procedure.

The present study consists of 104 cases who underwent FNAC for various salivary gland lesions. The lesions were categorized as neoplastic and nonneoplastic based on the cytological findings. Then, the cytological diagnosis was correlated with the histopathological diagnosis which was available in 36 (50%) cases diagnosed as neoplastic on cytology.

Salivary gland neoplasm can occur in any age group. In the present study, the lesions were seen in the age group of

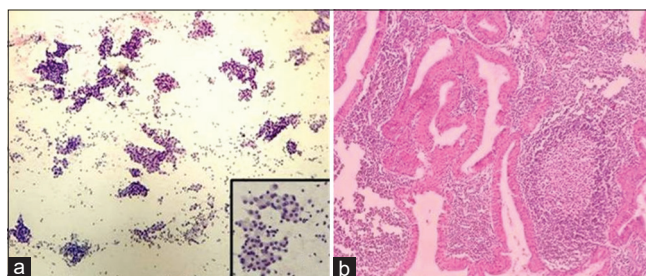


Figure 3: (a) Cytomorphology of Warthin's tumor showing sheets of oncocytic cells, polymorphous population of lymphocytes in a dirty granular background (H&E, x40). Inset: Sheets of oncocytes with background of lymphocytes (H&E, x400). (b) Histomorphology of Warthin's tumor showing cystic spaces lined by bilayered epithelium with lymphoid stroma (H&E, x100)

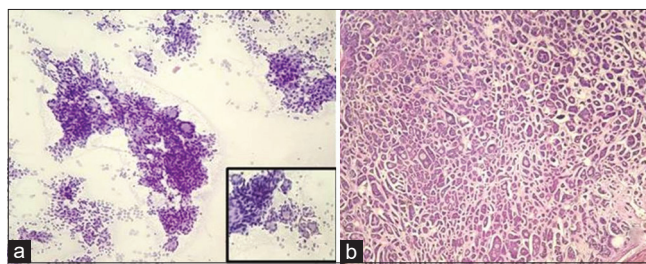


Figure 5: (a) The cytomorphology of adenoid cystic carcinoma showing small uniform epithelial cells with hyperchromatic nuclei and coarse chromatin adhering to a large, hyaline stromal globule (H&E, x100). Inset: Tumor cells attached to hyaline globule (H&E, x400); (b) Histomorphology of adenoid cystic carcinoma showing tumor cells arranged in cribriform pattern (H&E, x100)

10–70 years with a mean age of 45 years and majority in the fourth decade. These findings are similar to studies by Khandekar *et al.*^[5] and Kakoty *et al.*,^[6] whereas in studies by Koirala *et al.*^[7] and Anita Omhare *et al.*,^[8] majority of the cases were seen in the third decade. Male preponderance was observed in this study and is similar to most other studies.^[7,8] However, female preponderance has been observed by few other studies like Sikdar *et al.*^[9]

Among the salivary glands, the parotid was the most commonly affected gland ($n = 91, 87\%$), followed by submandibular gland ($n = 38, 13\%$). The sublingual gland and other minor salivary glands were not involved. This observation is comparable to other studies by Kakoty *et al.*^[6] and Koirala *et al.*^[7] where the parotid gland was the most common site of occurrence, followed by submandibular gland. However, this was in variance with the study conducted at a dental center which showed the minor salivary gland as the most common gland involved with palate swelling as the most common site of presentation.^[10]

On cytology, 58 (81%) were benign lesions in our study. Similar findings were noted in other studies too with an incidence of 77% and 80%.^[11,12] Pleomorphic adenoma comprised the main bulk of the benign neoplasm ($n = 48, 82\%$). Many previous studies have also reported pleomorphic adenoma as the most common benign neoplasm.^[6,13]

On FNAC, 20 (95%) cases diagnosed as pleomorphic adenoma were later confirmed by histopathological examination. However, in one case, low-grade MEC was misinterpreted as pleomorphic adenoma. In cases of low-grade MEC, the aspirate may show mucin in the smears which otherwise appears typical of pleomorphic adenoma.^[7] A study by Handa *et al.* states that cystic degeneration and mucin production are common in pleomorphic adenoma.^[14] On the contrary, cases of pleomorphic adenoma with goblet cells or squamous metaplasia should be observed carefully as it may mimic low-grade MEC on fine-needle aspiration (FNA).^[6]

A case diagnosed as Warthin’s tumor on cytology later turned out to be Mammary Analog Secretory Carcinoma (MASC) on histopathology and confirmed further by IHC. In this case, cytological diagnosis of Warthin’s tumor was offered because smears showed clusters of cells with abundant eosinophilic granular cytoplasm with the background showing plenty of vacuolated macrophages and occasional lymphocytes [Figure 6]. Histopathological examination showed a partially encapsulated neoplasm, the tumor was lobular with thick fibrous septae. The tumor cells were arranged in cystic, microcystic and papillary patterns. Individual cells were round with abundant eosinophilic to vacuolated cytoplasm and vesicular nuclei with some showing prominent nucleoli [Figure 6]. Some of the cystic spaces showed PAS-positive material. The discrepancy on FNA diagnosis might be due to the presence of cells with abundant eosinophilic cytoplasm simulating oncocytic cells of Warthin’s tumor. MASC may mimic benign oncocytic neoplasms such as oncocytoma, oncocytic cystadenoma and Warthin’s tumors. The distinguishing features are the

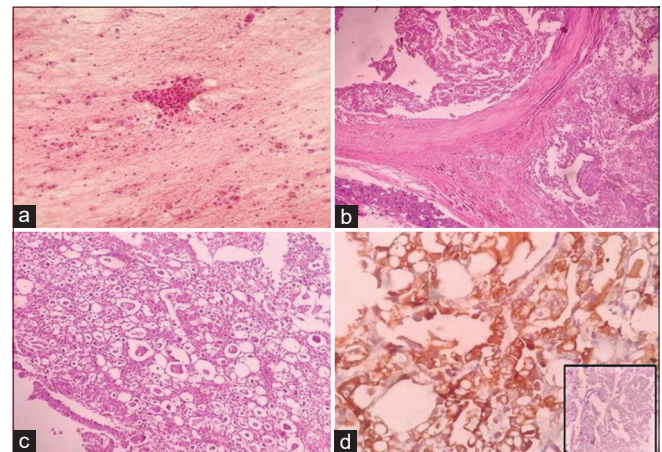


Figure 6: (a) Smears showing oncocytic cells in clusters, plenty of vacuolated macrophages and scattered lymphocytes (H&E, x100); (b) Sections of secretory carcinoma showing lobular neoplasm with neoplastic cells arranged in papillary, microcystic pattern (H&E, x400); (c) Neoplasm showing predominantly microcystic pattern with secretion within (H&E, x400); (d) Immunohistochemical stain showing cytoplasmic positivity for mammaglobin. Inset: DOG-1: negative (x400)

Table 2: Cytohistological correlation of benign and malignant salivary gland lesions

| Cytology Lesions | n | Histology correlated | Histology | |
|------------------------------------|----|----------------------|--------------------------|-------------------------|
| | | | Histology not correlated | Histology not available |
| Nonneoplastic ($n=33/104; 32\%$) | | | | |
| Chronic sialadenitis | 19 | - | - | 19 |
| Sialadenosis | 14 | - | - | 14 |
| Neoplastic ($n=71/104; 68\%$) | | | | |
| Benign ($n=58/71; 81\%$) | | | | |
| Pleomorphic adenoma | 48 | 20 | 1 | 26 |
| Warthin’s tumor | 10 | 2 | 1 | 7 |
| Malignant ($n=13/71; 19\%$) | | | | |
| Mucoepidermoid carcinoma | 12 | 12 | - | - |
| Adenoid cystic carcinoma | 1 | - | - | 1 |

Table 3: Sensitivity and specificity correlations of the present study with other studies

| | <i>n</i> | Sensitivity | Specificity |
|--------------------------------------|----------|-------------|-------------|
| SV Ramana <i>et al.</i> (2017) | 97 | 95% | 86% |
| Neha Sikdar <i>et al.</i> (2018) | 50 | 100% | 85% |
| Panchal Upasana <i>et al.</i> (2015) | 120 | 89% | 92% |
| Present study | 104 | 95% | 85% |

presence of vacuolar appearance and more prominent cell dyshesion in MASC.^[15]

Malignant neoplasm constituted 13 (19%) of the cases. MEC was the most common malignant neoplasm reported ($n = 12$, 92%). Here, all the 13 (100%) cases diagnosed as MEC on cytology were confirmed on histopathology with 100% correlation.

Our study had 33 (32%) nonneoplastic cases which were cytologically reported as chronic sialadenitis and sialadenosis. Histopathological examination was not available in all these cases as most of the nonneoplastic lesions were not surgically resected. This was in concordance with other studies.^[5,8]

The sensitivity, specificity, positive predictive value and negative predictive value of the present study are 95%, 85%, 92% and 95%, respectively, which are similar to those in previous studies [Table 3].^[9,12,16]

CONCLUSION

FNAC is a simple, quick and reliable technique for evaluating suspicious salivary gland lesions. Cytology can distinguish nonneoplastic from neoplastic and benign from malignant lesions. Identifying malignancy preoperatively helps in planning an appropriate surgical procedure for the patient. The high accuracy, sensitivity and specificity of FNAC make it an excellent first-line investigation for the evaluation of various salivary gland lesions.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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