VOLUME - 13, ISSUE - 12, DECEMBER - 2024 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Pathology

A CYTOPATHOLOGICAL SPECTRUM OF SALIVARY GLAND LESION A/C TO MILAN REPORTING SYSTEM –A RETROSPECTIVE STUDY OF 4 YEARS IN TERTIARY CARE CENTRE OF CENTRAL INDIA.

Dr Surabhi Mishra Senior Resident

Dr Anand Bhadkariya Associate Professor

Dr Arjun Singh Professor & Head

ABSTRACT

Introduction - Salivary gland lesions are mainly diagnosed by Fine needle aspiration cytology (FNAC); but there is considerable morphological and heterogenicity overlap between spectrum of lesions so there are few challenges in it. To minimise this overlapping in the diagnosis "The Milan system of reporting salivary gland cytopathology" (MSRSGC) was introduced; providing diagnosis and management in different categories according to the risk of malignancy. The current study is conducted retrospectively to see the spectrum of lesion of Salivary gland diagnosed according to MILAN System of Reporting and to evaluate the risk of malignancy in them. **Material and Method-** This retrospective study was conducted in Department of Pathology, Government medical College, DATIA (M.P.) during the period of 4 years from june 2020 to june 2024. FNAC was done on these patient and cytological smear were evaluated as per MILAN System:Histopathological diagnosis were also retrieved and correlated with the cytological findings wherever available.
The MILAN system of diagnosis is given hereunder-:

Category 1: Non diagnostic (ND)
Category 2: Non neoplastic (NN)
Category 3: Atypia of undetermined significance (AUS)
Category4a: Neoplasm: Benign
Category4b: Neoplasm: Salivary gland neoplasm of uncertain malignant potential (SUMP)
Category 5: Suspicious for malignancy (SM)
Category 6: Malignant(M)

Result: In this study Total 120 smears of salivary gland lesion were included and categorised using MILAN system of reporting. The number of cases distributed in different categories were as follows: 5% cases (6/120) in category 1(ND), 11.5% cases (14/120) in category 2(NN), 3% cases (4/120) in category 3(AUS), 65% cases (78/120) in category 4a(Benign), 5% cases (6/120) in category 4b(SUMP), 3% cases (3/120) in category 5(SM) & 7.5% cases(9/120) in category 6(M). **Conclusion:** FNAC is a reliable diagnostic tool for the evaluation and management of Salivary gland lesion prior to any surgical intervention. After implementing the MILAN system of reporting for the SALIVARY lesions enhances the accuracy of diagnosis, reduction in missed diagnosed cases, and increases the accurate assesement of risk of malignancy. Milan system is the crucial step in boosting the effectiveness of salivary gland lesion cytology reporting and because of that we will able to achieve improved patient care.

KEYWORDS : FNAC, Milan System, Salivary Gland Lesions.

INTRODUCTION

Fine needle aspiration (FNA) is now widely accepted as an efficient and reliable diagnostic test for salivary gland lesions because it is safe, easy to perform, inexpensive and can be performed on O.P.D. patients[1-5]. Almost every swelling of salivary gland is amenable to evaluation under FNAC.

Salivary gland FNAC reporting shows a range of sensitivity and specificity depends upon various factors such as operator dependency, morphological heterogeneity of lesion, cystic and necrotic component % in the lesion, quality of cytological smears which are prepared, use of rapid on site evaluation system, ancillary study performance, and last but not the least the reporting system [6,7,8]. The reported overall sensitivity and specificity of salivary gland FNA in distinguishing malignant from benign lesions in most series ranges from 86% to 100% and 90% to 100%, respectively[9,6,7,8].

The proportion of inadequate or non-diagnostic (ND) FNA samples can be significant and varies widely depending on the institution (0%–50% with a mean value of 16.9%)[9,6,10]

The reported ranges of sensitivity and specificity to differentiate neoplastic from non-neoplastic (NN) salivary gland lesions are 79% to 100% and 71% to 100%, respectively; while the accuracy of FNA in distinguishing benign from malignant salivary gland lesions ranges from 81% to 100%[9,6,7,8,10]

This is related to the fact that Pleomorphic Adenoma(PA) and Warthin's tumour (WT) are the most common salivary gland tumours (SGTs), and the majority can be reliably diagnosed by FNA based on key, consistent cytomorphologic features.

In most cases, FNA can also differentiate between low grade and high-grade carcinomas [11]However, the accuracy of salivary gland FNA when used to specifically subtype a neoplasm shows a wide range, varying from 48% to 94%[9,6,7]

This limitation is mainly due to the inherent morphologic heterogeneity of salivary gland lesions and the significant cytomorphologic overlap between some benign neoplasms and low-grade carcinomas as well as between the different types of high-grade carcinomas[9,6,7] ;So a universally accepted, uniform, and consistent terminology establishes as MILAN REPORTING SYSTEM as a standard of care, independent of geography, better final diagnostic conclusion of the cytopathologist and better stratify patients according to the severity of their disease and the implied Risk of Malignancy(ROM) to ensure that the patient receives the correct management [12] Standardized reporting systems also enable the comparison of data among institutions and provide a reliable tool for research and for quality control [12]

The many benefits of standardized reporting systems for diagnostic cytopathology, including the MSRSGC, are summarized in Table 1[6,12]

Table 1. Main Advantages of the Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) (and Other Reporting Systems)

1. Standardizes reporting and clarity of communication among cytopathologists, surgeons, radiologists, and other health care providers.
2. Correlates and stratifies the cytological diagnosis with a risk of malignancy.
3. Facilitates the use of clinical management algorithms.
4. Is relevant, transferable, and practical for institutions with variable experience and expertise in salivary gland cytology (i.e. user-friendly).
5. Facilitates quality assurance and clinical audits by setting standards (e.g.20% of nondiagnostic samples or 10% of atypia of undetermined significance samples).
6. Allows easy and reliable sharing of data from different laboratories for national and international collaborative studies and facilitates research into salivary gland lesion.

The overall objective of the MSRSGC was to standardize reporting of salivary gland cytology, promote better communication between clinicians and institutions, and ultimately improve patient care by providing a uniform reporting system.[6,13-17]

The MSRSGC consists of 6 diagnostic categories (summarized below in TABLE 2), which incorporate the morphologic heterogeneity and overlap among various Non neoplastic, benign and malignant lesions of the salivary glands[6] In addition, each diagnostic category of the MSRSGC corresponds to an inherent risk of malignancy (ROM) that may be used to guide decision making and patient counselling[6]

The MSRSGC is designed to be transferable and practical for institutions with all levels of expertise in salivary gland cytology. Since its implementation, the MSRSGC gained widespread international acceptance among cytologists and clinicians. It is currently used to report cytology results at many institutions worldwide and has been endorsed by the 2021 ASCO guidelines for the management of patients with salivary gland cancer[1,18] and by the 2022 WHO Classification of Head and Neck tumours [19] .The ASCO guidelines recommend that pathologists should report the ROM using a risk stratification scheme for salivary FNAs with particular attention to high-grade features [1].The MSRSGC is designated as the current standard reporting scheme. Since its introduction, numerous FNA studies including meta-analyses have been published using the MSRSGC diagnostic criteria, confirming the value and role of the Milan system as a practical and useful classification system [10,20-35].

Apart from this, FNAC is an useful tool to differentiate between primary vs. metastatic lesions specially head and neck malignancies and thus helping in deciding the treatment plan[36].

When FNAC is used to sub-classify the neoplasm, the accuracy ranges widely from 48% to 94% in different studies.[37,38,39,40]The presence of basaloid cell component, oncocytoid changes, squamous metaplasia, and cystic component are few cytomorphological features that make FNAC a diagnostic challenge. There are many studies proposing use of morphological pattern based analysis to develop a risk stratification approach for classification of salivary gland neoplasm and providing ROM and to guide for further ancillary test and management plan [41,42,43ss].

TABLE -2: The MSRSGC is a six tier classification providing a standardized terminology and ROM for each category and thus avoiding the ambiguity often seen in FNAC interpretation.

Diagnostic category	Risk of malignancy (%)	Management
I. Non-diagnostic	25	Clinical and radiologic correlation/ repeat FNAC
II. Non-neoplastic	10	Clinical follow-up and radiological correlation
III. Atypia of undetermined significance (AUS)	20	Repeat FNAC or surgery
IV. Neoplasm		
Neoplasm: Benign	<5	Surgery or clinical follow-up
Neoplasm: Salivary gland neoplasm of uncertain malignant potential (SUMP)	35	Surgery
V. Suspicious for malignancy (SM)	60	Surgery
VI. Malignant	90	Surgery

MATERIAL AND METHOD

This retrospective observational study is performed in the Department of Pathology, Government Medical College, Datia (M.P.) Ethical clearance was obtained from the Institutional Ethical Committee before commencement of the study. All FNACs performed on salivary gland lesions between June 2020 to June 2024 were included in the study, which accounted for a total of 120 patients.

All patients with salivary gland lesion were included in the study and lesion in other neck area were excluded. Salivary gland swelling both major and minor were aspirated through a direct percutaneous route with 22 or 23 gauze needle with 20 ml disposable syringe under all aseptic precautions after taking written informed consent of the patient.

The smears were aspirated by trained cytopathologists 2–3 times randomly in different areas, and the smears prepared on glass slides were air-dried or fixed in 95% ethyl-alcohol and stained with May-Grunwald-Giemsa (MGG) stain, H and E stain and Pap stain. After Slides preparation it was reviewed by three cytopathologists and reporting was done following the standard criteria of MILAN Reporting System for Salivary gland. The cytological features were evaluated, and then cases were reclassified according to MSRSGC as follows:
Category 1: Non-diagnostic (ND)
Category 2: Non-neoplastic (NN)
Category 3: Atypia of undetermined significance (AUS)
Category 4a: Neoplasm: Benign (NB)
Category 4b: Neoplasm: Salivary gland neoplasm of uncertain malignant potential (SUMP)
Category 5: Suspicious of malignancy (SM)
Category 6: Malignant (M).

The corresponding histopathological diagnosis, which was considered the gold standard, was available in 57 cases and the ROM was calculated for each category in these cases.

RESULT

The FNAC distribution of 120 cases according to age, sex, and site of involvement is shown in Table 3. Males were slightly more affected than female(70 vs. 50) the ratio being 1.4: 1. Largest number of cases were seen in age group 21 to 40 year (46.1%) followed by 41–60 year age group (27%) and rest of the cases were belongs to the older age group. Parotid gland was involved in highest number of cases (57.7% cases) followed by submandibular gland in 27.3% with minor salivary gland involved in 15% of cases.

Table 3 Distribution of cases according to age, sex, and site of involvement

PARAMETER	No of cases
1. Sex	

Male	70(58.3%)
Female	50(41.6%)
2. Age Group	
21- 40 years	55(46.1%)
41-60 years	32(27%)
>60 years	33 (26.9%)
3. Gland involved	
Parotid	57.7%
Submandibular	27.3%
Minor salivary gland	15%

The FNAC distribution of cases according to MSRSGC is shown in Table 4. Benign category was the largest category with 65% cases followed by NN category (11.5%). M, SUMP, ND, AUS and SM constitute 7.5%, 5%, 5%, 3%, and 3%, respectively.

Table 4 Histological follow-up of Milan system diagnostic categories-

	Cat 1	Cat 2	Cat 3	Cat 4a	Cat 4b	Cat 5	Cat 6
No. of Cases	6 (5%)	14 (11.5%)	4 (3%)	78 (65%)	6 (5%)	3 (3%)	9 (7.5%)
Cases with Histological followup	-	-	-	50		2	5
Benign-Non neoplastic							
Benign-Neoplastic							
Malignant							

Histological follow-up was available in cases, and available histopathological comparison according to MSRSGC and ROM of each category is shown in 4. In category 1 (ND) out of 6 cases and In category 2 (NN) out of 14 cases , no histological follow-up was available.

Out of total 78 cases, 3 cases of benign tumor were reported, which were wrongly diagnosed as category 2 (NN)- chronic sialadenitis, and 1 case of mucoepidermoid carcinoma (MEC) was reported on histopathology. Overall, ROM reported for this category was 5%.

No Histological follow-up was available in category 3 (AUS) cases Total 4 cases was included in this category, which comprises 3% of total cases. Overall, ROM for this category was 20%.

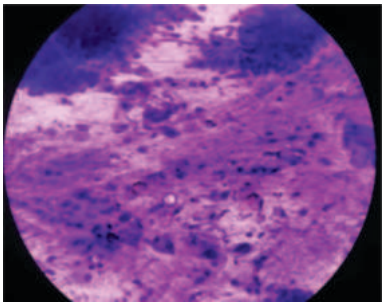
Category 4a had histological follow-up of 50 cases out of 78 cases. Out of 38 cases diagnosed as PA on FNAC, 34 cases showed concordance on histological follow-up, and 4 cases reclassified into malignant category (2 cases as AdCC, 1 case as MEC, and 1 case as unclassified carcinoma).

Out of 8 cases diagnosed as category benign on FNAC, 2 cases were reclassified as Pleomorphic Adenoma on histological follow-up. One case of Warthin's tumor on FNAC was reclassified as chronic sialadenitis on histological follow-up. Overall, ROM reported was less than 5% in this category.

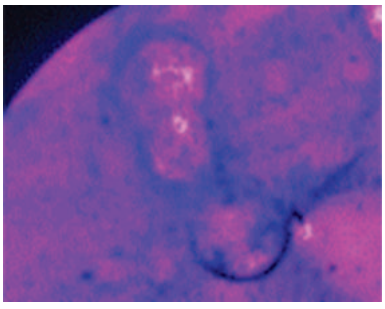
Category 4b cases were those, where a specific neoplastic entity cannot be made, and out of 6 cases, 1 case was reclassified as granulomatous sialadenitis, 3 cases as PA, and 1 case as AdCC and MEC each. Overall, ROM reported was 35% in this category.

Category 5 had histological follow-up of 2 cases, and all of these 2 cases showed concordance with diagnosis of malignancy with ROM of 60%.

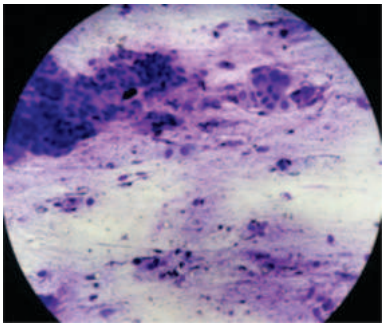
Category 6 is for the smears that are diagnostic for malignant lesion, and histological follow-up of 5 out of 9 cases was available. Only one case was misdiagnose as malignant on FNAC, which was reported as PA on histological follow-up. 12 cases of MEC, 13 cases of AdCC, 4 cases of lymphoma, 3 cases of carcinoma ex pleomorphic adenoma, 2 cases of epithelial myoepithelial carcinoma, acinic cell carcinoma, and polymorphous adenocarcinoma each, and 1 case of lymphoepithelial carcinoma were reported, and overall, ROM reported was 90% for this category.



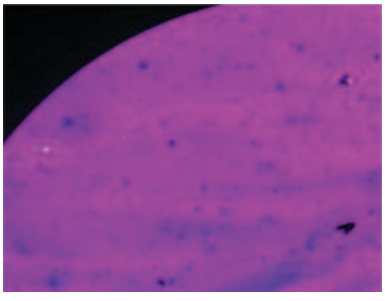
Pleomorphic Adenoma



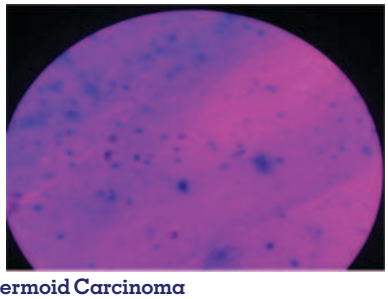
Mucoepidermoid Carcinoma



Mucoepidermoid Carcinoma



Mucoepidermoid Carcinoma



Mucoepidermoid Carcinoma

DISCUSSION

FNAC is a safe, accurate, and cost-effective method for evaluation of salivary gland swelling and can help in management of the patient by providing nature of the lesion.[44,45,46].

MSRSGC is a newer system for reporting salivary gland lesions according to risk stratification with an objective to provide a better communication between clinicians and cyto-pathologists so as to improve overall patient management.

It is an evidence based six tiered system, which provides ROM and clinical management strategies for each category[47,48,42].It classified FNAC into six categories; ND, NN, AUS, NB, SUMP, SM, and malignant with ROM of 25%, 10%, 20%, <5%, 35%, 60%, and 90% for each category[49]. Few other studies also classify salivary gland lesion according to risk stratification and provide ROM for different category with marked variation; ND (0–67%), NN (0–20%), AUS (10%–35%), NB (0%–13%), SUMP (0%–100%), SM (0%–100%), and malignant (57%–100%)[50,47,38,48,41,42,43].

Category 1 cases are non-diagnostic salivary gland aspirates providing insufficient diagnostic material for an informative interpretation. There were 6 cases (5%) in ND category, No histological follow up present for these cases.

Out of total 14 cases (11.5%), NO histological follow-up was available under category 2 (NN).

The AUS category cases are those, where a neoplastic lesion cannot be completely ruled out, and we had 4 cases (3%) in this category; No histological followup present in these cases.

The benign category 4a had 78 cases which is 65% of total no. of cases, and histological follow-up was available in 50 cases. Pleomorphic Adenoma constituted the highest percentage of all salivary gland tumor and in benign category also. FNAC is an effective tool to distinguish benign and malignant neoplasm with high specificity 97%–98%[50,51]. However, some time it is very difficult to differentiate between a benign neoplasm and low-grade malignant neoplasm.

In Category 4b total 6 cases was present to us for the FNAC which is total 5% of overall cases. No histological corelation present in this case.

The diagnosis of SUMP is reserved for FNAC specimen, where cytological features are diagnostic of a neoplastic process, but the cytological findings cannot effectively distinguish between a benign and malignant neoplasm[49]. Suspicious for malignancy (SM) category is reserved for FNAC specimens, where overall cytomorphological features are suggestive of malignancy, but not all the criteria for a specific diagnosis of malignancy are present[49].

The categories AUS, SUMP, and SM represent the intermediate diagnostic categories in Milan system[52].The SM category was used by cytopathologists since long-time and is well-known to clinicians also[54,39,40,53]. In our study, majority of FNAC cases classified as SM had high-grade features precluding them a definite diagnosis of malignant lesion.

MSRSGC is a recent six category scheme to classify salivary gland smears; despite being heterogenicity and morphological overlap between different salivary gland lesions, it will definitely cater the need of cytopathologists and treating clinician because beside the benefit of risk stratification and providing ROM, this system proposed a tiered scheme which places salivary gland FNAC into well-defined categories that limit the possibilities of false negative and false positive cases.

Limitation of this study is the small number of sample size, lesser number of histological follow-up, and retrospective nature of the study. Further studies including large sample size utilizing proposed management plan are required for prospective application of the study.

CONCLUSIONS

There is a significant clinical role for FNA and/or CNB in the preoperative assessment of salivary gland lesions, with both techniques being recently endorsed by the ASCO guidelines for the management of salivary gland cancer[1] Evaluation of salivary gland lesions remains one of the most challenging areas of cytopathology. The MSRSGC was developed to provide a universally accepted and consistent reporting structure for salivary gland FNA.5 The primary goals of the MSRSGC are to improve cytopathologist clinician communication and provide assistance with clinical decision making[3]. Since its implementation, the MSRSGC has gained international acceptance as a tool to improve reporting standards and consistency in this complex diagnostic area. An updated version of the MSRSGC is expected in early 2023. Subsequent experience will lead to further refinements to this terminology framework. Ancil lary testing has greatly enhanced the ability for more accurate classification as per the MSRSGC and allows for the definitive diagnosis of many salivary FNA specimens.

With the continuous discovery of additional specific genetic alterations in SGTs and the increasing availability of diagnostic markers that can be applied on FNA material, the diagnostic accuracy of salivary gland FNA will continue to be further improved leading to better patient management.

REFERENCES

1. Geiger JL, Ismaila N, Beadle B, et al. Management of salivary gland malignancy: ASCO guideline. J Clin Oncol. 2021;39(17):1909–1941.
2. Sood S, McGurk M, Vaz F. Management of salivary gland tumours: United Kingdom national multidisciplinary guidelines. J Laryngol Otol. 2016;130(S2): S142–S149.
3. Faquin WC, Rossi ED, Baloch Z, et al, eds. The Milan System for Reporting Salivary Gland Cytopathology. Cham, Switzerland: Springer; 2018.
4. Mantravadi AV, Moore MG, Rassekh CH. AHNS series: do you know your guidelines? Diagnosis and management of salivary gland tumors. Head Neck. 2019;41(2):269–280
5. Eytan DF, Yin LX, Maleki Z, et al. Utility of preoperative fine needle aspiration in parotid lesions. Laryngoscope. 2018;128(2):398–402.
6. Pusztaszeri M, Rossi ED, Baloch ZW, Faquin WC. Salivary gland fine needle aspiration and introduction of the Milan reporting system. Adv Anat Pathol. 2019; 26(2):84–92.
7. Schmidt RL, Hall BJ, Wilson AR, Layfield LJ. A systematic review and metaanalysis of the diagnostic accuracy of fine-needle aspiration cytology for parotid gland lesions. Am J Clin Pathol. 2011;136(1):45–59.
8. Faquin WC, Powers CN. Salivary Gland Cytopathology. New York: Springer; 2008. Essentials in Cytopathology Series, vol. 5.
9. Jalaly, JB, Farahani, SJ, Baloch, ZW. The Milan system for reporting salivary gland cytopathology: a comprehensive review of the literature. Diagn Cytopathol. 2020;48(10):880–889.
10. Johnson DN, Onenerk M, Krane JF, et al. Cytologic grading of primary malignant salivary gland tumors: a blinded review by an international panel. Cancer Cytopathol. 2020;128(6):392–402.
11. Sundling KE, Kurtycz DFI. Standardized terminology systems in cytopathology. Diagn Cytopathol. 2019;47(1):53–6
12. Rossi ED, Faquin WC, Baloch Z, et al. The Milan System for Reporting Salivary Gland Cytopathology: analysis and suggestions of initial survey. Cancer Cytopathol. 2017;125(10):757–766.
13. Rossi ED, Baloch Z, Pusztaszeri M, Faquin WC. The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC): an ASC-IAC-sponsored system for reporting salivary gland fine-needle aspiration. J Am Soc Cytopathol. 2018;7(3):111–118.
14. Barbarite E, Puram SV, Derakhshan A, Rossi ED, Faquin WC, Varvares MA. A call for universal acceptance of the Milan system for reporting salivary gland cytopathology. Laryngoscope. 2020;130(1):80–85.
15. Rossi ED, Faquin WC. The Milan system for reporting salivary gland cytopathology (MSRSGC): an international effort toward improved patient care— when the roots might be inspired by Leonardo da Vinci. Cancer Cytopathol. 2018;126(9):756–766.
16. Rossi ED, Wong LQ, Bizzarro T, et al. The impact of FNAC in the management of salivary gland lesions: institutional experiences leading to a risk based classification scheme. Cancer Cytopathol. 2016;124(6):388–396
17. Pusztaszeri M, Deschler D, Faquin WC. The 2021 ASCO guideline on the management of salivary gland malignancy endorses FNA biopsy and the risk stratification scheme proposed by the Milan system for reporting salivary gland cytopathology. Cancer Cytopathol. 2023;131(2):83–89.
18. El-Naggar AK, Chan J, Takata T, Grandis J, Blootweg P. WHO Classification of Tumours. Pathology and Genetics of Head and Neck Tumours. 4th ed. Lyon, France: IARC Press; 2022.
19. Lubin D, Buonocore D, Wei XJ, et al. The Milan System at Memorial

SloanKettering: utility of the categorization system for in-house salivary gland fine-needle aspiration cytology at a comprehensive cancer center. Diagn Cytopathol.2020;48(3):183–190.
20. Wei S, Layfield L, LiVolsi VA, Montone KT, Baloch ZW. Reporting of fineneedle aspiration (FNA) specimens of salivary gland lesions: a comprehensive-review. Diagn Cytopathol. 2017;45(9):820–827.
21. Layfield LJ, Baloch ZW, Hirschowitz SL, Rossi ED. Impact on clinicalfollow-up of the Milan system for salivary gland cytology: a comparison with atraditional diagnostic classification. Cytopathology. 2018;29(4):335–342.
22. Behaeghe M, Vander Poorten V, Hermans R, Politis C, Weynand B, HaubenE. The Milan System for Reporting Salivary Gland Cytopathology: single centerexperience with cell blocks. Diagn Cytopathol. 2020;48(11):972–978.
23. Maleki Z, Miller JA, Arab SE, et al. "Suspicious" salivary gland FNA: risk ofmalignancy and interinstitutional variability. Cancer Cytopath. 2018;126(2):94–100.
24. Viswanathan K, Sung S, Scognamiglio T, Yang GCH, Siddiqui MT, Rao RA. The role of the Milan system for reporting salivary gland cytopathology: a 5-yearinstitutional experience. Cancer Cytopath. 2018;126(8):541–551.
25. Wang H, Malik A, Maleki Z, et al. "Atypical" salivary gland fine needleaspiration: risk of malignancy and interinstitutional variability. Diagn Cytopathol.2017;45(12):1088–1094.
26. Rohilla M, Singh P, Rajwanshi A, et al. Three-year cytohistologicalcorrelation of salivary gland FNA cytology at a tertiary center with the applicationof the Milan system for risk stratification. Cancer Cytopath. 2017;125(10):767–775.
27. Thiryayi SA, Low YX, Shelton D, Narine N, Slater D, Rana DN. Aretrospective 3-year study of salivary gland FNAC with categorisation using theMilan reporting system. Cytopathology. 2018;29(4):343–348.
28. Liu H, Ljungren C, Lin F, Zarka MA, Chen L. Analysis of histologic follow-up and risk of malignancy for salivary gland neoplasm of uncertain malignantpotential proposed by the Milan system for reporting salivary gland cytopathol-ogy. Cancer Cytopath. 2018;126(7):490–497.
29. Maleki Z, Baloch Z, Lu R, et al. Application of the Milan system forreporting submandibular gland cytopathology: an international, multi-institu-tional study. Cancer Cytopath. 2019;127(5):306–315.
30. Kurtycz DFI, Rossi ED, Baloch Z, et al. Milan interobserver reproducibilitystudy (MIRST): Milan System 2018. J Am Soc Cytopathol. 2020;9(3):116–125.
31. Morand GB, Alsayegh R, Mlynarek AM, et al. Application of the Milansystem for reporting salivary gland cytopathology using cell blocks. VirchowsArch. 2022;481(4):575–583.
32. Rossi ED, Faquin WC. The Milan system for reporting salivary glandcytopathology: the clinical impact so far. Considerations from theory to practice. Cytopathology. 2020;31(3):181–184.
33. Maleki Z, Allison DB, Butcher M, Kawamoto S, Eisele DW, Pantanowitz L. Application of the Milan system for reporting salivary gland cytopathology tocystic salivary gland lesions. Cancer Cytopath. 2021;129(3):214–225.
34. Lui SK, Tenney T, Mullane PC, Viswanathan K, Lubin DJ. Nondiagnostic-salivary gland FNAs are associated with decreased risk of malignancy comparedwith "all-comer" patients: analysis of the Milan system for reporting salivarygland cytopathology with a focus on Milan I: nondiagnostic. Cancer Cytopath.2022;130(10):800–811.
35. Pusztaszeri MP, Faquin WC. Update in salivary gland cytopathology: Recent molecular advances and diagnostic applications. Semin Diagn Pathol. 2015; 32: 264–74. [PubMed] [Google Scholar]
36. Colella G, Cannavale R, Flamminio F, Foschini MP. Fine-needle aspiration cytology of salivary gland lesions: A systematic review. J Oral MaxillofacSurg. 2010;68:2146–53. [PubMed] [Google Scholar]
37. Liu CC, Jethwa AR, Khariwala SS, Johnson J, Shin JJ. Sensitivity, specificity, and posttest probability of parotid fine-needle aspiration: A systematic review and meta-analysis. Otolaryngol Head Neck Surg. 2016; 154: 9–23. [PMC free article] [PubMed] [Google Scholar]
38. Hughes JH, Volk EE, Wilbur DC Cytopathology Resource Committee. College of American Pathologists. Pitfalls in salivary gland fine-needle aspiration cytology: Lessons from the College of American Pathologists Interlaboratory Comparison Program in Nongynecologic Cytology. Arch Pathos Lab Med. 2005;129:26–31. [PubMed] [Google Scholar]
39. Griffith CC, Pai RK, Schneider F, Duvvuri U, Ferris RL, Johnson JT, et al. Salivary gland tumor fine needle aspiration cytology: A proposal for a risk stratification classification. Am J ClinPathol. 2015;143:839–53. [PMC free article] [PubMed] [Google Scholar]
40. Schindler S, Nayar R, Dutra J, Bedrossian CW. Diagnostic challenges in aspiration cytology of the salivary glands. SeminDiagnPathol. 2001;18:124–46. [PubMed] [Google Scholar]
41. Rossi ED, Wong LQ, Bizzarro T, Petrone G, Mule A, Fadda G, et al. The impact of FNAC in the management of salivary gland lesions: Institutional experiences leading to a risk-based classification scheme. Cancer Cytopathol. 2016; 124: 388–96. [PubMed] [Google Scholar]
42. Griffith CC, Schmitt AC, Little JL, Magliocca KR. New developments in salivary gland pathology: Clinically useful ancillary testing and new potentially targetable molecular alterations. Arch Pathos Lab Med. 2017;141:381–95. [PubMed] [Google Scholar]
43. Jain R, Gupta R, Kudesia M, Singh S. Fine needle aspiration cytology in diagnosis of salivary gland lesions: a study with histologic comparison. CytoJournal. 2013;10:5.
44. Rossi ED, Faquin WC, Baloch Z, et al. The Milan System for Reporting Salivary Gland Cytopathology: analysis and suggestions of initial survey. Cancer Cytopathol. 2017;125(10):757–766.
45. Rossi ED, Baloch Z, Pusztaszeri M, Faquin WC. The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC): an ASC-IAC-sponsored system for reporting salivary gland fine-needle aspiration. J Am Soc Cytopathol. 2018;7(3):111–118.
46. Barbarite E, Puram SV, Derakhshan A, Rossi ED, Faquin WC, Varvares MA. A call for universal acceptance of the Milan system for reporting salivary gland cytopathology. Laryngoscope. 2020;130(1):80–85.
47. Mantravadi AV, Moore MG, Rassekh CH. AHNS series: do you know your guidelines? Diagnosis and management of salivary gland tumors. Head Neck. 2019;41(2):269–280.
48. Hughes JH, Volk EE, Wilbur DC, Cytopathology Resource Committee College of American Pathologists. Pitfalls in salivary gland fine-needle aspiration cytology: lessons from the College of American Pathologists Interlaboratory Comparison Program in Nongynecologic Cytology. Arch Pathol Lab Med. 2005; 129(1):26–31.
49. Sundling KE, Kurtycz DFI. Standardized terminology systems in cytopa thology. Diagn Cytopathol. 2019;47(1):53–63.
50. El-Naggar AK, Chan J, Takata T, Grandis J, Blootweg P. WHO Classification of Tumours. Pathology and Genetics of Head and Neck Tumours. 4th ed. Lyon, France: IARC Press; 2022.
51. Rossi ED, Wong LQ, Bizzarro T, et al. The impact of FNAC in the management of salivary gland lesions: institutional experiences leading to a risk based classification scheme. Cancer Cytopathol. 2016;124(6):388–396.
52. Ali SZ, Cibas ED, eds. The Bethesda system for reporting thyroid cytopathology: definitions, criteria and explanatory notes. New York: Springer; 2017.