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CYTOLOGICAL ANALYSIS OF SALIVARY GLAND LESIONS WITH HISTOPATHOLOGICAL CORRELATION

N.Sangeetha*[1], V.Karthika[2] and S.Latha[3]

[1]Department of Pathology, Govt Stanley Medical College, Chennai, Tamil Nadu, India

[2]Department of Pathology, Govt Thanjavur Medical College Hospital, Thanjavur, India

*Corresponding Author Email: sangeetha.nedumaran@gmail.com

ABSTRACT

A swelling involving the salivary glands may be as a result of inflammation, cyst or neoplasms. Primary carcinomas of salivary glands are uncommon, accounting for less than 0.3% of all cancers. Aim of our study was cytological analysis of salivary gland lesions with Histopathological correlation, and the diagnostic pitfalls of fine needle aspiration cytology [FNAC] were analysed, to identify the causes for the misdiagnosis and to propose the possible ways for correction of those misdiagnosis. Out of the 83 cases taken for study, 58 cases had cytological correlation. FNAC was done with 10cc disposable syringe [25G needle]. Cytology smears were wet fixed in isopropyl alcohol and stained with Hematoxylin and Eosin. The sensitivity, specificity and diagnostic accuracy in detecting benign tumors were 93.75%, 92.31% and 94.74% respectively and in detecting malignant tumors were 76.92%, 100% and 94.74% respectively. In our study, a sufficiently high accuracy was achieved by FNAC and this can be a useful guide in making decisions for further management in patients with salivary gland lesions.

KEY WORDS

Salivary glands, neoplasms, sensitivity, specificity, accuracy.

INTRODUCTION

Of all the tissues in the human body perhaps the salivary glands have the most histologically heterogeneous group of tumors and the greatest diversity of morphological features among their cells and tissues. A swelling involving the salivary glands may be as a result of inflammation, cyst or neoplasms. Primary carcinomas of salivary glands are uncommon, accounting for less than 0.3% of all cancers. Epithelial tumors constitute about 80-90% of all salivary gland tumors with the majority being benign [75%], and pleomorphic adenoma is the commonest [65%] of all tumors, while malignant tumors account for 21-46% of all tumors.

The nature of the lesion cannot be determined on clinical examination and therefore pathological examination is required for definite diagnosis in suspected cases of neoplastic diseases. Fine needle aspiration cytology has emerged as an effective and sensitive technique in the diagnosis of salivary gland lesions. It is risk free, rapid, simple and inexpensive technique. Salivary glands are not subjected to incisional biopsy or core needle biopsy because of possible risk of causing fistula or tumor implantation through the disrupted capsule.

In the present study, the utility of FNAC in the diagnosis of salivary gland lesions were studied by correlating the cytological findings with the histopathological features. Diagnostic accuracy, specificity and sensitivity were evaluated, and the diagnostic pitfalls of FNAC were analyzed, to identify the causes for the misdiagnosis and to propose the possible ways for correction of those misdiagnosis.

MATERIALS AND METHODS

Patients presenting with signs and symptoms of salivary gland enlargement in Thanjavur medical college hospital, Thanjavur during the period of three

years were included in this study, irrespective of the age group and sex. FNAC was done with aseptic precautions by using 10cc disposable syringe [25G needle] after prior consent. Cytology smears were wet fixed in isopropyl alcohol for Hematoxylin and Eosin stain and PAP stain, and air dried for Giemsa stain.

All the surgical specimens received in the Department of Pathology were fixed in 10% neutral buffered formalin. Grossing of the specimens were done with utmost care, noting the size of the lesion, whether they have circumscribed or infiltrative borders and presence of cystic changes were noted with special attention to the number of cysts, single or multiple, appearance of the surface, color of the walls, presence of papillary projections into the lumen of the cyst wall. All the suspicious areas were grossly sectioned and subjected to histopathological examination. Sections were processed as small sections of 2-3 mm in thickness in the automatic tissue processor and processed in a routine way.

Sections of 5µ thickness were cut and stained with Hematoxylin and Eosin, and in doubtful cases slides were submitted for special histochemical stains such as PAS. Pre-operative FNAC results were then compared with the definitive histopathological diagnosis. The sensitivity, specificity and diagnostic accuracy in diagnosing salivary gland lesions were calculated.

OBSERVATION AND RESULTS

The study included 43 females and 40 males with male to female ratio of 1:1.075. Among the 83 cases 58 cases had histopathological correlation. Out of the 58 cytological smears, non neoplastic lesions were seen in 15 cases. 12 of them were chronic sialadenitis and one was Kimura's disease and two cases were non neoplastic cyst. Benign salivary gland tumors were seen in 33 cases; out of these 29 cases were pleomorphic adenoma, 3 cases were Warthin's tumor, and one case of basal cell adenoma. Malignant salivary gland tumors were seen in 10 cases. Among them, mucoepidermoid carcinoma was reported in 5 cases, adenoid cystic carcinoma in two cases, carcinoma ex pleomorphic adenoma in two cases and adenocarcinoma in one case.

In the present study 28 cases were cytologically diagnosed as pleomorphic adenoma. Among them 27 cases were subsequently confirmed by histopathological examination. One case was reported as pleomorphic adenoma but histopathological diagnosis was carcinoma ex pleomorphic adenoma. Three cases reported as Warthin's tumor in cytology, was later confirmed by histopathology. One case reported as cystic lesion in cytology was diagnosed as cystadenoma by histopathology. One case reported as basal cell adenoma in cytology, turned out to be basal cell adenocarcinoma by histopathological study.

Among 5 cases given as mucoepidermoid carcinoma in cytology, 3 cases were confirmed by histopathology and the other two cases were carcinoma ex pleomorphic adenoma and salivary duct carcinoma. 2 cases of adenoid cystic carcinoma and two cases of carcinoma ex pleomorphic adenoma diagnosed by cytology were later confirmed by histopathology.

Of the 15 cases of non neoplastic lesions diagnosed by cytology, 13 were confirmed with histopathology. Two cases were reported as cystic lesions in cytology but one was found to be mucoepidermoid carcinoma and the other cystadenoma by histopathology.

Of the 58 cases in cytology the sensitivity, specificity and diagnostic accuracy in detecting benign tumors were 93.75%, 92.31% and 94.74% and for malignant tumors were 76.92%, 100% and 94.74% respectively. For non neoplastic lesions, sensitivity specificity and accuracy were found to be 100%, 95.45% and 96.49% respectively [**Table-1**].

Table 1: sensitivity, specificity and accuracy of salivary gland lesions

SALIVARY GLAND LESIONS	SENSITIVITY	SPECIFICITY	ACCURACY
BENIGN	93.75%	92.31%	94.74%
MALIGNANT	76.92%	100%	94.74%
NON NEOPLASTIC	100%	95.45%	96.49%

DISCUSSION

In the present study, cytological diagnosis of pleomorphic adenoma was done in 28 cases, among them 27 cases were subsequently confirmed by histopathology. One case diagnosed as pleomorphic adenoma in cytology was later found to be a carcinoma ex pleomorphic adenoma in histopathology. Sampling error is the possible explanation for that particular case. This can be avoided by taking adequate samples and aspiration at multiple sites.

One case of cystadenoma of parotid was reported as cystic lesion in cytology. Layfield L.J and Gopez E.V[1] [2002] stated that FNA of cystic aspirates yield watery or mucoid material, frequently of low cellularity. The cellular component within the fluid obtained from these lesions may be scant or absent making cytologic diagnosis difficult and at times, impossible. Careful attention to the cellular elements present often allowed definitive cytologic diagnosis, with an overall accuracy of 84%. According to Mukunyadzi[2] [2002] reaspiration of residual solid mass in cystic lesions should avoid the misdiagnosis of cystic lesions of salivary glands.

The probable cause of error in our case was due to the presence of mucinophages in a mucoid background without an epithelial component. This is avoided by reaspiration of residual mass in cystic lesions. Cystic aspirates should be interpreted with caution.

Among five cases reported as mucoepidermoid carcinoma in cytology three were confirmed by histopathology as mucoepidermoid carcinoma. One case was found to be a carcinoma ex pleomorphic adenoma and another was salivary duct carcinoma in histopathology. One case reported as cystic lesion in cytology was later found to be a mucoepidermoid carcinoma by histopathology.

Mukunyadzi[2] [2002] stated that in any cystic lesions, the residual mass, following initial aspiration, should be reaspirated and careful search for a mixture of mucous cells and intermediate cells should avoid the misdiagnosis of mucoepidermoid carcinoma. Al-Khafaji et al[3] stated that most common false negative interpretation of mucoepidermoid carcinoma is due to dilution of tumor cells by mucoid fluid and bland looking intermediate cells.

The most probable cause of error in our case was due to fluid dilution of tumor cells and failure to observe the intermediate cells. This could be avoided by reaspiration of the residual mass and careful search for mucous and intermediate cells. The cystic aspirates should be interpreted with caution.

Among four cases reported as carcinoma ex pleomorphic adenoma in histopathology two cases were reported as carcinoma ex pleomorphic adenoma in cytology. One was reported as pleomorphic adenoma and other was reported as mucoepidermoid carcinoma in cytology.

Review of the cytological smear which was misdiagnosed as pleomorphic adenoma showed no evidence of malignancy, which was therefore categorized as a sampling error rather than interpretative error as observed by Jerzy Klijanienko et al[4].

One case of salivary duct carcinoma in histopathology was reported as mucoepidermoid carcinoma in cytology. In our study review of the cytological smear showed tumor cells arranged in papillary and cribriform pattern associated with necrosis. Thorough examination of the cytological smear looking for the specific patterns and associated necrosis may prevent the misdiagnosis of salivary duct carcinoma.

One case of basal cell adenoma reported in cytology was later found to be basal cell adenocarcinoma. Theodore R.Miller[5] stated that basal cell adenocarcinoma cannot be differentiated from basal cell adenoma by cytology alone and it can only be identified on histological sections by the demonstration of invasion or metastasis. In our case, basal cell adenocarcinoma misdiagnosed as basal cell adenoma since the cytological features of basal cell adenocarcinoma were not seen in the smears and moreover there were no areas of necrosis and mitosis.

The sensitivity, specificity and accuracy in detecting non neoplastic lesions were 100% 95.45 and 96.49% respectively. The reason for low specificity and accuracy in our case was due to reporting of one case of mucoepidermiod carcinoma and another case of cystadenoma as non neoplastic cystic lesions in cytology.

In our study, the sensitivity, specificity and accuracy was 93.75%, 92.31% and 94.74% respectively. Our study correlates with Amena Ashraf et al[10], cohen et al[8] and Stewart et al[7] [**Table-2**].

The sensitivity, specificity and diagnostic accuracy in detecting malignant salivary gland tumors by FNAC in our study was 76.92%, 100% and 94.74% respectively. Our study correlates with Postema et al[15], Muhammed Sohail Awan and Zafar Ahmad[12], Ameena Ashraf et al[10] and Stewart et al[7] [**Table-3**].

Table 2: **Sensitivity, specificity and accuracy of benign salivary gland tumors**

SERIES	SENSITIVITY %	SPECIFICITY %	ACCURACY %
Hughes et al[6] [2005]	73	91	-
Stewart et al[7] [2000]	97	100	97
Cohen et al[8] [2004]	72	93	87
Neil Riley et al[9] [2005]	85	97	-
Ameena Ashraf et al[10] [2010]	98.52	87.05	95
Ming Lim et al[11] [2007]	98.5	87.5	-
OUR STUDY	93.75	92.31	94.74

Table 3: **Sensitivity, specificity and accuracy for malignant salivary gland tumors**

SERIES	SENSITIVITY %	SPECIFICITY %	ACCURACY %
Cohen et al[4] [2004]	73	87	80
Muhammed Sohail Awan and Zafar Ahmad[9] [2004]	74	97	92
Al-Khafeji et al[3] [1998]	82	86	84
Das et al[13] [2003]	60	95	91.1
Stramandinoli et al[14] [2010]	68.2	87.7	82.3
Ameena Ashraf et al[10][2010]	77.77	98.78	95
Stewart et al[7] [2000]	92	100	98
Postema et al[15] [2004]	88	99	96
OUR STUDY	76.92	100	94.74

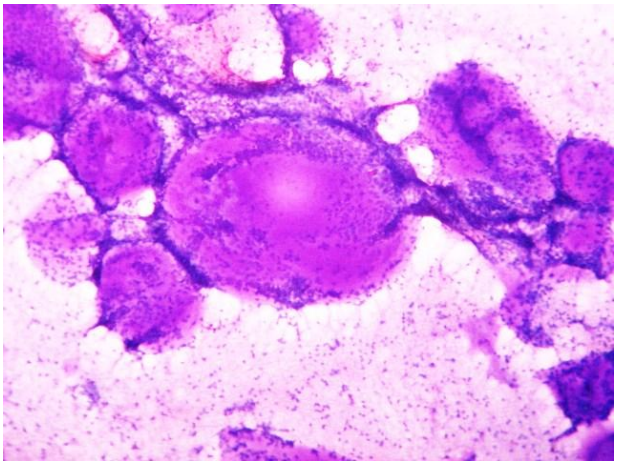

Figure 1

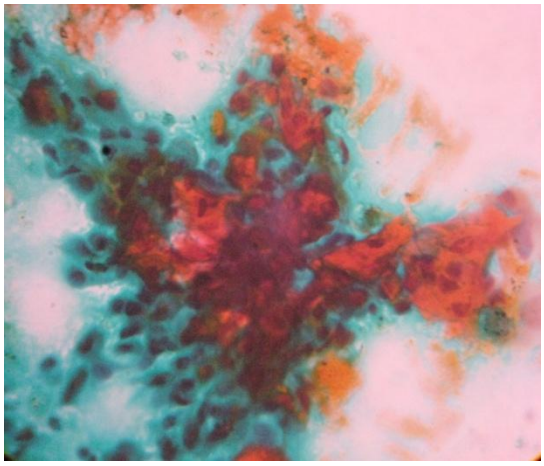

Figure 2

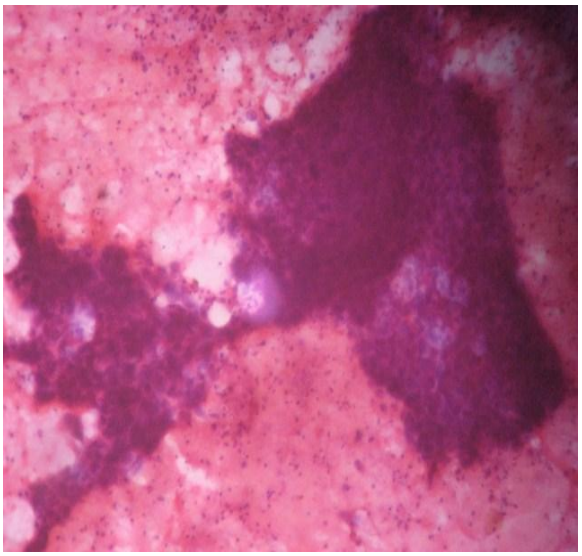

Figure 3

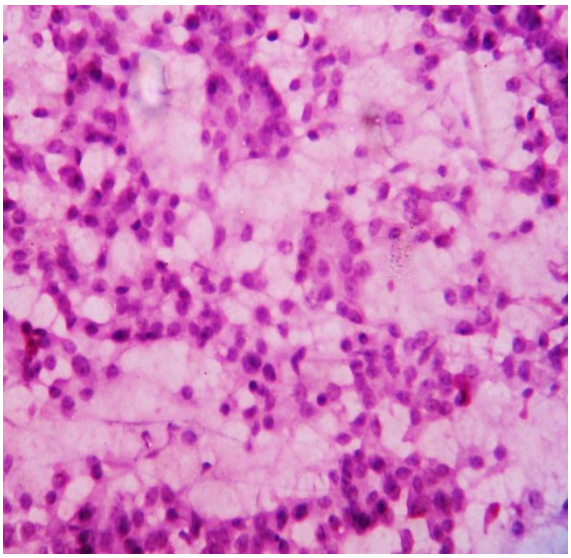

Figure 4

Figure 1 Adenoid cystic carcinoma showing epithelial cells adhering to hyaline stromal globules. Giemsa 10X
Figure 2 Mucoepidermoid carcinoma showing squmaous cells and intermediate cells. PAP Stain 40X
Figure 3 Salivary duct carcinoma showing clusters of malignant epithelial cells in a necrotic background. H & E 10X
Figure 4 Adenocarcinoma NOS showing microglandular arrangement of cells with pleomorphic nuclei. H & E 10X

CONCLUSION

FNAC is a simple, rapid and sensitive technique for the diagnosis of salivary gland lesions. It is a difficult area for the cytopathologist, due to great variety of benign and malignant neoplasms occurring in this site. In the present study, the sensitivity, specificity and diagnostic accuracy in detecting benign neoplasms were 93.75%, 92.31% and 94.74% respectively. In diagnosing malignant tumors, the sensitivity was 76.92%, the specificity was 100% and the diagnostic accuracy was 94.74%. For non neoplastic lesions, sensitivity, specificity and accuracy were found to be 100%, 95.45% and 96.49% respectively. With experience, however, a sufficiently high accuracy can be achieved by FNAC study and this can be a useful guide in making decisions for further management in patients with salivary gland lesions. In an era where advances in technology have added enormously to the burden of health care costs and facilities like ultrasound, Sialography, CT sialography and immune markers are available to aid in the diagnosis of salivary gland tumors. The continued and accelerated use of the FNA cytology has reduced the costs and has released

significant resources for alternate uses, a matter that the pathologists can feel justifiably proud of.

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***Corresponding Author:**
N.SANGEETHA*
Department of Pathology,
Govt Stanley Medical College,
Chennai, Tamil Nadu, India