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Correlation between cytology and histopathology of the salivary gland

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RESEARCH

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Abstract

Background
Salivary gland swellings can result from tumours, an inflammatory process, or cysts. It can sometimes be difficult to establish whether pathology arises from the salivary gland itself or adjacent structures. Fine needle aspiration cytology (FNAC) is a simple, rapid and safe method to diagnose salivary gland swelling. FNAC has high sensitivity, specificity and accuracy. The aims of this study are to correlate FNAC diagnoses with histopathology and to establish the sensitivity and specificity of FNAC in diagnosis of salivary gland swellings in our institution.

Method
The study was conducted in the department of pathology, Sri Venkateshwara Medical college Hospital and research Centre, Pondicherry, India. Data was collected retrospectively for the time period 2007-2008 and prospectively for that obtained between January 2009 and June 2010. Results of cytologicial assessment were compared with histopathological data where possible to establish sensitivity and specificity of FNAC.

Results
During the study period, 1309 FNAC were undertaken of which 96 FNAC were of salivary gland swellings. Correlation of cytology from FNAC with histopathology tissue was possible in 56 cases. Of the 96 cases for which FNAC data was available, 38.56% were from male and 61.45% were from female patients. The age of the patients ranged from 8 to 69 years. 48.95% cases were benign swellings, 13.54% were malignant, 6.25% were cysts and 31.25% had an inflammatory aetiology. Comparison of FNAC findings with histopathology specimens was available for 56 (58.33%) cases, following which the sensitivity and specificity of cytology were found to be 76.9% and 97.1% respectively.

Conclusion
FNAC is highly sensitive and specific technique for diagnosis of most of the salivary gland swelling. FNAC can be used preoperatively to avoid unnecessary surgery and discomfort associated with open biopsy.

Key Words
Salivary gland, Fine needle aspiration cytology, Histopathology, diagnostic accuracy.

Background

Salivary gland swellings can arise from a number of aetiologies including tumours, inflammatory processes or cysts. Lesions mimicking salivary gland tumours can arise in tissue close to the gland, such as lymph nodes, soft tissue and skin.[1] Clinical examination of the salivary glands can be inaccurate in distinguishing between salivary tumours, an inflammatory process or enlarged lymph nodes.[2] Imaging techniques used in conjunction with clinical examination can provide more accurate information about the size, site, and relationship if the mass with nearby salivary glands. However, imaging alone cannot reveal the exact nature of the lump.[2] Thus, a mass in the region of the salivary glands presents a diagnostic challenge with regards to its site of origin, histological behaviour, and tissue diagnosis. Careful history and clinical examination are required with specific reference to the duration of disease.[3-5.]
Fine needle aspiration cytology (FNAC) is a simple and rapid technique. No expensive instruments are needed.[6] The FNAC procedure is relatively safe, easy to perform and causes little discomfort to the patients.[7.] The single most important factor that determines accuracy is experience of the both pathologist and aspirator.[8]
The aims and objectives of the present study were.

1. To correlate the FNAC diagnosis of salivary glands swelling with histopathology.
2. To find out the sensitivity and specificity of FNAC of salivary gland swelling in our institution.

3. To investigate the discordant cases in detail to establish the source of the errors.

4. To identify the patterns of aetiology of salivary gland swelling in our institution.

Method

The study was conducted in the department of pathology, Sri Venkateshwara Medical college Hospital and research Centre, Pondicherry, India. Data was collected retrospectively between 2007 and 2008 and prospectively between January 2009 and June 2010. A study-specific proforma was prepared for the collection of prospective and retrospective data. All FNAC samples taken over the study period were identified and those performed on a salivary gland were identified and the records were reviewed. Faded slides were restained. The smears were stained using May-Grunewald Giemsa (MGG), Papanicoloau, and haematoxylin-Eosin (H&E) stain. The histopathological and clinical profiles were obtained with the help of a histopathological request form and the central record section of the institute. Demographic and diagnostic information was identified and recorded and, where available, the diagnostic information from FNAC was compared with that from histopathological investigation to establish correlation of the results. Where diagnoses differed between the two samples, the cases were reviewed in more detail to establish possible underlying reasons for this discordance.

Results

During this period total 1309 FNACs were performed in the department of which 96 FNACs were on salivary gland swelling. Salivary gland swellings had been aspirated by a pathologist using a 21-23 gauge needle. Of all the FNACs undertaken, 37 (38.56%) were from male patients and 59 (61.45%) were from female patients. Patient ages ranged from 8 to 69 years. Of the 96 FNAC samples 47 (48.95%) cases were diagnosed as being benign, 13 (13.54%) as malignant, 6 (6.25%) as cysts and 30 (31.25%) were inflammatory. (Table No.1)

Table 1
Diagnosis of salivary gland swelling on FNAC

Lesions	No. of cases	% of cases
Neoplastic Benign Malignant	 47 13	 48.95 13.50
Inflammatory	30	31.25
Non-neoplastic cyst	6	6.25
Total	96	100

The most common salivary gland to be examined by FNAC was the parotid (n = 76; 79.16%) followed by the submandibular gland (n = 18; 18.75%) and the remaining samples were from other minor salivary glands (n = 2; 2.8%) other minor salivary glands. (Table No. 2)

Table 2
Distribution of subjects by age, sex and site of lesion

Age (Yrs)	Sex			Site of lesion		
	M	F	Total	Parotid	Submandibular	Minor S gland
01-10	00	03	03	02	01	00
11-20	04	07	11	09	02	00
21-30	12	15	27	22	04	01
31-40	16	24	40	31	08	01
41-50	04	07	11	09	02	00
51-60	01	02	03	02	01	00
61-70	00	01	01	01	00	00
Total	37	59	96	76	18	02
%	38.56	61.45	100	79.16	18.75	02.80

FNAC-diagnosed benign lesions were most common in young adult between 20-40 years with a female predominance. The commonest benign tumour was pleomorphic adenoma (n = 47; 48.95%) followed by warthin's tumor (n = 4; 4.16%), capillary hemangioma (n = 2; 2.08%) and lipoma (n = 1; 1.04%). (Table No. 3)
Most of the malignant tumours were diagnosed in patients between the ago of 45-69 year with a male predominance. The most common malignancy was an adenoid cystic carcinoma followed by mucoepidermoid carcinoma, acinic cell carcinoma, carcinoma with sebaceous differentiation and metastatic tumour. (Table No. 3)

Table 3
Spectrum of salivary gland lesions

Diagnosis	Cytopathology (n = 96)	Histopathology (n = 56)
Benign	*47*	*34*
Pleomorphic adenoma	38	28
Basal cell adenoma	02	02
Warthin's tumor	04	03
Vascular tumor	02	01
Lipoma	01	00
Malignant	*13*	*10*
Adenoid cystic carcinoma	08	04
Mucoepidermoid carcinoma	04	03
Acinic cell carcinoma	01	01

Pleomorphic adenoma Ex carcinoma	00	01
Metastatic tumors	00	01
Inflammatory	*30*	*6*
Non- neoplastic cyst	*06*	*6*
% histopathology available	100	58.33

The histopathology was available in 56 (58.33%) cases for correlation with cytological diagnoses in our study. Disconcordant results between cytological diagnoses compared with histopathological diagnosis were observed in four cases. One case diagnosed by histopathological assessment as carcinoma ex pleomorphic adenoma was diagnosed as pleomorphic adenoma by FNAC. One case diagnosed as pleomorphic adenoma by histopathology was diagnosed as muco-epidermoid carcinoma on cytology. One case of adenoid cystic carcinoma was misdiagnosed by FNAC as a pleomorphic adenoma and one case of metastatic malignant melanoma was diagnosed as chronic sialoadenitis by FNAC. (Table No. 4)

Table 4

Cases with discordant in cytohistopathological diagnosis

S.N.	Cytological diagnosis	Histopathological diagnosis
01.	Pleomorphic adenoma	Carcinoma Ex with Pleomorphic adenoma
02	Mucoepidermoid carcinoma	Pleomorphic adenoma
03	Pleomorphic adenoma	Adenoid cystic carcinoma
04	Chronic sialoadenitis	Metastatic malignant melanoma

The study shows one false positive report for cancer but false negative results for cancer were seen in three cases. Thus the sensitivity and specificity of FNAC were calculated as 76.9% and 97.1% respectively.

Discussion

Fine needle aspiration cytology (FNAC) of the salivary gland is a commonly accepted, sensitive and specific technique in the diagnosis of both neoplastic and non neoplastic lesions of the salivary gland.[9]

In our study the age of the patients ranged from 8-69 year with mean age of 34.6 years. The 67 (69.79%) maximum numbers of cases investigated by FNAC were seen between ages of 21-40 year. This is similar to other studies.[10, 11, 12.]

In our study, the male to female ratio was 1.0:1.4. The results of previous studies are variable. Some of the studies show female preponderance where as others shows slight excess in male but sex differences are not significant. [10, 12, 13]

The parotid gland was the commonly studied gland in the present study, next in frequency was the submandibular glands and then the minor salivary gland. Similar observations were made by previous studies.[13, 14.]

In the present study, 60 cases were diagnosed as FNAC as being neoplastic conditions in which 47 (78.33%) benign and 13 (21.66%) were malignant. This was comparable with other studies, 80% benign vs 20% malignant[15] and 75.9% benign vs 14.6% malignant.[16]

In our study 13 cases (13.5%) were diagnosed by FNAC as being malignant in which adenoid cystic carcinoma were most common malignancy[17] and other were mucoepidermoid carcinoma, Acinic cell carcinoma, carcinoma with sebaceous differentiation and metastatic malignant melanoma.

In our study 31.25% cases were diagnosed by FNAC as being inflammatory while Goh and Sethi[18] showed 53.7%, which is very high and Ashraf A et al[14] shows 12% in their studies.

There were 6 (6.25%) cases diagnosed by FNAC as non-neoplastic cysts in our study and previous studies results are comparable to this; for example 10 (9%) cases in Arshad et al[19] and 3 (7.5%) cases in Akhtar J et al.[9]

Disconcordant diagnoses between cytology and histopathology results were observed in four cases. First case of disconcordent in cytopathology and histopathology diagnosis was, one case of Carcinoma ex pleomorphic adenoma was diagnosed as pleomorphic adenoma on cytology. This is a significant misdiagnosis as this is an extremely aggressive malignant tumour.[20] The main problem in the diagnosis of this case (S.N. 01 Table 4) was the lack of a representative sample. This problem has previously been highlighted by Klijanienko et al[21] who found that carcinoma ex pleomorphic adenoma has the highest false negative rate (35.3%) of all malignant salivary gland tumours.

One case of pleomorphic adenoma was diagnosed as mucoepidermoid carcinoma on cytology. Myxoid ground substance of pleomorphic adenoma can be mistaken for epithelial mucus if only pap staining is used. Aspiration of mucoid paucicellular fluid may suggest low grade mucoepidermoid carcinoma or mucoepidermoid carcinoma arising in pleomorphic adenoma.[22] Multiple sampling is important to overcome problems of misdiagnosis due to selective sampling.

One case of adenoid cystic carcinoma was diagnosed as pleomorphic adenoma. This may be because of the fibrillar stromal component and uniform epithelial cells which both led to the misdiagnosis of pleomorphic adenoma but is a characteristic of adenoid cystic carcinoma too.[23, 24]

Image 1
Adenoid cystic carcinoma biopsy, H&E stain at 400X

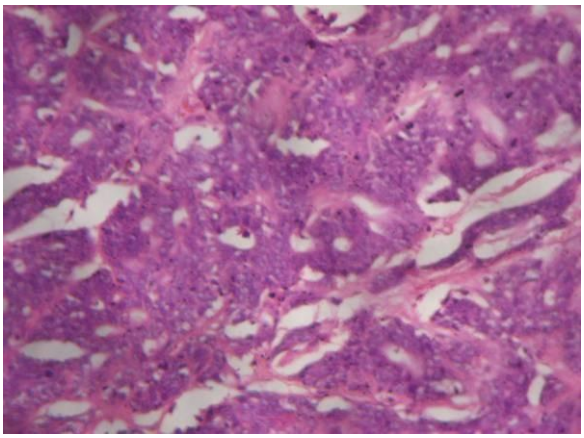
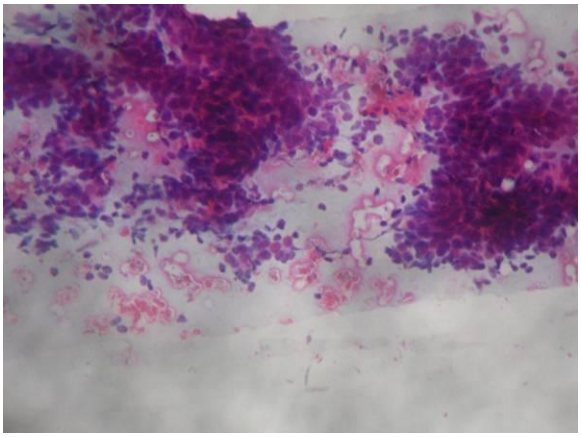


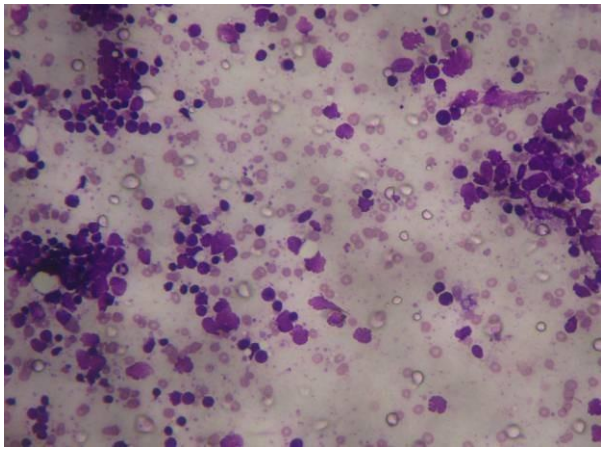
Image 2
Pleomorphic adenoma onFNAC, H&E stain at 400X



Cytological detail should be carefully examined i.e. scanty cytoplasm, high nucleus to cytoplasm ratio, naked nuclei, nuclear moulding and nuclear hyperchromasia to avoid erroneous diagnosis.[25]

One case of metastatic malignant melanoma wasdiagnosed as chronic sialoadenitis on cytology. Surgeons sent the sample with a clinical diagnosis of carcinoma without full clinical evaluation. On histopathology the finding of melanocytes raised suspicion of malignancy and the surgeons were asked to revaluate patient again. On revaluation surgeon found malignant melanoma nodule over the jaw which was neglected earlier.[26] This illustrates the need for careful and thorough clinical examination in all salivary gland swellings.

Image 3
Chronic sialoadenitis on FNAC, H&E stain at 400X



In our study the sensitivity and specificity of FNAC was 76.9% and 97.1% respectively which match with the results of previous studies of around 90% and 100%.[3, 4, 5, 9, 27, 28, 29]. (Table No.5)

Table No. 5
Diagnostic accuracy of FNAC of Salivary gland tumours

Study	Number of cases	Sensitivity %	Specificity %
Person and Zettergren[27]	216	87.5	99.4
Webb[28]	38	100	96.2
Qizilbash and Young[29]	155	90.7	98.0
Akhter J[9]	22	90	100
Present study	56	76.9	97.1

Malignancy should be suspected and followed by the surgical excision only in the case of numerous atypical cells associate with the absence of chondromyxoid stroma.[30]
Presence of the numerous keratin debris or mucoid material may be mistaken for keratin containing cyst, squamous cell carcinoma, or mucoepidermoid carcinoma and biopsy is essential to confirm our diagnosis.[31]
Darvishian et al suggest that the presence of pleomorphism, coarse chromatin, prominent nucleoli, mitotic figures, and necrosis are observed exclusively, in malignant myoepithelial lesions and the presence of any of these features may warrant a more aggressive surgical approach, and wide excision and lymph nodes dissection should be considered.[32] The distinction between basal cell adenoma and the solid variant of adenoid cystic carcinoma may sometimes be impossible without clinical correlation and/or surgical resection specimen.[33]
Finally, we can say that knowledge of cytological overlaps and pitfalls of salivary glands FNAC should always be considered. Details of clinical information and radiologic features may help the pathologist to arrive at the appropriate diagnosis and reduce false interpretation.[34]

Conclusion

FNAC is highly sensitive and specific technique for diagnosis of most salivary gland swellings. FNAC can be used preoperatively to avoid unnecessary surgery and the discomfort of open biopsy. Care should be taken in reporting of cystic and inflammatory lesions. Multiple sampling from different parts of swelling enhances diagnostic accuracy. It is mandatory to use FNAC as preliminary investigation and it should always be used in conjunction with thorough clinical history, physical examination and ultrasonography to reach correct diagnosis.

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