FNAC Diagnosis Of Salivary Gland Lesions With Histopathological Correlation

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Abstract : Introduction: The salivary gland lesions are relatively common clinical problems and range from non neoplastic lesions like sialadenitis and cysts to benign and malignant tumors of different malignant potential. FNAC is generally first diagnostic test in such patients. The objective of current study was to study the age, sex and site distribution of salivary gland lesions, and to analyze sensitivity and specificity of FNA diagnosis of salivary gland tumors by correlating with histopathological examination whenever available. Method: FNAC of all 90 patients was done using 22-gauge needle and 10 ml syringe applying negative pressure. Smears were either wet fixed or air dried and stained by H & E and Giemsa stain respectively. The histopathological specimens when available were fixed overnight in 10% formalin, processed using automatic tissue processor, stained with routine H & E stain and special stain if required and reported by a pathologist without prior knowledge of FNA diagnosis. Sensitivity & specificity of FNA diagnosis of salivary gland tumors were then analyzed. Results and conclusion: A total of 90 cases of salivary gland lesions were diagnosed on FNA, showing an overall male predominance with male to female ratio being 1.43:1. The maximum incidence of salivary gland lesions was observed in IV decade of life in both male and female patients. There were 36 (40%) non neoplastic and 54 (60%) neoplastic lesions which included 42 (46.7%) benign and 12 (13.3%) malignant neoplasm. Parotid gland was the commonest affected site, followed by submandibular and minor salivary glands but malignant lesions were commoner in minor salivary glands followed by Parotid gland. 49 cases in which histopathological correlation was available, there were 9 non neoplastic and 40 neoplastic lesions. There was no false positive diagnosis but one false negative diagnosis. Overall sensitivity and specificity of FNAC of salivary gland tumors were 97.5 and 100% respectively, thus FNAC is quite useful in diagnosing salivary gland lesions. [Gandhi S et al NJIRM 2013; 4(3) : 70-77]

Key Words: Fine needle aspiration cytology, Salivary gland lesions

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Introduction: The salivary gland system comprises three pairs of major glands- parotid, submandibular and sublingual and many minor glands dispersed in the sub mucosa of oral cavity. Minor salivary glands can be found in the lips, gingiva, floor of mouth, cheek, hard & soft palates, tongue, tonsillar areas and oropharynx.[1]

The lesions of salivary glands are commonly encountered clinical problems. They range from non neoplastic lesions like inflammation (sialadenitis) and cysts, commonest benign tumour like pleomorphic adenoma to malignant lesions of variable malignant potential. The world wide annual incidence of salivary gland tumors range from 0.4 to 13.5 per lac population. In general salivary gland tumors are commoner in older age group and females are affected more commonly except Warthin's tumour and High grade carcinoma.[2]

Diagnostic cytology, the science of interpretation of cells, that are either exfoliated or aspirated (FNA) from various tissues, is increasingly gaining popularity all over the world and in all parts of India.

FNAC is major diagnostic tool and is of great relevance in head neck lesions, including major salivary glands as they are easily accessible target sites. In this region FNAC is easy to perform and achieves excellent patient's compliance, being minimally invasive OPD procedure. For minor salivary glands also FNA can be done directly or under CT or MRI guidance. Though CT/MRI accurately localizes the lesion, it cannot give information about cytohistologic characteristic of lesion which FNA can readily provide. FNAC gives a chance of avoiding surgical procedure in certain inflammatory lesions and helps in rationally planning surgical procedure in case of neoplastic lesions. FNA is a better option than incisional

biopsy, considering the attendant risk of incisional biopsy like tumour implantation and fistula formation particularly in case of salivary glands.[3]

This study overviews the advantages and pitfalls of FNAC of salivary glands, by correlating with histopathological diagnosis.

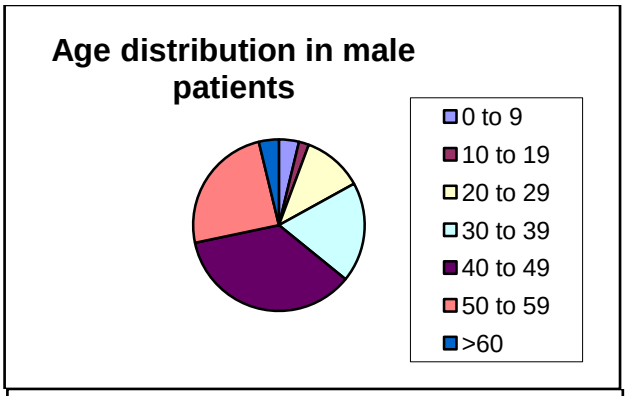
Objectives:

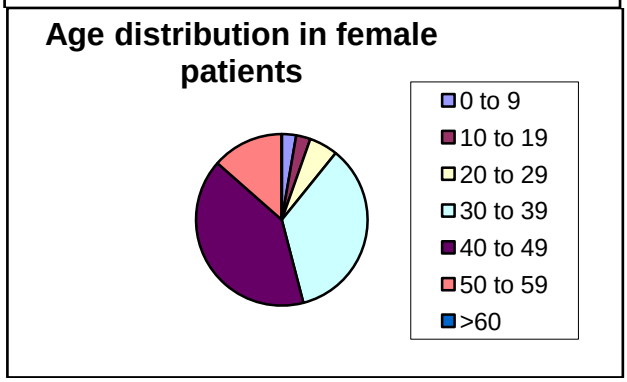
1. To study the age, sex and site distribution of various salivary gland lesions on FNAC.
2. To correlate FNA diagnosis with Histopathology diagnosis whenever available.
3. To decide sensitivity and specificity of FNA diagnosis in neoplastic salivary gland lesions.

Material and Methods: This was a one & half year retrospective study done at Pathology Department, P.D.U. Medical College, Rajkot, from January 2010 to June 2011. A total of 90 FNACs were done from salivary gland swelling, out of which in 49 cases Histopathological correlation was available. Before doing FNA procedure, thorough history was recorded including the personal history pertaining to the oral habits, smoking etc. for all cases. The procedure was explained to the patients. The overlying skin was disinfected and FNAC was performed with 22-gauge needle attached to a 10-ml disposable plastic syringe. The lesion was stabilized and the overlying skin stretched with the opposing hand. The needle was inserted into the lesion, and while applying suction by withdrawing the plunger, the needle was moved back and forth within the mass. Before withdrawing the needle, the suction on the syringe was released.

The sample obtained was then mounted onto glass slides and smeared. Few smears were wet fixed in methanol and one or two smears were kept air dried. Wet fixed smears were stained with H & E stain, while air dried smears were stained with Giemsa stain. Histopathological specimens were bisected and fixed overnight in 10% formalin. They were processed using Microm STP-120 automatic tissue processor. Acetone (LR Grade) was used for dehydration of tissue, Xylene (LR Grade) as clearing agent and Paraffin wax (melting point 54-56degree) was used for block preparation. The sections were prepared with Microm HM-325 microtome. Routine haematoxylin and eosin stain was done, as and when required special stains like PAS (Periodic acid Schiff) stain were employed. The histopathological examination (HPE) was carried out by a pathologist without prior knowledge of cytodiagnosis and then correlated with cytodiagnosis. The sensitivity and specificity of FNAC in comparison with histopathology for salivary gland tumors, on which histological confirmation was obtained, were calculated for benign (32 cases) and malignant neoplasms (8 cases).

Result: A total of 90 cases of salivary gland lesions were observed in the present study. The present study included 53(58.8%) male and 37 (41.1%) female cases with an overall male predominance, the male to female ratio being 1.43:1. The maximum incidence of salivary gland lesions was observed in IV decade of life in both male and female patients (fig 1).





On FNA, variety of cytological diagnosis was observed, including 36(40%) cases of non neoplastic and 54(60%) neoplastic lesions. In general Parotid was the commonest affected site. Number of cases in each diagnosis at various sites is summarized in following Table (Table 1).

Table 1: The cytological diagnosis at various sites

FNAC diagnosis	Parotid	SMG	SLG	MSG	Total
Non-neoplastic lesions					
Sialadenitis	12	18	–	–	30
Cystic	1	–	1	1	3
Abscess	1	2	--	–	3
Total(Non neoplastic lesions)	14	20	1	1	36
Neoplastic lesion					
Benign tumors					
Pleomorphic adenoma	28	3	–	2	33
Basal cell adenoma	1	-	-	-	1
Warthin's tumour	8	–	–	–	8
Malignant tumors					
Mucoepidermoid carcinoma	3	0	–	2	5
Adenoid cystic carcinoma	1	1	–	3	5
Acinic cell carcinoma	1	–	–	1	2
Total (Neoplastic lesions)	42	4	_	8	54
Total(Non Neoplastic & Neoplastic)	56	24	1	9	90

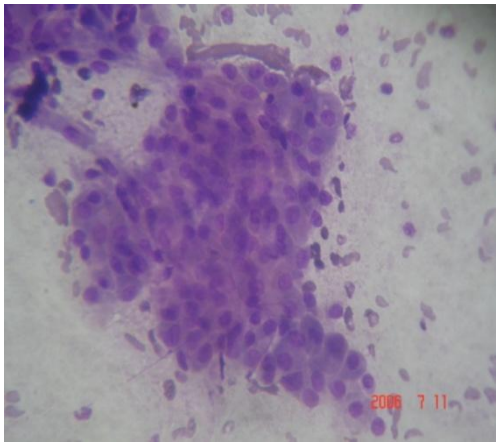
SMG, submandibular gland; SLG, sublingual gland; MSG, minor salivary gland.

Non-neoplastic lesions: Of total 90 cases of salivary gland swellings, 36 (40%) proved to be non-neoplastic on FNAC. Among the non-neoplastic lesions, inflammatory lesions were predominant, most common being sialadenitis found in 30cases (33.3 %) followed by cystic lesions in 3 cases (3.3%) and abscess in 3 cases (3.3%). Most of patients diagnosed as sialadenitis, gave positive clinical history of the same. Smears were cellular with presence of inflammatory cells including neutrophils, lymphocytes and histiocytes in acute sialadenitis, while there was predominance of ductal epithelial cells, few acinar cells and a variable number of chronic inflammatory cells in chronic sialadenitis. All cystic lesion smears contained macrophages against a mucinous or fluidic background. Three cases of abscess demonstrated plenty of polymorphs on necrotic background, out of which two cases on intraoral examination revealed carious third molar.

Neoplastic lesions: Of 90 cases, 54 (60%) cases of neoplastic lesions (42 benign and 12 malignant) were observed on FNAC of salivary gland swellings. Benign neoplasm in 42 cases (46.7%) outnumbered the malignant neoplasm in 12cases (13.3%).

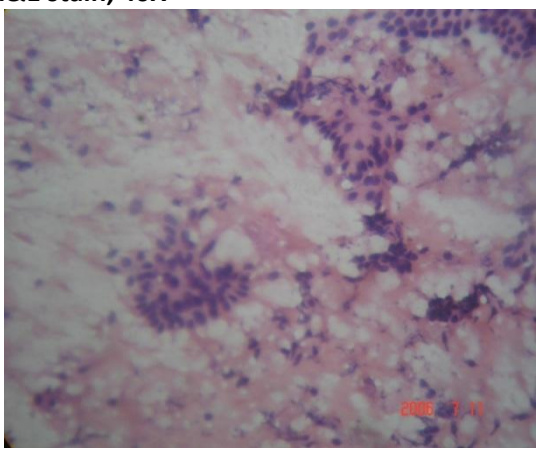
Among the 42 benign neoplasm, pleomorphic adenoma was the commonest lesion in 33 cases (36.7%) followed by Warthin's tumour in 8 cases (8.9%) and single case (1.1%) of basal cell adenoma. Twenty nine of thirty three (87.9%) pleomorphic adenoma occurred in parotid gland, three (9.1%) in the submandibular gland and one (3.0%) in minor salivary gland. All eight cases of Warthin's tumour occurred in parotid gland. One case of basal cell adenoma was reported in parotid gland. (Table 1).The smears diagnosed as pleomorphic adenoma were highly cellular most of the time with presence of both epithelial and chondromyxoid stromal component in various proportions. Epithelial component form either clusters or found dispersed, sometimes forming ducts. Myoepithelial cells in the background showed plasmacytoid appearance. The aspirates from Warthin's tumour were characteristic murky fluid in most of the cases. The smears showed clusters of oncocytic epithelial cells with plenty of lymphoid cells including germinal centre cells. As this tumour commonly undergoes cystic changes, the background showed macrophages and cellular debris (Fig 1).

Fig 1: FNA smear of Warthin's Tumour, Giemsa Stain, 40X



The smears from the case reported as basal Cell Adenoma were cellular and contained many uniform looking Hyaline globules and few finger like stromal structures surrounded by round to oval small epithelial cells.(fig 2)

Fig.2 FNA smear reported as Basal Cell Adenoma, H&E stain, 40X



Among the malignant neoplasms, 5 cases (5.5%) each of mucoepidermoid carcinoma and adenoid cystic carcinoma were seen followed by 2 cases (2.2 %) of acinic cell carcinoma. Out of 5 cases, 3 cases (60 %) of mucoepidermoid carcinoma occurred in parotid gland and 2 cases (40 %) in minor salivary glands. Of 5 cases of adenoid cystic carcinoma, one case (20 %) occurred in parotid, one (20%) in submandibular gland and three cases (60%) in the minor salivary glands. Out of 2 cases of acinic cell carcinoma, one case (50%) occurred in parotid gland and one case (50%) in minor salivary gland (Table 1).

The smears from Mucoepidermoid Carcinoma showed variable cytomorphology according to grade of tumour. The low grade tumors showed few groups of and dispersed mucous secreting cells with finely vacuolated cytoplasm at places showing single intracytoplasmic vacuole. The cells were uniform and had comparatively bland look. Few small clusters of and dispersed cells with `squamoid differentiation'were seen. The high grade tumors showed definite features of malignancy and more obvious squamous differentiation. Smears from all the cases showed dirty background of mucus and debris (Fig 3). The smears diagnosed as Adenoid cystic Carcinoma showed typical hyaline spherical globules of varying sizes and few finger like stromal structures surrounded by epithelial cells. The epithelial cells were also arranged in dense aggregates or lie singly. The cells were small and uniform but showed hyperchromatic nuclei, coarse nuclear chromatin and at places nucleoli (Fig 4).

Fig 3 : FNA smear, Mucoepidermoid Carcinoma, H & E, 40X

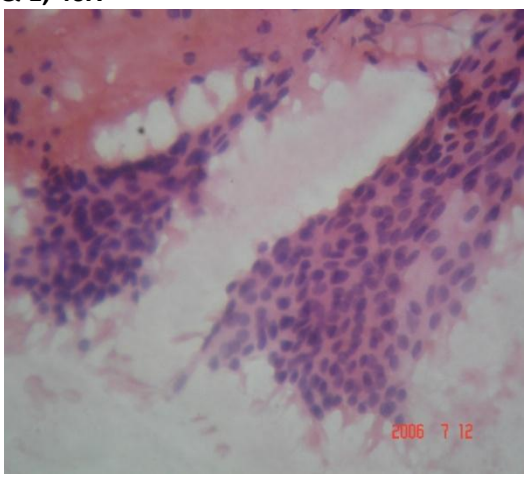


Fig 4: FNA Smear, Adenoid Cystic Carcinoma, H & E, 10X

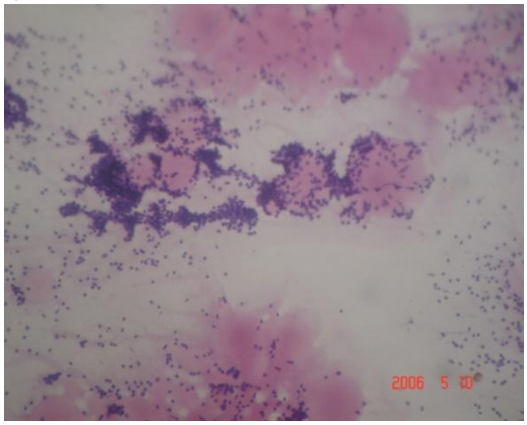
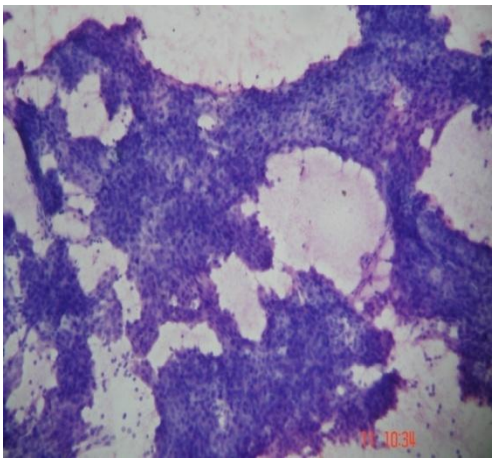


Fig 5 FNA Smear, Acinic Cell Carcinoma, H & E Stain 10X



Smears from acinic cell carcinoma showed cohesive clusters of cells with fibro vascular cores at places. Cells showed rather bland look with abundant finely vacuolated or dense cytoplasm (Fig 5).

Histopathological correlation: Out of 90 cases of salivary gland lesions FNA, histopathological material was available in 49 cases (54.4%), including 9 cases of non-neoplastic and 40 cases of neoplastic lesions. The details are shown in Table-2

Table 2. Results of fine-needle aspiration cytology (FNAC) in 90 salivary gland lesions with histopathological correlation

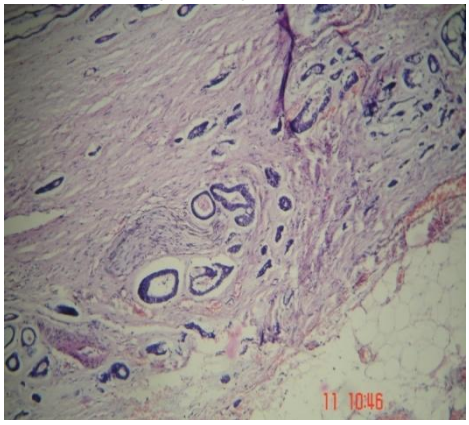
Diagnosis	Total number of cases		Cytopathological diagnosis confirmed	False positive	False negative
	FNAC (n = 90)	Histopathological correlation available in (n = 49)			
Non-neoplastic	36	9	9	0	0
Pleomorphic adenoma	33	27	27	0	0
Basal Cell Adenoma	1	1	0	0	1
Warthin's tumour	8	4	4	0	0
Mucoepidermoid carcinoma	5	4	4	0	0
Adenoid cystic carcinoma	5	3	3	0	0
Acinic cell carcinoma	2	1	1	0	0

Non-neoplastic lesions: Of 36 cases of non-neoplastic lesions on FNAC, histological material was available in 9 cases only, as most of non neoplastic lesions don't require surgical intervention. Nine cases of non-neoplastic lesions in which histopathological correlation was available, included 6 cases of cysts. Cytopathological diagnosis in all cases found to be correct on histopathological examination (Table 2).
Neoplastic lesions

Out of 54 cases classified as neoplastic (42 benign and 12malignant) on FNAC, histopathological correlation was available in 40 cases (32 benign and 8 malignant).

Among the benign neoplasms, in which histopathological correlation was available, all 27 cases of pleomorphic adenoma and four cases of Warthin's tumour were confirmed (Table 2). Single case diagnosed as basal cell adenoma on FNA, submitted for histopathological examination, found to be adenoid cystic carcinoma showing typical cribriform pattern of cells and perineural invasion (Fig.7). So, this proved to be false negative diagnosis for malignancy.

Fig 7, Adenoid cystic carcinoma showing perineural invasion, H & E, 10X

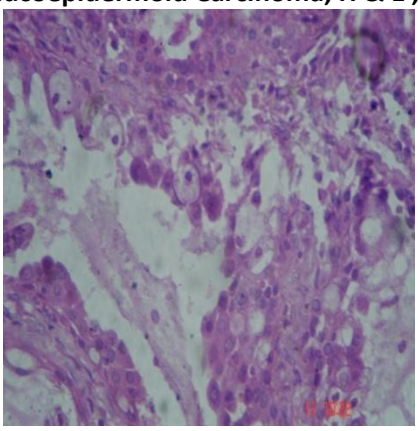


Among the malignant neoplasms diagnosed on cytopathology, all 8 cases in which histopathological correlation was available, found to be correct. These included four cases of mucoepidermoid carcinoma (Fig.8), three cases of adenoid cystic carcinoma and one case of acinic cell carcinoma.

Overall, in present study, there was no false positive diagnosis for malignancy, but there was one case of false negative diagnosis in which

adenoid cystic carcinoma was diagnosed as basal cell adenoma on FNA. So, the sensitivity and specificity of FNA diagnosis of neoplastic salivary gland lesions in present study was 97.5%% and 100% respectively.

Fig. 8 Mucoepidermoid Carcinoma, H & E , 40X



Discussion: FNAC has been applied to the diagnosis of salivary gland lesions for more than three decades[4,5] and found out to be of great use not only in the diagnosis and typing of salivary gland tumors but also in their segregation from non-neoplastic lesions[6]. The cytological appearance of benign and malignant salivary gland neoplasms is well documented in the literature[3,6].

The current study done at Pathology department, P.D.U. Medical College, Rajkot, includes 90 cases of salivary gland FNACs and their histopathological correlation when available.

The male predominance (58.8%), observed in the present study is similar to that reported by Nanda et al.[6], Cajulis et al.[7], Cristallini et al.[8], and Young et al[9]. Maximum incidence of salivary gland lesions in both male and female is observed in fifth decade in this study. Nanda et al.[6] and Oliveira et al.[10] also found maximum incidence in fourth decade in women but in fifth decade in men, which can be partly explained by a trend of delayed presentation in this area or can be due to a small sample size.

Considering all lesions, Parotid gland is most frequently involved in present study, followed by submandibular and minor salivary glands, which is consistent with Nanda et al.[6] and Kamal et al.[11]

Among non neoplastic lesions Sialadenitis is the commonest non neoplastic lesion in present study which involved submandibular gland most frequently followed by parotid gland. This is again in concordance with Nanda et al.[6] and Young et al.[9] Other non neoplastic lesions included cystic lesions and abscess. As most of the nonneoplastic lesions were treated conservatively, in only 25% of cases histological correlation is available in this study and all cases were correlated with cytological diagnosis. Among neoplastic lesions, present study shows Pleomorphic adenoma as most commonly encountered benign lesion and warthin's tumour as second most common lesion, which is again well documented by Nanda et al.[6] and Young et al.[9] In this study Pleomorphic adenoma shows higher incidence of occurrence in the parotid gland followed by submandibular gland, whereas warthin's tumour cases are seen in parotid gland only again comparable with Nanda et al.[6] In present study, out of 41 cases of pleomorphic adenoma and Warthin's tumour, in 31cases histopathological specimens were available and in all cases, diagnosis correlated correctly. Other benign neoplastic lesion on FNA, in present study includes one case of basal cell adenoma but later on, on histopathological examination, it was diagnosed as adenoid cystic carcinoma with perineural invasion. Basal Cell Adenoma and Adenoid cystic carcinoma are well documented differential diagnosis on FNA sharing features like Hyaline globules and stromal structures surrounded by epithelial cells. On retrospection in this case though comparatively uniform Hyaline globules on FNA smears were present, cellular morphology showed small epithelial cells with rather hyperchromatic and granular nuclei and presence of nucleoli at some places, which remained unnoticed on initial examination.[3] This is the only false negative diagnosis in the present study.

Among malignant neoplastic lesions Minor salivary glands are the commonest site, followed by parotid which is similar to studies by Nanda et al[6] and Akhter et al.[12] Mucoepidermoid carcinoma and adenoid cystic carcinoma are observed in similar number of cases in present study. The findings can be compared to the study of Nanda et al[6] and Jayaram et al.[12], who found Mucoepidermoid

carcinoma as commonest malignant lesion while study of Akhter et al[13], who found adenoid cystic carcinoma as the commonest.

Out of total 12 malignant neoplasms, 4 cases of Mucoepidermoid carcinoma, 3 cases of adenoid cystic carcinoma and 1 case of acinic cell carcinoma were available for histopathological correlation and all proved to be correct. So, there is no false positive diagnosis for the malignancy in the present study.

Thus, sensitivity and specificity of FNAC of neoplastic salivary gland lesions in present study are 97.5% and 100% respectively, which is quiet comparable with other studies (Table 3).

Table 3. Comparison with results from other studies

Authors	Year of study	Aspirations	Sensitivity (%)	Specificity (%)
Jayaram et al.[12]	1994	247	87.8	98.0
Cristallini et al.[8]	1997	153	97.64	98.43
Contucci et al.[14]	2003	146	57.2	100
Cohen et al.[15]	2004	258	80.0	79.0
Zbaren et al.[16]	2008	110	74.0	88.0
Nanda et al[6]	2011	127	84.6	86.48
Akhter et al.[13]	2004-06	40	90	100
Current Study	2010-11	90	97.5	100

Conclusion: : FNAC of salivary gland lesions is found out to be of great use not only in the diagnosis and typing of salivary gland tumors but also in their segregation from non-neoplastic lesions. The cytological appearance of benign and malignant salivary gland neoplasms is well documented in the literature and histopathological correlation with cytopathologic diagnosis in the present study yielded 100% specificity as in some other comparable studies. Though it has to be admitted that due to subtle histopathological differences, a low grade malignant lesion can be occasionally under diagnosed so the sensitivity in the study remained 97.5%. In general, most of the time cytopathology differentiate between a non neoplastic, benign neoplastic and malignant neoplastic process and thus helps in further surgical management whenever required

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