

Fine Needle Aspiration Cytology: A Diagnostic Tool for Oral Lesions

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Abstract

Introduction: The oral cavity often shows a wide variety of lesions. In recent years fine needle aspiration cytology (FNAC) has been a tool for probable diagnosis because it is speedy, rapid, cost effective and less invasive procedure in comparison to biopsy. The simplicity of aspiration technique, however, does not mean that interpretation is less demanding than that of the surgical biopsy specimen.

Purpose: This study was carried out to assess the sensitivity, specificity, the diagnostic accuracy of FNAC in the oral lesions and to analyse the cyto-histopathology correlation.

Materials and Methods: This prospective study includes 82 patients with oral and oropharyngeal lesions who underwent FNAC. Both wet and dry smears were prepared. Final cytologic results were then compared with the definitive histopathological diagnoses, which were considered the gold standard.

Results: Out of 82 cases 75 (91.4%) were adequate for cytological study, in these 45 (60%) were neoplastic and 30 (40%) were non-neoplastic. 16 cases (35.5%) out of 45 neoplastic cases were diagnosed as benign and 29 (64.4%) as malignant. Chronic inflammation including chronic sialadenitis ($n = 11$, 36.6%) was the most common non-neoplastic lesion. The most common benign lesion was pleomorphic adenoma 3 (18.75% of total benign cases) while the most common malignant lesion was squamous cell carcinoma 23 (79.31% of total malignant cases). Cytological diagnoses were compared with the confirmatory histopathology diagnosis. There was one false negative case and one false positive case. The sensitivity was 94.44%; specificity was 85.71%; the positive predictive value was 94.44%; the negative predictive value was 85.71% with a diagnostic accuracy of 92.0%. $P = 0.01$. Kappa was 0.8.

Conclusion: FNAC was found to be highly accurate in the diagnosis of oral lesions. Detailed cytomorphologic examination coupled with clinical data, and appropriate use ancillary techniques can lead to an accurate diagnosis. Overlapping features of some tumors, especially in minor salivary glands, as well as limitations in accessibility of the lesions were probably responsible for the inaccurate diagnoses in few cases.

Key words: Cytology, Fine needle aspiration, Histopathology correlation, Oral cavity, Sialadenitis

INTRODUCTION

Fine-needle aspiration cytology (FNAC) is a procedure to obtain cells and tissue fragments through a needle

introduced into abnormal tissue and its study.¹ It is a simple, safe, speedy, cost-effective and rapid procedure. The simplicity of aspiration technique, however, does not mean that interpretation is less demanding than that of the surgical biopsy specimen. FNAC technique was first introduced in 1930 by Martin, Ellis, and Stewart.^{2,3}

Oral cavity lesions are of unknown etiology, endemic in India and Indian subcontinent affecting mainly age group of 20-40 years.⁴ An allergic reaction has been suggested as a possible cause by some authors.^{5,6} It may be related to

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a peculiar dietary, component betel nut chewing, use of tobacco and vitamin deficiency in Indians.⁴

The prevalence rate of oral cavity lesions varies from 0.2% to 0.5 % in India with a higher percentage being found in southern areas of country.⁴ Sex ratio demonstrates male predominance.⁴ The incidence of oral cavity lesions is increasing now days probably due to increasing use of tobacco, pan masala and also because of better clinico histopathological diagnosis.

Pindborg *et al.* studied the disease submucous fibrosis and leukoplakia and defined it as “Insidious-chronic disease of unknown etiology” identified mainly in Indians and affecting all part of oral cavity and sometimes pharynx.⁷⁻⁹

Oral and oropharyngeal mass lesions are commonly diagnosed by biopsy. Traditional biopsy techniques in the oral cavity may require anesthesia and may have diagnostic difficulties particularly for transmucosal lesions. FNAC overcomes these shortcomings by providing a minimally invasive means to rapid diagnosis of intraoral lesions, and if necessary, a re-aspiration can be done quickly at the time of initial testing.⁴

There is a relatively large volume of literature documenting the effectiveness of FNA for diagnosis of head and neck and salivary gland lesions. Scant literature, however, explore the potential of FNA for the diagnosis of intraoral and lesions of the maxillofacial region.¹⁰ The diversity of lesion types, heterogeneity of cell population, difficulties in reaching and aspirating the lesion, and rarity of this type of lesion make the cytological diagnosis of oro-maxillofacial lesions difficult.

The fundamental indication for FNAC is a lesional mass that is palpable or visible by a radiological imaging method. This technique may also assist in establishing a specific diagnosis for radiolucent lesions of the jaw. The thinning or destruction of cortical bone permits the use of thin needles to aspirate such abnormalities.

This study was conducted to calculate the diagnostic accuracy, sensitivity, the specificity of needle aspiration of oral and oropharyngeal mass lesions and to study the cytological features in the aspirate so obtained.

MATERIALS AND METHODS

This study was conducted in the Department of Pathology and Department of ENT at a tertiary level teaching hospital in North India over a period of 2 years. A total of 82 cases were studied.

The procedure was well explained to patients in their language, and due consents were taken from all of them. Aspiration was performed with 22-23 gauge needle attached to a 20 ml disposable syringe. Visibility was enhanced by using a head mirror in a few cases. The needle was introduced into the target and suction was applied by retracting the syringe plunger to the 1-2 ml mark. The needle moved back and forth 4-5 times in same plane to ensure minimal bleeding. Aspiration was taken from proliferative or ulcero-proliferative lesions. Both air dried, and wet fixed smears were prepared. Whenever needed, Ziehl-Neelsen staining was performed. The smears were then cytologically examined, and a diagnosis was made. The smears were reported as inadequate in cases when:

- i. Only hemorrhagic material was aspirated
- ii. Only benign squamous epithelial cells were seen, not directing towards any specific diagnosis.

In 28 cases, biopsies were taken, and histopathological diagnosis was given which were then correlated.

All the statistical parameters were calculated using Statistical Package for the Social Sciences version 20 software.

RESULTS

The results of twenty-eight patients, who had both FNAC and histopathological examination, were analyzed. Among the total patients (82) included in the study 57 (69.51%) were male and 25 (30.48%) were female. Age of the patients ranged from 10 to 82 years with a mean age of 40.74 years. The maximum number of patients were in the 31-40 years of age ($n = 27$) followed by 41-50 years of age (14 patients) (Table 1). A total of 12 sites were aspirated from oral and oropharyngeal regions. Maximum aspirates ($n = 20$) were from buccal mucosa followed by aspirates from the tongue ($n = 11$) (Table 2).

The FNAC results revealed 29 malignant and 16 benign cases. Among the malignant lesions squamous cell carcinoma was seen in 23 (79.3% out of all malignant lesions) patients (Figures 1 and 2). Among non-neoplastic

Table 1: Distribution of cases according to age

| Age group (in years) | Number of cases | Percentage |
|----------------------|-----------------|------------|
| 0-10 | 01 | 1.21 |
| 11-20 | 09 | 10.97 |
| 21-30 | 11 | 13.41 |
| 31-40 | 27 | 32.92 |
| 41-50 | 14 | 17.07 |
| 51-60 | 13 | 15.85 |
| 61-70 | 06 | 7.31 |
| 71-80 | 00 | 00 |
| 81-90 | 01 | 1.21 |
| Total | 82 | 9 |

lesion, chronic inflammation was seen in 11 (36.6% of all non-neoplastic lesions) patients (Figures 3 and 4, Table 3).

Histopathology of subsequent punch biopsy specimens showed malignant lesions in 19 (67.85%) and benign in 9 (32.14%) patients (Table 4).

Correlation of FNAC with Histopathology Reports

It was found that most of the benign and malignant lesions reported in FNAC correlated with the histopathology results. There was one false positive result in the benign

group where aspiration showed squamous cell carcinoma, but the histopathology showed keratosis only.

Similarly, there was one false negative where FNAC showed chronic inflammatory lesion and the histopathology report showed squamous cell carcinoma.

Table 2: Distribution of different lesions according to site

| Site | Lesions |
|--------------------|---|
| Buccal mucosa (20) | SCC (9), benign spindle cell lesion (1), NHL (1), carcinoma ex pleomorphic adenoma (1), hemangioma (1), Chronic sialadenitis (1), acrochordon (1), Acute inflammation (1), Chronic inflammation (1), inadequate (3) |
| Tongue (16) | SCC (7), metastatic SCC (1), squamous papilloma/acrochordon (1), acute inflammation (2), chronic inflammation (1), hemangioma (2), cystic lesion (1), Poorly diff ca/adenoid cystic ca/basal cell carcinoma (1) |
| Alveolus (11) | SCC (1), benign spindle cell lesion (1), chronic inflammation (1), infected epidermal cyst (1), acute inflammation (2), chronic sialadenitis (2), mucoepidermoid carcinoma (1), Tuberculosis (1), inadequate (1) |
| Palate (11) | SCC (1), pleomorphic adenoma (3), basal cell adenoma/myoepithelioma (1), inflammatory cystic lesion (1), benign spindle cell lesion (1), chronic inflammation (1), acrochordon (1), inadequate (2) |
| Floor of mouth (7) | Mucocoele (3), chronic sialadenitis (4) |
| Paratonsillar (6) | SCC (2), met. SCC (1), acute inflammation (1), acinic cell carcinoma (1), inadequate (1) |
| Lip (4) | Mucocoele (1), hemangioma (3) |
| Sublingual (2) | Mucocoele (2) |
| Oropharynx (2) | SCC (2) |
| Tonsil (1) | Acute inflammation (1) |
| Angle of mouth (1) | Giant cell granuloma (1) |
| Pharynx (1) | Cystic lesion (?atypical branchial cyst) (1) |

SCC: Squamous cell carcinoma, NHL: Non-Hodgkin's lymphoma

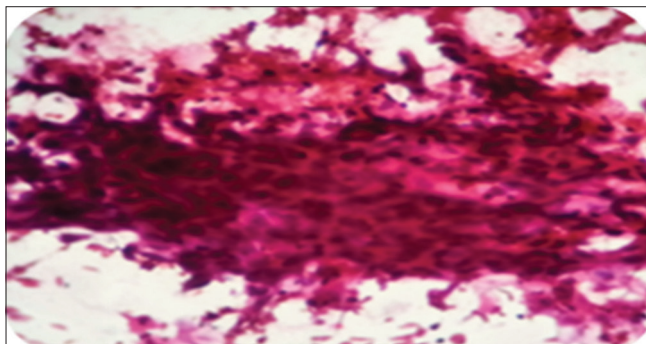


Figure 1: Photomicrograph of poorly differentiated squamous cell carcinoma showing sheets of malignant squamous epithelial cells (H and E, x400)

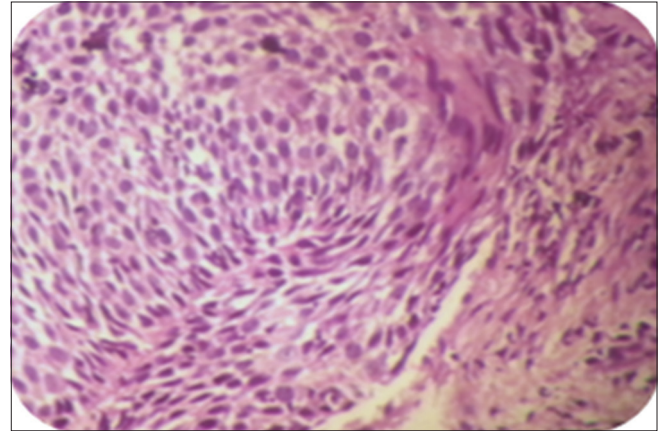


Figure 2: Section shows moderately differentiated malignant squamous epithelial cells. High N: C ratio is seen with hyperchromatic nuclei and pleomorphism (H and E, x400)

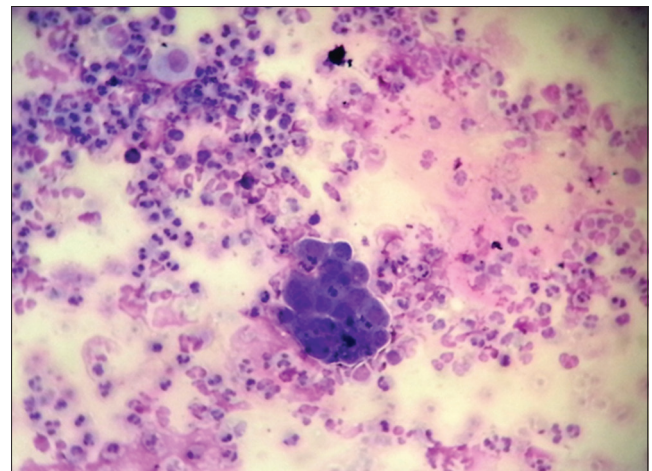


Figure 3: Photomicrograph of smear shows ductal epithelial cells against a background of acute inflammatory cells. A diagnosis of obstructive sialadenitis was given (H and E, x400)

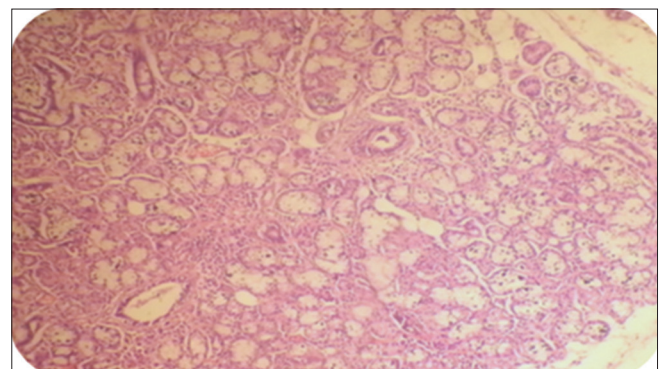


Figure 4: Section shows abundant mucinous glands with mild chronic inflammatory infiltrate; (H and E, x100)

Data analysis showed sensitivity 94.44% and specificity 85.71% with positive predictive value (PPV) and negative predictive value (NPV) of 94.44% and 85.71% respectively. The diagnostic accuracy was found 92%. $P < 0.05$, which is significant and kappa was 0.81 (kappa value >0.75 shows excellent correlation between two studies).

DISCUSSION

A wide range of age was observed in the present study. The youngest case in the present study aged 12 years and

the oldest case were of 82 years of age. Previous studies¹¹⁻¹³ also yielded subjects with a wide range of age. Only a study was done by Saleh *et al.* had subjects from 30 to 87 years.¹⁴

In a study conducted by Singh *et al.*¹⁵ the age of the patients was found to be 14 months to 84 years.

Similarly in the studies conducted by Deng *et al.*¹¹, Singh *et al.*,¹⁶ the patients fell in the age group of 3-91 years and 5-80 years respectively.

Aspirates were taken from various sites. This study had maximum aspirates from the buccal mucosa (Table 5).

Table 3: Distribution of different cytological diagnosis of oral cavity and oropharynx

| S. no. | Lesions | No. of cases | Percentage |
|--------|--|--------------|------------|
| 1 | SCC | 23 | 30.66 |
| 2 | Chronic inflammatory lesion including chronic sialadenitis | 11 | 14.66 |
| 3 | Acute/subacute inflammation | 07 | 9.33 |
| 4 | Mucocoele | 06 | 8 |
| 5 | Hematoma/hemangioma | 06 | 8 |
| 6 | Cystic lesion with/without inflammation | 04 | 5.33 |
| 7 | Pleomorphic adenoma | 03 | 4 |
| 8 | Squamous papilloma/acrochordon | 03 | 4 |
| 9 | Benign spindle cell lesion | 03 | 4.0 |
| 10 | Mucoepidermoid carcinoma | 01 | 1.33 |
| 11 | Metastatic SCC | 01 | 1.33 |
| 12 | Poorly diff ca/adenoid cystic ca/basal cell carcinoma | 01 | 1.33 |
| 13 | Basal cell adenoma/myoepithelioma | 01 | 1.33 |
| 14 | Carcinoma ex pleomorphic adenoma | 01 | 1.33 |
| 15 | Acinic cell carcinoma | 01 | 1.33 |
| 16 | Large cell NHL | 01 | 1.33 |
| 17 | Giant cell granuloma | 01 | 1.33 |
| 18 | Tuberculosis | 01 | 1.33 |
| Total | | 75 | 9 |

SCC: Squamous cell carcinoma, NHL: Non-Hodgkin's lymphoma

Table 4: Cyto-histological correlation

| Number of cases | Histologic diagnosis | Cytologic diagnosis |
|-----------------|--|---|
| 19 | SCC | 17 SCC (TP) 1 chronic inflammatory lesion (FN) 1 non diagnostic |
| 1 | Mucocoele | 1 mucocoele (TN) |
| 1 | Pyogenic granuloma | 1 hemangioma (TN) |
| 1 | Chronic inflammation | 1 chronic inflammation (TN) |
| 1 | Cellular fibrous histiocytoma | 1 benign spindle cell lesion (TN) |
| 1 | Acrochordon | Acrochordon (TN) |
| 1 | Moderate dysplasia (lichenoid type) | 1 non diagnostic |
| 1 | Pseudoepitheliomatous hyperplasia and ?histoplasma | 1 non diagnostic |
| 1 | Keratosis | SCC (FP) |
| 1 | Tongue cyst | 1 Acute suppurative lesion (TN) |

SCC: Squamous cell carcinoma, total 82 cases were considered. Histology was available for 28 cases out of 82

Malignant Lesions and Benign Lesions

Squamous cell carcinoma was the most common oral and oropharyngeal lesion, which was aspirated in the current study. Results of other comparable studies reported in the literature^{11,12,15-17} are shown in Table 6.

The most common non-malignant lesions diagnosed on FNAC in the literature are given in Table 7.

Table 5: A comparison showing the most common site of aspiration in other studies with present study

| Studies | Most common site |
|--|--------------------|
| Saleh <i>et al.</i> ¹⁴ 2008 | Pharynx/oropharynx |
| Deng <i>et al.</i> ¹¹ 2011 | Palate |
| Singh <i>et al.</i> ¹⁶ 2011 | Mandible |
| Gillani <i>et al.</i> ¹⁷ 2012 | Alveolar ridge |
| Present study | Buccal mucosa |

Table 6: A comparison showing the most common malignant lesion in various studies with present study

| Studies | Most common malignant lesion |
|--|--|
| Saleh <i>et al.</i> ¹⁴ 2008 | SCC (22.2%) |
| Deng <i>et al.</i> ¹¹ 2011 | SCC, basaloid neoplasm, metastatic (18.1%) |
| Singh <i>et al.</i> ¹⁶ 2011 | SCC (28.0%) |
| Gillani <i>et al.</i> ¹⁷ 2012 | SCC (60%) |
| Present study | SCC (79.31%) |

SCC: Squamous cell carcinoma

Table 7: A comparison showing the most common non-malignant lesion in other studies with present study

| Studies | Most common non-malignant lesion |
|---|---|
| Abrari <i>et al.</i> ¹³ 2002 | Pleomorphic adenoma (59.0%) |
| Singh <i>et al.</i> ¹⁵ 2008 | Chronic inflammatory lesions (35.3%) |
| Deng <i>et al.</i> ¹¹ 2011 | Cystic lesions (23.5%) |
| Singh <i>et al.</i> ¹⁶ 2011 | Acute inflammatory lesions (34.6%) |
| Present study | Chronic inflammatory lesions- including chronic sialadenitis (36.66%) |

The results of the current study are in accordance with those of Singh *et al.*¹⁵ i.e., chronic inflammatory lesions, including chronic sialadenitis. Even in the other studies, the frequency of pleomorphic adenoma ranged from 11.7% to 26.9%, which is roughly similar to the results in the current study.^{11,14}

Sensitivity

The present study which had a high sensitivity of 94.44% showed concordance with Gandhi *et al.*¹⁸ and Singh *et al.*¹⁵ which had a sensitivity of 93.75% and 97.87%, respectively (Table 8).

Specificity

Our study which showed a specificity of 85.71%, was in concordance with Singh *et al.*¹⁵ which had a specificity of 88.35% (Table 8).

Positive Predictive Value

Our study had a PPV of 94.4% that corresponds to PPV of Singh *et al.*¹⁵ which is 93.93% (Table 9).

Negative Predictive Value

The NPV for our present study is 85.71%, which is in concordance with Hafez *et al.*¹⁹ which was 89.3% (Table 9).

Diagnostic Accuracy

The diagnostic accuracy of our present study is 92%, which is similar to Singh *et al.*¹⁵ and Gandhi *et al.*¹⁸ which were 93.75% and 90% respectively (Table 8).

Table 8: A comparison of sensitivity, specificity and diagnostic accuracy of various studies with present study

| Study | Sensitivity (%) | Specificity (%) | Diagnostic accuracy (%) |
|---|-----------------|-----------------|-------------------------|
| Singh <i>et al.</i> ¹⁵ 2008 | 97.87 | 88.35 | 93.75 |
| Deng <i>et al.</i> ¹¹ 2011 | 9 | 95 | 97 |
| Singh <i>et al.</i> ¹⁶ 2011 | 77.70 | 9 | 9 |
| Gandhi <i>et al.</i> ¹⁸ 2011 | 93.75 | 93.45 | 90 |
| Present study | 94.44 | 85.71 | 92 |

Table 9: A comparison of NPV and PPV with present study

| Study | PPV (%) | NPV (%) |
|--|---------|---------|
| Singh <i>et al.</i> ¹⁵ 2008 | 93.93 | 93.75 |
| Gillani <i>et al.</i> ¹⁷ 2012 | 97.0 | 9 |
| Hafez <i>et al.</i> ¹⁹ 2014 | 97.7 | 89.3 |
| Present study | 94.4 | 85.71 |

PPV: Positive predictive value, NPV: Negative predictive value

CONCLUSION

Cytological examination of the oral cavity is an accurate and reliable diagnostic tool in the pre-operative work-up of patients with intraoral lesions. Detailed cytomorphologic examination coupled with clinical data, and appropriate immunocytochemical study can lead to an accurate diagnosis. Although most cases are not problematic, there are few cases that can be challenging to the cytopathologists, especially minor salivary gland masses. These pitfalls, therefore, should always be kept in mind when faced with.

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