*Original Research Article*

Indian Journal of Pathology: Research and Practice
Volume 6 Number 4, October - December 2017 (Part-I)
DOI: http://dx.doi.org/10.21088/ijprp.2278.148X.6417.6

# Accuracy of FNAC in Diagnosis of Non-Neoplastic Salivary Gland Lesions: A Cyto-Histopathology Correlation Study

**Bhuvanamha Devi Ramamurthy*, Kalaivani Amitkumar**, Shivashekar Ganapathy*****

*Assistant Professor **Associate Professor ***Professor & Head, Department of Pathology, SRM Medical College Hospital & Research Centre, Potheri, SRM Nagar, Chennai, Tamil Nadu 603203, India.

**Abstract**

*Background*: Non neoplastic salivary gland lesions have to be differentiated from neoplastic lesions that mandates preoperative evaluation by aspiration cytology. *Objective*: To evaluate the diagnostic accuracy of the non-neoplastic salivary gland lesions by fine needle aspiration. *Materials and Methods*: This is a cross sectional study was conducted in the Department of Pathology, at two tertiary care centres. The clinical details and examination findings were recorded. The aspirates were studied by two pathologists. The cytology smears were subsequently correlated with histopathology. The collected data were analyzed statistically for sensitivity, specificity, positive predictive value, negative predictive value and overall diagnostic accuracy of FNAC. Data analysis was done with SPSS. *Results*: A total of 135 patients studied of which 58 were non – neoplastic lesions. Most common age of presentation was 3-4$^{th}$ decade. Chronic sialadenitis was commonest (45%) followed by Benign cystic lesion (26%), Acute sialadenitis (16%), lymphoepithelial lesion (12%) and Granulomatous sialadenitis (1%). The sensitivity, specificity and diagnostic accuracy of non-neoplastic lesion was 96%, 100% and 96.6% respectively. The positive and negative predictive value is 100% and 75% respectively. *Conclusion*: The salivary gland lesions constitutes only a small proportion of head and neck cytology, however cytology poses difficulty in arriving at lesion specific diagnosis. Our study eliminated the risk of surgery in 20% of patients and were managed conservatively. Hence fine needle aspiration holds good for the initial evaluation of patients with major salivary gland lesions especially in experienced hands.

**Keywords:** Salivary Gland, Fine Needle Aspiration Cytology, Histopathology, Non-Neoplastic Lesions.

## Background

Salivary glands are unique secretory glands, with major and minor groups. In general salivary glands are prone for non-neoplastic lesions (developmental, inflammatory, immunopathic, degenerative) and neoplastic lesions.

The diseases of salivary gland form a rare and yet an interesting group of lesions in respect to diagnosis, treatment and prognosis. The nature of the lesion cannot be diagnosed just merely on clinical examination. Hence for definite diagnosis, histopathological examination is essential.

**Corresponding Author: Bhuvanamha Devi Ramamurthy,** Assistant Professor, Department of Pathology, SRM Medical College Hospital & Research Centre, Potheri, SRM Nagar, Chennai, Tamil Nadu 603203, India.
E-mail: drrbdevi@gmail.com

**(Received on** 13.08.2017, **Accepted on** 01.09.2017)



Salivary glands are generally not subjected to incisional core biopsy because of the possible risk of fistula, facial nerve injury & tumor implantation in case of neoplasms. Therefore Fine Needle Aspiration Cytology (FNAC) plays a vital role as preoperative diagnostic tool in salivary gland lesions. It is simple, risk free, inexpensive technique with maximum diagnostic accuracy.

In this study, the utility of FNAC in the diagnosis of nonneoplastic salivary gland swelling is studied. This cytological study was correlated with that of histopathology. Diagnostic accuracy, specificity, sensitivity, positive and negative predictive values were evaluated.

## Materials and Methods

This is a cross sectional study was conducted in the Department Of Pathology, at two tertiary care

center, Sree Balaji Medical College & Hospital, Chromepet and SRM Medical College Hospital and Research center, Potheri from June 2010 to December 2013.

During the study period FNA was performed on total of 135 (89 in centre A and 46 in Centre B) patients who presented with symptoms and signs of salivary gland swelling (unilateral or bilateral). Prior to FNAC, the procedure was explained to the patient and consent was obtained. For each patient, age, gender, clinical history, presenting symptoms, their duration and clinical examination findings were recorded.

FNAC was performed after careful local examination of the swelling, using a 23-gauge needle attached to a 5 ml disposable syringe, under aseptic precautions (Figure 1a). The nature and the quantity of aspirates were recorded and then it was spread on clean glass slides and wet fixed using 100% isopropyl alcohol and stained with Papanicolaou and Haematoxylin and Eosin; unfixed air dried smears were stained with May Grunwald-Giemsa (MGG). Wherever necessary and relevant, smears were subjected to Periodic Acid Sciff (PAS) staining and cytological evaluation was done.

The surgical specimens of salivary gland lesions, from patients who underwent surgery, were fixed in 10% neutral buffered formalin for 24 hours representative tissue bits were sampled and processed according to laboratory standardized operative procedure. Sections of 4 micron thickness were cut and stained with haematoxylin and eosin.

The cytology smears were studied in detail and subsequently correlated with histopathology who underwent surgery. The interpretation was done by two pathologists.

The collected data were analyzed statistically for sensitivity, specificity, positive predictive value, negative predictive value and overall diagnostic accuracy of FNAC. Data analysis was done with SPSS version 20.

## Results

A total of 135 FNAC of salivary gland swellings were done during this study period. 11 were non diagnostic aspirates. Out of which non – neoplastic lesions were 58 (40 in Centre A and 18 in Centre B).

Most commonest among non neoplastic lesion was Chronic sialadenitis (45%) followed by Benign cystic lesion (26%), Acute sialadenitis (16%), lymphoepithelial lesion (12%) and Granulomatous sialadenitis (1%). Most common age of presentation was 3-4$^{th}$ decade. There was no gender predilection noted in the present study. Most common clinical presentation of non-neoplastic lesion was swelling (Figure 1b) with average duration of 4 months, followed by pain. Most common site of the clinical presentation was submandibular gland 48%(28/58), followed by parotid gland 45%(26/58) and sublingual gland 7% (4/58).

In our present study, 58 non-neoplastic lesions were reported on FNAC (Figure 2), out of which, 30 cases had resected specimens that were studied for histopathological correlation (Table 1).

- One case reported as chronic nonspecific sialadenitis on FNAC, was diagnosed as tuberculous sialadenitis on histopathology section.
- Two cases diagnosed as benign cystic lesion on FNAC, diagnosed on histopathology one as sialadenosis and another as Monomorphic adenoma (Basal cell adenoma).
- One case reported on smear as lymphoepithelial lesion showed features of intraparotid lymph node on histology.

The sensitivity, specificity and diagnostic accuracy of non-neoplastic lesion was 96%, 100% and 96.6% respectively. The positive and negative predictive value is 100% and 75% respectively. False negativity rate is 3.7%. There were no false positive diagnosis in the present study.

**Table 1:** Cyto-Histopathological correlation of Non-neoplastic lesions

| Cytology Diagnosis (58) | Histopathology Diagnosis(30) | No of Cases Correlated (%) |
|---|---|---|
| Chronic sialadenitis (26) | Chronic sialadenitis (10/11)<br>Granulomatous lymphadenitis within normal salivary gland (1/11) | 82% |
| Benign cystic lesion(15) | Benign cystic lesion (10/12)<br>Sialadenosis (1/12)<br>Monomorphic adenoma (1/12) | 83% |
| Lympho-epitheleialsialadenitis (7) | Lympho-epithelial sialadenitis (6/7)<br>Intraparotidlymphnode (1/7) | 86% |

## Discussion

The salivary gland lesions constitutes only a small proportion of head and neck cytology, however, wide variants of histopathological lesions encountered in the salivary gland makes this an interesting and challenging task in FNAC diagnosis.

In the present study, the percentage of non-diagnostic aspirate was 8% (11/135). 3-12% is the percentage of the unsatisfactory samples given in literature [9,17]. The proportion of non-neoplastic lesions in the present study is 46.7% (58/124) comparable with incidence of non-neoplastic lesions described in medicine literature which ranges between 20 – 61.6%. Akhter [13] et al had 47%Nguansangiam S [17] 52% and Jayaram [5] et al 34%. Few authors (Cajulis et al [3], Yang et al [4], Das et al [5]) concluded that the variation in proportion of benign non neoplastic lesion probably due to geographical differences.

*Acute Sialadenitis*

In our study, 7.2% (9/124 cases) acute sialadenitis was reported; Verma [21] et al had 12.38%. These patients were managed conservatively. Thus risk of surgery was averted in these patients.

Smears studied show fragments of salivary duct epithelial cells admixed with predominantly of acute and chronic inflammatory cells and macrophages in a serofibrinous background (Figure 1c).

*Granulomatous Sialadenitis*

In our study there was one case of granulomatous sialadenitis that was 90 years old female patient presented with parotid swelling. Clinically 3x2cm firm swelling noted 3cm below the left ear lobe, beneath the angle of left mandible non tender, restricted mobility. No signs of inflammation noted. No other swellings seen. No cervical / supraclavicular lymph node palpable. FNAC done from the swelling and aspirated 0.3ml of blood admixed purulent material. Smears are adequately cellular with few loosely cohesive epitheloid clusters, fragments of granulation tissue and plenty of cyst macrophages and few multinucleated giant cells in a suppurative background (Figure 1d). Stain for AFB is negative. This case was


**Fig. 1a:** FNAC equipment. **b.** Clinical photographs of patients presenting parotid gland swelling (Left) submandibular gland swelling (Right). **c.** Smears of acute sialadenitis show fragments of salivary duct epithelial cells admixed with predominantly of acute and chronic inflammatory cell and macrophages in a serofibrinous background. **d.** Smears of granulomatous sialadenitis show few loosely cohesive epithelioid clusters, plenty of cyst macrophages and few multinucleated giant cells in a suppurative background.

conservatively managed with anti-tuberclosis therapy.

*Chronic Sialadenitis*

Chronic sialadenitis (20.9%) (26/124) was the most common non neoplastic lesion. The incidence observed by Das [5] et al is 34.4% Vaidya [16] et al is 18.9% and Dhanalakshmi [15] et al is 21.6%. Most common site is submandibular gland (57.6%) (15/26) followed by parotid (38.4%) (10/26) and sublingual gland (3.8%) (1/26) similar observation was noted by Das [5] et al and Dhanalakshmi [15] et al. Females were most commonly affected in 3 – 4th decades of life.

Smears studied showed, mixed population of lymphocytes, plasma cells and histiocytes, fibrous tissue fragments, scarcity of acinar cells, ductal cell hyperplasia with or without squamous metaplasia (Figure 3a). Its histopathology showed dilated ducts with eosinophilic secretion, extensive atrophy of

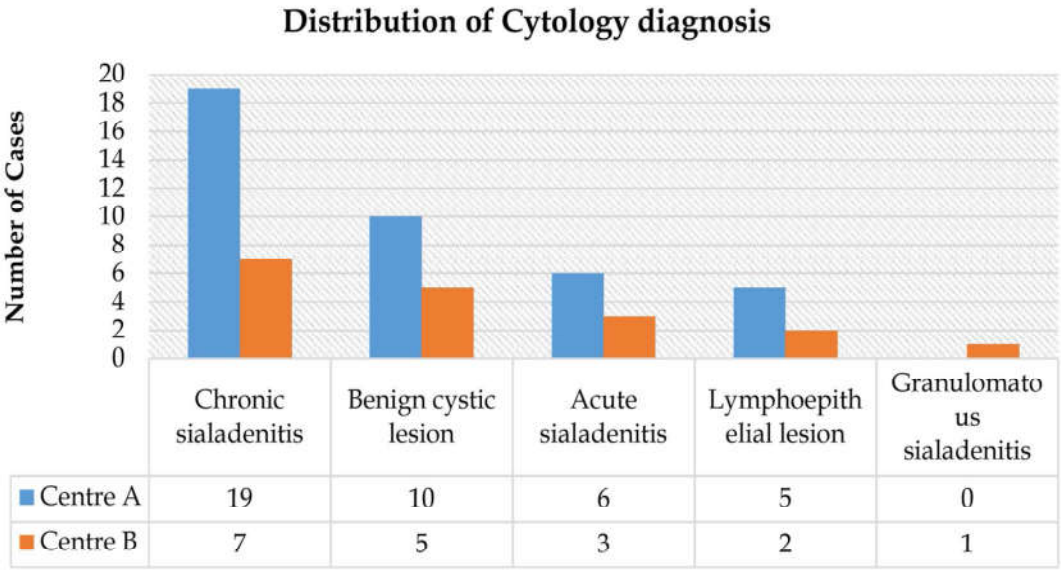


**Fig. 2:** Distribution of Cytology diagnosis

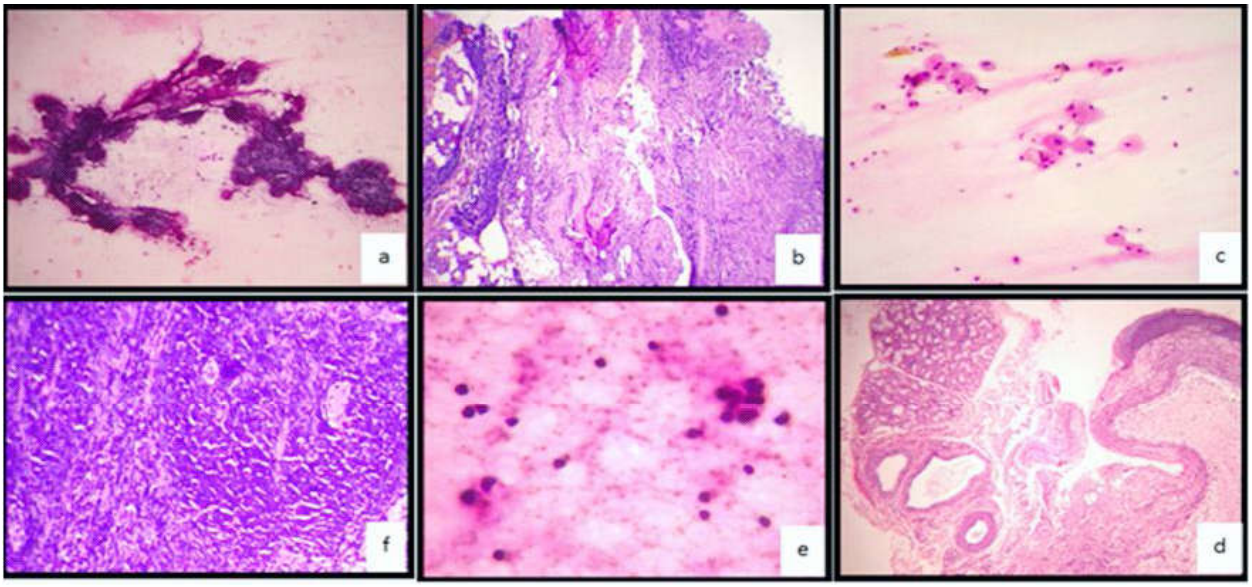


**Fig. 3a:** Smears of chronic sialadenitis showing mixed population of lymphocytes, plasma cells and histiocytes, fibrous tissue fragments, scarcity of acinar cells (H & E 10x). **b.** Section of chronic sialadenitis showing lymphocytic infilteration of salivary gland parenchyma with extensive fibrosis (H&E 10x). **c.** Smear of non-neoplastic cystic lesion showing muciphages with scattered inflammatory cells (H&E 10x). **d.** Section showing cyst line by stratified squamous epithelium with adjacent normal salivary gland (H&E 10x). **e.** Smear of lymphoepithelial lesion showing scattered lymphocytes and occasional clusters of epithelial cells (H&E 40x). **f.** Section of lymphoepithelial lesion, showing lymphoid infiltration of salivary parenchyma, and formation of epimyoepithelial islands with atrophy of acini (H&E 40x)

serous and mucin secreting glands. Diffuse dense lymphocytic infiltration in the stroma between lobulated salivary gland, periductal fibrosis and collagen deposition were noted (Figure 3b).

In our study, out of 26 FNAC diagnosed as chronic sialadenitis, surgically resected specimen was available in only 10 cases. Rest of the 16 cases were conservatively managed. One case that was discordant was of 80 years old female presented with swelling in the left parotid gland cytology smears were reported as chronic sialadenitis. Surgically excised mass grossly was measuring 4X3X2cm. outer suface was lobulated with areas of congestion. Cut surface showed a whitish nodule measuring 2X2cm with a central hemorrhagic area. Microscopically sections studied revealed a lymphoid tissue in the nodule within the salivary gland with thickened capsule. The architecture of the nodes is altered by presence of large caseating and few non caseating granulomas composed of epithelioid cells, langhans giant cells and cuff of lymphocytes. Rest of the tissue showed lobules of salivary gland with normal draining duct. It was reported as caseating granuloma with features compatible with caseating tuberculous lymphadenitis within the normal salivary gland.

*Benign Cystic Lesion*

In our study, 12% (15/124 cases)of benign cystic lesion was reported. Vaidhya [16] et al had 13.8% similar to our study whereas Akhter [13] et al had 7% Jayaram [5] et al had 4.2% Nguansangiam S et al [17], had 1.7%. Most common age group affected was in 2 – 4$^{th}$ decades of life. Females were most commonly affected with most common site being submandibular gland.

Smears studied from aspirated mucoid material which showed mucinophages with or without inflammatory cells were diagnosed as mucocoele or benign cystic lesion (Figure 3c). Histopathological showed salivary gland with cyst lined by cuboidal epithelium surrounded by mononuclear cell infiltration and fibrocollagenous tissue (Figure 3d).

Out of 15 cases diagnosed on FNAC, 12 resected specimens were available. One case reported as benign cystic lesion on FNAC, diagnosed as Sialadenosis on histpathology. 55 years old female presented with bilateral swelling associated with mild pain in the parotid region for 1 month Radiologically swelling with mild echo in the parotid gland measuring 1.8X1cm and 1.5X1cm? Lymphadenopathy was reported. On cytology, right parotid swelling aspirate showed clusters and scattered salivary acini admixed with naked nuclei of acinar cells in a clear background and diagnosed as sialadenosis. Left parotid swelling aspirate showed hypocellular aspirate with occasional squamous epithelial cell clusters and degenerated squamous in a necrotic background. There is no atypia. Suggestive of cyst of salivary gland.

Another case of 44 years old male patient presented with right parotid slow growing swelling not associated with pain for 2 years. Smears studied show plenty of cyst macrophages and few inflammatory cells in an eosinophilic background. It was reported as cystic lesion. Surgically excised lesion on macroscopic examination showed parotid mass measuring 8X5X1cm. Outer surface shows greyish brown areas with attached fibrofatty areas.

Cut surface shows large greyish white along with brownish black cystic region. Microscopically, sections studied show parotid gland enclosing a cystic neoplasm composed of cyst lined by cuboidal epithelium and focally showing uniform basaloid cells with vesicular nuclei arranged in islands and in trabecular pattern with peripheral palisading of nuclei. Hyalinized stroma is seen surrounding and also noted within the islands. Some of the island show tumor cells arranged in acinar pattern. It was reported as monomorphic adenoma (basaloid adenoma).

Jan et al [14] concluded that there were four reasons for incorrect interpretation in cytological diagnosis of salivary gland lesions, which includes inadequate sampling or insufficient specimens; marked cellular degeneration; error of labeling specimens and cytologist unfamiliar with morphology of rare salivary gland lesion.

Jayaram et al [5], Mihashi et al [12], and Piccioni LO et al [18]suggested that sufficient sampling can improve the diagnostic accuracy.

*Lymphoepithelial Sialadenitis*

In our study, 9.6% (7 cases) of Lymphoepithelial sialadenitis was reported. Most common age group affected was in 4 – 5$^{th}$ decades of life. Males were more commonly affected and parotid gland was most commonly involved. Das et al [6], (13.1%) and Jayaram et al [5], (4.1%) had similar observation.

Smears studied from aspirated fluid which revealed lymphocytes and occasional small clusters of epithelial cells were diagnosed as benign lymphoepithelial lesion (Figure 3e). Histopathologically, is characterized by lymphoid infiltration of the salivary parenchyma, associated with atrophy of acini and ductal proliferation with formation of epimyoepithelial islands (Figure 3f).

In the present study, one case cytologically reported as lymphoepithelial lesion was turned out to be intraparotid lymph node on histopathology. This could be avoided if the patient is radiologically evaluated prior to the aspiration procedure.

A high diagnostic efficacy of FNAC in diagnosing salivary gland lesions was achieved in this study. Postema et al [8], observed difficulties in the diagnosis of cystic lesion and concluded that cytologic diagnosis of cysts should be interpreted with caution. Eneroth et al [1] and Muhammed Sohalil et al [7] had similar problem and mentioned in their study that the most common cause of false positive report is atypia in benign mixed tumor.

The reason for low lesion prediction in typing specific salivary gland lesion is due to the fact that variety of lesions arise in the salivary glands and also there is considerable overlap of morphological features of these lesions posing diagnostic difficulties.

## Conclusion

Though the cytological diagnosis posed difficulties in the diagnosis of cystic lesions. Our study shows high diagnostic accuracy, sensitivity and specificity; and do confirm that fine needle aspiration of salivary gland lesions is a valuable diagnostic tool in the workup of patients with salivary gland lesions.

In our study, 20% of patients with non-neoplastic lesions were managed conservatively and thereby eliminated the risk of surgery. It is simple and cost effective method, so it is suitable for developing countries with low financial resources. For these reasons, fine needle aspiration holds good for the initial evaluation of patients with major salivary gland lesions.

Even though false positive and false negative results are inevitable, the use of fine needle aspiration in combination with clinical examination and radiological findings (triple test) approach similar to that used in fine needle aspiration of breast lesions would provide valuable and accurate preoperative diagnosis in the evaluation of salivary gland lesions.

## References


1. Eneroth CM. Salivary gland tumors in the parotid gland, submandibular gland and the palate region. Cancer, 1971;27:1415–1418.
2. Jayaram G, Verma AK, Sood N, Khurna N. Fine needle aspiration cytology of salivary gland lesions. J Oral Pathol Med, 1994;23(6):256–261.
3. Cajulis RS, Gokaslan ST, Yu GH, Frias-Hidvegi D. Fine needle aspiration biopsy of the salivary glands: five-year experience with emphasis on diagnostic pitfalls. Acta Cytol, 1997;41:1412-20.
4. Yang GCH, Kuhel WL. Uncommon tumors odf the salivary gland in fine needle aspiration biopsies: A surgeon's perspective Acta Cytol,1997;41:1015-1022
5. Jayaram G, DashiniM. Evaluation of fine needle aspiration cytology of salivary glands: an analysis of 141 cases. Malays J Pathol, 2001;23(2):93–100.
6. Das K Dilip, Petkar A Mahir, Al Mane M Nadre, Sheik A Zafar and Malik K Mrinmay. Role of fine needle aspiration cytology in the diagnosis of swellings in the salivary gland regions: A study 712 cases. Med Princ Pract 2004;13:95–106.
7. Muhammed Sohalil A, Zafar Ahmed. Diagnostic value of fine needle aspiration cytology in parotid tumors. JPMA, 2004;54:617–620.
8. Postema RJ, Van Velthuysen MLF, Van den Brekell, Balm AJM, Peterse JL. Accuracy of fine needle aspiration cytology of salivary gland lesions in the Netherlands Cancer Institute Head and Neck, 2004; 26:418–424.
9. Tan LG,Khan ML, Accuracy of fine needle aspiration cytology and frozen section histopathology for lesions of major salivary glnads Annals of Academy of Medicine Singapore 2006;35(4):242
10. Barnes EL, Eveson JW, Reichart P, Sidransky D. Tumors of the salivary glands. In World Health Classification of Tumors: Pathology and Genetics of Head and Neck Tumours. Lyon: IARC, 2005;209-81.
11. Orell SR, Sterrett GF, Whitaker D. Fine Needle Aspiration Cytology. 4/e. 2005;17(4):41-82.
12. Mihashi H, Kawahara A, Kage M. Comparison of preoperative fine needle aspiration cytology diagnosis and histopathological diagnosis of salivary gland tumors. Kurume Med J, 2006;53:23–27.
13. Akhter J, Hirachand S, Lakhey M. Role of FNAC in the diagnosis of salivary gland swellings. KUMJ 2008;6: 204–208.
14. Jan IS, Chung PF, Weng MH. Anlysis of Fine needle aspiration cytology of the salivary gland. J Formos Med Assoc, 2008;107:364–370.
15. Dhanalakshmi M, Lakshmana Rao, Krishnaswamy, Manohar, Gopalakrishnan, Aruna. Fine needle aspiration cytology and histopathology of salivary gland lesions: A correlative study in rural teaching hospital. JCCM 2009;12:674–680.
16. Vaidhya S, Sinha A, Narayan S, Adhikari, Sabira. A comparative study of fine needle aspiration cytology and histopathology in salivary gland lesions. jpn, 2011; 1:108–113.
17. Nguansangiam S, Jesdapatarakul S, Dhanarak N, Sosrisakorn K. Accuracy of fine needle aspiration cytology of salivary gland lesions: routine diagnostic

experience in bangkok, thailand. asian pacific journal of cancer prevention. 2012;13(4):1583-8.

18. Piccioni LO, Fabiano B, Gemma M, Sarandria D, Bussi M. Fine needle aspiration cytology in the diagnosis of parotid lesions. Acta Otorhinolaryngol Ital. 2011;31(1):1-4.
19. Jain R, Gupta R, Kudesia M, Sing S. Fine needle aspiration cytology in the diagnosis of salivary gland lesions: a study with histologic comparison. Cytojournal. 2013;10:5.
20. Omhare A, Singh SK, Nigam JS, Sharma A. Cytohistopathological study of salivary gland lesions in Bundelkhand region, Uttar Pradesh, India. Pathology Research International. 2014.
21. Verma S. Fine needle aspiration cytology of salivary gland lesions: study in a tertiary care hospital of North Bihar. Int J Res Med Sci 2016;4:3869-72.