RESEARCH PAPER | MEDICAL SCIENCE | Volume : 5 | Issue : 4 | April 2015 | ISSN - 2249-555X

Evaluation of Fine Needle Aspiration Cytology in The Diagnosis of Salivary Gland Lesions and its Correlation with Histopathological Findings

KEYWORDS: Salivary gland lesions, FNAC, Histopathology, Diagnostic accuracy

Dr. Ramesh Chandrakar
MD Pathology, Assistant Professor, Department of Pathology, Government Medical College, Rajnandgaon, Chhattisgarh, India

Dr. Riti Sharma
MD Pathology, Assistant Professor, Department of Pathology, "Government Medical College, Rajnandgaon, Chhattisgarh, India

ABSTRACT *Salivary gland lesions form about 2-6.5% of all head and neck lesions in adults. FNAC is safe, almost painless and cost-effective procedure. Salivary gland tumors are notoriously difficult to categorize because of the diverse morphological patterns and overlapping features, even with standard paraffin preparations, it is sometimes difficult to distinguish benign from malignant disease. So the present study was undertaken to study the cytomorphological features of the various salivary gland lesions and to assess the diagnostic accuracy of FNAC by comparing it with the histopathology. The present prospective and retrospective study was carried out in Pt. J.N.M. Medical College, Raipur (C.G.) India and associated Dr.B.R.Ambedkar Memorial Hospital, Raipur (C.G.) during a period between 1st September 2004 to 31st August 2010. A total of 278 cases included in present series were taken up for the study. FNAC was performed using a 10cc syringe and 20-22 no needle. Out of 278 cases, in 76 cases surgical biopsies were available for histopathological correlation. Data was compiled in MS excel and checked for its completeness, correctness and then it was analyzed. Of the total 278 cases of salivary gland lesions, non-neoplastic lesions were the commonest forming 42.8% of the total number of cases. Benign and malignant salivary gland tumors constituted 37% and 17.9% of all the cases studied. Diagnostic accuracy of FNAC for non-neoplastic lesions, benign and malignant neoplasms were 85.7%, 85.1% and 81.8% respectively. The overall diagnostic accuracy of FNAC in the present study was 84.2%. To conclude, fine needle aspiration cytology is an important diagnostic tool in evaluating salivary gland lesions, considering the results and experiences of the present study.*

INTRODUCTION

Salivary gland lesions form about 2-6.5% of all head and neck lesions in adults.[1, 2] Salivary glands are actively functioning structures at birth and throughout life, which may undergo neoplastic change or be subject to various inflammatory conditions.[3] The diagnosis of salivary glands lesions has often proved tricky because a variety of tumors are seen in the salivary glands, apart from the other causes of enlargement of the salivary glands.

Fine needle aspiration cytology (FNAC) is an outpatient department procedure necessitating neither patient preparation nor general anaesthesia. It is safe, almost painless and cost-effective. FNAC is a useful technique for the evaluation of salivary gland lesions, because of their rather superficial location and easy accessibility.[4] It is now commonly being used with increasing frequency for the preoperative diagnostic work-up of salivary gland lesions. A pre-operative diagnosis by FNAC has several advantages. Better planning of the type and extent of the surgical procedure can be done. The urgency with which it must be performed can be determined. This allows better informed consent, which makes it possible to prepare the patient better, especially psychologically for surgery. This essentially eliminates unnecessary surgery in about 1/3rd of cases.[2,4] Alternatively, chemotherapy or radiotherapy may be preferable for treating patients, particularly if they have metastatic, inoperable or hematopoietic neoplasms. However, it has areas of considerable interpretational difficulties. Salivary gland tumors are notoriously difficult to categorize because of the diverse morphological patterns and overlapping features, even with standard paraffin preparations, it is sometimes difficult to distinguish benign from malignant disease. The diversity manifests among many different tumor types and even within an individual tumor and therefore complicates interpretation.[5] The low-grade cytology of some malignancies and frequent problems of inflammation or cystic change in masses of many types exacerbate this problem.[5, 6]

The present study was undertaken to study the cytomorphological features of the various salivary gland lesions and to assess the diagnostic accuracy of FNAC by comparing it with the histopathology.

MATERIAL & METHODS

The present prospective study was carried out in 60 patients who were selected from those attending the ENT outpatient department as well as indoor patients of the Pt. J.N.M. Medical College, Raipur (C.G.) India and associated Dr.B.R.Ambedkar Memorial Hospital, Raipur (C.G.) during a period between 1st September 2009 to 31st August 2010. A retrospective study was also done from 1st September 2004 to 31st August 2009 and a total of 218 cases were retrieved from the record. Thus all 278 cases included in present series were taken up for the study**.** Ethical considerations were met through institutional ethical committee.

The history was elucidated as per predesigned proforma and the presenting chief complaints were noted in chronological order. Local examination of the swelling was done carefully. A clear explanation of the procedure ensured the patient's consent and cooperation. FNAC was performed using a 10cc syringe and 20-22 no needle. At least six smears were made per patient whenever possible, out of which two were air-dried to be stained with May-Grunwald-Giemsa stain and rest of the smears were immediately fixed in 95% ethyl alcohol to ensure fixation. In fixed smears, staining was done with Papanicolaou and Haematoxylin-eosin stains (H & E).

Out of 278 cases, in 76 cases surgical biopsies were availa-

Volume : 5 | Issue : 4 | April 2015 | ISSN - 2249-555X

ble for histopathological correlation. Histomorphology was assessed on routine H & E stained paraffin sections and the final histopathological diagnosis was compared with the FNAC findings to assess the accuracy of cytodiagnosis. Data was compiled in MS excel and checked for its completeness, correctness and then it was analyzed.

RESULT

Table- I. Year wise distribution of FNAC of salivary gland lesions

Year	Total No. of FNAC done	Salivary gland lesions diagnosed on FNAC
		No.(Percentage)
1st Sept 2004 – 31st Dec 2004	467	08(1.70%)
2005	1517	30(1.90%)
2006	1846	41(2.20%)
2007	1984	50(2.50%)
2008	2086	68(3.20%)
2009	2195	46(2.00%)
1st Jan – 31st Aug 2010	1525	35(2.22%)
Total	11,620	278(2.30%)

Of the total 11,620 FNAC done in six year's period, 278 (2.3%) cases were diagnosed as salivary gland lesions. (Table-I)

Table- II. Cytological categorization of salivary gland lesions

Salivary gland lesions	No. (Percentage)	Total 278 (100%)
Non-neoplastic lesions		
[A] Inflammatory reactive conditions		119 (42.8%)
Chronic sialadenitis	57(47.8%)	
Acute sialadenitis	19(15.9%)	
Granulomatous sialadenitis	05(4.20%)	
Necrotizing sialometaplasia	05(4.20%)	
[B] Benign inflammatory cystic lesion		
Mucocele	06(5.0%)	
Mucus retention cyst	20(16.8%)	
Lymphoepithelial cyst	01(0.8%)	
Sialadenosis	06(5.0%)	
Benign salivary gland tumors		103 (37.0%)
Pleomorphic adenoma	92(89.30%)	
Warthin's tumor	06(5.80%)	
Oncocytoma	02(1.90%)	
Monomorphic adenoma	02(1.90%)	
Myoepithelioma	01(0.90%)	
Malignant salivary gland tumors		50 (17.9%)
Mucoepidermoid carcinoma	18(36.0%)	
Acinic cell carcinoma	11(22.0%)	
Adenoid cystic carcinoma	09(18.0%)	
Undifferentiated carcinoma	03(6.0%)	
Ca ex pleomorphic adenoma	02(4.0%)	
Poorly differentiated carcinoma	03(6.0%)	
Metastatic squamous cell carcinoma	04(8.0%)	
Inadequate		06 (2.1%)

Of the total 278 cases of salivary gland lesions, non-neoplastic lesions were the commonest forming 42.8% of the total number of cases. Chronic sialadenitis was the commonest (47.8%) among them.

Benign salivary gland tumors constituted 37% of the total number of cases. Pleomorphic adenoma (89.30%) was the commonest benign tumor among them.

Malignant tumors comprised 17.9% of all the cases studied and among them mucoepidermoid carcinoma was the commonest. (Table-II)

Table- III. Anatomical distribution of salivary gland lesions

Salivary gland lesions	Parotid Gland	Submandibular gland	Minor salivary glands	Total
	N (%)	N (%)	N (%)	N
Non-neoplastic	72(60.5)	45(37.8)	02(1.6)	119
Benign	82(79.6)	19(18.4)	02(1.9)	103
Pleomorphic adenoma	77(83.6)	15(16.4)	-	92
Warthin's tumor	04 (66.7)	02(33.3)	-	06
Oncocytoma	01(50)	01(50)	-	02
Myoepithelioma	-	-	01(100)	01
Monomorphic adenoma	-	01(50)	01(50)	02
Malignant	36(72)	06(12)	08(16)	50
Mucoepidermoid carcinoma	14 (77.7)	03(16.6)	01(55.5)	18
Acinic cell carcinoma	09 (81.8)	01(9.1)	01(9.5)	11
Adenoid cystic carcinoma	07(77.7)	02(22.2)	-	09
Undifferentiated carcinoma	02(66.7)	-	01(33.3)	03
Ca ex pleomorphic adenoma	02(100)	-		02
Poorly differentiated carcinoma	-	-	03(100)	03
Metastatic squamous cell carcinoma	02(50)	-	02(50)	04
Inadequate	05(83.3)	01(16.7)	-	06
Total	195(70.2)	71(25.5)	12(4.3)	278

Volume : 5 | Issue : 4 | April 2015 | ISSN - 2249-555X

The parotid gland was the commonest site involved constituting of 70.2% cases. The parotid gland was involved in 83.6% of all pleomorphic adenoma cases. The submandibular gland was mostly affected by non-neoplastic lesions (37.8%). The minor salivary glands were mostly affected by high grade carcinomas (16.0%). (Table-III)

Table- IV. Comparative analysis of FNAC and Histopathological Diagnosis of salivary gland lesions

FNAC Diagnosis	Total	Histopathological Diagnosis	
		Concordance	Discordance
Non-neoplastic lesions		06 (85.7%)	01 (14.3%)
Chronic sialadenitis (05)	**07**	04 (80%)	Pleomorphic adenoma (1)
Benign lymphoepithelial lesion (02)		02 (100%)	-
Benign		40 (85.1%)	07 (14.9%)
Pleomorphic adenoma (41)	**47**	36 (87.8%)	Chronic sialadenitis (2) Mucoepidermoid carcinoma (1) Adenoid cystic carcinoma (1) Ca ex Pleomorphic adenoma (1)
Warthin's tumor (05)		03 (60%)	Parotid abscess (1) Acinic cell carcinoma (1)
Monomorphic adenoma (01)		01 (100%)	-
Malignant		18 (81.8%)	04 (18.2%)
Mucoepidermoid carcinoma (07)	**22**	05 (71.4%)	Chronic sialadenitis (1) Pleomorphic adenoma (1)
Acinic cell carcinoma (03)		03 (100%)	-
Adenoid cystic carcinoma (04)		03 (75%)	Pleomorphic adenoma (1)
Undifferentiated carcinoma (02)		01 (50%)	MPNST (1)
Ca ex Pleomorphic adenoma (01)		01 (100%)	-
Poorly differentiated carcinoma (02)		02 (100%)	-
Metastatic squamous cell carcinoma (03)		03 (100%)	-

Table– V. Diagnostic Accuracy of FNAC

Accuracy	No.	Percentage
Overall	64/76	84.2%
Overall for non-neoplastic lesions	06/07	85.7%
Overall for benign tumors	40/47	85.1%
Overall for malignant tumors	18/22	81.8%

Out of 278 cases, in 76 cases surgical biopsies were available for histopathological correlation. Diagnostic accuracy of FNAC for non- neoplastic lesions, benign and malignant neoplasms were 85.7%, 85.1% and 81.8% respectively. (Table-IV & V)

DISCUSSION

Salivary gland lesions have always been of interest to pathologists and surgeons alike. Several cytologic findings overlap a number of diagnoses. This overlap continues to the difficulty of salivary gland cytology and serves to emphasize both the need for excellent specimen collection and the diagnostic limitations of the method.

In the present study, of the 11,620 cases of FNAC done during six years period, 2.3% (278 cases) were diagnosed as salivary gland lesions on cytology.

In the current study, non-neoplastic lesions (42.8%) were the commonest which was in concordance with the findings of Kaur et al[7] and Das et al[2] who also reported a higher incidence of non-neoplastic lesions as 55.8% and 73% cases respectively. Higher proportion of inflammatory lesions in the present study might be related to poor hygiene of the patients. This is also supported by Das et al[2]. In the present study, benign and malignant tumors constituted 37% and 17.9% respeively. This is in concordance with the findings of Zbaren et al[8], Layfield et al[9] and Rodriguez et al[10]. In the current study, inadequate smears were obtained in 2.1% cases due to poor cellularity. Roland et al[11] reported 14.4% FNAC specimens which were inadequate for assessment due to the poor cellularity or quality of material.

In the present study, Pleomorphic adenomas 89.3% (92/103) formed the main chunk of benign lesions. This is in concordance with the studies of Tambwekar et al[12] and Kamal M[13] who reported 85.7% and 87.5% as Pleomorphic adenomas respectively. In the current study, mucoepidermoid carcinoma was the most common malignant tumor constituting 36% cases, followed by acinic cell carcinoma (22%), adenoid cystic carcinoma (18%), and undifferentiated carcinoma (6.0%). This is keeping with the findings of Tambwekar et al[12] and Spitz et al[14] who also reported a higher incidence of mucoepidermoid carcinoma and acinic cell carcinoma as 67.8%, 10.7% and 29.3% and 20.5% respectively.

In the present study, parotid gland was the most common site for all the salivary gland lesions (70.2%), followed by submandibular gland (25.5%) and minor salivary glands (4.3%). This is in keeping with the findings of Dhanalakshami M[15] who observed that salivary gland lesions were more frequently involved in the parotid gland (74.7%), followed by submandibular gland (24.0%) and minor salivary glands (1.3%). Similar findings were observed in the studies of Verma et al[16] and Sengupta et al[17]. In the present study, submandibular glands were more commonly involved by non-neoplastic lesions especially the inflammatory lesions followed by benign and malignant neoplasms. This is in keeping with the observations of Das et al[2] who observed that submandibular gland region was more commonly affected by inflammatory processes (73%), followed by neoplasms (27%).

In the current study, overall diagnostic accuracy of FNAC was found to be 84.2%. This is in concordance with the studies of Hellar et al[18], Kocjan G et al[19] and Zbaren et al[8] who reported diagnostic accuracy to be 85%, 86% and 86% respectively. In the present study, diagnostic accuracy of FNAC for non- neoplastic lesions, benign and malignant neoplasms were found to be 85.7%, 85.1% and

Volume : 5 | Issue : 4 | April 2015 | ISSN - 2249-555X

81.8% respectively which is in accordance with the study of Qizilbash et al[20] who reported diagnostic accuracy rate for benign and malignant lesions to be 89.6% and 80% respectively.

Sampling error accounts for the majority of discordant cases (15.6 %) in salivary gland lesions in the present study. A case of pleomorphic adenoma was misdiagnosed as chronic sialadenitis because of unrepresentative sampling. Two cases of chronic sialadenitis were misdiagnosed as pleomorphic adenoma by FNAC. The lesions aspirated, were poorly and sparsely cellular smear with few inflammatory cells in the background, leading to misdiagnosis. A case of parotid abscess was misdiagnosed as Warthin's tumor on FNAC. The dirty background with a few lymphocytes and occasional cells resembling oncocytes led to the error. Sparse cellularity of smears can increase the difficulty in diagnosis. Borges, A.M. [21] is of the opinion that smears of scanty cellularity should be viewed cautiously.

In the present study, there were 4 false negative cases on FNAC. One case of mucoepidermoid carcinoma (which was well-differentiated) was misdiagnosed as pleomorphic adenoma on FNAC. The bland appearance of the cells in well-differentiated tumor and the abundant mucin led to confusion in the diagnosis. A case of adenoid cystic carcinoma was mistaken for pleomorphic adenoma in the cytology smears. This is because myxoid acellular material can occur in both and the globules of basement membrane material so characteristic of adenoid cystic carcinoma can sometimes be seen in pleomorphic adenomas. One case of carcinoma ex pleomorphic adenoma was mis-diagnosed as a pleomorphic adenoma on FNAC due to sampling error. So sampling from several areas of the tumor is essential to reduce the likelihood of error. A case of acinic cell carcinoma was misdiagnosed as Warthin's tumor on cytology smears. In this case, smears showed an abundance of clusters of bland epithelial cells, some of which had a dense, finely granular cytoplasm resembling that of oxyphil cells. The epithelial cells were admixed with few lymphoid cells. On histopathology, it came out to be acinic cell carcinoma. On reviewing the smears, with the abundance of epithelial cells, there was slight but definite nuclear atypia. Also, lymphocytic infiltration within the tumor contributed for misdiagnosis.

In the current study, there were 3 false positive cases on cytology. One case which was diagnosed as mucoepidermoid carcinoma on cytology was in fact a case of chronic sialadenitis. Sometimes inflammatory lesions may yield mucus, debris, metaplastic squamous cells and glandular cells in a combination which simulates mucoepidermoid carcinoma. Stanley M.W. et al [22] observed that the mucus accumulation and epithelial changes in sialolithiasis are difficult to distinguish from well-differentiated carcinomas, especially when stone fragments are not present in the smears. A case of pleomorphic adenoma was misdiagnosed as mucoepidermoid carcinoma. The error was due to inadequate sampling. Intracellular mucus and squamous cells can occasionally occur in pleomorphic adenomas, causing confusion with mucoepidermoid carcinomas. Therefore, to avoid mistakes, it is important to use criteria of atypical mucinous and squamous components with adequate pleomorphism, nuclear irregularity, and nucleoli to justify the diagnosis of carcinoma. Another case of pleomorphic adenoma was mis-diagnosed as adenoid cystic carcinoma on cytology. This error occurred as it is well known that pleomorphic adenomas may contain areas indistinguishable from adenoid cystic carcinoma. So, several areas of the tumor should be sampled to reduce the likelihood of the error.

One case of 70yr old male presented with a swelling in parotid region diagnosed as undifferentiated carcinoma of salivary gland on cytology came out to be malignant peripheral nerve sheath tumor (MPNST) on histopathology. The fibrillary or myxoid background missed in the smears lead to mis-diagnosis. Endoparotid location is extremely uncommon, causing major differential diagnostic problems on cytologic material of FNAC.

CONCLUSION

The overall diagnostic accuracy of FNAC in the present study was 84.2% which is at par with other studies. FNAC is gaining popularity in the pre-operative diagnosis of salivary gland lesions and in detecting malignancy in its early stages. This also helps to plan the therapeutic strategy. With experience in preparing and interpreting the smears, the chances of error will come down.

Proper sampling of the lesions and adequate cellularity are the pre-requisites for an accurate diagnosis. The principal causes of error in this study were inadequate aspirate and improper sampling of the lesions. The variability of histological patterns within the same tumor, which is particularly common in pleomorphic adenomas, is an important problem in FNACs which can only be partly overcome by multiple samplings.

To conclude, fine needle aspiration cytology is an important diagnostic tool in evaluating salivary gland lesions, considering the results and experiences of the present study. The amount of research going on in this field and the improving results, along with the simplicity, rapidity and cost effectiveness of this technique, predict a widespread implementation of FNAC in the years to come, in the pre-operative diagnosis of salivary gland lesions.

REFERENCE

1. M.M.Khandekar et al, FNAC of salivary gland lesions with histopathological correlation, Indian journal of Otolaryngology Head Neck Surg 2006; 58:3; 246-248. | 2. D.K.Das, M.A.Petkar, Z A Sheikh et al, Role of FNAC in diagnosis of swellings in salivary gland lesions, Med Princ Pract 2004, Mar-Apr-13(2): 95-106. | 3. Krolls et al, Salivary gland lesions in children. A Survey of 430 cases, Cancer, Aug 1972; 459-469. | 4. Arati Bhatia, FNAC in the diagnosis of mass lesions of the salivary gland, Indian Journal of Cancer, March 1993; 30: 26-30. | 5. Silverberg, Diagnostic Cytopathology, 4th edi. | 6. Jayaram G., Fine needle aspiration cytology of salivary glands, Acta Cytol, 2000; 17(1): 1-13. | 7. Kaur V. et al, Diagnostic accuracy of FNAC in salivary gland lesions, Journal of Cytology 2005; 22(1): 15-18. | 8. Zbaren P. et al, Value of Fine needle aspiration cytology Parotid gland masses, Laryngoscope; Nov 2001. | 9. Layfield, L.J. et al, Fine needle aspiration of salivary gland lesions. Comparision with frozen sections and histologic findings, Arch Pathol Lab Med 1987; 111: 346-53. | 10. Rodriguez et al, Fine needle aspiration of parotid tumors, Am J. of Surg 1989;158: 342-44. | 11. Roland et al, Fine needle aspiration cytology of salivary gland lesions reported immediately in head and neck clinic, J Layngol Otol 1993;107(11): 1025-28. | 12. Tambwekar et al, Utility of FNAC in the diagnosis of salivary gland lesions, J Cytol 1997; 14(1): 135-37. | 13. Kamal M.M.et al, Aspiration cytology of salivary gland lesions- advantages and pitfalls, Indian J Pathol Microbiol 1994; 37(3): 281-7. | 14. Spitz M.R. et al , Major salivary gland carcinoma- descriptive epidemiology and survival of 498 patients, Arch Otolaryngol 1984; 110: 45. | 15. Dhanalakshmi M. et al, FNAC and histopathology of salivary gland lesions: A correlative study in a rural teaching hospital, Journal of Chinese Clinical Medicine 2009; 12(4): no.12. | 16. Verma K et al, Role of fine needle aspiration cytology in diagnosis of pleomorphic adenomas, Cytopathology 2001; 13, 121-27. | 17. Sengupta et al, FNAC of salivary glands, Indian J of Otolaryngology and H & N Surg 2002; 54 no.3:184-188. | 18. Hellar, K.S. et al, Accuracy of frozen section in the evaluation of salivary tumors, Am J Surg 1993; 166:424-427. | 19. Kocjan G et al, Fine needle aspiration cytology of salivary gland lesions: advantages and pitfalls, Cytopathol 1990; 1(5): 269-75. | 20. Qizilbash A.H. et al : Fine needle aspiration biopsy of major salivary gland. Acta Cytol 29 : 503-512, 1985. | 21. Borges, A.M., Aspiration cytology of salivary gland tumors, Proc .I.A.C. National Conference 1989; 108-130. | 22. Stanley, M.W. et al, Sialolithiasis. Differential diagnostic problems in fine needle aspiration cytology, Am J Clin Pathol 1996; 106(2): 229-33.