



Original Article

A comparative study of fine-needle aspiration cytology and histopathology in salivary gland lesions

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ABSTRACT

Background: A wide variety of benign and malignant tumours originate in the salivary glands and insufficient tumour cells make their diagnosis difficult in some patients. The aim of this study was to evaluate the efficacy of fine-needle aspiration cytology in the diagnosis of salivary gland lesions and to correlate cytological findings with histopathology.

Materials and Methods: This was a prospective study done from September 2002 to May 2004. Fine needle aspiration cytology was performed in 58 patients with clinically significant salivary gland masses.

Results: Fine needle aspiration cytology categorized 67.24% of the salivary gland lesions as neoplastic and 32.76% as non-neoplastic lesions. Amongst the neoplastic lesions, 76.9% were benign and 23.1% were malignant cases. Histopathological examination revealed that 81.05% of the cases were benign and 18.95% were malignant. Fine needle aspiration cytology had a sensitivity, specificity and diagnostic accuracy of 81.82%, 100% and 96.55%, respectively. The positive predictive value and negative predictive value was 100% and 95.9%, respectively.

Conclusion: Fine needle aspiration of the salivary gland is a safe and reliable technique in the primary diagnosis of salivary gland lesions. Although, limitations are encountered while predicting specific lesions on cytology, especially when dealing with cystic and some malignant lesions, this study has shown that fine needle aspiration cytology has a high sensitivity, specificity and diagnostic accuracy in diagnosing salivary gland lesions.

INTRODUCTION

Salivary gland tumours are uncommon, corresponding to approximately 3-10% of neoplasms of the head and neck regions.^{1,2} However, a wide variety of benign and malignant tumours that can originate in these glands and insufficient tumour cells make their diagnosis difficult in some patients.³

Therefore, the primary challenge of fine needle aspiration cytology (FNAC) is differentiating benign from malignant disease, then differentiating the various malignancies. The preoperative information is used to plan the most effective therapeutic approach.

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The aim of the present study was to evaluate the efficacy of FNAC in diagnosis of salivary gland lesions and to correlate cytological findings with histopathology.

MATERIALS AND METHODS

This was a prospective study conducted in the Departments of Pathology and Surgery, in B.P. Koirala Institute of Health Sciences (BPKIHS), Dharan, Nepal, between September 2003 and May 2004. A total of 58 patients with salivary gland lesions who had undergone preoperative FNAC and had been diagnosed by subsequent histopathological examination were included in this study.

The FNAC was performed using a 23-gauge needle attached to a 10 ml disposable syringe. Aspirates were smeared on clean slides, wet fixed or air dried and stained by Papanicolaou (PAP) and May-Grunwald-Giemsa (MGG) stains. The excised surgical specimens were fixed in 10% formalin, then routinely processed and stained by Haematoxylin and Eosin (HE) stain.

We compared the histopathological findings with the preoperative cytology of the FNAC specimens and calculated the sensitivity, specificity, positive predictive value (PPV) negative predictive value (NPV), and overall accuracy of FNAC for diagnosing benign and malignant diseases. Data analysis was based on Galen and Gambino method to calculate sensitivity and specificity of FNAC in differentiating between benign and malignant lesions.

RESULTS

Age of the patients ranged from 6-73 years with a median age of 38 years. However, most malignant cases (45.5%) were seen after the age of 60. The parotid and the submandibular glands were the two most frequently involved sites in this study, each accounting for 46.5% of the cases, followed by minor salivary glands (5.2%). The sublingual gland was involved in 1 case (1.7%). Of the 47 cases diagnosed in histology as benign, most were seen in the submandibular gland (53.2%) followed by the parotid (40.4%). Most malignant cases (11 cases, 72.7%) were diagnosed in the parotid followed by submandibular gland (18.2%).

The results of FNAC were broadly categorized into inflammatory lesions, benign cystic lesions, benign neoplasms and malignant neoplasms. Of the 58 cases (49, 84.5%) were benign and 9 cases (15.5%) were malignant. Also, amongst the 58 cases, 39 cases (67.2%) were neoplastic while 19 cases (32.8%) were non-neoplastic. Table 1 shows the FNAC diagnoses in 58 cases. In 8 cases, fluid was aspirated but a specific cytological diagnosis could not be reached. Such lesions were assessed to be benign in nature and were categorized as benign cystic lesions.

Histology and cytohistological correlation

Of the 58 cases, 49(84.5%) cases were benign and 9(15.5%) cases were malignant. There were 2 false negative cases but no false positive cases. The histopathological diagnoses are

shown in Table 2.

Pleomorphic adenoma (fig. 1A, B&C) was the most common salivary gland tumour followed by warthin tumor (fig. 2). Amongst the malignancies, acinic cell carcinoma, mucoepidermoid (fig.3) and polymorphous low grade adenocarcinoma was more common than other tumors like infiltrating salivary duct carcinoma (fig.4), epithelial-myoeplithelial carcinoma (fig.5), myoeplithelial carcinoma, papillary carcinoma and adenoid cystic carcinoma.

Overall, for diagnosing salivary gland lesions (benign and malignant tumours combined), the sensitivity, specificity and diagnostic accuracy of FNAC were 81.82%, 100% and 96.55%, respectively. The positive predictive value (PPV)

Table 1. FNAC diagnoses of salivary gland lesions

	Diagnosis	Total	%
Benign	Benign cystic lesions	8	13.8%
	Chronic sialadenitis	11	18.9%
	Pleomorphic adenoma	24	41.5%
	Basal cell adenoma	2	3.4%
	Warthin's tumour	3	5.2%
	Lymphangioma	1	1.7%
	Total	49	84.5%
Malignant	Mucoepidermoid carcinoma	3	5.2%
	Adenocarcinoma	1	1.7%
	Acinic cell carcinoma	3	5.1%
	Adenoid cystic carcinoma	2	3.5%
	Total	9	15.5%
	Grand total	58	100%

Table 2: Histopathological diagnoses of salivary gland lesions

	Histopathological diagnosis	Total	%
Benign	Chronic sialadenitis	13	22.4%
	Sialadenosis	2	3.5%
	Basal cell adenoma	2	3.5%
	Pleomorphic adenoma	24	41.4%
	Warthin's tumour	6	10.4%
	Total	47	81.1%
Malignant	Infiltrating salivary duct carcinoma	1	1.7%
	Papillary adenocarcinoma	1	1.7%
	Acinic cell carcinoma	2	3.5%
	Epithelial- myoeplithelial carcinoma	1	1.7%
	Mucoepidermoid carcinoma	2	3.5%
	Adenoid cystic carcinoma	1	1.7%
	Polymorphous low-grade carcinoma	2	3.5%
	Myoeplithelial carcinoma	1	1.7%
	Total	11	18.9%
	Grand total	58	100%

Table 3: Cytohistological correlation of benign salivary gland lesions

Histological diagnosis	No of cases	FNAC diagnosis		
		Exactly categorized	Benign but not exactly categorized	False-positive
Chronic sialadenitis	13	10	3	-
Sialadenosis	2	-	2	-
Basal cell adenoma	2	2	-	-
Pleomorphic adenoma	24	23	1	-
Warthin's tumour	6	3	3	-
Total	47	38	9	-

Table 4: Cytohistological correlation of malignant salivary gland tumours

Histological diagnosis	No of cases	FNAC diagnosis		
		Exactly categorized	Malignant but not exactly categorized	False-negative
Infiltrating salivary ductal Ca	1	-	1	-
Papillary adenocarcinoma	1	1	-	-
Acinic cell Ca	2	2	-	-
Epithelial-myoepithelial Ca	1	-	1	-
Mucoepidermoid Ca	2	2	-	-
Adenoid cystic ca	1	1	-	-
Polymorphous low-grade Ca	2	-	1	1
Myoepithelial Ca	1	-	-	1
Total	11	6	3	2

Ca: Carcinoma

Table 5: Cytohistological correlation with other studies

First author	No. of cases	Diagnostic accuracy	Sensitivity	Specificity	PPV	NPV
Jayaram G ⁵	53	73.6%	90%	95%	-	-
Das D ⁶	712	91%	94.6%	75%	-	-
Stramandinoli RT ⁷	79	82.3%	68.2%	87.7%	68.2%	87.7%
Piccioni LO ⁸	176	97%	81%	99%	93%	98%
Iqbal M ⁹	49	96.4%	62.5%	96.97%	-	-
Stow N ¹⁰	104	92.3%	86.9%	92.3%	96.8%	86.6%
Postema RJ ¹¹	380	96%	88%	99%	95%	97%
Rehman H ¹²	50	78%	53.28%	88.57%	72.7%	79.9%
Lukas J ¹³	107	89.2	85.0%	97.5%		
This study	58	96.55%	81.82%	100%	100%	95.9%

was 100% and the negative predictive value (NPV) was 95.9%.

An accurate specific lesion prediction for both benign and malignant lesions combined by FNAC was achieved in 75.86% (44/58) of the cases.

Benign lesions

For benign lesions, the sensitivity, specificity and diagnostic accuracy of FNAC were 100, 81.8% and 96.6%,

respectively. The PPV for benign disease was 95.9% and the negative predictive value (NPV) was 100%. An accurate specific lesion prediction for these lesions was achieved in 80.9% (38 cases, Table 3).

Pleomorphic adenoma was the commonest lesion in this study. FNAC had a sensitivity of 95.83%, specificity of 97.05% and a diagnostic accuracy 96.55% in diagnosing this tumour. An accurate lesion prediction for pleomorphic adenoma was seen in 95.83% (23) cases.

Malignant lesions

The sensitivity, specificity and diagnostic accuracy of FNAC for diagnosing malignant salivary gland tumours were 81.8%, 100% and 96.6%, respectively. The positive predictive value (PPV) was 100% and the negative predictive value (NPV) was 95.9%. An accurate specific lesion prediction for these lesions was achieved in 54.6% (6 cases, Table 4).

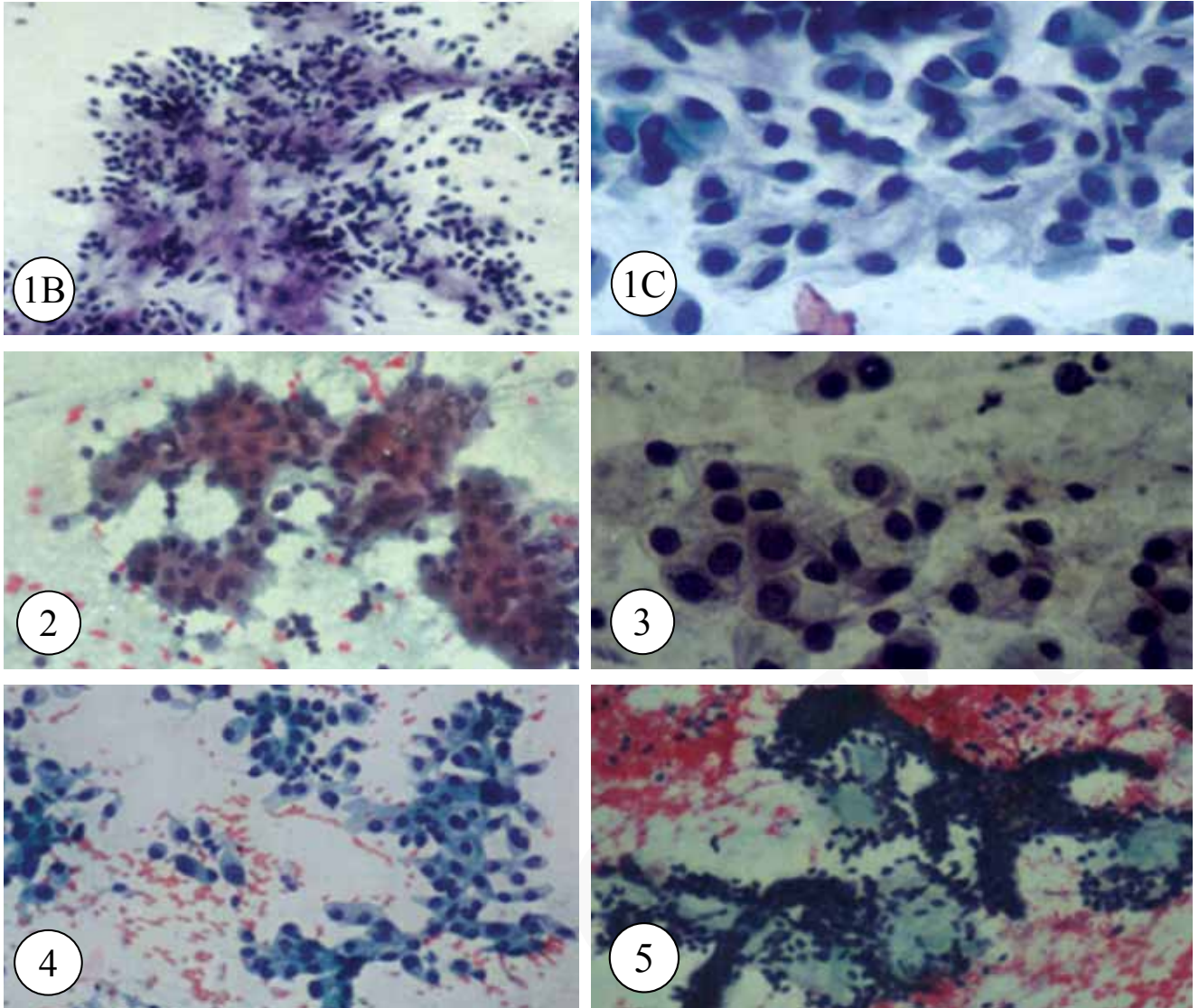


Figure 1A: Mixture of epithelial cells and myxoid stroma in pleomorphic adenoma (MGG stain, X400).

Figure 1B: Myxoid stromal tissue with admixed epithelial cells in pleomorphic adenoma (Pap stain, X100).

Figure 1C: Plasma cell-like pattern in pleomorphic adenoma (Pap stain, X400).

Figure 2: Monolayered clusters of oxyphilic cells and scattered lymphocytes in the background in Warthin's tumour (Pap stain, X200).

Figure 3: Intermediate cells with abundant and vacuolated cytoplasm in mucoepidermoid carcinoma (Pap stain, X400).

Figure 4: Loosely cohesive clusters of malignant cells with large pleomorphic nuclei and abundant cytoplasm in salivary duct carcinoma (Pap stain, X100).

Figure 5: Clusters of epithelial cells with scanty cytoplasm and large stromal hyaline globules in epithelial-myoepithelial carcinoma (Pap stain, X100).

DISCUSSION

FNAC is a safe and reliable and relatively painless procedure for the preoperative diagnosis of the salivary gland lesions.⁴

In our study, a high diagnostic efficacy of FNAC in diagnosing both benign and malignant lesions was achieved. Overall, for benign and malignant lesions, combined, FNAC showed a sensitivity of 81.8%, specificity of 100% and an overall diagnostic accuracy of 96.6%. These results were comparable to previously reported results (Table 5).⁵⁻¹³

Although a high diagnostic efficacy of FNAC in diagnosing salivary glands was achieved in this study, an accurate lesion prediction in typing specific histological lesions was achieved in only 80.6% of benign lesions and 54.5% of malignant lesions. A lower diagnostic accuracy of FNAC in typing specific benign lesions was observed in this study while aspirating cystic lesions (8 cases). These lesions were cytologically categorized as benign cystic lesions, as no features of malignancy were seen in their respective smears.

Of the 8 cystic lesions, 3 cases each were diagnosed on histology as Warthin's tumour and chronic sialadenitis and a case each were diagnosed as a pleomorphic adenoma and polymorphous low-grade adenocarcinoma. Postema et al¹¹ also observed similar findings when diagnosing cystic lesions, and concluded that cytologic diagnosis of "cysts" should be interpreted with caution.

Of the 11 malignancies, 2 were misdiagnosed in cytology as benign (Table 4). One was a case of polymorphous low grade adenocarcinoma (PLGA), which was diagnosed on cytology as a benign cystic lesion. The aspirate of the lesion yielded 2 ml of straw coloured fluid, which on microscopic examination showed foamy macrophages and few ductal cells only. The other false-negative result was reported in a case of myoepithelial carcinoma, which was reported on cytology as a pleomorphic adenoma. Review of the slides showed cellular smears, comprising of epithelial cell clusters in a chondromyxoid background.

The reason for low lesion prediction in typing specific malignant salivary gland lesions is due to the fact that a large number of benign and malignant neoplasms arise in the salivary glands and as there is considerable overlap of morphological features of these lesions causing diagnostic difficulties. Also, in new entities like polymorphous low-grade adenocarcinoma, cytological diagnosis is still not characterized.¹⁴

In this study, the maximum number of patients presenting with salivary gland lesions (29.3%) and the maximum number of benign lesions (31.9%) were seen in the 21-30 years age group. Most of the malignancies were seen in the fifth and sixth decades. Similar observations were found in other studies.¹⁵⁻¹⁷ No sex preponderance was noticed in

the overall incidence of salivary gland lesions in this study. Similar reports have been reported by others.^{16,18}

The proportion of non-neoplastic lesions in the present study (22.4%) is similar to that reported by Jayaram et al⁵ and Cardillo et al.¹⁹ As in other studies, pleomorphic adenoma was also the most common salivary gland lesion in this study, followed by Warthin's tumour.^{6,15,20} Amongst the malignancies, acinic cell carcinoma, mucoepidermoid and polymorphous low grade adenocarcinoma was more common than the others. The incidence of malignant salivary gland tumours in the literature are variable. In a study by Postema et al¹¹ acinic cell carcinoma was most common while it was adenoid cystic carcinoma in studies by Akhter et al¹⁵ and Stewart et al.²¹

CONCLUSION

FNAC of the salivary gland is a safe and reliable technique in the primary diagnosis of salivary gland lesions. Although, limitations are encountered while predicting specific lesions on cytology, especially when dealing with cystic and some malignant lesions, this study has shown that FNAC has a high sensitivity, specificity and diagnostic accuracy in diagnosing salivary gland lesions.

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