

Original research article

Diagnosis of major salivary gland tumors by FNAC: A prospective study

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Abstract

Background: Salivary glands are one of the most common target organs where Fine needle aspiration cytology is performed because of their superficial location and easy accessibility. Many unexplained questions regarding a mass arising in the major salivary gland lesions can be answered by evaluation of FNAC.

FNAC of the major salivary gland lesions, determine the need for surgical intervention and assist in planning the appropriate surgical approach prior to resection.

Methods and materials: 74 patients with major salivary gland lesions were included in the study. This is a prospective study, undertaken in the Department of Pathology, J.J.M. Medical College, Davangere, during the period of March 2021 to August 2022. 11 cases were available for histopathological examination.

Results: Our study included 74 patients with major salivary gland lesions. Age group ranged from 12 years to 80 years with the mean age of 45.50 years. Majority of the patients were encountered in the age group of 31-40 years (31%). Male to Female ratio was 1:1.5. Among the 74 patients, most common benign and malignant neoplastic lesions noted were pleomorphic adenoma 55 cases and mucoepidermoid carcinoma 7 cases respectively. Histopathological correlation was available in 11 cases, in which cytological diagnosis differed in 4 cases.

Conclusion: FNAC is a simple and valuable tool for the correct pre-operative distinction between benign and malignancies in the outpatient setting and to avoid unnecessary surgery.

Keywords: Fine needle aspiration cytology (FNAC); Major salivary gland lesions

Introduction

Salivary glands are exocrine organs that secrete saliva widely distributed throughout the mouth and oropharynx. There are 3 pairs of major salivary glands-parotid, submandibular and sublingual glands ^[1]. There may be no tissue anywhere in the body that's subject to such a different and heterogenous range of tumors and tumor-like conditions, emerging in fascinating cytopathology, encountered in further 500 salivary glands present in the human body. It also produces diagnostic limitations, which must be appreciated by both pathologists and clinician, if the expansive benefits of the technique are to be completely and safely employed in patient management. With all of these hurdles to overcome, it is relatively impressive that salivary gland FNA emerges as an accurate and effective tool for diagnosing this complex group of lesions. Presently, FNA has gained wide acceptance as a 1st-line procedure in the evaluation of a salivary gland lesions ^[2].

Aim and Objectives

1. To study the cytomorphological features of major salivary gland tumors.
2. To correlate the cytological features with histological features wherever possible.

Materials and Methods

This is a prospective study, undertaken in the Department of Pathology, JJM Medical college, Davangere, during the period from MARCH 2021 to AUGUST 2022. All the patients referred to the Department of Pathology for fine needle aspiration cytology of lesions in salivary glands during this period, were included in the study.

Sample size: 74 patients

Inclusion criteria: All cytologically diagnosed tumors of the major salivary glands.

Exclusion criteria: Patients with bleeding diathesis and non-cooperative patients.

All the patients having major salivary gland lesions were subjected to detailed clinical examination. After obtaining an informed consent, under aseptic precautions FNAC was performed using 22 or 23 gauge, 30- 40 mm long needle fitted to a 5 ml syringe. Both air dried and alcohol fixed smears (smears were immediately fixed in 95% ethyl alcohol) were prepared. Alcohol fixed smears were stained with Papanicolaou stain, Hematoxylin and Eosin stain. Air dried smears were stained with Giemsa stain. Histopathological correlation was made in cases where the surgically resected specimens were available. Surgically resected specimens were subjected to gross examination and fixed in 10% formalin for 24 to 48 hours. Paraffin blocks were prepared and sections of 5-7 μ thick were cut and stained with Hematoxylin and Eosin stain. The cytological and histopathological study were done separately and reported independently.

Results

Age of the patients with major salivary gland lesions ranged from 11 years to 80 years with the mean age of 45.50 years. Majority of the patients were encountered in the age group of 31-40 years (31%). Out of 74 patients, 29 cases (39.0%) were males and 45 cases (61.0%) were females. Male to Female ratio was 1:1.5

Table 1: Site distribution

Site	Parotid gland	submandibular gland	Total
Right	33 (45.0%)	15 (20.0%)	48 (65.0%)
Left	24 (32.0%)	02 (3.0%)	26 (35.0%)
	57 (77.0%)	17 (23.0%)	74 (100.0%)

In the present study, Parotid gland was the commonest site involved and was seen in -57 cases (77.0%). Right parotid gland was involved in 33 cases (45.0%) and left parotid gland was involved in 24 cases (32.0%).

Second common site involved was submandibular gland in 17 cases (23.0%). Right submandibular gland was involved in 15 cases (20.0%) and left submandibular gland was involved in 2 cases (3.0%).

Table 2: Distribution of Cytologically Diagnosed Major Salivary Gland Neoplasms

Sl. No.	Neoplastic Lesions	No. of Cases	Percentage
1	Benign lesions	65	88%
2	Malignant lesions	9	12%
	Total	74	100%

Cytological diagnosis of neoplastic lesions of major salivary gland were made in 74 cases which included 65 cases (88%) of benign neoplasms and 9 cases (12%) of malignant neoplasms.

Table 3: Incidence of Cytologically Diagnosed Benign Major Salivary Gland Neoplasm

Sl. No.	Neoplastic Lesions: Benign	No. of Cases	Percentage
1	Pleomorphic adenoma	55	85%
2	Warthins tumor	9	14%
3	Myoepithelial cell rich neoplasm	1	1%
	Total	65	100%

Cytological diagnosis of benign neoplastic salivary gland lesions in the present study included pleomorphic adenoma in 55 cases (85%), warthins tumor in 9 cases (14%) and Myoepithelial cell rich neoplasm in 1 case (1%) noted.

Table 4: Incidence of Cytologically Diagnosed Malignant Major Salivary Gland Neoplasm

Sl. No.	Neoplastic Lesions: Malignant	No. of Cases	Percentage
1	Mucoepidermoid carcinoma	7	78%
2	Adenoid cystic carcinoma	1	11%
3	Salivary duct carcinoma	1	11%
	Total	9	100%

Cytological diagnosis of malignant neoplastic salivary gland lesions in the present study included mucoepidermoid carcinoma of 7 cases (78%) and adenoid cystic carcinoma, salivary duct carcinoma of 1

case each (11%) noted.

Table 5: Cyto-Histological Correlation in the Present Study

Sl. No.	Cytopathological Diagnosis	Histopathological Diagnosis				
		Pleomorphic adenoma	Warthins tumor	Myoepithelioma	Mucoepidermoid carcinoma-High/low grade	Schwannomatosis
1	Pleomorphic adenoma (6)	4	2			
2	Warthins tumor(1)			1		
3	Mucoepidermoid carcinoma-High grade(2)/ low grade(1)				2- High 1- Low	
4	Myoepithelial cell rich neoplasm (1)					1
Total No. of. Cases		11				

Of the 74 cases, 11 surgical specimens were available for histopathological examination. Histopathological diagnosis differed in 4 patient. In 2 patients, the FNAC diagnosis was pleomorphic adenoma which on biopsy showed warthins tumor. In 1 patient, the FNAC diagnosis was warthins tumor, which on biopsy showed myoepithelioma. In 1 patient, the FNAC diagnosis was myoepithelial cell rich neoplasm, which on biopsy showed schwannomatosis. In remaining 7 cases, histopathology confirmed the cytological diagnosis.

Table 6: Cases with discordance between cytological and histological diagnoses

No. of Cases	Cytology	Histology
2	Pleomorphic adenoma	Warthins tumor
1	Warthins tumor	Myoepithelioma
1	Myoepithelial cell rich neoplasm	Schwannomatosis

Discussion

The diagnostic role of FNAC in the evaluation of salivary lesions has been thoroughly evaluated and reported in the literature. There are many benefits of using FNA in the evaluation of a salivary gland mass. Salivary gland FNA has many advantages in comparison with other diagnostic modalities as it is easily performed, minimally invasive, safe, cost effective and accurate, provides a rapid diagnostic interpretation, and can easily be used to obtain material for special ancillary studies.

The distribution between the different salivary gland lesions in this prospective study is similar to what has previously been reported, with the parotid gland being the most commonly affected site [2,3].

Pleomorphic adenoma was the most common benign tumour, with slight female preponderance occurring mainly in the third decade of life. It most commonly affects the parotid gland. Incidence rate of pleomorphic adenoma correlates well with Naz S *et al.*, and Pai RR *et al.*, who observed the rate of pleomorphic adenoma as 89.06% and 87.5% respectively [4,5]. Right and left parotid gland was involved in 20 cases each, right submandibular gland was involved in 13 cases and left submandibular gland was involved in 2 cases each. Aspirates were cellular in all the cases and showed epithelial cells in sheets and groups, mesenchymal cells aspirates showing fibrillary myxoid background. The epithelial cells were small, uniform and had round to oval eccentric nuclei. Nuclei had bland granular chromatin and nucleoli were inconspicuous. These cells had moderate amount of densely stained cytoplasm and well defined cell borders. Mesenchymal cells seen were round to spindle shaped with elongated nuclei. The fibrillary myxoid background substance was pinkish grey in colour with Papanicolaou stain and bright magenta with giemsa stain. In one case hyaline globules were noted which is surrounded by epithelial cells. Bare nuclei were observed. Background also showed RBCs.



Fig 1: Clinical photograph of a patient with pleomorphic adenoma in right parotid gland



Fig 2: Photograph of surgically resected specimen of Pleomorphic adenoma

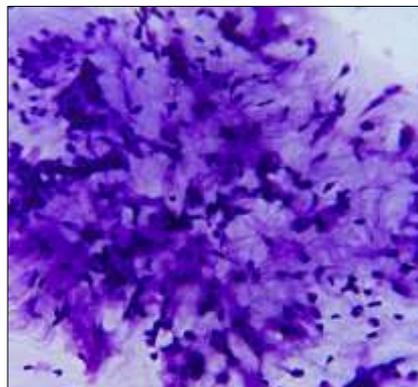


Fig 3: Photomicrograph of cytologically diagnosed pleomorphic adenoma showing ductal cells, myoepithelial cells and chondromyxoid stroma Giemsa x400



Fig 4: Photomicrograph of cytologically diagnosed pleomorphic adenoma showing hyaline globules admixed with ductal and myoepithelial cells Giemsa x400

In the present study, histopathological study was possible in 04 cases, which confirmed the diagnosis of pleomorphic adenoma. Microscopy showed benign biphasic neoplasm, composed of epithelial, myoepithelial and stromal components. Epithelial component lined the tubules. Myoepithelial cells show spindled to stellate morphology. Stromal component is myxoid. Adjacent area showed normal salivary gland tissue. Other 2 cases of pleomorphic adenoma was diagnosed histopathologically as warthins tumor. Microscopy showed a well circumscribed benign tumor comprising of epithelial cells with underlying basal cells resting on lymphoid aggregates with few lymphoid follicles.

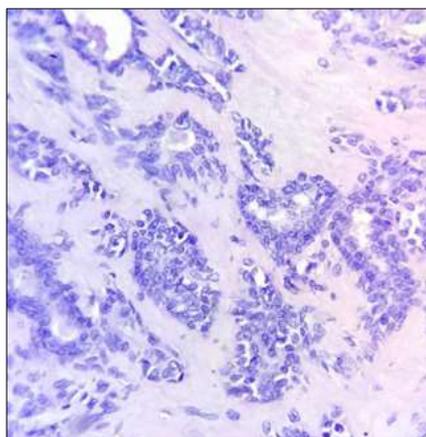


Fig 5: Photomicrograph of PA on HP H & E x400

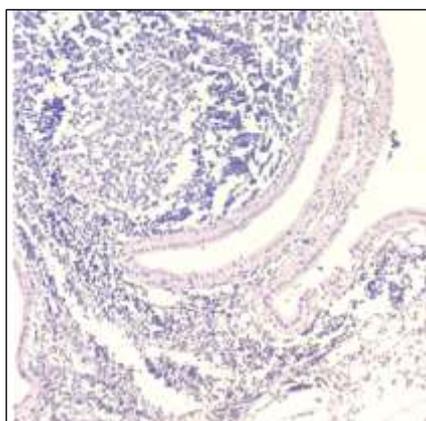


Fig 6: Photomicrograph of WT on HP showing bilayered oncocytic epithelium, underlies lymphoid follicles showing germinal center H&E x400

Warthin's tumor was the second most common benign tumor noted in 9 cases in this study, predominantly affecting the males and occurring exclusively in parotid gland with cases occurring from 20 to 65 years. Right parotid gland was involved in 7 cases and left parotid gland was involved in 2 cases. Pai RR *et al.*, and Sandhu VK *et al.*, observed similar incidence rates for Warthins's tumor ^[5, 6]. Grossly aspirates were hemorrhagic. Microscopically, Warthin's tumor showed lymphocytic population of cells, oncocytes and dirty fluid background. On histopathologically, it was diagnosed as myoepithelioma composed of tumor cells arranged in solid sheets. These tumor cells are spindle shaped with elongated nuclei and scant cytoplasm. Stroma is hyalinized with thick bands of hyaline seen focally.

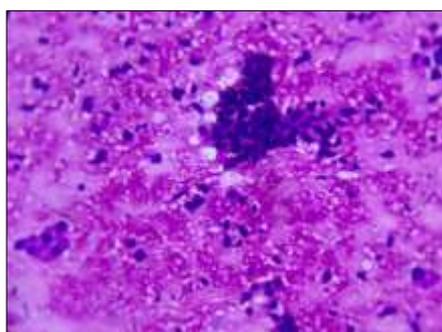


Fig 7: Photomicrograph of WT showing Oncocytes having abundant homogeneous granular cytoplasm H & E x400

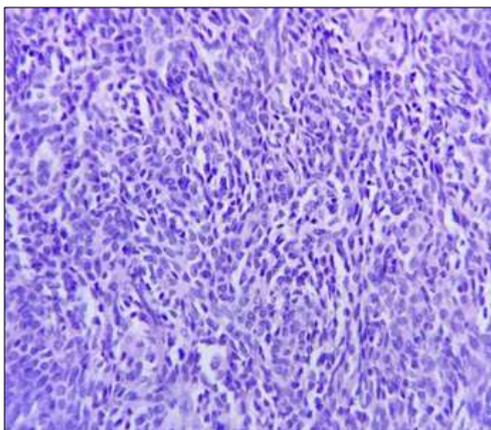


Fig 8: Photomicrograph of myoeptithelioma showing tumor cells, which are spindle shaped with elongated nuclei and scant cytoplasm. HP H&E x400

One case of myoeptithelial cell rich neoplasm is made in a 52 year male patient in the right parotid gland. Grossly aspirate was hemorrhagic and on cytomorphologically smear showed clusters of benign spindle cells with regular elongated nuclei giving a differential diagnosis of myoeptithelioma or myoeptithelial component rich pleomorphic adenoma. Histopathological examination of the specimen showed shwannomatosis. Microscopy showed a circumscribed encapsulated tumor composed of compact hypercellular Antoni A and mucoid hypocellular Antoni B areas. Cellular areas show spindled cells with nuclear palisading and verocay bodies. Cells have indistinct cell borders, elongated nuclei with dense chromatin. Loose hypocellular areas show myxoid change, focally congested vessels and numerous lymphocytes. Extensive cystic change, congestions, many thick hyalinized blood vessels, hemorrhage along with numerous hemosiderin laden macrophages and areas of hyalinization seen. Foci of normal salivary gland also seen.

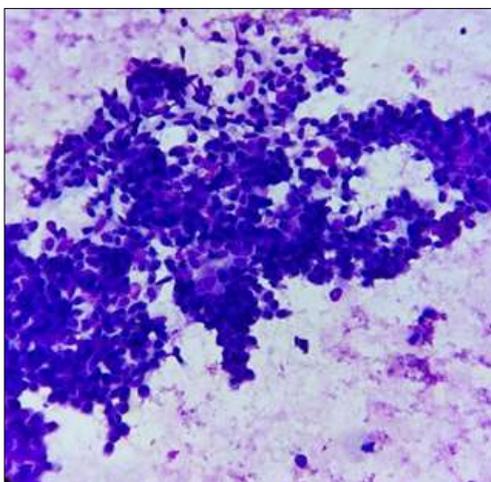


Fig 9: Photomicrograph of cytologically diagnosed myoeptithelial cell rich PA Giemsa x100

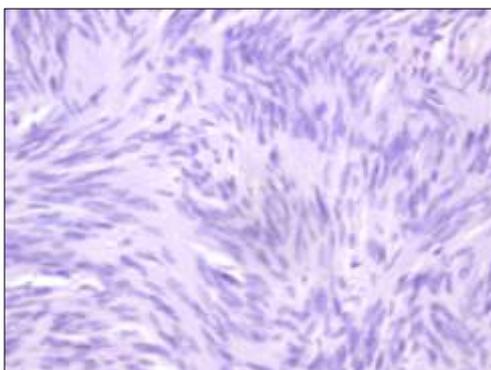


Fig 10: Photomicrograph showing spindled cells with nuclear palisading and verocay bodies in Shwannomatosis of parotid gland. H & E x400

Cytological diagnosis of mucoepidermoid carcinoma (MEC) was made in seven cases is the most common malignant tumor in the present study. Age ranged from 35 years to 65 years. Four cases were seen in male patients and three in females of which five cases involved the parotid gland and two case involved the submandibular gland. Grossly, all aspirates were hemorrhagic. The smears were sparsely cellular, with cases containing intermediate cell, squamous cells and with a mucoid background. Aspirate in two cases showed occasional mucus filled epithelial cells and benign looking squamous cells suggesting MEC.

Pai RR *et al.*, and Arul Pet *al.*, reported an incidence rate of mucoepidermoid carcinoma of 37.5% and 30% respectively in their studies ^[5, 7]. Gupta S *et al.*, reported the maximum no of cases of mucoepidermoid carcinoma occurring in parotid gland in their study ^[8].

The differential diagnosis 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 ^[9].



Fig 11: Clinical picture of diffuse swelling of the right parotid gland

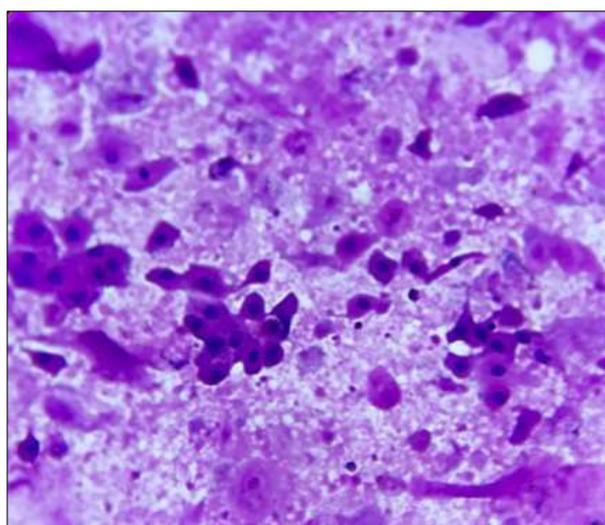


Fig 12: Photomicrograph of High grade MEC showing squamous cell rich with cellular debris in the background H & E x400

Histopathology was available in three cases. In all three cases histology confirmed the cytological diagnosis of mucoepidermoid carcinoma, with 2 cases of high grade mucoepidermoid carcinoma and 1 case of low grade mucoepidermoid carcinoma. Microscopy showed neoplastic lesion composed predominantly cystic growth pattern. These cystic and microcystic areas lined by flattened to cuboidal mucus secreting epithelium filled with mucin. Focal areas showed epidermoid cells. Stroma shows extracellular pools of mucin and fibrosis with chronic inflammatory infiltrates.

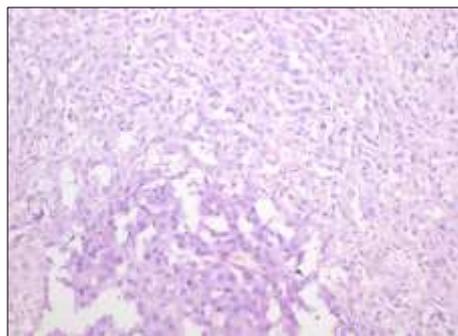


Fig 13: Photomicrograph of MEC on HP H&Ex100

Other malignant tumors seen in the present study were 1 case each of adenoid cystic carcinoma and salivary duct carcinoma.

Adenoid cystic carcinoma (AdCC) was diagnosed in 1 case, in a female patient aged 56 years in right parotid gland. Grossly aspirate was hemorrhagic. Aspirate was cellular and showed basaloid epithelial cells. These cells were large with hyperchromatic nucleus, scant cytoplasm against a background of acellular hyaline globules and hemorrhage. Adenoid cystic carcinoma is known for perineural spread and patient usually presents with facial nerve paralysis if parotid gland is involved. Similar observations were seen in other studies.

Salivary duct carcinoma (SDC) was seen in a 1 case in a male patient aged about 65 years in left parotid gland. Grossly aspirate was hemorrhagic. Cytologically smears of salivary duct carcinoma showed poorly cohesive clusters of large epithelial cells with variable amount of cytoplasm and large pleomorphic nuclei which was a similar finding observed in an other study done by Mori M *et al* ^[10]. SDCs and high-grade mucoepidermoid carcinomas have similar appearances, especially in view of the squamoid features that can occasionally be seen in salivary duct carcinoma.

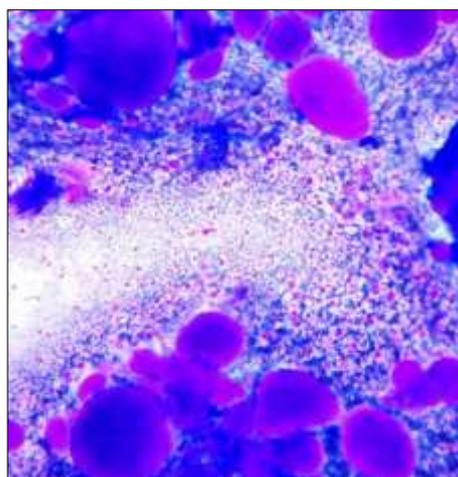


Fig 14: Photomicrograph of cytologically diagnosed AdCC showing variable sized magenta stromal spheres Giemsa x100

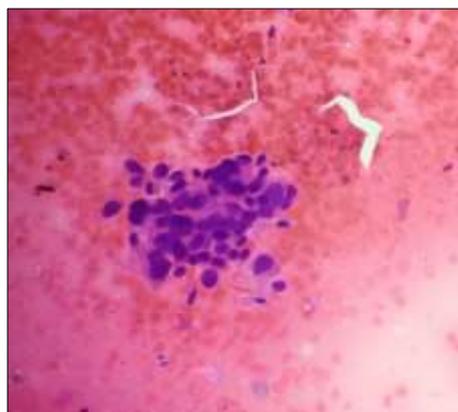


Fig 15: Photomicrograph of salivary duct carcinoma showing polygonal cells with pleomorphic nuclei H & E x400

Conclusion

FNAC is a highly reliable technique for pre-operative diagnosis of major salivary gland tumors in hands of experienced pathologists. It was a sensitive and specific diagnostic tool in our institution. An accurate cytologic diagnosis can avoid unwarranted surgery. Due to the minimally invasive nature of this technique, FNAC offers valuable information for planning of subsequent therapeutic management.

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