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Research Article

Diagnostic Accuracy of Fine Needle Aspiration Cytology in Salivary Gland Lesions: A Cytohistopathological Correlation Study

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ABSTRACT

Introduction: Salivary gland lesions comprise a diverse group of inflammatory and neoplastic conditions with variable clinical behavior. Although histopathology remains the diagnostic gold standard, preoperative evaluation is essential for planning management. Fine needle aspiration cytology (FNAC) is widely used as a minimally invasive, rapid, and cost-effective diagnostic tool for salivary gland lesions.
Materials and Methods: A descriptive study with both prospective and retrospective components was conducted in the Department of Pathology at D.Y. Patil Medical College over a period of 1 year**.** A total of 50 cases of salivary gland lesions were included based on the availability of both FNAC samples and corresponding histopathological specimens. Cytological findings were correlated with histopathological diagnoses to evaluate diagnostic accuracy and to calculate sensitivity, specificity and predictive values.
Results: Most patients were in the 41–50year age group (24%) with male predominance (64%). Benign lesions constituted 90% of cases, while 10% were malignant. Pleomorphic adenoma was the most common benign lesion (48%). FNAC showed a sensitivity of 89%, specificity of 83%, positive predictive value of 95.45%, and negative predictive value of 83.33%.
Conclusion: FNAC is a reliable, rapid, and minimally invasive diagnostic modality for evaluating salivary gland lesions. It effectively differentiates non-neoplastic from neoplastic lesions and aids in preoperative planning, reducing unnecessary surgical interventions.

Keywords*: Fine needle aspiration cytology, Salivary gland lesions, Diagnostic accuracy, Histopathology correlation.*

INTRODUCTION

Salivary glands are specialized exocrine organs comprising the parotid, submandibular, sublingual, and numerous minor salivary glands distributed throughout the oral cavity and oropharynx.[1] Lesions affecting these glands range from inflammatory conditions to benign and malignant neoplasms with diverse histomorphological patterns.[10]

Salivary gland tumors account for less than 2% of all human tumors, with the parotid gland being the most commonly involved site.[5] Approximately two-thirds of parotid tumors are benign, with pleomorphic adenoma representing the most frequent neoplasm.[6]

Histopathological examination is considered the definitive diagnostic method; however, incisional biopsy of major salivary glands carries potential risks including facial nerve injury, fistula formation, and tumor seeding.[12] Therefore, FNAC has emerged as a preferred preoperative diagnostic tool due to its safety, minimal invasiveness, rapid turnaround time, and high diagnostic accuracy.[3],[4]

The diagnostic utility of FNAC in salivary gland pathology has been extensively studied, demonstrating high sensitivity and specificity when correlated with histopathology.[3],[7]

Given the clinical importance of accurate preoperative diagnosis, the present study was undertaken to assess the diagnostic accuracy of FNAC in salivary gland lesions at a tertiary care center.

MATERIAL AND METHODS

A Descriptive study (Prospective + Retrospective) conducted at Department of pathology in D.Y. Patil Medical College. Study subjectswith Aspirate from all salivary gland lesions and corresponding histopathological specimen (Biopsy specimen, surgical excised specimen) receiving in department of pathology during study period such cases were included in the study.

Sample Size: 50

Inclusion criteria:

1. All patients presenting with salivary gland lesions, irrespective of age and gender.
2. Cases that underwent fine needle aspiration cytology (FNAC) in the Department of Pathology.
3. Cases with available corresponding histopathological specimens (biopsy and/or excision) for cytohistological correlation.

Exclusion Criteria:

1. FNAC smears that were inadequate or non-diagnostic due to low cellularity.
2. Smears obscured by blood, mucus or artifacts interfering with interpretation.
3. Poorly preserved cytological smears.
4. Histopathological specimens inadequate or lacking representative lesional tissue.
5. Cases with incomplete clinical details or missing records.

Methodology specified for data collection: FNAC was performed under aseptic precautions using a 22–23gauge needle attached to a disposable syringe. The aspirated material was smeared onto clean glass slides, and both air-dried and alcohol-fixed smears were prepared. Air-dried smears were stained with May-Grünwald-Giemsa (MGG)/Diff-Quik, while alcohol-fixed smears were stained with Hematoxylin and Eosin (H&E) and/or Papanicolaou stain.

The corresponding histopathological specimens were fixed in 10% formalin, processed by routine paraffin-embedding techniques and stained with hematoxylin and eosin for microscopic examination.

Relevant clinical details including age, gender, site of lesion, and clinical presentation were recorded. Cytological findings were documented and subsequently correlated with histopathological diagnoses. The collected data were analyzed to assess the diagnostic performance of FNAC by calculating sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

RESULT

A total of 50 cases of salivary gland lesions were studied. The age of patients ranged widely, with the majority of cases observed in the 41–50 years age group (24%), followed by 31–40 years and 51–60 years (20% each). Patients above 60 years constituted 18%, while those in the 20–30 years age group accounted for 14%, and less than 20 years comprised 4% of cases.There was a male predominance, with 32 cases (64%) in males and 18 cases (36%) in females.

TableNo. 1: Distribution of cases as per histopathology diagnosis (n=50)

Histopathology diagnosis	Numberofcases andpercentage
Pleomorphicadenoma	24 (48%)
Warthin'stumor	4 (8%)
Sialadenitis	5 (10%)
Basalcelladenoma	2 (4%)
Myoepithelioma	1 (2%)
Cyst	8 (16%)
KimurasDisease	1 (2%)
Mucoepidermoid carcinoma	2 (4%)
MetastasisofSquamous cell carcinoma	1 (2%)
Adenoidcysticcarcinoma	1 (2%)
Carcinomaex Pleomorphicadenoma	1 (2%)
Total	50 (100%)

The above table shows majority of cases were benign lesions 45 (90%) and 05 (10%) were malignant lesions. Most

common benign lesions were Pleomorphicadenoma 24 (48%) followed by Cyst 8 (16%), Sialadenitis 5 (10%), Warthin'stumor 4 (8%), Basalcelladenoma 2(4%), Myoepithelioma 1 (2%), KimurasDisease 1 (2%), Mucoepidermoid carcinoma 2 (4%), MetastasisofSquamous cell carcinoma 1(2%), Adenoidcysticcarcinoma 1(2%) and Carcinoma ex Pleomorphicadenoma 1 (2%).

Tableno.2 : Showing histopathology diagnosis & cytology discordanc

Benign	**Histopathologydiagnosis**	**Cytologydiscordance**
Pleomorphicadenoma	24(48%)	4(8%)
Warthin'stumor	4(8%)	
Sialadenitis	5(10%)	1(2%)
Basalcell adenoma	2(4%)	
Myoepithelioma	1(2%)	
Cyst	8 (16%)	1(2%)
KimurasDisease	1(2%)	
TotalBenign	45(90%)	6(12%)
Malignant		
Mucoepidermoid carcinoma	2(4%)	1(2%)
MetastasisofSquamous cell carcinoma	1(2%)	
Adenoid cystic carcinoma	1(2%)	
Carcinoma ex Pleomorphicadenoma	1(2%)	
TotalMalignant	5(10%)	1(2%)

Histopathology diagnosis Most common benign lesions were Pleomorphicadenoma 24 (48%) followed by Cyst 8 (16%), Sialadenitis 5 (10%), Warthin'stumor 4 (8%), Basalcelladenoma 2(4%), Myoepithelioma 1 (2%), KimurasDisease 1 (2%), Mucoepidermoid carcinoma 2 (4%), MetastasisofSquamous cell carcinoma 1(2%), Adenoidcysticcarcinoma 1(2%) and Carcinoma ex Pleomorphicadenoma 1 (2%).Cytologydiscordance Pleomorphicadenoma 4(8%), Sialadenitis 1(2%), Cyst 1(2%) and Mucoepidermoidcarcinoma 1 (2%)

Table no.3: Comparison of histological results in 50 cases with FNAC Diagnosis

FNAC diagnosis	**Histologicaldiagnosis**			
		Benign	**Malignant**	**Total**
	Benign	42TN	02 FN	44
	Malignant	01FP	05TP	06
		43	07	50

The above table shows Sensitivity and specificity of FNAC sensitivity was 89%, Specificity 83%, Positive Predictive value 95.45% and Negative Predictive value 83.33%.

Figure 1: Parotid gland swelling diagnosed as mucoepidermoid carcinoma on FNAC with histopathological confirmation

Figure 2: Gross specimen of parotid gland swelling showing irregular grayish brown tissue mass (10x8x4 cm).External surface is congested and variegated.

Figure 3: Gross examination of cut section showing a well-circumscribed, lobulated, firm, tan-white mass.

Figure 4:Protid gland FNAC smear of pleomorphic adenoma showing epithelioid tumor cells in a chondromyxoid and mucinous background. (Diff-Quik stain, 40x)

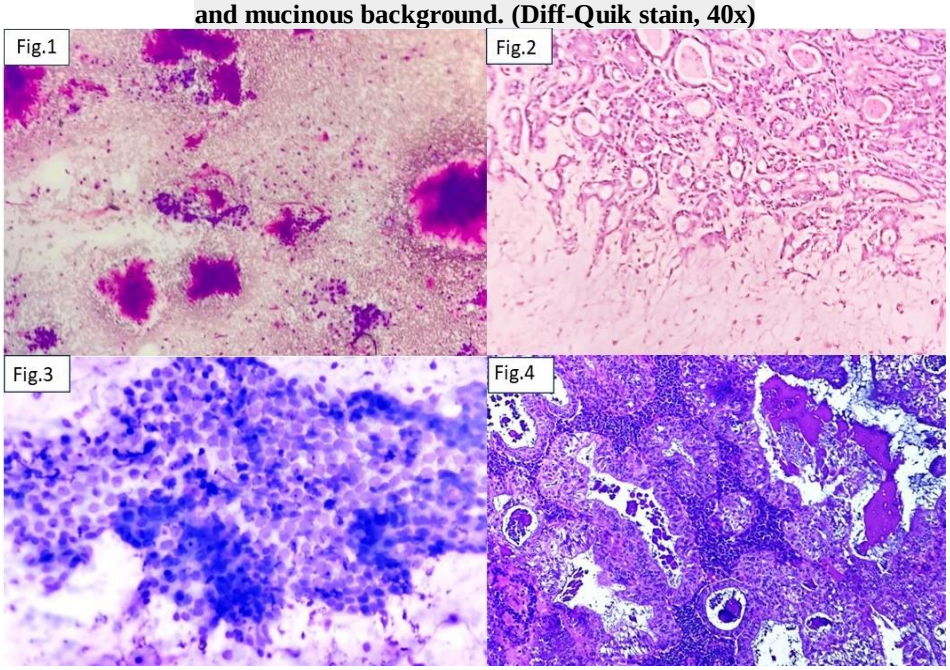

Figure 1: Pleomorphic adenoma- Clusters of ductal and myoepithelial cells with fibrillary stroma. (MGG 100x), 2. Pleomorphic adenoma- Cyst and tubules lined by inner layer of epithelial cells and outer layer of myoepithelial cell scattered within the myxoid stroma. (H & E 100x), 3. Warthin tumor- Monolayered sheet of oncocytic cells with lymphocytes and cellular debris in the background. (MGG 400x), 4. Warthin Tumour - Cystic spaces lined by double layer of surface oncocytic columnar cells with underlying basal cells resting on dense lymphoid stroma. (H & E 400x).

DISCUSSION

Fine needle aspiration cytology (FNAC) is a well-established, minimally invasive diagnostic modality widely used in the evaluation of salivary gland lesions due to its simplicity, rapid turnaround time, and cost-effectiveness. Its role as a reliable preoperative diagnostic tool has been well documented in the literature by Diaz et al. [3] and Frable et al. [4].

In the present study, the majority of patients were in the fourth and fifth decades of life, with a peak incidence in the 41–50years age group. Similar age distribution has been reported by Kambale et al. [17] and Rameeza et al. [18]. A male predominance was observed, which is in concordance with findings reported by Kambale et al. [17].

The present study demonstrated that benign lesions constituted the majority (90%) of cases, while malignant lesions accounted for a smaller proportion (10%), indicating the predominance of benign pathology in salivary gland lesions. Similar observations have been reported by Kambale et al. [17], Tessy et al. [19], and Agravat et al. [20]. Among benign lesions, pleomorphic adenoma was the most common entity, which is in agreement with findings reported by Rosai et al. [5], Lingen et al. [6], and Agravat et al. [20].

The diagnostic performance of FNAC in the present study showed high sensitivity and specificity, along with good positive and negative predictive values. Comparable diagnostic accuracy has been reported by Khandekar et al. [7,21], Kambale et al. [17], and Rameeza et al. [18], supporting the reliability of FNAC in differentiating benign from malignant lesions.

A small degree of cytohistological discordance was observed in a few cases. Similar discrepancies have been documented by Diaz et al. [3] and Song et al. [11], and may be attributed to factors such as sampling error, cystic degeneration, overlapping cytomorphological features and inadequate cellularity. These limitations highlight the importance of careful interpretation and clinicoradiological correlation.

Overall, the findings of the present study are in concordance with previously published literature and reaffirm the role of FNAC as an effective first-line diagnostic modality in salivary gland lesions. Its use facilitates early diagnosis, appropriate treatment planning, and helps in reducing unnecessary surgical interventions.

CONCLUSION

Sensitivity and specificity of FNAC was 89% and 83% respectively,Positive Predictive value 95.45% and Negative Predictive value 83.33%. FNAC is a simple, quick and reliable technique for evaluating suspicious salivary gland lesions. Cytology can distinguish non-neoplastic from neoplastic and benign from malignant lesions. Identifying malignancy preoperative helps in planning an appropriate surgical procedure for the patient. The high accuracy, sensitivity and specificity of FNAC make it an excellent first-line investigation for the evaluation of various salivary gland lesions.

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