

Fine needle aspiration cytology-based spectrum of salivary gland lesions at a teaching institute in north India

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Abstract

Introduction: Salivary gland swellings can occur because of inflammation, cyst or neoplastic process. Neoplasms of salivary glands are relatively rare comprising less than 2% of all human tumors. Prevalence of salivary of gland lesions differ from place to place. There are more than 30 morphologically different types of salivary gland neoplasms; majority of which can be diagnosed on fine needle aspiration cytology with expertise. **Material and methods:** This was a retrospective observational study spanning over 5 years carried out in the department of Pathology, Shaheed Hasan Khan Mewati Government Medical College, Nalhar. Hundred and forty-seven patients with salivary gland swelling were included in the study. **Result:** Benign salivary gland neoplasm was the most common lesion (54.42%) followed by inflammatory lesions (20.40%). Pleomorphic adenoma (90%) was the most common benign tumor affecting predominantly female patient and mostly involving the parotid gland. Mucoepidermoid carcinoma was the most common malignant tumor (36.85%) followed by poorly differentiated carcinoma (26.31%). Benign tumors were more common in females, whereas malignant tumors occurred more frequently in males. **Conclusion:** Fine needle aspiration cytology is fast, reliable and relatively accurate method to give tissue-based diagnosis of salivary gland swellings. It helps the clinician to plan the treatment modality for the patients in short time.

Keywords: Cytology, Salivary gland diseases, Salivary gland neoplasm, Sialadenitis.

Introduction

Pathological swellings of three major salivary glands- parotid, submandibular and sublingual as well as innumerable minor salivary glands distributed throughout the mucosa of the oral cavity can occur because of inflammatory process, cyst or tumors causing havoc in the patients as swellings in these glands is aesthetically disturbing. Neoplasms of the salivary glands are relatively rare and make up less than 2% of all human tumors [1].

As per WHO classification of salivary gland tumors 2017, there are more than 30 morphologically different types of salivary gland lesions. Role of fine needle aspiration cytology (FNAC) in the diagnosis of salivary gland swellings has remained challenging as many different salivary gland tumors share similar cellular constituents; it is the architectural relationship and abundance of these constituents that ultimately determines the tumor type [2].

It is now widely accepted as the first-line tissue-based method for diagnosing the salivary gland lesions. The purpose of FNAC in salivary gland lesions is two folds. Firstly, to confirm the origin from salivary gland,

as preauricular and submandibular lymph node swellings can mimic salivary gland neoplasm clinically and secondly to get a preliminary diagnosis about the nature of the disease process before proceeding to the definite management plan [3].

The sensitivity and specificity of the FNAC ranges from 64% -100% and 85%-100% respectively; interpretation error can lead to lower sensitivity of the procedure [4]. The minimally invasive procedure of fine needle aspiration in patients with salivary gland swellings helps in triaging and planning the therapeutic approach in individual patient [5]. The cytological diagnosis of salivary gland lesions is limited by wide range and heterogeneous nature of lesions arising in this area, many of which share overlapping cytological features, thus making the diagnosis problematic at times. The accuracy of cytological diagnosis depends on multiple factors which include experience of the person doing the procedure of fine needle aspiration, size of the lesion, clinical and radiological data about the lesion and utilization of Romanowsky type of stain for FNA of salivary gland lesions [6]. The present study was conducted with the aim to study the cytomorphological spectrum of salivary gland lesions in patients subjected to cytological examination in our institute.

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Material and Methods

Place: Study was done in the department of Pathology, SHKM Govt Medical College, Nalhar.

Duration: Study was carried out during period from January 2013 to December 2018.

Type of study: This is a retrospective observational study.

Sampling method: Patients with superficial, palpable swelling of salivary gland referred for cytological examination were selected as study subjects.

Inclusion criteria: Patients presenting with superficial, palpable and nodular lesions of salivary glands which yielded the adequate aspirate were included in the study.

Exclusion criteria: Patients with hemorrhagic or inadequate aspirate were excluded in data analysis.

Data collection procedure: Total 147 patients with salivary gland swelling attended the cytopathology section of the department during 5-year period. FNAC smears and reports of the patients with salivary gland swelling were retrieved. Slides were re-examined and patient details like age, sex, site of lesion were recorded. Tissue blocks of the patients who underwent biopsy were retrieved. Fresh sections were taken and stained with hematoxylin and eosin stain (H & E). The H & E stained sections were examined under microscope and special stains like PAS were performed wherever required.

Data analysis: Data analysis was reported in terms of frequencies and percentages.

Ethical consideration and permission: Study protocol was submitted to institutional ethical committee and approval was granted on 29/10/2018 by letter no SHKM/IEC/2018/14.

Results

Wide range of cyto-pathologically diagnosed salivary gland lesions were encountered in the present study (Table 1). Most common lesion was benign salivary gland neoplasm comprising of 80 (54.42%) cases followed by inflammatory disorder of salivary glands 30 (20.40%) cases.

Table-1: Spectrum of salivary gland lesions.

		Frequency	Percentage	Male	Female
Inflammatory	Chronic sialadenitis	24	16.32	15	9
	Acute on chronic sialadenitis	03	2.04	1	2
	Granulomatous sialadenitis	03	2.04	3	0
Non - neoplastic	Sialadenosis	05	3.40	5	0
	Cyst	04	2.72	0	4
	Adenomaoid hyperplasia	01	0.68	0	1
	Normal salivary gland	03	2.04	1	2
Benign tumors		80	54.42	32	48
Malignant tumors		19	12.92	11	8
Suspicious for malignancy		02	1.36	1	1
Inadequate /hemorrhagic aspirate.		03	2.04	2	1
Total		147		71	76

Pathological involvement of salivary glands was slightly found to occur more commonly in female than male with male to female ratio of 1:1.07. Mean age of the patients in the present study was 37.9 years. Out of 147 patient's cytological diagnosis could not be given in 3 cases due to inadequate or hemorrhagic aspirate with inadequacy rate of 2.04%.

Benign tumors of salivary gland comprised 54.42% of total no of cases (Table 2).

Table-2: Spectrum of benign tumors of salivary glands diagnosed on cytology.

Name of tumor	Frequency	Percentage	Male	Female
Pleomorphic adenoma	72	90	27	45
Warthins tumor	05	6.25	4	1
Basal cell adenoma	02	2.5	1	1
Myoepithelioma	01	1.25	0	1
Total	80	100	32	48

Pleomorphic adenoma (90%) was the most common benign tumor followed by Warthin's tumor (6.25%). Benign tumors were more common in females than males. Rare benign tumors of salivary gland like basal cell adenoma and myoepithelioma were also encountered in this study. Benign tumors were common in 21 to 40 years of age group (Table 3). Pleomorphic adenoma occurred most commonly in parotid followed by submandibular gland. It was also seen to occur in palate (3 cases), lip (1 cases) and cheek (3 cases).

Table-3: Age distribution of benign salivary gland tumors

Name of tumor	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Pleomorphic adenoma	3	10	20	13	12	10	3	0	1
Warthin's tumor	0	0	0	1	2	1	1	0	0
Basal cell adenoma	0	0	0	0	1	1	0	0	0
Myoepithelioma	0	0	0	0	0	1	0	0	0
Total	03	10	20	14	15	13	4	0	1

Table-4: Spectrum of malignant tumors of salivary glands diagnosed on cytology.

Name of tumor	Frequency	Percentage	Male	Female
Mucoepidermoid carcinoma	07	36.85	03	04
Adenoid cystic carcinoma	03	15.80	0	03
Poorly differentiated carcinoma	05	26.31	04	01
Adenocarcinoma	02	10.52	02	0
Acinic cell carcinoma	01	5.26	01	0
Carcinoma ex pleomorphic adenoma	01	5.26	01	0
Total	19	100	11	8

Malignant tumors were diagnosed in 19 (12.92%) patients with male predominance (Table 4). Mucoepidermoid carcinoma was the most common malignant tumor occurring in salivary glands followed by poorly differentiated carcinoma. Malignancies were common in age group 41 to 60 (Table 5).

Table-5: Age distribution of malignant tumors of salivary glands diagnosed on cytology.

Name of tumor	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
Mucoepidermoid carcinoma	0	2	1	2	1	1	0	0
Adenoid cystic carcinoma	0	0	0	0	0	2	0	1
Poorly differentiated carcinoma	0	0	0	0	1	1	2	1
Adenocarcinoma	0	0	0	0	0	0	1	1
Carcinoma ex pleomorphic adenoma	0	0	0	0	1	0	0	0
Acinic cell carcinoma	0	0	1	0	0	0	0	0
Total	0	2	2	2	3	4	3	3

Parotid gland was involved in 89 (60.54%) patients out of total 147 patients (Table 6). Inflammatory and non-neoplastic lesions were more commonly seen in the submandibular gland.

There were 24 (16.32%) cases of chronic sialadenitis out of which 16 cases involved the submandibular gland and 8 cases involved the parotid gland. There were 3 cases each of acute on chronic sialadenitis and granulomatous sialadenitis.

Table-6. Site wise distribution of salivary gland lesions.

Site	Non neoplastic lesions	Benign tumor	Suspicious for malignancy	Malignant tumor	Total
Parotid	19	58	1	11	89
Submandibular	24	14	1	7	46
Palate	0	3	0	1	4
Floor of mouth	0	1	0	0	1
Lip	0	1	0	0	1
Cheek	0	3	0	0	3

Out of 147 patients in the present study, the surgically excised specimens of only 20 patients were obtained. Cytological diagnosis correlated well in 19 patients who were diagnosed as having pleomorphic adenoma on cytology. Cyto-histological diagnosis was discordant in one case where patient was diagnosed as having benign salivary gland neoplasm but histologically it proved to be chronic sialadenitis.

Discussion

Salivary glands are complex in nature. They could be either tubulo acinar, merocrine or exocrine glands secreting mainly saliva. Salivary glands may be affected by a number of diseases: local and systemic and the prevalence of salivary gland diseases depend on various etiological factors. The glands may be infected by viral, bacterial, rarely fungal or its ductal obstruction which may cause painful swelling or obstruction, affecting their functions. The salivary gland may also be affected by various benign and malignant tumors.

Inflammatory lesions: In the present study inflammatory lesions of salivary glands were diagnosed in 30 patients on FNAC (Figure 1b and 1c). The most common inflammatory lesion was chronic sialadenitis contributing 16.32% of cases (24/147) comparable to the study done by Pai R [4] who found chronic sialadenitis in 17.33 % (26/150) of patients. Naz S et al [3] and Arul P et al [5] found the rate of chronic sialadenitis as 13.3% (25/187) and 13.2% respectively in their study. Higher rates of chronic sialadenitis were observed by Sandhu VK et al [6] 28.23% (48/170), Singh Nanda et al [7] 83% and Gupta R et al [8] 57.4%. In the present study inflammatory lesions predominantly affected the submandibular gland and occurred more commonly in males (63.33%, 19/30) than females (36.66%, 11/30). Male predominance was also noted by Gupta R et al [8].

Microscopically the smears from patients diagnosed as chronic sialadenitis showed ductal epithelial cells in clusters and acinar pattern along with scanty to moderate population of chronic inflammatory infiltrate. Cases of acute on chronic sialadenitis had polymorphonuclear infiltrate, lymphocytes, ductal epithelial cells and cellular debris. Granulomatous sialadenitis showed typical granulomas with lymphoplasmocytic infiltrate and ductal epithelial cells. Ziehl-Neelsen stain was done in all cases of granulomatous lymphadenitis but none of them revealed the presence of acid-fast bacilli.

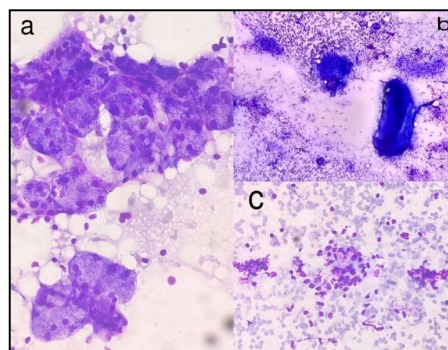


Fig-1: a. Sialadenitis – Fine needle aspiration (FNA) smear from parotid gland show plenty of acinar epithelial cells; normal in size (Giemsa, x 400), b. Granulomatous sialadenitis – epithelioid cell granuloma and ductal epithelial cells with chronic inflammatory infiltrate (Giemsa stain, x100), c. Chronic sialadenitis – FNA smear from submandibular gland is scanty cellular with few ductal epithelial cells, fibrous strands and lymphocytic infiltrate (Giemsa, x 200).

Non neoplastic lesions of salivary gland: Non neoplastic lesions encountered in the present study were sialadenitis (Figure 1 a), cysts, adenomatoid hyperplasia and normal salivary gland tissue. Five case (3.40%) of sialadenitis were seen, all of them occurred in males with 1 case involving the parotid and other 4 involving the submandibular gland. All the 4 cases (2.72%) of cysts occurred in females, exclusively affecting the parotid gland. Khandelia R [10] quoted the rate of sialadenitis and cystic

lesions as 5.55% each. Choudhary M et al [11] reported the rate of sialadenosis as 16.12% (29/180), whereas Fernandes H et al [12] observed the rate of sialadenosis as 9.09% (8/88) and that of cystic lesion as 11.36% (10/88) in their study of 80 patients with salivary gland swellings.

Neoplastic lesions of salivary glands: Hundred and one (68.70%) patients were diagnosed with salivary gland neoplasms on FNAC in the present study. These tumors were further categorized as benign (54.42%) (Figure 2), suspicious for malignancy (1.36%) and malignant (12.92%) (Figure 3) which is in accordance with Gupta S et al [9] who reported the benign tumor as 54.94% (50/91) and malignant tumor as 15.38% (14/91) in their study, based on salivary gland aspirates from 91 cases. Rate of occurrence of benign tumors in various studies ranged from 29% to 80% and that of malignant tumors from 4.44% to 26.66% [3-6,9-18].

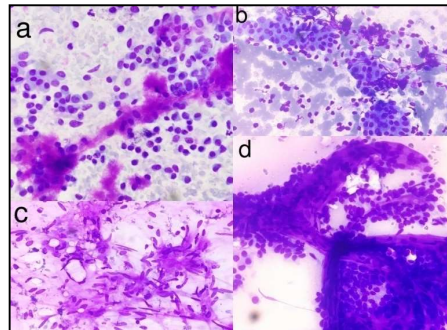


Fig-2: a. Pleomorphic adenoma - FNA smear cheek swelling showing mixture of epithelial cells and chondromyxoid stroma (Giemsa stain, x 400), b. Warthin's tumor – oncocytic cells in sheets with lymphocytes and hemorrhagic background (Giemsa, x 400), c. Myoepithelioma – loosely cohesive spindle cells with bland nuclei (Giemsa, x 400), d. Basal cell adenoma – small epithelial cell with scanty cytoplasm in groups surrounded by stromal material possibly of basement membrane origin (Giemsa, x 400).

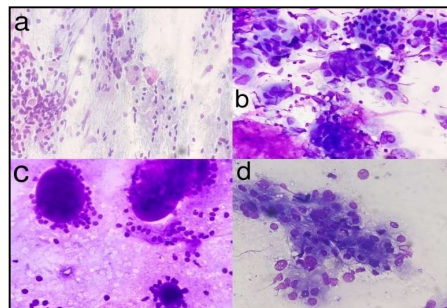


Fig-3: a. Mucoepidermoid carcinoma – smear from parotid swelling in 45-year female showing squamous and intermediate cells scattered singly in mucinous background (Pap stain, 200x), b. Carcinoma ex-pleomorphic adenoma – smear from parotid swelling in 43-year male showing malignant tumor cells and remnants of pleomorphic adenoma (myxoid stroma) left lower quadrant (Giemsa stain, 400x), c. Adenoid cystic carcinoma – smear from submandibular swelling in 60-year female comprised of variable sized hyaline stromal globules surrounded by tumor cells (Giemsa stain, 200x), d. Acinic cell carcinoma - FNA smear from 25-year male with swelling in palate showing cohesive cluster of tumor cells with high nuclear: cytoplasmic ratio having finely vacuolated cytoplasm (Giemsa stain, 400x).

Most common benign tumor in the present study was pleomorphic adenoma (90%) with maximum no of cases in 21-40 years age group predominantly affecting the females, with male to female ratio of 1:1.66. Incidence rate of pleomorphic adenoma correlates well with Naz S et al [3] and Pai RR et al [4] who observed the rate of pleomorphic adenoma as 89.06% and 87.5% respectively. In the present study parotid gland was the most common site for pleomorphic adenoma, rarely it was seen in lip and cheek. Usually, the diagnosis of pleomorphic adenoma is made after apparent identification of 3 main components such as extracellular matrix, myoepithelial cells and ductal cells. These components are present in varying proportions making the diagnosis at times challenging because of long list of differential diagnosis [19].

Warthin's tumor (6.25%) was the second most common benign tumor in this study, predominantly affecting the males and occurring exclusively in parotid gland with cases occurring from 31 to 70 years. Pai RR [4] and Sandhu VK et al [6] observed similar incidence rates for Warthin's tumor. Microscopically, Warthin's tumor showed dense lymphocytic population of cells, oncocytes and dirty fluid background. It needs to be differentiated from lymphoepithelial cysts of salivary gland, chronic inflammatory and obstructive duct lesions and oncocytic neoplasms [19-21].

In the present study malignant tumor predominantly affected the male patients with male to female ratio of 1.37:1 and mostly occurred in age >41 years. Mucoepidermoid carcinoma was the most common malignant tumor (36.85%) in the present study involving the parotid gland (5 cases) and submandibular gland (2 cases). Patients of Mucoepidermoid carcinoma were from 2nd to 6th decade. Pai RR et al [4] and Arul P et al [5] reported an incidence rate of mucoepidermoid carcinoma of 37.5% and 30% respectively in their studies. Gupta S et al [9] reported the maximum no of cases of mucoepidermoid carcinoma occurring in parotid gland in their study. On cytology mucoepidermoid carcinoma show mucin producing cells, squamous cells and intermediate cells in the dirty mucoid background with varying degree of atypia depending on the grade of tumor [22]. The differential diagnoses of Mucoepidermoid carcinoma include squamous cell carcinoma, both primary as well as metastatic or contiguous involvement from cutaneous or intra-oral location. The distinction from metastatic carcinoma requires clinical and radiological findings suggesting the involvement of intraparotid or submandibular lymph node [19]. Other malignant tumors seen in the present study were poorly differentiated carcinoma, adenoid cystic carcinoma, adenocarcinoma, acinic cell carcinoma and carcinoma ex pleomorphic adenoma.

Histopathological specimens of 20 patients were available out of total 147 patients who were subjected to FNAC of salivary gland swelling in this study. Cyto-histological correlation was observed in 19 cases with diagnostic accuracy of 95% which is comparable to other studies [14,23]. Cyto histological correlation was discordant in one case. Cytological diagnosis in this case was benign salivary gland neoplasm, whereas on histopathological examination it proved to be a case of chronic sialadenitis. This discordance occurred because of interpretative error. Limitation of the present study was the histopathological specimen in only 20 patients out total 147 patients was examined. Histopathological diagnosis in all these 20 cases who have undergone surgery was Pleomorphic adenoma. One of the reasons for this may be referral of the patients with cytologically proven malignancy to higher centre as our institute is very new and oncology services were not available in the initial years.

Conclusion

The present study highlighted the importance of FNAC as initial minimally invasive technique which give tissue-based diagnosis of salivary gland lesions. It helps in making the primary diagnosis thereby avoiding the major surgical procedure in inflammatory and benign tumors. Adequate sampling techniques, good quality smear preparation and expertise in field of cytopathology can diagnose the majority of salivary lesions with more specificity.

Pleomorphic adenoma was the most common benign tumor involving the parotid gland predominantly affecting the females whereas mucoepidermoid carcinoma was the most common malignant tumor in the present study. Chronic sialadenitis was the commonest inflammatory lesion of salivary glands predominantly affecting the submandibular gland.

What this study adds to existing knowledge?

This study draws attention to the most common lesions of salivary glands occurring in this region in different age group and sex. No such study has been carried in our institute previously. In future it will help to take any interventional measures to prevent the mortality and morbidity from salivary gland diseases.

Author's contributions

Dr. Rahul N. Satarkar: Concepts, Design, Definition of intellectual content, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript review.

Dr. Ashok Sangwaiya: Definition of intellectual content, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript review.

Dr. Pawan Singh: Definition of intellectual content, Data acquisition, Manuscript review.

Dr. Shivani Kalhan: Data acquisition, Manuscript preparation, Manuscript review.

Dr. Puja: Literature search, Data acquisition.

Dr. Neerav Saini: Literature search, Data acquisition.

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