

Diagnostic Significance of FNAC in Salivary Gland Tumours - A Cyto-histologic Correlation

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ABSTRACT

Introduction: Tumors of salivary glands display a variety of histologic appearance & vary in behaviour from benign to high grade & fatal malignancies. These neoplasms constitute 3-4% of all head & neck tumors.

Open biopsy almost always accurately predicts the histologic features of salivary gland masses, the method involves risk of an operative procedure & contamination of operative field with tumor cells.

Fine needle aspiration cytology is a useful technique for evaluating masses suspected of being salivary gland origin, majority of which arise from the same cell line- epithelial and myoepithelial and have ability to undergo a variety of metaplastic changes. This technique in the diagnosis of salivary tumors is well established with high degree of sensitivity and specificity. It is safe, easy to perform, causes little discomfort and accompanied by negligible risk of implantation of tumor cells. FNA speeds up the diagnostic process and is valuable adjunct to preoperative assessment. The rapid report system of FNAC is helpful in planning the treatment and invaluable in management of patients with salivary neoplasms.

Key words: salivary glands; FNAC; neoplasms; histology.

Material & methods:

This prospective study was conducted on 42 patients presenting with palpable salivary gland lesions referred to cytology section of Department of Pathology GMC, Jammu for a period of one year. Subsequent histological correlation was done in 33 cases. Fisher exact test was used for statistical analysis. Sensitivity, specificity, positive & negative predictive values were defined in comparison to various other studies.

Results:

Out of 42 cases subjected to FNAC, 27 were from parotid, 13 from submandibular, 1 each from sublingual & minor salivary glands.

31 were confirmed on histopathology. Two cases reported as benign on FNAC turned out to be malignant on histology (false negative). All the five malignant cases reported on FNAC were confirmed to be malignant on histology i.e., false positive rate was zero.

Conclusion: On the basis of present study it can be concluded that FNAC is a reliable tool in distinguishing malignant tumors from benign ones. It is safe, easy to perform, rapid & accurate diagnostic procedure. FNAC provides a rapid preoperative diagnosis with

reasonable degree of concordance with histopathology, hence, this is recommended in all patients presenting with salivary gland lesions as first line of investigation.

Introduction:

Salivary gland lesions pose a diagnostic dilemma & are to be investigated cytologically to know the nature of the lesion. FNAC is a simple, quick & cost effective method to sample superficial lesions in head & neck region.

The method of securing the tissue has been described by Martin and Ellis (1993) using an ordinary 18 gauge needle. They described the usefulness of FNAC in the diagnosis of tumors. Stewart (1993) said that, "the diagnosis by aspiration is as reliable as the combined intelligence of the clinician and the pathologist make it. It is safe to state that FNAC has so established its usefulness that it has acquired a permanent place as means of diagnosis.

Diagnosis of salivary gland lesions by FNAC has reduced the number of patients subjected to surgery by one-third or more. FNAC of salivary gland tumors is useful in distinguishing malignant from benign conditions. When malignancy is suspected, the routine use of FNAC allows the surgeon to counsel the patient preoperatively. FNAC also helps to establish diagnosis of a benign tumor in elderly patients in whom surgery is contraindicated.

To avoid unnecessary surgery and to manage salivary gland lesions properly, FNAC is a useful, safe and inexpensive tool in experienced hands, Thus, this procedure is suggested for all lesions of salivary glands.

Material & Methods:

This prospective study was conducted on 42 patients presenting with palpable salivary gland lesions referred to cytology section of Department of Pathology GMC, Jammu from the Department of ENT, Surgery and other associated hospitals for one year.

A detailed clinical history was taken from each patient regarding duration, site, fever, Pain, lymphadenopathy & facial weakness. Clinical examination regarding site, size, consistency, mobility, tenderness, regional lymphnode enlargement & facial nerve involvement was done. Palpable swellings were subjected to FNAC, two pricks given to minimize sampling error. FNAC was carried out using 20ml disposable syringe with 23-25 gauge needle. Two smears were fixed in 95% alcohol for PAP staining & rest air dried for MGG staining.

A detailed examination of cytology & histology slides was carried out. Histopathologic correlation was possible in 33 cases. Biopsy/post operative specimen were fixed in 10% formalin & processed for paraffin sections & stained with H&E & PAS wherever required.

Results:

FNAC from 42 Salivary gland masses were analyzed & histopathologic correlation done in 33 cases. Of 42 cases, 27 were from parotid, 13 from submandibular & 1 each from sublingual & minor salivary glands. On FNAC, 26 were diagnosed as pleomorphic adenoma, 2 as wartin’s tumor, 3 as monomorphic adenoma, 1 as oncocytoma. In malignant group, 1 each was diagnosed as mucoepidermoid, acinic cell, squamous cell carcinoma & 3 as undifferentiated carcinoma. 3 cases of salivary gland cysts were diagnosed in submandibular gland & one case as NHL.

Accuracy of FNAC in diagnosing Salivary gland tumors:

The diagnostic accuracy of FNAC in diagnosing salivary gland tumors is depicted in Table 1.

Table :-1

Accuracy of FNAC in diagnosing Salivary gland tumors

Cytologic Diagnosis	Histologic Diagnosis	
	Malignant	Benign
Malignant	5	0
Benign	2	26

Cyto-Histologic correlation of Salivary gland tumours :-

The cytohistologic correlation was possible in 33 cases.

Table :-2

Cytologic Diagnosis	Histologic Diagnosis									
	Total	Pleomorphic adenoma	Wartins tumors	Monomorphic adenoma	Mucoepidermoid carcinoma	Acinic cell carcinoma	Adenoid cystic carcinoma	Salivary duct carcinoma	Epidermoid carcinoma	Carcinoma ex-pleomorphic adenoma
Pleomorphic adenoma	25	24			1					
Wartin's tumor	1		1							
Monomorphic adenoma	2			1			1			
Mucoepidermoid carcinoma	1				1					
Acinic cell carcinoma	1					1				
Undifferentiated carcinoma	2							1	1	
Metastatic/ Squamous, cell carcinoma	1									1
Total	33	24	1	1	2	1	1	1	1	1

Of the 33 salivary gland tumors confirmed on histology, 24 were of pleomorphic adenoma. One each of warthin's tumor and monomorphic adenoma in the benign category. Amongst the malignant group. two cases were mucoepidermoid carcinoma and one case each of acinic cell carcinoma, adenoid cystic carcinoma, salivary duct carcinoma, epidermoid carcinoma and carcinoma ex-pleomorphic adenoma.

Cytologic patterns of salivary gland tumors :-

1. Cellularity:- The cellularity of smears in benign & malignant salivary gland tumors are showed in Table.3.

Table :- 3

S.No	Diagnosis	Low	Moderate	High	Total
1	Benign	7 (20%)	22 (62.8%)	6 (17.2%)	35 (100%)
2	malignant	1 (14.4%)	2 (28.5%)	4 (57.1%)	7 (100%)
	Total	8 (19%)	24 (57.2%)	10 (23.8%)	42 (100%)

Amongst the benign tumors, FNA smears showed low, moderate and high cellularity in 7(20%), 22(62.8%) and 6(17.2%) respectively.

Amongst the malignant tumors, high cellularity was obtained in 4 cases (57.1%) & moderate cellularity in 2 (28.5%) cases, One case (14.4%) showed low cellularity of malignant epithelial cells & reported as undifferentiated carcinoma.

2. Cell Pattern:- The cell patterns observed in cytology smears is depicted in Table 4.

Table.4 cell pattern

s.no	Diagnosis	Cohesive clusters	Acinar pattern	Loose & dispersed cells	total
1.	Benign	28(80%)	3(8.6%)	4(11.4%)	35
2.	Malignant	5(71.4%)	1(14.3%)	1(14.3%)	7
	total	33(78.6%)	4(9.5%)	5(11.9%)	42

28(80%) of benign tumours showed cohesive clusters, 3(8.6%) showed acinar pattern & 4(11.4%) showed loose clusters/singly dispersed cells.

5(71.4%) of malignant tumours showed multilayered cell clusters & aggregates & few scattered cells while 1 case showed dispersed cells (reported as NHL) & one acinar pattern (reported as acinic cell carcinoma).

3. Cell Population: The cell population observed in benign & malignant tumours of salivary glands on cytological smears is depicted in table 5.

Table 5 cell population

s.no	diagnosis	epithelial	oncocytes	macrophages	lymphoid	total
1.	benign	29(82.8%)	3(8.6%)	3(8.6%)	--	35(100%)
2.	Malignant	6(85.7%)	--	--	1(14.3%)	7(100%)
total		35(83.3%)	3(7.1%)	3(7.1%)	1(2.4%)	42(100%)

Amongst benign salivary gland tumore 29 cases (82.8%) showed epithelial cells including both acinar and ductal cells. Acinar cells were seen as clusters of cells with abundant cytoplasm and small round dark nucleus. Ductal cells showed tubular pattern with dense cytoplasm and round or oval nuclei.

3 cases(8.6%) showed oncocytes seen as flat monolayered sheets of cells with abundant finely granular cytoplasm and uniform, round central nucleus with bland chromatin. These included two cases of warthin's tumor and one case of oncocytoma.

3 cases (8.6%) showed macrophages as the predominant component and were diagnosed as benign cyts. Macrophages were also seen in 3 cases of malignant tumors with necrosis in variable amounts.

Amongst malignant tumors 6 cases (85.7%) showed malignant epithelial cells while one case (14.3%) showed lymphoid population(diagnosed as case of NHL). Many tumors showed presence of normal lymphoid cells and metaplastic changes.

4. Myxoid stroma: The presence of chondro-myxoid stroma or stromal material on FNA smears is shown in the table 6.

Table 6 Myxoid stroma

S.No.	Diagnoses	Present	Absent / Scanty	Total
1.	Benign	30(85.7%)	5 (14.3%)	35 (100%)
2	Malignant	5 (71.4%)	2 (28.6%)	7 (100%)
Total		35 (83.3%)	7(16.7%)	42(100%)

30 cases (85.7%) of benign tumors showed presence of chondro-myxoid or myxoid stroma which stained bright magenta to pink with MGG stain, had fibrillary or hyaline structure and contained spindle cells. This was seen in all the cases diagnosed as pleomorphic adenoma and monomorphic adenoma. Myxoid material or hyaline material was seen in 5 cases of malignant tumors.

Background: The background seen in cytological smears is depicted in the Table 7.

S. No.	Diagnoses	Haemorrhagic	Mucoid	Necroinflammatory	Clear	Total
1.	Benign	23 (25.7%)	9(25.7%)	1.(2.9%)	2(5.7%)	35(100%)
2.	Malignant	5(71.4%)	1(14.3%)	1((14.3)	0	7(100%
Total		28(66.7%)	10((23.8%)	2(4.8%)	2(4.8%)	42(100%)

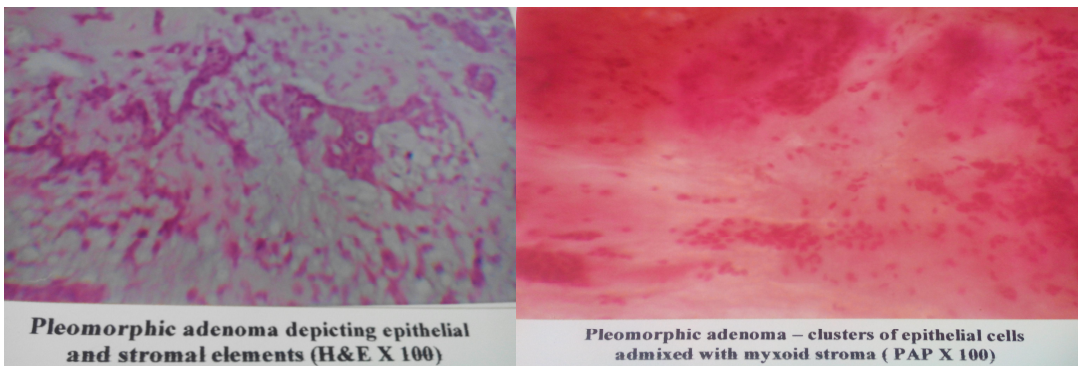
23 (65.7%) of benign tumors showed haemorrhagic background, 9 cases showed mucoid, 1 case showed necro-inflammation and 2 cases showed clear background. Case showing necro-inflammatory background was diagnosed as pleomorphic adenoma and oncocytoma. Malignant tumors showed mostly haemorrhagic background in 5 out of 7 cases while mucoid and necro-inflammatory background was seen in one case each (2 out of 7 cases).

Cytological diagnosis: The FNAC diagnosis of 42 cases of prospective one year are as under :

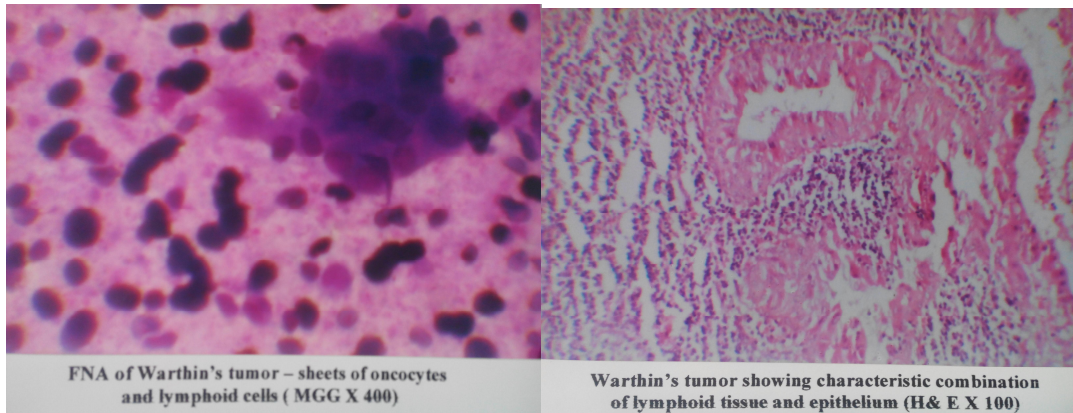
Cytological diagnosis Table 18

FNAC Diagnosis	No.of cases	Percentage
Pleomorphic Adenoma	26	61.9
Warthin Tumor	2	4.8
Monomorphic adenoma	3	7.1
Oncocytoma	1	2.4
Mucoepidermoid carcinoma	1	2.4
Acinic cell carcinoma	1	2.4
Squamous cell carcinoma	1	2.4
Undifferentiated carcinoma	3	7.1
Benign Cysts	3	7.1
Non – Hodgkin’s lymphoma	1	2.4

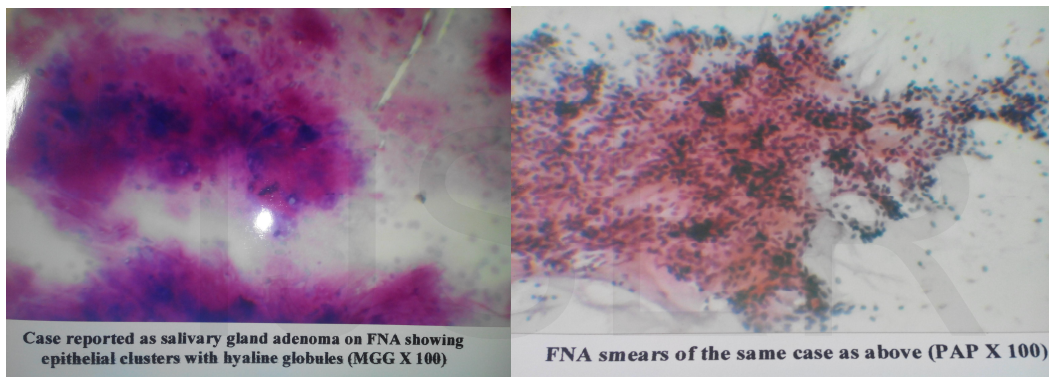
Pleomorphic adenoma comprised the most frequent tumor (61.9%) , mostly encountered in parotid gland . Out of 26 cases , 24 were confirmed correctly on HPE (92.3%) . Layfield et al (1987)⁸ reported 44 cases of pleomorphic adenoma .On FNAC and HPE correlation was obtained in 42 (95.4%) . The diagnostic criteria in the present study was the presence of a mixture of epithelial and mesenchymal elements .



Two cases of Warthin’s tumor were diagnosed on FNAC and one was confirmed on HPE . Smears showed sheets of oncocytes with round nuclei and granular cytoplasm along with many lymphoid cell in the background . Similar features were noticed by Chan et al (1997) ⁹and Cristillani et al (1997)¹⁰.

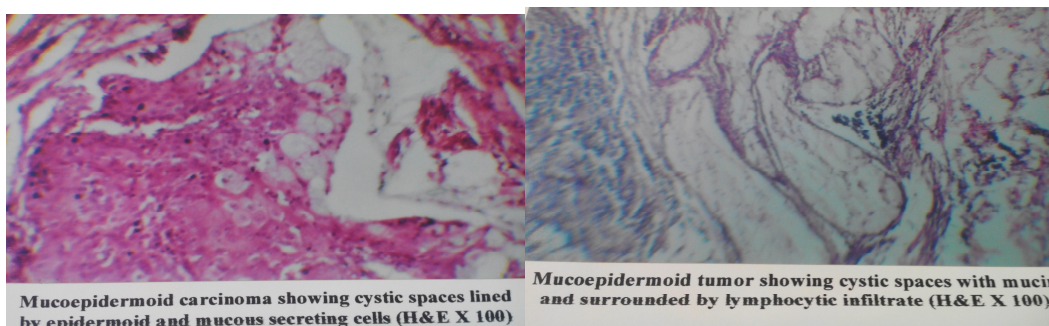


Monomorphic adenoma accounted for 3 out of 42 cases . One case was confirmed on HPE while other turned out to be adenoid cystic carcinoma on HPE. Histopathologic correlation was not available in one case. Smears showed clusters of cells with regular round nuclei and scant cytoplasm. Similar features were observed by Cajulis et al (1997)¹¹ and Orell et al (1999).¹²



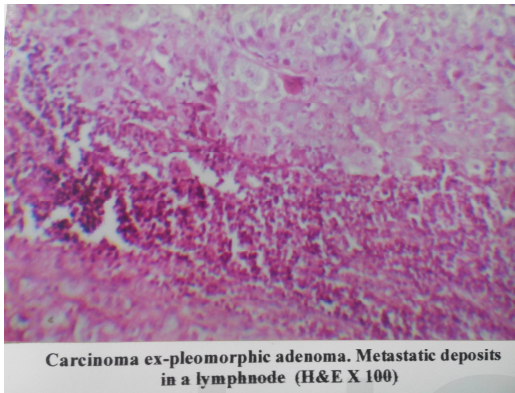
A Single case of oncocytoma was diagnosed on FNAC . Smears showed cohesive clusters of oncocytes in clean background .Cytologic features matched those observed by Cajulis et al (1997) and Orell et al (1999).

Mucoepidermoid carcinoma, a single case was diagnosed by FNAC and later confirmed on HPE Smears showed low cellularity comprising of squamous and mucus cells in mucoid background . Features observed resembled previous Studies of Kline et al (1988)¹³, Cajulis et al (1997) and Orell et al (1999).



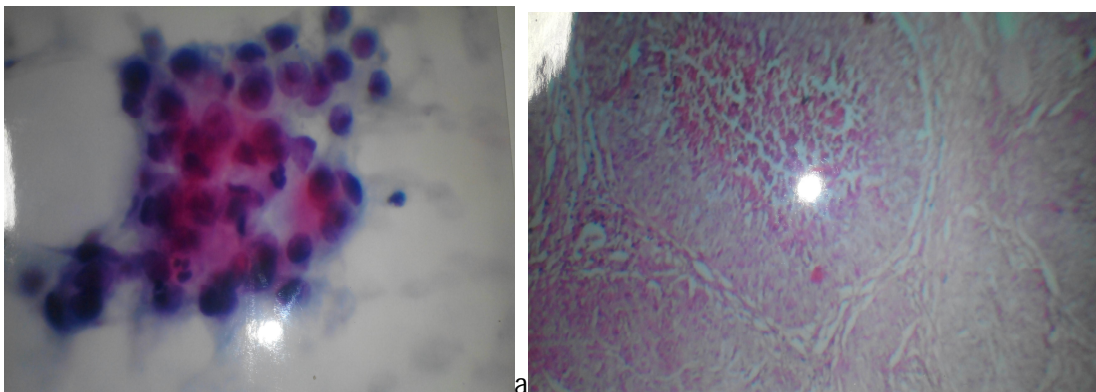
Acinic cell carcinoma accounted for 1 case (out of 42) on FNA which was confirmed on histology . Smears showed high cellularity comprising of cohesive cell clusters with fibrovascular cores. Cells showed abundant cytoplasm at places forming acini. Chan et al (1992)&Orell et al (1999) observed similar features.

A single case of squamous cell carcinoma ,Possibly of metastatic nature was labelled on FNAC . HPE correlation turned out to be carcinoma -Ex plemorphic adenoma of epidermoid type. Cytologic features of squamous cell carcinoma were noticed in smears . 2 cases of squamous cell carcinoma were reported by Chan et al 1992 and Cajulis et al (1997) each.



Undifferentiated carcinoma accounted for 3 cases out of 42 on FNAC. Cytological features of epithelial malignancy were noticed in all the three cases. HPE correlation was available in two cases, which were diagnosed as Epidermoid carcinoma and salivary duct carcinoma. Chan et al (1992), Orell et al (1999) reported 5 & 4 cases of these tumors of FNAC respectively.

Case reported as undifferentiated carcinoma on FNAC SAME CASE REPORTED AS SALIVARY DUCT CARCINOMA ON H&E



Salivary gland cysts – three cases of benign cysts were encountered on FNAC. Smears showed low cellularity comprising of degenerating epithelial cells and macrophages. Kline et al (1988) reported percentage of cystic lesions as 9% while Zurrida et al (1993) reported these to be 5.9%.

One case was labeled as Non Hodgkins Lymphoma on FNAC in 60 years old man presenting with

Submandibular swelling. Smears showed sheets of dissociated cells resembling centrocytes and centroblasts along with lymphoglandular bodies in background. HPE correlation was not available in this case. Chan et al (1992) reported two cases of large cell lymphoma in salivary gland.

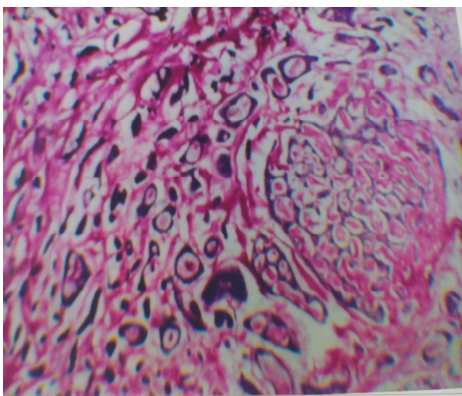
Role of Fine Needle Aspiration cytology:-In our study, 42 cases were diagnosed on FNAC & subsequent histological correlation was available in 33 cases were correctly diagnosed by FNAC. The criteria used for cytologic diagnoses were same as described by Orell et al (1999). Our observations were in close proximity with Cajulis et al (1997), Cristallini (1997) and Orell et al (1999).

In case of benign neoplasms, 35 cases were diagnosed on FNAC and histopathology was available in 28 cases (80%). 26 of these were correctly diagnosed giving an accuracy rate of 92.85%. Two cases diagnosed as benign neoplasms on FNAC turned out to be malignant tumors on subsequent histopathologic examination (false negative).

In case of malignant tumors, 7 cases were diagnosed on FNAC and subsequent histopathology was available in 5 cases (71.4%). All the 5 cases were confirmed to be malignant giving an accuracy rate of 100%. There was no false positive case.

False negative Cases: -

- One case diagnosed as pleomorphic adenoma on FNAC in 12 years old male child turned out to be Mucoepidermoid carcinoma on HPE. Smears showed scanty epithelial cells in mucoid background and a few bland appearing squamous cells.
- The other case diagnosed as monomorphic adenoma on FNAC in 30 year old female confirmed as Adenoid cystic carcinoma on HPE. Smears showed high cellularity comprising of epithelial cell clusters and moderate amount of stroma along with hyaline globules. Similar Problem cases were noticed by Zurrida et al (1993), Macleod et al (1993), Cajulis et al (1997) and Sengupta et al (2004).



Adenoid cystic carcinoma depicting PAS positive material

The sensitivity , specificity , positive predictive value , negative predictive values and diagnostic accuracy of present study are compared with different Selected studies in tables. –

Authors & Year	Sensitivity	Specificity	PPV	NPV	Accuracy
O' Dwyer et al 1985	73	94	74	93.5	90
Qizilbash et al 1985	88	100	---	---	98
Layfield et al 1987	91	98	---	----	92
Frable et al 1987	93	99	98.3	-----	96.4
Chan et al 1992	86	90.9	---	----	95
Abad et al 1992	--	----	90	96.3	---
Zurrída et al 1993	62	100	100	90.4	87
Cajulis et al 1997	91	96	--	--	---
Cristallini et al 1997	97	98.4	--	96.9	97.9
Khafaji et al 1998	82	86	---	---	84
Das et al 2004	94.6	75	---	--	91.1
Kaur V et al 2005	88.2	80	--	--	62.9
Present study	71.4	100	100	92.9	93.9

The sensitivity in the present study was lower than most of the studies because of lesser number of cases and shorter period of study. However, it is closer to that of O'Dwyer et al (1985).

The specificity matches of Qizilbash et al (1985), Frable et al(1991) and Zurrída et al (1993). Positive and negative predictive values are similar to those of Zurrída et al (1993) while overall diagnostic accuracy is in close proximity to Layfield et al (1987) and Chan et al (1992).

On the basis of foregoing discussion it can be safely concluded that FNAC is a reliable tool in distinguishing malignant tumors from benign ones. It is safe, easy to perform rapid and accurate diagnostic procedure. Although histologic diagnosis is the gold standard but FNAC provides a rapid preoperative diagnosis with reasonable degree of concordance with histopathology. Time bound experience of the cytopathologist and proper sampling methods

would minimize the false negativity . Hence , this procedure is recommended in all patients presenting with salivary gland lesions.

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