

## **Original Article**

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# **Role of fine needle aspiration cytology in the preoperative diagnosis of malignancy in parotid and submandibular gland neoplasm**

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### **Abstract**

**Objective:** To evaluate the role of Fine Needle Aspiration Cytology in the preoperative diagnosis of malignancy in parotid and submandibular gland neoplasm.

**Methods:** This cross sectional study on 50 cases was conducted in the Department of Otolaryngology and Head-Neck Surgery of Sir Salimullah Medical College Mitford Hospital and Dhaka Medical College Hospital from January'2009 to June 2010.

**Results:** Fine needle aspiration cytology findings of our all 50 cases were compared with postoperative histopathological reports. Out of the 50 cases, in 36(72%) cases of benign neoplasm and 7(14%) cases of malignant neoplasm, pre-operative FNAC findings and post operative histopathological findings were same. In 7 cases, FNAC and post operative histopathological findings did not matched. These were 2 (4%) false positive and 5 (10%) false negative result. In our study sensitivity of FNAC for reporting malignancy was 58.33%, specificity to rule out malignancy was 94.73% and overall accuracy in detecting malignant tumour was 86%. Positive predictive value and negative value were 77.77% and 87.80% respectively. It can be concluded that fine needle aspiration cytology is a safe, cheap and useful preoperative diagnostic tool in the diagnosis of malignancy in parotid and submandibular gland, but as fine needle aspiration cytology partly depends on operator skill, it may give false negative and false positive result.

**Conclusion:** FNAC is a useful preoperative diagnostic tool for malignant parotid and submandibular glands with high specificity and sensitivity.

**Key Words:** FNAC, sensitivity, specificity.

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## Introduction

Salivary glands are compound, tubuloacinar exocrine glands whose ducts open into the oral cavity. The major salivary glands are the paired parotid, submandibular, sublingual glands. Minor salivary glands are unpaired and located in the submucosa of oral cavity, nose, paranasal sinuses, pharynx, larynx and even tracheobronchial tree.<sup>1</sup>

Neoplasm's of Salivary gland are uncommon and together comprise less than 3% of all head and neck neoplasm.<sup>2</sup> Salivary gland malignancy accounts 1% to 3% of all head neck malignant tumour and 0.3% of all malignant neoplasm of the body.<sup>3</sup>

Most (70%) salivary gland tumours originate in the parotid gland. The remaining tumours arise in the submandibular gland (8%) and minor salivary glands (22%). Although 75% of parotid gland tumours are benign, slightly more than 50% of tumours of the submandibular gland and 80% of minor salivary gland are found to be malignant.<sup>4</sup> The malignancy of parotid tumour was 14% to 25%.<sup>5</sup> Incidence of malignancy is relatively higher in submandibular, sublingual and minor salivary glands than parotid. One sixth parotid tumours and 40% submandibular gland tumours are malignant.<sup>6</sup>

A study on incidence of malignancy showed 13% of all parotid gland tumours are malignant, while one of three submandibular gland tumours is malignant.<sup>7</sup>

It is important to do preoperative cytological diagnosis of a salivary gland lesion, for its early management. Fine needle aspiration cytology may provide preoperative tissue diagnosis of salivary gland lesions. It is a simple and well tolerated diagnostic tool, which provides nearly accurate information for diagnosis and the management of the salivary gland neoplasm. One of the studies on salivary gland malignancy showed

sensitivity of fine needle aspiration cytology for malignancy was 83% and specificity was 100% and diagnostic accuracy 97%.<sup>8</sup>

Fine needle aspiration cytology is being increasingly used in the diagnosis of salivary gland lesions. An FNAC diagnosis of neoplastic major salivary gland disease is generally predictive of final histological diagnosis. One study of India, reported the sensitivity, specificity and diagnostic accuracy of FNAC was 94.6%, 75% and 91.1% respectively. FNAC diagnosis is also useful in planning treatment including the avoidance of unnecessary surgery and ultimately in reduction of patients morbidity.<sup>9</sup>

FNAC diagnosis of malignant or suspicious lesion has positive and negative predictive value of 84% and 77% respectively and of benign neoplasm has value of 83% and 88% respectively. Lymphocyte predominant FNAC specimens are found to have low predictive value.<sup>10</sup>

Interpretation of FNAC report may vary from centre to centre, as it is partly dependent on operator's skill and adequacy of cell yielded by fine needle aspiration. It is a safe and effective modality in diagnosis and treatment of salivary gland tumour.

## Methods

This was a cross sectional study. It was carried out during the period of January' 2009 to June' 2010 among the patients admitted in The Department of Otolaryngology and Head-Neck Surgery of Sir Salimullah Medical College Mitford Hospital and Dhaka Medical College Hospital, Dhaka.

All patients of parotid and submandibular gland neoplasm, of all age and sex, which were FNAC proved, were included in this study. All inflammatory, autoimmune and granulomatous lesions involving parotid and submandibular gland and Neoplasm affecting

sublingual and minor salivary gland were excluded. Sampling was done by purposive sampling method.

Due to limitation of time & less availability of cases, fulfilling the inclusion criteria, 50 cases were taken as sample size. After explaining total procedure to every patient and taking written consent from every study subject, data was collected in prescribed data sheet. Collected data were analyzed and were presented in table and diagram in simplified manner. A thorough history was taken from each and every study subjects about age, sex, occupation, personal habits, residence, socioeconomic status and detail symptoms. Every case was subjected to meticulous examination of head neck region. Site, size, shape, surface, margin, tenderness, consistency, mobility, condition of overlying skin- every details of swelling of parotid and submandibular gland and palpable cervical neck nodes were noted.

In all 50 cases of this study series (which were already proved as neoplastic lesion), resected surgical specimen was sent for histopathology, report was collected and was compared with preoperative FNAC reports.

The usefulness of FNAC was evaluated by calculation of its sensitivity, specificity, accuracy, Positive Prediction Value (PPV) and Negative Prediction Value (NPV) as follows:

Sensitivity= True positive/ (true positive + false Negative)

Specificity= True negative/ (true negative+ false Positive)

Accuracy= (True positive +True negative)/ (true positive +true negative +false positive + false negative)

PPV= True positive/ (true positive+ false positive)

NPV= True Negative / (true negative + false negative)

**Results**

Table- I  
*Distribution of neoplasm in parotid and submandibular gland. (n = 50)*

Site of involvements	No. of cases	Percentage
Parotid gland	37	74
Submandibular gland	13	26
Total	50	100

z= 2.729; P = 0.006

Table shows in the series there were total 37 patients with parotid tumour and 13 patients with submandibular tumour. Statistical analysis was done by “Z” test. Statistically neoplasm involved the parotid gland significant!

**Table- II**  
*Distribution of benign and malignant neoplasm in parotid and submandibular gland. (n = 50)*

Gland involved	Benign		Malignant		Total	
	No.	%	No.	%	No.	%
Parotid	31	83.78	06	16.21	37	100
Submandibular gland	07	53.84	06	46.15	13	100
Total	38	76	12	24	50	100

“Z”=1.98; P<0.05

Statistically malignant neoplasm was significantly common in submandibular gland.

**Table-III**

*Distribution of different types of benign neoplasm in parotid gland & submandibular gland (After FNAC)*

Diff. types of neoplasm	Parotid (33)		Submandibular (8)		Total (41)	
	No.	%	No.	%	No.	%
Pleomorphic adenoma	25	75.75	07	87.5	32	78.04
Warthin's tumour	06	18.18	0	0	06	16.63
Oncocytoma	01	3.03	0	0	01	2.43
Haemangioma	01	3.03	01	12.5	02	4.87

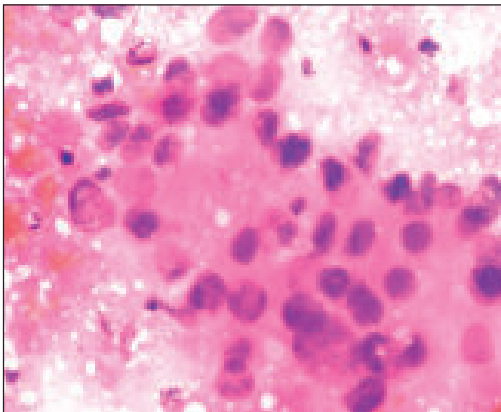
Table shows frequency of different benign neoplasm of parotid and submandibular gland, diagnosed by the FNAC. Most common benign tumour was pleomorphic adenoma.

**Table- III**

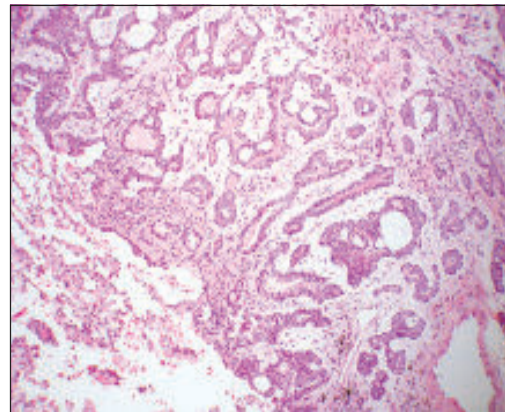
*Distribution of different types of benign neoplasm in parotid and submandibular gland neoplasm (Histopathologically confirmed)*

Diff. types of neoplasm	Parotid (31)		Submandibular (07)		Total (38)	
	No.	%	No.	%	No.	%
Pleomorphic adenoma	22	70.35	06	85.71	28	75.68
Warthin's tumour	06	19.35	0	0	06	15.78
Synchronous pleo. adenoma & warthin's tumour	01	3.22	0	0	01	2.63
Oncocytoma	01	3.22	0	0	01	2.63
Haemangioma	01	3.22	01	14.28	02	5.26

Table shows Pleomorphic adenoma was the commonest benign neoplasm in both parotid (70.90%) and submandibular gland (85.71%).



**Figure-1:** Cytology blog of Salivary gland carcinoma



**Figure-2:** Histopathological feature of Submandibular adenoid cystic carcinoma

**Table- IV**

*Distribution of different malignant neoplasm in parotid and submandibular gland (after histopathology)*

Diff. types of neoplasm	Parotid (06)		Submandibular (06)		Total (12)	
	No.	%	No.	%	No.	%
Mucoepidermoid carcinoma	04	66.66	01	16.66	05	41.66
Adenoid cystic carcinoma	01	16.66	03	50	04	33.33
Adenocarcinoma	01	16.66	01	16.66	02	16.66
Squamous cell carcinoma	-	-	01	16.66	01	8.33

Table Mucoepidermoid carcinoma was the commonest malignant parotid neoplasm (66.68%) and commonest submandibular gland malignancy was adenoid cystic carcinoma (50%).

**Table- V**

*Comparison of FNAC report with histopathological report*

	Pleomorphic adenoma	Warthin's tumour	Oncocytoma	Haemangioma	Mucoepidermoidcarcinoma	Adenoid cysticcarcinoma	Adenocarcinoma	Squamous carcinoma
Histopathologically confirmed								
Diagnosed by FNAC								
Pleomorphic adenoma (32)	27	-	-	-	02	02	01	-
Warthin's tumour (06)	-	06						
Oncocytoma (01)	-	-	01					
Haemangioma (02)	-	-	-	02				
Mucoepidermoidcarcinoma (05)	02	-	-	-	03			
Adenoid cysticcarcinoma (02)	-	-	-	-	-	02		
Adenocarcinoma (01)	-	-	-	-	-	-	01	
Squamous carcinoma (01)	-	-	-	-	-	-	-	01

Table shows the comparative study of FNAC and the final histopathological findings of surgically resected specimen. 36 cases of benign and 7 cases of malignant tumour were accurately diagnosed.

**Table- VI**  
*Comparison of postoperative histopathological results in 50 cases with preoperative cytology.*

		Histopathological diagnosis		
		Malignant	Benign	Total
Cytological Diagnosis	Malignant	7TP	2FP	9
	Benign	5FN	36 TN	41
Total		12	38	50

(TN-True Negative, FN-False Negative, FP-False Positive, TP-True Positive)

Table shows comparison of histopathological result with pre-operative FNAC report of all 50 cases. 36 cases were true negative (72%) and 5 cases were false negative (10%), 2 cases (4%) were false positive and 7 cases (14%) were true positive. So in our series sensitivity was 58.33%, specificity was 94.73% and overall accuracy was 86%. Positive predictive value was 77.77% and negative predictive value was 87.80%.

### Discussion

Neoplasm of salivary gland is an uncommon disease. Our study was done to find out the role of fine needle aspiration cytology in their pre-operative diagnosis of malignancy in parotid and submandibular gland neoplasm.

In this study series, out of 50 cases 74% neoplasm's were involved the parotid gland and 26% involved the submandibular gland. This result consistent with a study, where they found 74% parotid gland involvement and 26% submandibular gland involvement<sup>10</sup>. Our study result differ from a study of India, where they showed 70% salivary gland neoplasm was found in the parotid gland, followed by 18% in the submandibular gland, and rest was in minor salivary glands<sup>11</sup>.

It had found 31 (83.78%) parotid neoplasm were benign and 06 (16.21%) neoplasm were malignant. This is consistent with a study of our country, where 85% parotid tumours were

benign and 15% were malignant<sup>12</sup>. One study of this country showed 50% neoplasm of submandibular gland was malignant<sup>13</sup>. In this series 46.15% neoplasm of submandibular gland was malignant and 53.84% was benign. This study was more or less similar to above study but differ with the result of another study, where malignancy rate in submandibular gland was 32%<sup>14</sup>.

In this study, statistical analysis was done between frequency of malignant tumour in the submandibular gland and in the parotid gland. Analysis showed malignant tumour was significantly higher in the submandibular gland than the parotid gland. This have consistent with a study of this subcontinent, where submandibular gland was more commonly affected by malignancy than parotid gland ( $p = 0.0003$ )<sup>9</sup>.

Malignant salivary gland tumour also can grow slowly as a painless swelling for long times. So that patients often report in tertiary Hospital in advanced stages. Most of the malignant parotid tumour patients presented in this series in stage-3 and malignant submandibular tumour in stage-2. In this series, maximum patients of both the parotid and the submandibular gland malignancy were presented in stage 3<sup>13</sup>.

After doing fine needle aspiration cytology of the swelling, pleomorphic adenoma was the



commonest benign neoplasm involving both parotid and submandibular glands (78.04%). In case of malignant neoplasm mucoepidermoid carcinoma was the commonest variety (55.55%). In this series, after Histopathological confirmation of the resected specimen, most common benign parotid tumour was pleomorphic adenoma (70.96%), followed by warthin's tumour (19.35%). This result has consistent with a study of India<sup>9</sup>. In one Series most frequent malignant neoplasm of parotid gland was mucoepidermoid carcinoma<sup>5</sup>. This is similar to our study. This is also similar with another study of our country<sup>13</sup>.

In benign submandibular gland neoplasm, pleomorphic adenoma was the commonest benign tumour (85.71%) followed by haemangioma (14.28). Commonest malignant tumour of submandibular gland was adenoid cystic carcinoma (50%). In one study, commonest benign submandibular neoplasm was pleomorphic adenoma and adenoid cystic carcinoma was the commonest malignant neoplasm<sup>13</sup>. So, our study strongly correlates with that series. But doesn't correlate with another, where lymphoma was the most common malignant submandibular neoplasm<sup>10</sup>.

Fine needle aspiration cytology has been widely used for many year's as a method for assessing salivary gland lesion pre-operatively. The aim of this study was to evaluate the role of fine needle aspiration in pre-operative diagnosis of parotid and submandibular gland malignancy. Histopathological examination of resected salivary gland neoplasm was taken as gold standard, to compare the fine needle aspiration cytology report in our series. Here fine needle aspiration cytology findings of all 50 cases were compared with post-operative histopathological examination report. Out of 50 cases, 43 (86%) were accurately

diagnosed pre-operatively by FNAC. In 7 cases fine needle aspiration cytology findings didn't matched with post operative histopathological report.

Study on correlation of fine needle aspiration cytology with histopathology in one series has showed diagnostic accuracy of fine needle aspiration was 92% and sensitivity and specificity was 70% and 97% respectively. In 50 cases of that series, 3 cases were false negative and only one case was false positive<sup>15</sup>.

In this series, out of 50 cases 41 cases were diagnosed as benign and 9 cases were diagnosed as malignant by fine needle aspiration cytology. Among 41 benign neoplasm reported on fine needle aspiration cytology, 36 (72%) cases were confirmed as benign on final Histopathological examination. So there were 5 cases (10%) of false negative. Out of 9 cases reported as malignant lesion by FNAC, 7 were confirmed as malignant by histopathology. So there were 2 false positive results (4%).

One study of India, found the sensitivity of fine needle aspiration cytology was 96.4%, specificity was 75.0% and accuracy was 91.1%<sup>9</sup>. In our study due to 5 false negative (10%) and 2 false positive (4%) result, specificity to rule out malignancy was 94.73%, sensitivity for reporting malignancy was 58.33% and diagnostic accuracy for malignancy was 86%.

Our study results also differ with another study, where diagnostic accuracy was 89.7% and sensitivity and specificity both was 100%<sup>16</sup>.

One study series of our subcontinent correlated FNAC of 32 cases with their postoperative histopathological findings, where 26 benign and 2 malignant neoplasm were accurately diagnosed. The overall diagnostic accuracy, sensitivity and

specificity were calculated. The overall diagnostic accuracy of their series was 87.5%, the sensitivity was 90.3% and specificity was 80%. This result was compared well with other study results, carried on different centers, where diagnostic accuracy ranged from 84% to 98%, sensitivity from 56.5% to 97.6% and specificity from 94% to 100%. The result of our study also lies within that range of study results. Overall accuracy of our study strongly correlated with the result of that study series, where accuracy was 87.5%. ( $Z = 0.196$ ,  $P > 0.05$ )<sup>17</sup>.

So we can conclude that fine needle aspiration cytology is an important and useful diagnostic tool in the pre-operative assessment of patient with malignant salivary gland neoplasm. Though in our study showed low rate of sensitivity in compare to others. This can be happened; as result of fine needle aspiration cytology partly depends on individual skill of operator, proper facilities and adequacy of cell yielded by fine needle aspiration.

### Conclusion

FNAC is a useful preoperative diagnostic tool for malignant parotid and submandibular glands with high specificity and sensitivity. But it partly depends on operative skill, it may give false negative and false positive result. So every surgically resected parotid and submandibular gland tumour specimen should be confirmed by histopathological examination.

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