

## Diagnostic role of fine needle aspiration cytology in the evaluation of salivary gland lesions

Hirachand S, Kafle N, Thapa R, Gurung P

Department of Pathology, Kathmandu Medical College and Teaching Hospital, Kathmandu, Nepal.

Correspondence to: Dr. Suspana Hirachand,

E-mail:suspi1974@hotmail.com

### Abstract

**Introduction:** Fine needle aspiration cytology (FNAC) is a popular method for diagnostic evaluation of salivary gland lesions due to their superficial nature and easy accessibility for the procedure. The technique is simple and cost effective. The present study was conducted to evaluate the diagnostic accuracy of fine needle aspiration cytology in various salivary gland tumors, which helps in an early diagnosis and appropriate therapeutic management.

**Methods:** The study was conducted in the Department of Pathology in Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal from October 2014 to September 2016 (2 years). A total of 48 fine needle aspirations of salivary gland lesions were done, of which histopathological conformation of diagnosis was available in 34 cases. A standard cytological and histopathological staining were used and examined.

**Results:** Forty eight cases of salivary gland lesions were included in the study. The age of patients ranged from 6 to 88years, with a mean age of 46years. Male: female ratio was 1.4:1 with common site being the parotid gland. Histopathological conformation of diagnosis was available in 34 cases. Pleomorphic adenoma was found to be the most common benign tumor (50%) and mucoepidermoid carcinoma (14.70%) was the commonest malignant tumor. The overall diagnostic accuracy of FNAC in diagnosing salivary gland lesions was 89.47 % with a sensitivity of 77.77 % and a specificity of 93.10 %.

**Conclusion:** Fine needle aspiration cytology is an important and useful diagnostic tool for diagnosing salivary gland lesions. Proper sampling of lesions and adequate cellularity of the smears are the prerequisites for accurate diagnosis. Hence, the appropriate therapeutic management could plan earlier.

**Keywords:** Cytology, Fine needle aspiration cytology, Salivary gland lesions

### Introduction

Fine needle aspiration cytology (FNAC) is a popular method for diagnostic evaluation of salivary gland lesions due to their superficial nature and easy accessibility for the procedure. The technique is simple and cost effective.<sup>1</sup> Salivary gland tumors are uncommon accounting to approximately 2-6.5% of neoplasms of head and neck region. The general rule in salivary gland tumors is smaller the gland, higher rate of malignancy.

The rate of malignancy increases from 20-25% in the parotid gland to 40-50% in the submandibular gland and to 50-81% in the sublingual gland and minor salivary glands. Nearly 80% of benign parotid tumors are pleomorphic adenomas. While pleomorphic adenoma is the most common benign tumor for both parotid and submandibular glands, the malignant tumors correspondingly are mucoepidermoid and adenoid cystic carcinomas.<sup>2-5</sup> However, a wide variety of tumors in these glands and overlapping features that

make an accurate diagnosis difficult in few cases.<sup>6-9</sup> This has led to a wide range of sensitivity (62-97.6%) and specificity (94.3-100%) of cytological diagnosis. The reported diagnostic accuracy is high for benign tumors, but lower for malignant tumors. The accuracy of type specific diagnosis of malignant salivary gland tumors is quite poor, as reported in the literature.<sup>10-11</sup> Hence, the present study was done to evaluate the diagnostic accuracy of fine needle aspiration cytology in various salivary gland tumors, which helps in an early diagnosis and appropriate therapeutic management.

## Methods

A prospective study was conducted in the Department of Pathology in Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal from October 2014 to September 2016 (2 years). A total of 48 fine needle aspirations of salivary gland lesions were done, of which histopathological conformation of diagnosis was available in 34 cases.

All the patients underwent FNAC, which was performed using disposable 10ml syringe and 23 G needle. If the aspirate was insufficient, a repeat aspiration was done. Air dried smears and wet smears fixed in alcohol were made from the aspirate. Giemsa staining was done on the air dried smears while those fixed in 95% alcohol were stained by Papanicolaou's method. Formalin fixed (10%), surgically resected specimens were processed and stained with Haematoxylin and Eosin for histopathological examination. The cytological diagnosis was compared to the histopathological diagnosis. The histopathological diagnosis was considered as the gold standard for assessment of sensitivity, specificity and diagnostic accuracy of FNAC. Cyto-histologic correlation was done and appropriate statistical tests applied.

## Results

Forty eight cases of salivary gland lesions were included in the study. The age of patients ranged from 6 to 88 years, with male: female ratio being 1.4:1. Out of 48 cases 36 had swelling in the parotid gland, 7 had in submandibular and 5 in minor salivary glands. Cytological diagnosis offered for different cases have been listed in **Table 1**. There were 40 (83.33 %) benign lesions and 8 (16.67 %) malignant lesions.

**Table 1: Cytological diagnosis in 48 cases of salivary gland lesions.**

Cytological diagnosis	No. of cases	Percentage (%)
Pleomorphic adenoma	22	45.83
Warthin's tumor	07	14.59
Monomorphic adenoma	02	4.16
Chronic sialadenitis	04	8.33
Sialadenosis	02	4.16
Intraparotid reactive lymphadenitis	02	4.16
Keratinous cyst	01	2.02
Mucoepidermoid carcinoma	04	8.33
Adenoid cystic carcinoma	02	4.16
Malignant salivary gland tumor ( Unspecified)	02	4.16

Out of 48 cases studied, histopathological conformation of diagnosis was available in 34 cases (**Table 2**).

**Table 2: Histological diagnosis in 34 cases of salivary gland lesions.**

Histological diagnosis	No. of cases	Percentage %
Pleomorphic adenoma	17	50
Warthin's tumor	06	17.65
Basal cell adenoma	02	5.88
Chronic sialadenitis	01	2.94
Keratinous cyst	01	2.94
Mucoepidermoid carcinoma	05	14.71
Adenoid cystic carcinoma	01	2.94
Salivary duct carcinoma	01	2.94

A total 27(79.41 %) cases were histologically diagnosed as benign lesions and 7 (20.59%) cases were malignant. Pleomorphic adenoma was found to be the most common benign tumor (50%) and mucoepidermoid carcinoma (14.70%) was the commonest malignant tumor. Of the 18 FNAC cases of pleomorphic adenoma, 16 cases were diagnosed as pleomorphic adenoma and 2 cases as mucoepidermoid carcinoma after histopathological

examination. Four cases cytologically diagnosed as mucoepidermoid carcinoma, out of which 1 turned out to be Warthin's tumor histologically. Of the 2 cases of adenoid cystic carcinoma, one came out to be pleomorphic adenoma histologically (Table 3).

**Table 3: Cyto-histopathological correlation in 34 cases of salivary gland lesions.**

Cytological Diagnosis	No. of Cases	Histopathological diagnosis							
		Pleomorphic adenoma	Warthin's tumor	Basal cell adenoid	Chronic sialadenitis	Keratinous Cyst	Mucoepidermoid carcinoma	Adenoid cystic carcinoma	Salivary duct carcinoma
Pleomorphic Adenoma	18	16					02		
Warthin's Tumor	05		05						
Monomorphic Adenoma	02			02					
Chronic Sialadenitis	01				01				
Keratinous Cyst	01					01			
Mucoepidermoid Carcinoma	04		01				03		
Adenoid cystic Carcinoma	02	01						01	
Malignant salivary gland tumor (unspecified)	01								01
<b>Total</b>	<b>34</b>	<b>17</b>	<b>06</b>	<b>02</b>	<b>01</b>	<b>01</b>	<b>05</b>	<b>01</b>	<b>01</b>

Overall, FNAC helped in the correct diagnosis of 25 (73.53 %) benign lesions; but among the 7 malignant lesions there was misdiagnosis of 2 cases which were later proven benign on histopathological examination.

In our study FNAC was found to have a sensitivity of 77.77 % and a specificity of 93.10 % with an accuracy of 89.47 % in diagnosing salivary gland lesions.

## Discussion

The FNAC has been widely used as a diagnostic tool for the management of various salivary gland lesions. Many authors considered FNAC a superior modality and claimed it accurate and safe. In contrast, others argued that it has little influence on clinical management because of its high rates of false positives and false negatives and also ultimately patients have to undergo surgery. However, the preoperative cytology helps to the differential diagnosis between benign and malignant lesions of salivary glands, and thus the extent of the surgery can be planned and modified accordingly.<sup>12</sup>

The age range of patients with salivary gland tumors was 6 to 88 years in the present study with a mean age of 46 years. Masoud et al. and Tessa et al. also

reported a similar age range in their studies.<sup>13,14</sup> There was male preponderance in our study which correlated with studies done by Tessa et al., Agrawat et al. and Fernandes et al.<sup>14,15,16</sup> Benign tumor accounted for 79.41 % of all salivary gland lesions in the present study and pleomorphic adenoma was the most common benign tumor. Malignant tumor constituted 20.59 % with mucoepidermoid carcinoma being the most common entity. Mihashi et al., Jan S et al. and Tessa et al. reported an incidence of 79.1%, 67%, 62 % for benign tumors and 20.9 %, 19 %, 27 % for malignant tumors.<sup>17, 18,14</sup>

Pleomorphic adenoma is the most common benign tumor which accounts for 60-70% of all the salivary gland tumors. These tumors occur in the middle age group with 85-90% of cases occurring in male population. The reliability of FNAC in diagnosing pleomorphic adenoma has been reported as 90-97%.<sup>19</sup>

Among the 48 cases of salivary gland lesions in the present study, 22 cases (45.83%) were diagnosed as pleomorphic adenoma cytologically. Eighteen of them were available for histopathological correlation, out of which 16 were concordantly diagnosed. Remaining 2 cases were diagnosed as low grade mucoepidermoid

carcinoma histopathologically. Cytologically, mucin along with intermediate cells was misinterpreted for fibromyxoid and epithelial elements. Frable et al and Suresh et al. also in their studies cytologically misinterpreted as pleomorphic adenoma in FNAC, which on histopathologically diagnosed as low grade mucoepidermoid carcinoma.<sup>20,21</sup>

The most common malignant salivary gland tumor is mucoepidermoid carcinoma, which comprises 5-10% of all the salivary gland tumors. Parotid gland is the most common site for these tumor.<sup>22</sup> Cellular smears from well differentiated mucoepidermoid carcinomas usually pose no problem in their diagnosis. However, the high grade, poorly differentiated tumors may be difficult to recognize as mucoepidermoid carcinoma and they may be misdiagnosed as poorly differentiated squamous cell carcinoma. When tumor is cystic and the aspiration yields only mucus material, a diagnosis of mucoepidermoid may be missed.

In our study, out of 34 cases there were 4 cases of mucoepidermoid carcinoma, which were diagnosed by FNAC. Among these three cases were concordantly diagnosed. FNAC smears of these cases showed all 3 types of cells, epidermoid cells, intermediate cells and mucus cells against a necrotic background. Remaining one case histologically turned out to be Warthin's tumor. Retrospectively when the FNAC slides were reviewed it showed cyst macrophages, epithelial cells and scanty

lymphocytes with mucoid background, which mimicked low grade mucoepidermoid carcinoma.

According to the AFIP, adenoid cystic carcinoma account for 4% of all benign and malignant salivary gland tumors.<sup>23</sup> It is a common malignancy of minor salivary glands. In FNAC smears hyaline stromal globules are the most striking features of this tumor but are not diagnostic thereof. They occur in several other entities such as basal cell adenoma, basal cell carcinoma, pleomorphic adenoma, polymorphous low grade adenocarcinoma and epithelial myoepithelial carcinoma. In our study 2 cases were cytologically diagnosed as adenoid cystic carcinoma. One case was concordantly diagnosed and one histologically came out to be pleomorphic adenoma. However, cytology diagnosis was made on the bases of presence of hyaline globules and increase cellularity with predominance of cells with hyperchromatic nuclei.

In our study, benign tumors were more common than malignant tumors, which was similar to the findings in other studies.<sup>19, 24, 25</sup> The parotid gland was commonly involved, whereas pleomorphic adenoma and mucoepidermoid carcinoma were the commonest benign and malignant tumors respectively, which was similar to the studies done by Matsushita I et al. and Hood IC et al.<sup>22,25</sup> The diagnostic accuracy was 89.5%, the sensitivity was 77.8% and the specificity 93.1%, which were similar to the other studies shown in the **Table 4.**

**Table 4: Diagnostic accuracy of FNAC in various studies.**

Author	No. of cases	Diagnostic accuracy	Sensitivity	Specificity
Shintani	43	93 %	88.90 %	94.10 %
Stow N	104	92.3 %	86.9 %	92.3 %
O'Dwyer	341	90 %	73 %	94 %
Fernandes GC	32	87.5 %	90.30 %	80 %
Jayaram	57	87.7 %	80.90 %	94.30 %
Beno	79	80.40 %	85.70 %	100 %
Our study	34	89.5 %	77.8 %	93.1 %

## Conclusions

Fine needle aspiration cytology is a safe and economic procedure with acceptable diagnostic accuracy especially in the experienced hands. Proper sampling of lesions and adequate cellularity of the smears are the pre-requisites for accurate diagnosis.

Awareness of the therapeutic implications and limitations of the cytological interpretation amongst both the clinicians and the cytopathologists should enable fine needle aspiration cytology to its best advantage.

### Conflict of interest: Non declared

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