Research Paper

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Value of Fine Needle Aspiration Cytology in The Diagnosis of Salivary Gland Lesion

MEDICAL SCIENCE

KEYWORDS : FNAC,Salivary gland lesion,Histopathology

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ABSTRACT

Value of Fine needle aspiration cytology in the diagnosis of salivary gland lesions.

Background : Salivary gland lesions represents about less than 2% of tumors in human. They are easily accessible for FNAC and risks of fistula formation or tumor implantation are low compared to surgical biopsy. Cytology can provide distinction between benign and malignant lesions and classify its types.

Methods: Fifty patients were studied prospectively over 1 year. FNAC was done using 10cc syringes and 20-22 gauge needles. Smears are made in the conventional way and stained using May Grunwald Giemsa and Papanicolaou stain. Histopathological examination was done on routine Hematoxylim and Eosin stained paraffin sections. PAS stain was done in selected cases.

Results: 86% of the lesions were neoplastic (58% benign, 28% malignant) 14% is non-neoplastic. Pleomorphic adenoma is the most frequent benign neoplasm while Mucoepidermoid carcinoma is the most frequent malignant neoplasm reported. Among the non neoplastic lesions maximum number of cases are of chronic sialadenitis. In the study FNAC has sensitivity of 82.35% with 3 false negative cases specificity of 100%, positive predictive value 100% and diagnostic accuracy 93.75%.

Conclusion: Our data shows that cytology is a reliable technique to assess lesions of salivary glands. The cytological diagnosis of cysts should be interpreted with caution.

Introduction

Salivary gland lesions are relatively uncommon. Neoplastic salivary gland lesions represent about less than2% of the tumors in human. FNAC is considered to highly sensitive in diagnosis of salivary gland lesions. Purpose of FNAC in salivary gland lesions is to provide the best possible initial assessment in conjunction with clinical & radiological assessment on the basis of which management decision can be taken. FNAC is a safe ,easy and cause little discomfort to patient and carries negligible risk of contamination by tumor cells.

Salivary gland fine needle aspiration represents one of the most challenging areas of cytopathology. This is due in part to the wide range of lesions, both reactive and neoplastic, that can be encountered in the more than 500 salivary glands present in the human body. In fact, histologically and cytologically salivary gland tumours have been described as one of the most heterogeneous groups of human tumors. An additional challenge for salivary gland FNAC is the significant cytomorphologic diversity and overlap between many benign and malignant salivary gland tumours. With all of these hurdles to overcome, it is quite impressive that salivary gland FNAC emerges as an accurate and effective tool for diagnosing this complex group of lesions.

Despite this, FNAC of salivary gland lesions still appears to be underutilized. Factors contributing to this situations are:

1. The rarity of salivary gland tumours make it difficult to collect representative cytology series, resulting in unfamiliarity of clinician and lack of experience of pathologists with this technique.
2. Continuous progress in the histological classification till 2005 limiting the value of large historical series.
3. The lack of correlation between cytological and histological findings in early learning series, giving this technique a bad reputation.
4. Unique use of Papanicolaou stain, which is less informative than the May-Grunwald-Giemsa stain.
5. A trend from fine needle to large core biopsies as a result of professional pressure.

The replacement of 18G needles by finer needles (22 or 27G), the rare complication reported, the growing accuracy and simplicity of the technique have led to a renewed interest in this technique, as reflected by the large number of scientific publications each year.

AIMS AND OBJECTIVES OF THE STUDY

1. To ascertain sensitivity, specificity and diagnostic accuracy of the FNAC procedure in the diagnosis of salivary gland lesions.
2. To establish a cytological diagnosis.
3. To correlate the findings histologically in selected cases.

Inclusion criteria:

1. All salivary gland mass lesions
2. Both male and female
3. All age groups

Exclusion criteria:

1. Patients with bleeding diathesis
2. Extremely uncooperative or agitated patient
3. Skin infection at needle aspiration site.

Literature Survey:

Fine needle aspiration cytology was introduced in 1920s by Martin, Ellis & Stewart at the Memorial Hospital in New York using 18 gauge needles and by Dudgeon & Patrick in St. Thomas' Hospital in London. Both centre reported very encouraging results, but this procedure declined in both the centre 20 years later.

Various studies up till 1999 shows that sensitivity ranges from 62% to 98%, specificity ranges from 85% to 100%, accuracy ranges from 81% to 97%. However these results must be interpreted cautiously, as early Scandinavian series used the Foote and Frazell tumour classification. The benign lesions are now considered to be low grade malignancies. It is therefore possible that a large percentage of cases were misdiagnosed in historical series.

In the year 2000, Klijanienko J, Vielh P[1,2,3,4] ,Batsakis JD, et al. did an extensive cytological study on salivary gland lesions with 1253 number of cases and reviewed many large series and published "Monographs in clinical cytology of salivary gland lesions". They have reported accuracy of FNAC to a particular tumour type for most of the salivary gland tumours because accuracy of cytology varies according to particular tumour type. After considering several large series of Pleomorphic adenoma including their own study, they found that the diagnosis of Pleomorphic adenoma is obvious in typical tumour representing large majority of cases. The suspicious and false positive rates represent 3% of cases. For adenoid cystic carcinoma diagnostic accuracy is found to be 86.2%. False negative results were mainly related to confusion with Pleomorphic adenoma. The diagnostic accu-

racy of Mucoepidermoid carcinoma was found to be low. In their previous study they found that out of 22 cases of low grade Mucoepidermoid carcinoma only 15 was diagnosed as malignancy. It may be because of cystic nature of the sample or failure to recognise intermediate cells. Detailed data about diagnostic accuracy of Mucoepidermoid carcinoma is not available.

In the year 2000, in India, same study was carried out by Jayram G et al.[5,6,7] in Maulana Azad Medical College, New Delhi on 247 patients. Out of these 179 designated as neoplastic and 68 non-neoplastic salivary gland lesions. Based on cytomorphlogical features, both neoplastic and non-neoplastic lesions were subcategorized. Overall diagnostic accuracy of FNAC for neoplastic lesions was 91%, sensitivity for malignant tumours was 87.8% and for benign tumours 100%.

In the year 2007, In Indian Journal of Cytology there was a publication on FNAC of salivary gland lesions-an useful tool in pre-operative diagnosis or a cytopathologist's riddle by M. Kotwal, S. Gaikwag, R. Patil, M. Munshi, S. Bobhate of Government Medical College, Nagpur. They took a total of 101 cases (from January 2004 to June 2005) and cytohistological correlation was made. They found 4 discordant cases. In first 3 cases cytological diagnosis was Pleomorphic adenoma and histological diagnosis were low grade mucoepidermoid carcinoma, squamous cell carcinoma with fibromyxoid stroma and basal cell carcinoma. In the fourth case, cytological diagnosis was low grade Mucoepidermoid carcinoma and histologically found to be benign lymphoepithelial cyst. They have concluded that genuine problems do occur in typing of salivary gland tumours and it is prudent on occasion to limit the cytological report to differential diagnosis.

In July 2009, there was another publication on FNAC of salivary gland lesions with histopathological correlation in the Indian Journal of Otolaryngology and Head and Neck surgery by Khandekar M.M, Kavathar A.N, Patankar S.A, Bagwan I.B, Puranik S.C, Deshmukh S.D from the department of pathology B.J Medical College & Sassoon General Hospital, Pune. They found that among 70 number of cases 80% of the lesions were neoplastic (61% benign, 31% malignant) and 20% were non neoplastic. Pleomorphic adenoma was the most frequent benign neoplasm while Mucoepidermoid carcinoma was the most frequent malignant lesion. Among the non neoplastic lesions, the maximum numbers of cases were of chronic sialadenitis. They found that, FNAC has a sensitivity of 94.54% and specificity of 80.95% for neoplastic lesions. So in their study, FNAC was found to be a useful diagnostic tool in the evaluation of salivary gland lesions because of its simplicity, excellent patient compliance and rapid diagnosis. This cost effective tool is invaluable in planning the surgical management of the patient.

Materials & Methods

Samples for FNAC were collected from patients attending the cytology division in the department of pathology at Silchar Medical College & Hospital with clinical diagnosis of salivary gland mass lesions. CT scan or US guided FNAC were taken for non palpable and deep seated targets to obtain representative samples and to avoid large vessels and other sensitive structures. A total of 50 patients were included in the study for a period of 1 year (from 1stDecember 2009 to 30th November 2010).

PLAN OF STUDY

Initially, a thorough clinical examination and then routine haematological and biochemical investigations were carried out in the cases. Radiological investigation like X-ray, Ultrasonography, CT scan were also available in some cases. Fine needle aspiration was performed in all cases by using a 22 gauge needle with or without aspiration.

In those cases where biopsy was done, the materials were sent for processing for histopathological examination.

Collection of specimen for cytology:

The fine needle aspiration cytology was carried out in the cytology division of pathology department. The aspiration was performed using 22 gauge needles without aspiration or with aspiration attaching to a 10ml plastic syringe. The patient did not require prior anaesthesia.

The details of equipments for aspiration are given below:

- Spirit swab to clean the skin.
- 22 gauge needle (external diameter ranging from 0.6 to 1.8 mm and length ranging from1 to 11/2 inches).
- 10 cc plastic syringe.
- One pair of disposable gloves, Coplin jars.
- A number of 76 x 26 mm microscope slides.
- Marker for labeling.
- Completed laboratory requisition form giving the clinical details.
- 95% alcohol or ether alcohol for fixation (in case of pap staining).
- Local anesthesia in some cases.

TECHNIQUE OF ASPIRATION

The procedure was carried out as described by Zajicek (1974) Bottles et al (1985) and Orell (2005).[9,10,11]

Fine needle aspiration is most conveniently carried out with the patient lying supine in an ordinary examination couch. A clear explanation of the procedure ensures patient's consent and cooperation. The overlying skin is made sterile by swabbing with alcohol (rectified spirit) and antiseptic solution.

FINE NEEDLE SAMPLING WITH ASPIRATION

In this technique needle is attached to a plastic syringe and introduced into the target tissue and the other hand fixes the target tissue. The plunger is pulled to apply negative pressure; needle is moved back and forth inside target. The negative pressure is released while needle remains in target tissue, needle is detached and air drawn into syringe. The sample is blown onto microscopy slides.

FINE NEEDLE SAMPLING WITHOUT ASPIRATION

In this technique needle is inserted into target tissue without attaching to the syringe. The needle is moved back and forth inside target varying the angle and after that needle is withdrawn. Thereafter needle is attached to a syringe and sample is blown onto microscopy slides.

Results & observations

The study work was carried out in the Cytology Section of the Pathology Department, Silchar Medical College & Hospital, Silchar, on 50 cases presenting with salivary gland enlargement who were subjected to FNAC.

Whenever material was available for histopathological examination, the cytologic diagnosis was compared with the histopathological diagnosis, and only those cases which had histopathologic correlation available, were included in calculating diagnostic accuracy.

The results and observations of the present study are shown in following tables:

Cytological Findings

In all the 50 aspirates, smears were adequate. Out of 50 cases 44 cases had rich cellularity and the remaining 6 cases had poor cellularity. The smears with poor cellularity were mainly from cystic lesions.

The cytological diagnosis was made on the basis of accepted cytological criteria (Orell, 2005). Following table shows distribution

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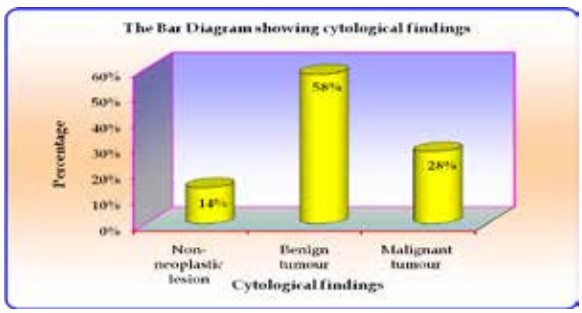
of 50 cases of salivary gland lesions diagnosed by cytological examination.

Table 1: The table shows distribution of 50 cases on cytology

Cytological finding	No. of cases	Percentage
Non-neoplastic lesion	07	14%
Benign tumour	29	58%
Malignant tumour	14	28%

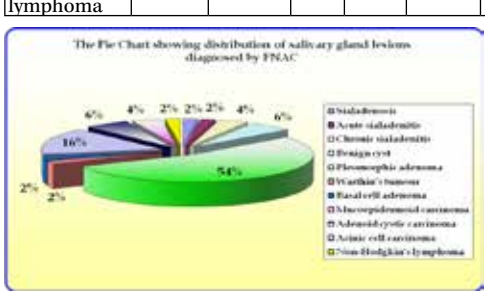
It is evident from the above table that benign tumours constituted maximum number of cases (29 cases, 58%) in this series.



The following table shows distribution of salivary gland lesions diagnosed by FNAC.

Table 2: The table showing distribution of 50 salivary gland lesions diagnosed by FNAC

Cytological findings	Parotid	Submandibular	Sublingual	MSG	Total	Percentage
Non-neoplastic:						
a)Sialadenosis	01				01	02%
b)Acute sialadenitis	01				01	02%
c)Chronic sialadenitis	01		01		02	04%
d) Benign cyst	01	01		01	03	06%
Benign tumours:						
a)Pleomorphic adenoma	19	07		01	27	54%
b)Warthin's tumour	01				01	02%
c)Basal cell adenoma				01	01	02%
Malignant tumours :						
a)Mucoepidermoid carcinoma	04	03		01	08	16%
b)Adenoid cystic carcinoma			01	02	03	06%
c)Acinic cell carcinoma	02				02	04%
d)Non-Hodgkin's lymphoma	01				01	02%



Out of 50 cases, 29 cases were benign tumours, 14cases were malignant tumours and 7 cases were of non-neoplastic lesions. Among 7 cases of non-neoplastic lesions, benign cyst (3cases) was highest in number. Out of 29 benign tumours, pleomorphic adenoma was highest in numbers (27 cases). Mucoepidermoid carcinoma (8 cases) was commonest among all malignant tumours (14 cases). Out of all 50 cases (benign, malignant and non-neoplastic lesion), maximum numbers of cases were found to be pleomorphic adenoma (27 cases, 54%).

Table 3: The table showing Cytohistopathological correlation

Cytological diagnosis	No. of cases	Histopathological correlation available	Consistent	Not consistent
(1) Non-neoplastic				
a) Sialadenosis	01	01	01	00
b) Acute Sialadenitis	01	--	--	--
c) Chronic sialadenitis	02	02	02	00
d) Benign cyst	03	02	01	01
(2) Benign tumours				
Pleomorphic adenoma	27	27	26	01
b) Warthin's tumour	01	01	01	00
c) Basal cell adenoma	01	01	00	01
(3)Malignant trauma				
MEC	08	08	08	00
Adenoid cystic carcinoma	03	03	03	00
Acinic cell carcinoma	02	02	02	00
d) Lymphoma(NHL)	01	01	01	00

In this study, all the malignant cases diagnosed by cytology were found to be consistent with histopathological diagnosis so there is no false positive (FP) case for malignancy.

But there are 3 cases which were diagnosed as benign by cytological examination were later diagnosed to be cases of malignancy on histopathology. So, there are 3 false negative (FN) cases .These cases are Pleomorphic adenoma, Benign cyst, Basal cell adenoma which were later on found to be Adenoid cystic carcinoma, Mucoepidermoid carcinoma and Ameloblastic carcinoma on HPE respectively.

So on final analysis of the present series, there were 14 malignant tumours on cytological diagnosis and histological correlation available in all the 14 cases.

FP (False positive) –NIL
TP (True positive) -14

Similarly there were 36 benign lesions (both non-neoplastic lesions and benign tumours). Out of these 36 cases, histological correlation available in 34 cases.

TN (True negative)-31
FN (False negative)-3

Table 4: The table showing sensitivity, specificity and predictive value of Cytologic results

Cytologic results	Malignant tumours	Benign lesions
Malignant	True positive (TP) – 14	False positive (FP) NIL
Benign	False negative (FN) –03	True negative (TN) - 31

$$\text{Sensitivity} = \frac{TP}{TP + FN} \times 100 = \frac{14}{14 + 3} \times 100$$
$$= 82.35\%$$

$$\text{Specificity} = \frac{TN}{TN + FP} \times 100 = \frac{31}{31 + 0} \times 100$$
$$= 100\ \%$$

$$\text{Positive predictive value} = \frac{TP}{TP + FP} \times 100 = \frac{14}{14 + 0} \times 100$$
$$= 100\%$$

$$\text{Diagnostic accuracy} = \frac{TP + TN}{TP + TN + FP + FN} \times 100$$
$$= \frac{14 + 31}{14+31+0+3} \times 100 = \frac{45}{48} \times 100$$
$$= 93.75\%$$

So, the sensitivity, specificity, positive predictive value and diagnostic accuracy of the study is 82.35%, 100%, 100%, 93.75% respectively.

Complication of Fine needle aspiration procedure:
No complications were encountered in any of the patients who were undergone FNAC throughout the period of the study.

Discussion
FNAC of salivary gland lesions was first introduced by Stewart in 1933. Since then it has gained importance over years and practiced by many experts. It has also gained popularity in India and various reports by different Indian authors have appeared in the Indian literature (Shaha et al[12]., 1990. Jayram[6], 2000). So FNAC of salivary gland lesions is now regarded as a safe and accurate method in the pre-operative diagnosis of the lesions.

The classic features of most salivary gland lesions are so characteristic that they are highly reproducible (Cajulis et al., 1996) and predictive of final histologic diagnosis (Cohen et al[13]., 2000).

FNAC of salivary gland lesions is similar to frozen section in terms of reliability and accuracy (Shintani et al[14]., 1997). A variety of non neoplastic lesions occurs in the salivary glands and FNAC is diagnostic (Tewari et al[15]., 2001).

The diagnostic accuracy of FNAC of salivary gland lesions as compared to intra operative biopsy is equal if not superior. Since FNAC has proven to be so useful in the study of salivary gland lesions, it has become the principal research technique. The choice is motivated by the sensitivity (about 90%, range 81-100%), specificity (about 95%, range 94-100%) and diagnostic accuracy (about 90%, range 61-95%) values reported (Cristallini, 1996).

Although the main object of FNAC of salivary gland masses is to distinguish between benign and malignant lesions often possible (Nettle and Orell[16], 1988). Like any other investigative procedure, Fine needle aspiration has its limitation and diagnostic accuracy is not 100% (Orell, 2005). It can be considered as a quick, reliable, cheap and easy to perform diagnostic procedure with low risk of complications.

In the present study, aspirations were done in 50 cases with salivary gland swelling in the pathology OPD and in minor O.T. under strict aseptic precautions. Aspirations were done using 22 gauge needle with or without attachment to a 10 ml disposable plastic syringe. The procedure was carried out as described by Zajicek (1974), Bottles et al. (1985) and Orell (2005).

Mavec et al.[17] (1964), O' Dwyer[18] (1986), Nettle and Orell[16] (1988), MAS et al. (1990). Cristallini et al.[19] (1996) Jayram[6] (2000). Cohen et al.[13] (2000), all reported that the technique is easy, simple and can be carried out as an outpatient procedure.

In the present study sufficient materials was obtained in all 50 cases. Persson and Zettergreen[20] (1973). Linderg and Akermann[21] (1976). Sismanis et al[22].(1981). O' Dwyer[18] (1986), Mas et al. (1990), Cristallini at al[19]. (1996), Shintani et al.[14] (1997). Tewari et al.[15] (2001), all performed Fine needle aspiration using 22 gauge needle fitted to 10-20 ml disposable syringe and obtained sufficient material.

Cytological Diagnosis:
In our study, Fine needle aspiration was performed in all 50 cases. Out of these, definitive diagnosis by cytological examination was possible in 47 cases. In the remaining 3 cases diagnosis was found to be wrong after correlation with histopathological diagnosis.

In one case, the lesion was cystic, and on aspiration yielded hypocellular fluid like material. Cytological examination revealed clusters and dispersed cystic macrophages only. But on histopathological examination this turned out to be Mucoepidermoid carcinoma, but on review of cytological smears, a cluster of cells which was initially thought as cystic macrophages, later on after HPE interpreted as a cluster of intermediate cells.

This error due to sampling is an agreement with various authors. Persson and Zettergreen[20] (1970) in their report stated that cystic areas in salivary gland tumours occur quite often and complicate the diagnosis by cytology. Orell, 2005 stated that the aspirated fluid from a cystic neoplasm is often poor in cells and nondiagnostic.

Other case, which was diagnosed as Pleomorphic adenoma was found to be Adenoid cystic carcinoma on histopathological examination. This finding is in agreement with various authors. Because of the presence of high cellularity with abundant fibromyxoid material which may be present in Adenoid cystic carcinoma, give rise to confusion with pleomorphic adenoma (Orell). On review of the cytological smears after HPE , it was found that although there were cells with abundant cytoplasm but at many areas cells were having scant cytoplasm with increased n:c ratio & coarse irregular chromatin; and cellular areas with cup shape open at one end was also seen; all these are characteristics of Adenoid cystic carcinoma.

There was another case which was diagnosed as basal cell adenoma was found to be ameloblastic carcinoma on histopathological examination.Cytological smear showed presence of basaloid cells with peripheral palisading and Squamous metaplastic cells which are also the features of ameloblastic carcinoma except the presence of mild nuclear atypia and mitotic figure which were not found in the cytological smear of our case. But the biopsy section showed typical ameloblastic carcinoma with plenty mitotic figures and mild nuclear atypia and CT-scan showed odontogenic origin (initially thought to be originated from minor salivary gland of oral cavity) of the tumour and invasion into the surrounding tissue further confirm the diagnosis. As only few reports of FNAC of ameloblastic carcinoma have appeared in the literature and there is lack of experience of FNAC of odontogenic tumours in our part this error is not the exception .

The diagnosis of various lesions were based on cell characteristic as reported by various authors. Our description of various lesions correlated with that of reports published by Orell 2005, Jayram 2000, Bhatia A[23] 1993, Shaha et al.[12] 1990. Nettle & Orell[16] 1988, Kawasaki et al.[24] 1978.

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Based on cytological diagnosis in the present series, maximum number of cases occupied by benign tumours (58%) followed by malignant tumours (28%) and nonneoplastic lesion (14%).So incidence of benign lesions (72%) was found to be more than malignant tumours (28%.

Diagnostic accuracy:
In the our study, the diagnostic accuracy was calculated by comparing the cytological reports with histopathologic diagnosis of surgically resected specimens. Only those cases which had histopathologic correlation were included when diagnostic accuracy was calculated.

In our study, histopathologic correlation was available in 48 cases out of 50 cases. On final analysis, there were 14 cases of true positive (TP), 31 cases of true negative (TN), no cases of false positive (FP) and 3 cases of false negative (FN). Diagnostic accuracy was expressed in terms of sensitivity, specificity and predictive value. In the present series, sensitivity found to be 82.35%, specificity 100% and predictive value came out to be 100% and overall diagnostic accuracy of 93.75%. The works of various authors showed various results.

Eneroth et al.[27] (1970) reported on 690 cases with 4 cases false positive, 73 cases false negative with sensitivity 64%, specificity 95% and accuracy 89%. Lindberg and Akerman (1976), on a study of 461 cases reported false positive in 10 cases and false negative in 30 cases with an overall accuracy of 81%. Qizillbash et al.[30] (1985) reported on 101 FNACs, where there were no false positive cases, 3 false negative with a sensitivity of 88%, specificity of 100% and overall accuracy being 98%. Shintani et al. (1997) reported on 43 patients with 1 false positive case, 2 false negative cases with diagnostic sensitivity being 88.9%, specificity 94.l % and the accuracy 93%.

Jayram et al. (2000) reported on 247 cases with sensitivity 87.8%, specificity 98% and accuracy 91%. Cohen et al. (2000) reported on 169 cases with diagnostic accuracy of 86.7%. Zbaren et al. (2001) reported on 160 cases with accuracy 96.1%.

These results indicate that FNAC is a highly sensitive and specific screening procedure.

But because of less number of sample size (50) in the present study, as compared to other studies, there is always a possibility of missing the uncommon cases.

Summary & Conclusion
The study was carried out on 50 patients with the clinical diagnosis of salivary gland enlargement in the Department of Pathology. Silchar Medical College & Hospital, Silchar for a period of one year from 1st December 2009 to 30th November 2010. Fine needle aspiration was performed on all 50 patients coming to ENT and Surgery Department of Silchar Medical College & Hospital. Findings of cytological examination were correlated with histopathological diagnosis. Out of 50 cases, biopsy material was available for histopathological examination in 48 cases.

1. After performing the study for a period of one year, the following conclusions are made :
2. : In our institution, cases of salivary gland lesions are not so commonly reported.
3. Diagnostic accuracy of Fine needle aspiration of salivary gland lesions in our study is 93,75%. :
4. In all the aspirations, materials were adequate for cytological diagnosis.
5. In all cases, aspirated materials were stained by May Grunwald Giemsa and Papanicolaou stain. Periodic acid schiff stain was done as and when required. The overall staining was found to be satisfactory.
6. Based on cytological diagnosis, out of 50 cases, maximum numbers of cases were found to are benign tumours (58%) followed by malignant tumours (28%) and then non neoplastic lesions (14%).
7. Among benign tumours, maximum numbers of cases were diagnosed as pleomorphic adenoma, mainly involving parotid followed by Warthin's tumour.
8. Among malignant tumours, maximum number of cases constituted by Mucoepidermoid carcinoma followed by Adenoid cystic carcinoma followed by Acinic cell carcinoma. Mucoepidermoid carcinoma and Acinic cell carcinoma mainly- involved parotid gland, whereas Adenoid cystic carcinoma mainly involved minor salivary glands. Among non neoplastic lesions benign cysts was found to be most common.
9. No complications were recorded in the aspirations carried out on 50 cases.
10. Fine needle aspiration of the salivary glands was done by the procedure as described by Bottle K et al. is safe, reliable and speedy that can be employed as an outpatient procedure.
11. Cytological diagnosis after correlating with histopatholgical examination, found no false positive and 3 false negative case in the ourt study.
12. It is seen that this type of fallacies have been reported in different series.
13. The technique of Fine needle aspiration cytology is a logical extension of the time honoured biopsy procedures. It saves the clinician and patient's time, cost and can be used in conjunction with clinical and radiological findings to provide the best possible initial assessment on which management decision can be based.
14. Considering the high rate of accuracy in almost all series, treatment modalities can be planned and started on the basis of cytological results, till the final biopsy results are available.
15. So Fine needle aspiration cytology can be used as a reliable, cheap, quick and easy to perform pretreatment diagnostic method in the diagnosis of salivary gland lesions with low risk of complications.

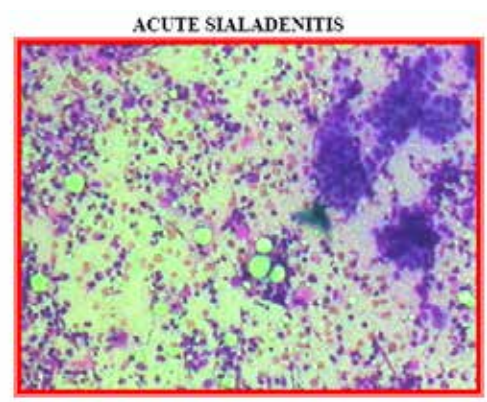

Fig 1: Fragments of duct epithelium with small uniform nuclei in a CHRONIC SIALADENITIS

Fig 1: Chronic sialodenitis, patient presenting with a swelling in the parotid region

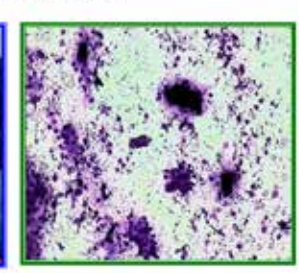

Fig 2: Fragments of epithelium & fibrous stroma in a background of relatively few chronic inflammatory cells & debris (MGG, LP, 10x)

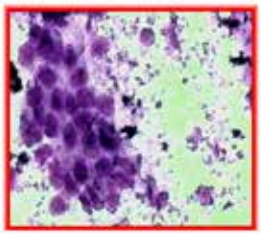

Fig 3: Ductal cells showing mild reactive atypia in chronic sialadenitis (MGG, HP, 40x)

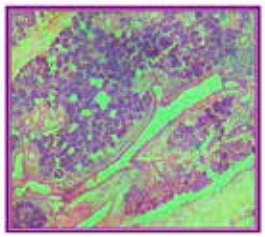

Fig 4: Tissue section showing dilated ducts patchy inflammatory cells & fibrosis in chronic sialadenitis (H&E, Scanner view, 4x)

SIALADENOSIS

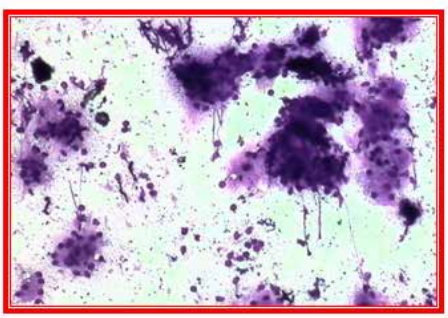

Fig 1: Abundant of normal salivary gland acini with fibrous stroma & plenty naked nuclei (MGG, LP, 10X)

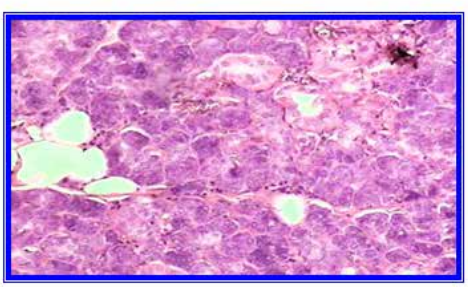

Fig 2: Corresponding tissue section shows normal histology of salivary gland (H&E. LP. 10X)

MUCOUS CYST (MUCOCELE)

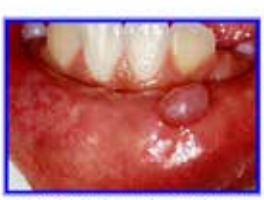

Fig 1: Mucocele: Fluctuant fluid filled lesion on the lower lip (minor salivary gland)

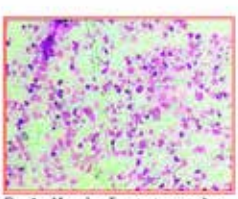

Fig 2: Mucocele: Few cyst macrophage, inflammatory cells & degenerated cells in a mucinous background (MGG, LP, 10X)

NON NEOPLASTIC SALIVARY GLAND CYST

Fig 3: Mucocele: Cyst like cavity filled with mucinous material with surrounding normal salivary gland tissue (H&E, LP, 10x)

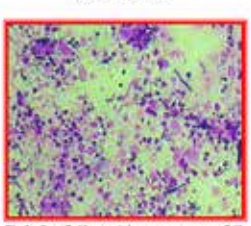

Fig 1: Cyst fluid containing numerous cystoliths in a background of inflammatory cells & degenerated cells suggestive of non-neoplastic cyst (MGG, 10X)

PLEOMORPHIC ADENOMA

Fig 1: Typical presentation of a pleomorphic adenoma of the parotid gland

Fig 2: Pleomorphic adenoma in the submandibular gland of a 10 yrs old boy presenting as well circumscribed slowly growing swelling, an atypical presentation

Fig 3: Atypical presentation of a pleomorphic adenoma, presented as slowly enlarging neoplasm of many years in the minor salivary gland (palate)

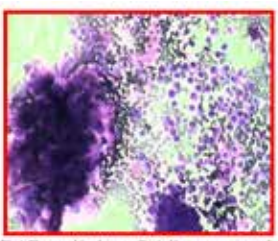

Fig 4: Pleomorphic adenoma: Typical low power pattern of poorly cohesive myoepithelial cells associated with fibromyxoid stroma, some of them are buried in the stroma (MGG, LP, 10x)

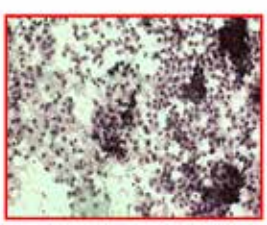

Fig 5: Cellular Pleomorphic adenoma: Cellular smear showing dispersed myoepithelial cells with abundant pale cytoplasm and minimal fibromyxoid stroma (Pap LP, 10x)

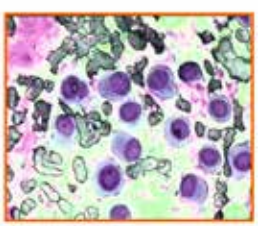

Fig 6: Plasmacytoid appearance with abundant well defined cytoplasm and bland nuclei typical of a myoepithelial cell (MGG, HP, 40X)

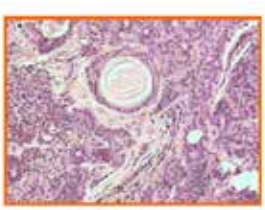

Fig 7: Pleomorphic adenoma Epithelial, myoepithelial cell with a prominent component of squamous epithelial cell & myxoid stroma in tissue section (H & E, LP,10X)

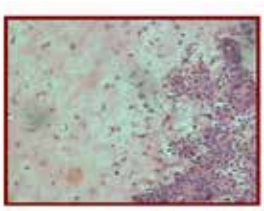

Fig 8: Pleomorphic adenoma: myoepithelial cells melting in a chondromyxoid stroma (tissue section, H & E, LP, 10X)

PLEOMORPHIC ADENOMA

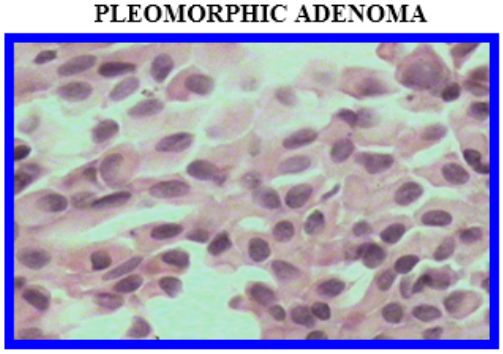

Fig 9: Plasmacytoid nature of the myoepithelial cells in the histology section (tissue section, H & E, HP,40X)

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WARTHIN'S TUMOUR

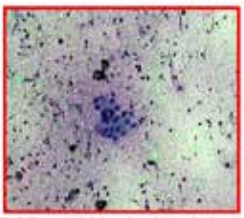

Fig 1: Diagnostic triad of monolayered sheets of uniform oncocytic epithelial cells with small blood nuclei & lymphocytes in a background of proteinaceous material

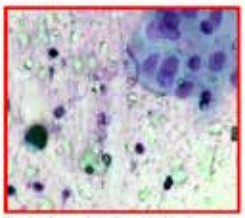

Fig 2: Oncocytic cells with bland nuclei (MGG, HP, 40X)

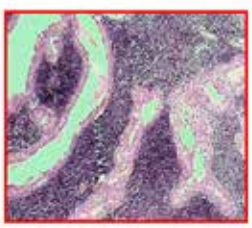

Fig 3: Low power appearance of Warthin's tumour showing prominent lymphocytic component covered by epithelial cell (H&E, LP, 10X)

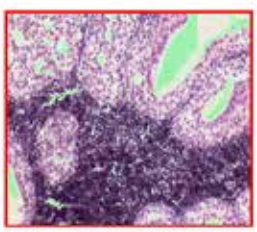

Fig 4: High power of the same tissue section showing tall and oxyphilic epithelial cell (H & E, HP, 40X)

MUCOEPIDERMOID CARCINOMA

Fig 1: A massive mucoepidermoid carcinoma of the parotid gland

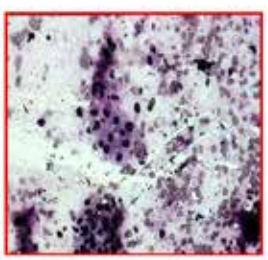

Fig 2: Smear shows a cluster of intermediate cells in a hemorrhagic & dirty background (MGG, LP, 10X)

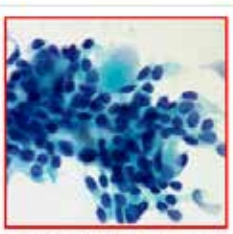

Fig 4: Adenoid cystic carcinoma: The hyaline stromal globules are less striking in pap-stained smears & appear pale (Pap, HP)

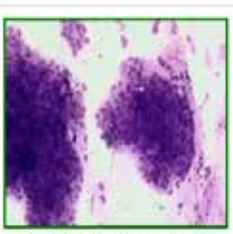

Fig 5: Adenoid cystic carcinoma: Cellular epithelial tissue fragments with a characteristic cup shape open at one end (MGG, LP, 10X)

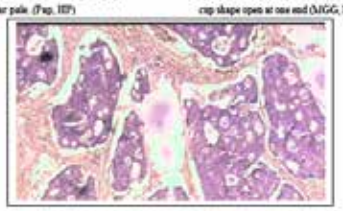

Fig 6: Corresponding tissue section of Adenoid cystic carcinoma (H&E, 4X)

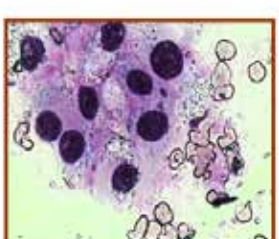

Fig 3: Intermediate cells in high power view, relatively cohesive, have a well defined finely vacuolated cytoplasm & bland nuclei. (MGG, HP, 40X)

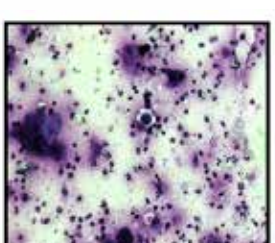

Fig 4: Intermediate and squamous cell in a mucinous & inflammatory background (MGG, LP, 10X). Muco-epidermoid carcinoma

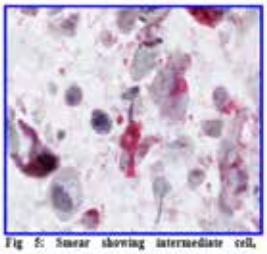

Fig 5: Smear showing intermediate cell, squamous cell and cell with an intracytoplasmic mucin vacuole, diagnostic of mucoepidermoid carcinoma (Pap, HP, 40X)

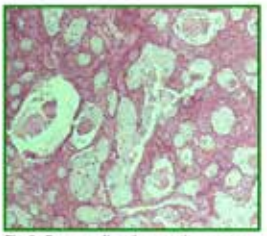

Fig 6: Corresponding tissue section mucous, squamous & intermediate cells can be seen (H & E, LP, 10X)

ADENOID CYSTIC CARCINOMA

Fig 1: Swelling and ulceration of the palate, typical of a minor salivary gland tumour. (Adenoid cystic carcinoma)

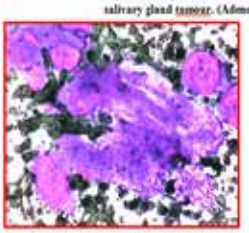

Fig 2: Adenoid cystic carcinoma: Numerous hyaline stromal globule with epithelial cells adhering to the hyaline globules (MGG, LP, 10X)

Fig3: Epithelial cell shows hyperchromatic nuclei & coarse chromatin scant cytoplasm with ↑ N: C ratio (MGG, HP, 40X)

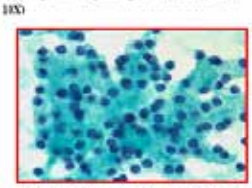

Fig 1: Acinic cell carcinoma: Epithelial fragments composed of cells with abundant vacuolated cytoplasm, resembling normal acinar cells, &, there

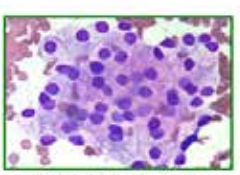

Fig 3: Acinic cell carcinoma: (MGG, HP)

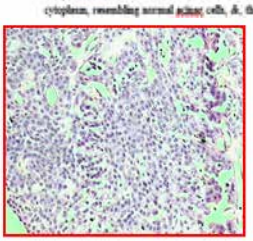

Fig 3: Corresponding tissue section of Acinic cell carcinoma; the cells have abundant basophilic cytoplasm (H & E, LP,10X)

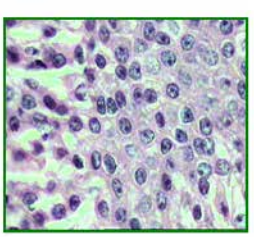

Fig 4: Acinic cell carcinoma, same tissue section in high power (H & E, HP, 40X)

NON-HODGKIN'S LYMPHOMA

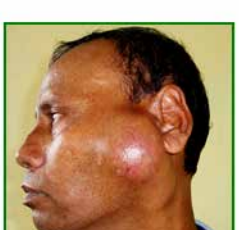

Fig 1: A lymphoma of the parotid gland

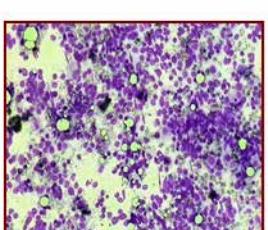

Fig 2: Non-Hodgkin's Lymphoma: Monotonous population of slightly enlarged lymphocytes (MGG, LP, 10X)

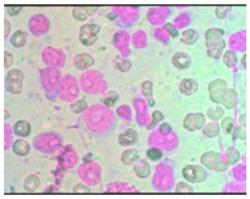

Fig 3: Diffuse large cell type: Individual cells are having prominent nucleoli & basophilic cytoplasm (MGG, HP, 40X)

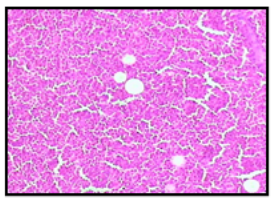

Fig 4: Corresponding tissue section of Non Hodgkin's lymphoma (H&E, 4X)

INCONSISTENT CASES

(1) FNAC diagnosis was benign cyst but after HPE found to be mucoepidermoid carcinoma

Fig 1: Young patient presented with recurrent cystic swelling in the parotid gland due to mucoepidermoid carcinoma

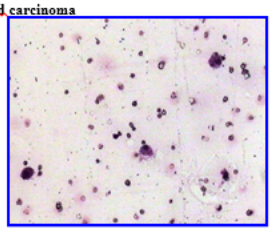

Fig 2: Cyst fluid from the same lesion shows only dispersed cystic macrophages, (MGG, 4X)

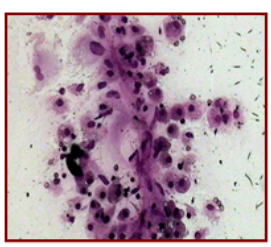

Fig 3: Another slide from the same patient shows a cluster of cells which was initially thought as cluster of cystic macrophages later when on biopsy proved it to be a mucoepidermoid carcinoma, cluster is interpreted as intermediate cells (MGG, LP, 10X)

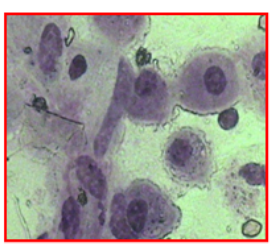

Fig 4: The same cluster on high power shows well defined finely vacuolated cytoplasm and bland nuclear details, the intermediate cell cluster, (MGG, HP, 40X)

(2) FNAC diagnosis was pleomorphic adenoma but after HPE found to be adenoid cystic carcinoma

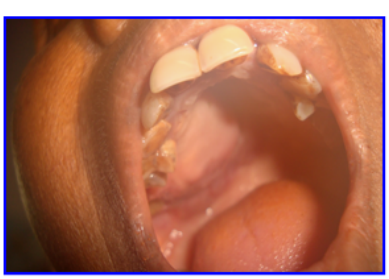

Fig 1: An elderly female presented with swelling in the hard palate (Adenoid cystic carcinoma)

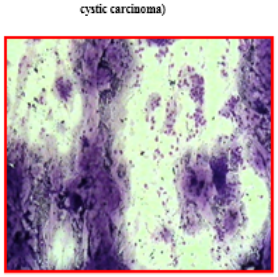

Fig 2: Adenoid cystic carcinoma: Cellular smear with abundant hyaline stroma, at some areas showing finger like projection, some of the cells are having abundant cytoplasm & few naked nuclei seen, initially thought to be pleomorphic adenoma (MGG, LP, 10X)

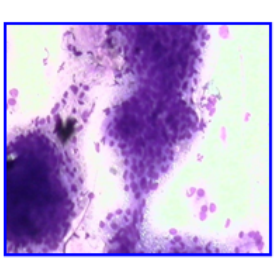

Fig 3: On review after HPE, area like this shows individual cells are having ↑ N:C ratio, coarse clump chromatin which goes in favour of adenoid cystic carcinoma than pleomorphic adenoma (MGG, HP,40X)

(3) FNAC diagnosis was basal cell adenoma on HPE it was found to be Ameloblastic carcinoma

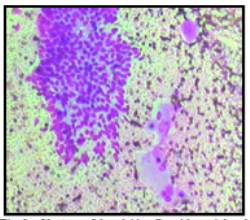

Fig 1: Clusters of basaloid cells with peripheral palisading & squamous metaplastic cells initially thought as basal cell adenoma of minor salivary gland, later on HPE found to be ameloblastic carcinoma (MGG, LP, 10x)

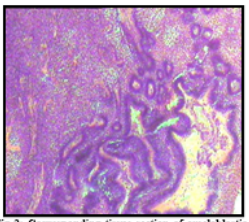

Fig 2: Corresponding tissue section of ameloblastic carcinoma (H&E, LP, 10x)

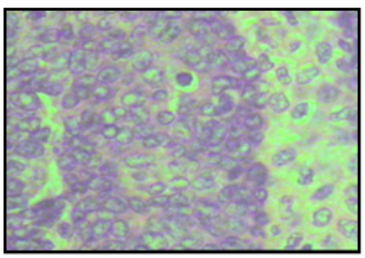

Fig 3: Corresponding tissue section Amel oblastic carcinoma with prominent mitotic figure (H&E, HP40X).
Because of the presence of plenty mitotic figures & mild nuclear atypia; CT-scan evidence of odontogenic origin and invasion of surrounding structure help making diagnosis of Ameloblastic carcinoma

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