

Diagnostic role of Aspiration Cytology in Salivary Gland Lesions

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ABSTRACT

Aim: The aim of the present study is to examine the cytological details in aspirated smears from salivary gland swellings and to evaluate the efficacy of Fine needle aspiration cytology (FNAC) in the diagnosis of salivary gland lesions.

Materials and Methods: The present study was carried out in the Department of Pathology, Kamineni Institute of Medical Sciences, Narketpally. In this study 53 patients with salivary gland lesions diagnosed clinically in the ENT and Surgery department of Kims hospital were selected during the period from september 2008 to october 2010. Histopathological follow-up data were acquired in 37 cases. The study was carried out to observe the sensitivity, specificity, and diagnostic accuracy of FNAC for salivary gland lesions.

Results: The male-to-female ratio was 1:1.1. Parotid gland was involved in 59.37%, submandibular gland in 34.37% and other minor salivary glands in 6.25% of patients. There were 29.73% cases of non-neoplastic lesions, 54.05% cases of benign neoplastic lesions and 16.22% of malignant lesions. In our study, the sensitivity was 92.30%, specificity 100.00% and diagnostic accuracy was 94.59%.

Conclusion: The present study has indicated the diagnostic role of fine needle aspiration cytology in salivary gland lesions and its reliability. Re-aspirations and image-guided techniques, coupled with immunohistochemistry, will certainly enhance the diagnostic accuracy

Keywords: FNAC, salivary gland, histopathology, diagnostic accuracy.

INTRODUCTION

Fine needle aspiration was first described in 1847 by Kun, later in the 1920's, it was reintroduced and promoted by Martin and Ellis from USA memorial hospital.^[1] Fine needle aspiration cytology of salivary gland tumors was fully developed in the early 1950 in Europe by Antoine Zajdela and Joseph Zajicek's at the Karolinska institute.^[2]

The main goal of any diagnostic procedure is to assist the clinician in the management of patients. The salivary glands, both major and minor, are subject to many tumors

and tumor-like conditions. The varying and interesting cytological details have their own advantages and limitations in the diagnostic screening of salivary gland lesions, which must be understood by pathologists and mostly by clinicians, who invariably look for certain outcome. Even though imaging techniques, needle biopsies and frozen sections are available for enhancing, fine needle aspirations offer fairly good pre-treatment diagnosis. The procedure is safe, rapid, economical, and easy to perform.

The following study has been undertaken to ascertain the

cytological features of commonly encountered salivary gland lesions and correlate them with histopathological details in order to achieve higher degree of accuracy by giving specific diagnosis whenever possible.

MATERIALS AND METHODS

The present study was a prospective study carried out in the Department of Pathology, kamineni Institute of Medical Sciences Narketpally(KIMS). In this study 53 patients with salivary gland lesions diagnosed clinically in the ENT and Surgery department of KIMS hospital, were selected during the period of two years (2008 to 2010). This study included 53 patients who underwent pre-operative FNAC followed by surgical procedure and histologic examination. The histologic diagnosis was considered as the gold standard. FNAC diagnosis was compared with the final histologic impression and concordance assessed.

Procedure

FNAC was done under aseptic precautions by using 5cc/10cc disposable syringe [22-23Gneedle] after prior consent. Cytology smears were dried in air, stained with May-Granwald-Giemsa' and fixed isopropyl alcohol smears stained with Haematoxylin-eosin stain and Modified Paanicolou (Pap) stain. All the surgical specimens received in the Department of Pathology were fixed in 10% neutral buffered formalin. Grossing of the specimens were done with utmost care, noting the size of the lesion, whether they have circumscribed or infiltrative borders and presence of cystic changes were noted with special attention to the number of cysts, single or multiple, appearance of the surface, color of the walls, presence of papillary projections into the lumen of the cyst wall. All the suspicious areas were grossly sectioned and subjected to histopathological examination. Sections of 5 μ thickness were cut and stained with Hematoxylin and Eosin, and in doubtful cases slides were submitted for special histochemical stains such as PAS. Pre-operative FNAC results were then compared with the definitive histopathological diagnosis. The sensitivity, specificity and diagnostic accuracy in diagnosing salivary gland lesions were calculated.

RESULTS

The present study included 53 patients under age group ranging from 15-76 years. Among 53 aspirations, histopathological follow-up data were acquired in 37 cases. Maximum number of patients belongs to the age group of 31-40 years (32.43%). Distribution in females-19(51.35%) and males- 18(48.65%) were almost equal as shown in (Table-1)-(female:male-1.1: 1). Nonneoplastic lesions were common in the age group of 21-40 yrs (63.63%) benign lesions in 31-50 yrs age group(65.00%) and malignant lesions in 41-50 yrs age group(50.00%)

Regarding the site and laterality-wise distribution of salivary gland lesions, the lesions were more common in right parotid gland (40.63%) followed by right submandibular gland (25.00%) compared to left side salivary glands. Salivary gland lesions were classified into three diagnostic classes revealing 11 nonneoplastic lesions, 20 benign lesions, 6 malignant lesions.

Table-1: Age and sex distribution of salivary gland lesions

Age group (yrs)	Females n (%)	Males n (%)	Total n (%)
1 - 10	--	--	--
11-20	2(10.52)	1(5.55)	3(8.10)
21-30	5(26.31)	3(16.66)	8(21.62)
31-40	6(31.57)	6(33.33)	12(32.43)
41-50	4(21.05)	5(27.77)	9(24.32)
51-60	-	2(11.11)	2(5.40)
61-70	2(10.52)	--	2(5.40)
71-80	--	1(5.55)	1(2.70)
Total	19(51.35)	18(48.65)	37(100.00)

Non-neoplastic lesions

Chronic sialadenitis was the most common lesion seen in the submandibular gland which comprised 9 cases (81.82%) and 2 cases (18.18%) of mucocele were seen in the minor salivary glands. Among 10 cases of chronic sialadenitis, 9 were correlated (69.24%) and one case turned out as pleomorphic adenoma. 2 cases of mucocele were correlated(15.38%) and one case of infected cystic lesion was diagnosed as salivary duct carcinoma.

Benign neoplasms

Among 20 benign neoplastic lesions of salivary glands, pleomorphic adenoma was the most common lesion seen in the parotid gland comprising 19 cases (95.00%) and one case of monomorphic adenoma was seen in parotid gland. Most common benign tumor in the study was pleomorphic adenoma. Cytological smears show fibrillary chondromyxoid ground substance admixed with epithelial cells, single or in poorly cohesive clusters and sheets shown in (Fig:1).

Among 19 cases of pleomorphic adenoma, 18 (90.00%) were correlated and one case of benign cystic lesion was diagnosed as monomorphic adenoma. Pleomorphic adenoma was misdiagnosed as chronic sialadenitis on fnac possibly due to the needle entering the area adjacent to the tumor. Monomorphic adenoma was misdiagnosed as benign cystic lesion in fnac due to scant cellularity and abundant necrotic material.

Malignant neoplasms

Among 6 malignant neoplastic lesions of salivary glands 2cases of polymorphous low grade adenocarcinoma (PLGA)(40.00%) , 2cases of mucoepidermoid carcinoma (33.33%) and 1 case of salivary duct carcinoma (16.67%) were seen in the parotid gland. One case of polymorphous low grade adenocarcinoma (16.67%) was seen in the submandibular gland.

2 cases of each mucoepidermoid carcinoma 2(50.00%) and low grade adenocarcinoma 2(50.00%) were correlated. Salivary duct carcinoma was diagnosed as infected cystic

lesion in fnac smears due to scant cellularity and abundant necrotic material, probably obtained from the comedo necrotic areas of the tumor. Polymorphous low-grade adenocarcinoma was misdiagnosed as pleomorphic adenoma in fnac as hyaline globules were spread like streaks which were mistaken as chondriod matrix and due to scanty cellularity. In Polymorphous low grade adenocarcinoma cells are arranged in poorly cohesive clusters with small scanty cytoplasm and ovoid nuclei, nuclear chromatin is bland and nucleoli are inconspicuous shown in (Fig.2). Cytological smear findings of salivary duct carcinoma were shown in (Fig.3.)

Table2: Comparative study of nonneoplastic and neoplastic salivary gland lesions

Lesions	Jayram ⁶ (2001) N=53	Das ⁸ (2004) N=45	Ersoz ³ (2004) N=151	Akther ⁷ (2008) N=24	Present Study N=37
	CORRELATED Cases /Total number of cases (%)				
1. Chronic Sialadenitis	2/6 (33.33)	2/3(66.66)	18/22(81.81)	2/4(50.00)	9/10(90.00)
2. Mucocele	-	-	8/10(80.00)	-	2/2(100.00)
3. Cystic lesions	-	-	1/2(80.00)	3/3(100.00)	0/1(0.00)
4. Pleomorphic Adenoma	22/23(95.65)	25/28(89.28)	46/69(66.66)	9/12(75.00)	18/19(94.73)
5. Mucoepidermoid Carcinoma	1/2(50.00)	1/2(50.00)	2/16(12.50)	1/1(100.00)	2/2(100.00)
6. Polymorphous Low-grade adenoca	1/2(50.00)	2/2(100.00)	-	-	2/2(100.00)
7. Salivary duct Carcinoma	-	-	1/2(50.00)	-	0/1(0.00)
Other lesions [not comparable]	27	15	7	4	-
Total	26/33(78.78)	30/35(85.71)	76/121(62.80)	15/20(75.00)	33/37(89.19)

DISCUSSION

In the present study, 53 aspirations were performed over a period of two years. Among 53 aspirations, 37 cases were followed up by histopathological confirmation. These 37 cases were considered as the study group for cytological and histopathological correlation of salivary gland lesions and for calculating their diagnostic accuracy.

The age of the patients ranged from 15 to 76 years. Maximum number of patients belonged to the age group of 31-40 yrs (32.43%) with almost equal distribution in females (51.35%) & males (48.65%). Erosz^[3] had an age range of 4-80 years with a mean of 47 years. The female and male distribution was in the ratio of 1.2:1. Ashraf^[4] and Edda^[5] reported the same findings with the sex distribution and site of salivary gland lesions, distribution of females and males were almost equal.

The parotid gland (59.37%) was most commonly involved followed in decreasing order of frequency by submandibular gland (34.37%) and minor salivary glands (6.25%). Most of the salivary gland lesions were seen in the right parotid gland (40.63%) followed by right submandibular gland (25.00%).

Non neoplastic lesions were common in the age group of 21-40 yrs (63.63%). Benign lesions were common in the age group of 31-50yrs (65.00%). Malignant lesions were common in the age group of 41-50 yrs (50.00%)

Various authors proposed different reporting protocols in classifying the salivary gland lesions. Erosz^[3] performed 221 fine needle aspirations of salivary gland lesions and cytological diagnosis were classified as benign, suspicious

for malignancy, malignant and unsatisfactory samples.

Jayaram^[6] broadly classified cytological diagnosis of 141 salivary gland lesions into nonneoplastic and neoplastic which included benign and malignant tumors. In this study the lesions were divided into 3 categories. They are nonneoplastic, benign and malignant lesions. In the present study, cytological diagnoses of 37 aspirations were reviewed, and lesions were classified into three diagnostic classes revealing 11 nonneoplastic lesions, 20 benign and 6 malignant lesions. Comparative study of nonneoplastic and neoplastic salivary gland lesions were shown in (Table-2).

In the present study, Cytohistologic correlation was 90.00% for chronic sialadenitis, 100.00% for mucocele when compared with Erosz^[3] which was 81.81% for chronic sialadenitis, 80.00% for mucocele. Two cases of cystic lesions were infected and benign cystic lesion which were not correlated when compared to Erosz^[3] (80.00%) and Akther^[7] (100.00%)

Among benign neoplastic lesions of salivary glands, pleomorphic adenoma was the most common lesion seen in the parotid gland comprising 19 cases (95.00%). Cytohistologic correlation was 94.73% which was comparable with Jayaram^[6] (95.65%) Monomorphic adenoma was misdiagnosed as benign cystic lesion in FNAC due to scant cellularity, marked cellular degeneration, and abundant necrotic material.

Among malignant neoplastic lesions of salivary glands, cytohistologic correlation was (100.00%) for polymorphous low grade adenocarcinoma (PLGA) and mucoepidermoid carcinoma (100.00%). Das^[8] has 100.00% cytohistologic correlation for polymorphous low grade adenocarcinoma when compared with mucoepidermoid carcinoma which was 50.00%. PLGA of parotid gland is a rare occurrence, which was noted in the present study.^[11]

Jayaram^[6] had 50.00% cytohistologic correlation for polymorphous low grade adenocarcinoma and mucoepidermoid carcinoma. Salivary duct carcinoma was diagnosed as infected cystic lesion in FNAC smears due to scant cellularity and abundant necrotic material, probably obtained from the comedo necrotic areas of the tumor.

Jan shiow^[9] described four major reasons for incorrect interpretation of cytological diagnosis 1. Inadequate sampling with insufficient cellularity of the aspirate 2. Marked cellular degeneration 3. Erroneous labeling of specimens 4. Cytologist unfamiliar with morphology of rare salivary gland lesions.

Postema^[10] explained the reason for misdiagnosis in case of cystic lesions due to poor cell yield or due to aspiration

of non representative material. So, repeated FNAC and ultrasound guided (USG) FNAC from representative area is indicated.

Table 3: Comparison of incidence of inadequate aspirates.

	Stewart ¹² N=341 n (%)	Das ⁸ N=712 n (%)	Straman- dinoli ¹³ N=106 n (%)	Present study N=53 n (%)
Inadequate aspirates	10(2.93%)	44(6.20%)	27(25.5%)	2(3.77%)

In this study, among 53 aspirations, 2 aspirations were inadequate (3.77%) shown in (Table-3)

Poor cellularity was the main reason for inadequate smears which could be due to lack of experience in performing aspiration technique or getting the material on to the slide.

The diagnostic accuracy of FNAC in 37 histopathologically correlated cases was shown in (Table.4). True positive cases-24, False positives cases -0, True negative cases -11, False negative cases-2. 2 False negatives were salivary duct carcinoma and polymorphous low-grade adenocarcinoma. There were no false positive cases in the study done by Chetana Jain¹⁴ which was comparable with the present study.

Table-4: The diagnostic accuracy of salivary gland lesions

FNAC Diagnosis	Histopathological Diagnosis		
	Positive for neoplasm	Negative for neoplasm	Total
Positive for neoplasm	TP=24	FP=0	24
Negative for neoplasm	FN=2	TN=11	13
Total	26	11	

Table 5: False negatives / false positives from different series

	Akther ⁷ N=24 n (%)	Orell ² N=187 n (%)	Present study N=37 n (%)
False negatives	4 (1.64)	5(5.05)	2(7.69)
False positives	0(0.00)	1(1.01)	0(0.00)

In the present study, no false positives were observed. False negatives were 7.69%. False negatives were noticed in analyzing nonneoplastic lesions.

Table-6: Comparative Study of diagnostic accuracy of salivary gland lesions

	Jayram6 (n=53)	Das8 (n=45)	Ersoz3 (n=151)	Akther7 (n=24)	Present study (n=37)
Sensitivity	90.00%	94.6%	94%	90%	92.30%
Specificity	95.00%	75%	100%	100%	100%
Diagnostic accuracy	73.60%	91.1%	-	96.43%	94.59%

In this study, the sensitivity was 92.30%, specificity 100.00% and diagnostic accuracy was 94.59% which was correlated with the studies done by Akther^[7] and chetana-jain.^[14]

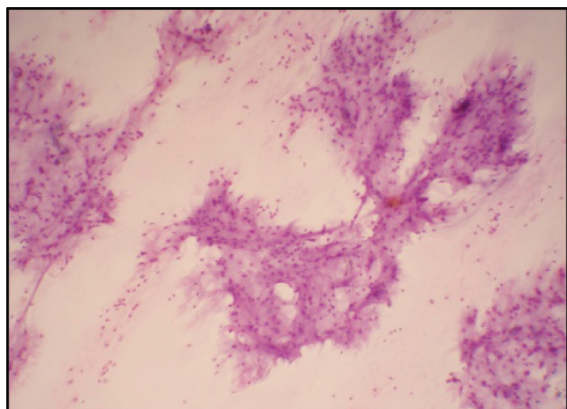


Figure 1 : Pleomorphic adenoma: Aspirate comprised of a combination of epithelial cells and fibrillary chondromyxoid matrix. (H&E,x100)

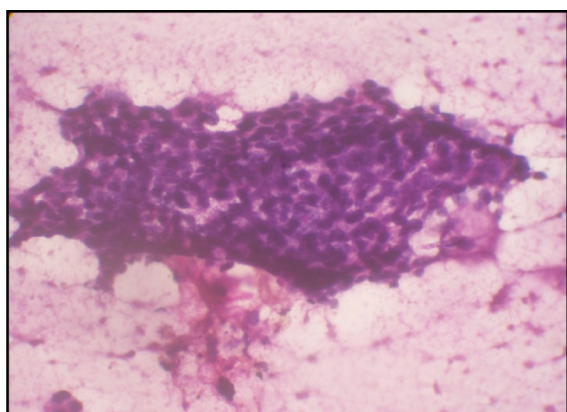


Figure 3 : Aspirate shows Polygonal cells with abundant vacuolated or granular cytoplasm having enlarged, pleomorphic and hyperchromatic nuclei in a necrotic background of salivary duct carcinoma (H&E,x400)

CONCLUSION

FNAC is a very valuable diagnostic adjuvant to the clinician in the diagnosis of various salivary gland lesions. The technique is accurate and highly reliable in the detection of malignancy. It is the safe, simple, minimally invasive with low-cost procedure especially for surgeons having accuracy and results comparable to that of frozen sections. Delay in diagnosis with conventional histopathological method is overcome and this would allow us prompt further management.

In order to avoid a hemorrhagic aspirate and to reduce the false negative rate, it is essential to reach the centre of the mass and carry out multidirectional movements of the needle in the mass. Re-aspirations and image-guided techniques, coupled with immunohistochemistry, will certainly enhance the diagnostic accuracy.

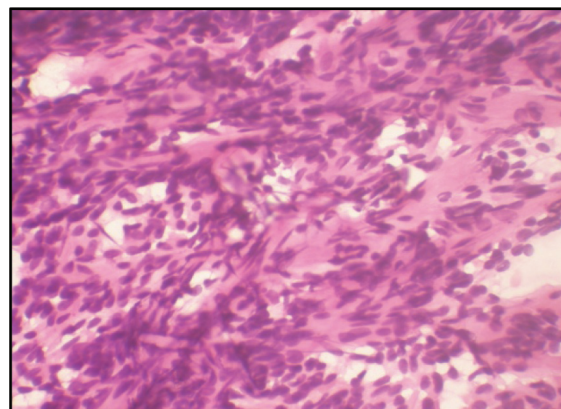


Figure 2 : Polymorphous low-grade adenocarcinoma: Aspirate shows pseudo papillary pattern with small basaloid cells adhering to anastomosing strands of fibrovascular stroma (H&E,x400)

CONFLICT OF INTEREST

The authors declared no conflict of interest.

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