

Fine Needle Aspiration Cytology of Cystic Head and Neck Lesions: A Prospective Study of 90 Cases with Histopathological Correlation

Veeksha V. Gowda¹, S.B. Patil², Subhashini H. Bevinakatti³

¹Assistant Professor, Department of Pathology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

²Professor, Department of Pathology, J J M Medical College, Davangere, Karnataka, India

³Assistant Professor, Department of Pathology, Hassan Institute of Medical Sciences, Karnataka, India

Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026

Corresponding author: Dr. Subhashini H. Bevinakatti

Conflict of interest: Nil

Abstract

Background: Cystic lesions of the head and neck constitute a heterogeneous group of developmental, inflammatory, benign neoplastic, and malignant conditions. Although fine needle aspiration cytology (FNAC) is widely used as a rapid and minimally invasive diagnostic procedure for head and neck swellings, cystic lesions present particular diagnostic difficulties because of hypocellularity, degenerative changes, and overlapping cytomorphological features.

Aim: To evaluate the cytomorphological spectrum of cystic lesions of the head and neck and determine the diagnostic accuracy of FNAC by correlation with histopathological examination.

Materials and Methods: This prospective observational study included 90 patients presenting with clinically and/or radiologically cystic lesions of the head and neck. FNAC was performed using standard technique, and smears were stained with May-Grünwald-Giemsa and Papanicolaou stains. Histopathological examination was performed on subsequently excised lesions. Cytological diagnoses were correlated with histopathological findings. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy of FNAC for detection of malignancy were calculated.

Results: Of the 90 patients, 52 (57.8%) were females and 38 (42.2%) were males. The most frequently affected age group was 31–40 years. Thyroid lesions constituted the largest group (41.1%), followed by lymph-node lesions (24.4%), salivary-gland lesions (17.8%), and developmental/other cystic lesions (16.7%). Histopathological examination identified 74 benign and 16 malignant lesions. FNAC correctly classified 71 benign and 14 malignant lesions. Two malignant lesions were falsely categorized as benign, while three benign lesions were considered suspicious/malignant cytologically. The sensitivity, specificity, PPV, NPV, and diagnostic accuracy of FNAC for detecting malignancy were 87.5%, 95.9%, 82.4%, 97.3%, and 94.4%, respectively.

Conclusion: FNAC is a simple, safe, economical, and highly accurate first-line investigation for cystic lesions of the head and neck. However, cystic malignancies may yield hypocellular aspirates and cause false-negative diagnoses. Careful clinical-radiological correlation, ultrasound-guided sampling of solid components, repeat aspiration, and histopathological examination are advisable in suspicious or discordant cases.

Keywords: Fine Needle Aspiration Cytology; FNAC; Cystic Lesions; Head And Neck; Histopathology; Cytohistological Correlation; Diagnostic Accuracy.

DOI: 10.25258/ijcpr.18.8.222

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Cystic lesions of the head and neck are commonly encountered in clinical practice and encompass a broad spectrum of developmental, inflammatory, degenerative, and neoplastic disorders. These lesions may originate from lymph nodes, salivary glands, thyroid gland, soft tissues, or embryological remnants. The clinical presentation is frequently similar across different pathological entities, making an accurate preoperative diagnosis

challenging. Fine needle aspiration cytology (FNAC) has emerged as an important first-line diagnostic modality because it is simple, minimally invasive, inexpensive, and can provide rapid diagnostic information [1,2]. FNAC has demonstrated high diagnostic accuracy in the evaluation of head and neck masses. Tilak et al. reported an overall diagnostic accuracy of approximately 92.7%, with sensitivity and

specificity of 90.9% and 93.2%, respectively [1]. More recent studies have similarly demonstrated that FNAC can substantially influence clinical decision-making by distinguishing inflammatory and benign lesions from malignant neoplasms [2,3]. However, the diagnostic performance of FNAC varies according to the anatomical site and nature of the lesion.

Cystic lesions represent a particular diagnostic challenge. Aspiration frequently yields fluid containing macrophages, inflammatory cells, proteinaceous material, and cellular debris, while the diagnostically important epithelial or malignant cells may be scant or completely absent. Consequently, cystic neoplasms can be mistakenly diagnosed as non-neoplastic cysts. Firat et al., in their cytohistological analysis of cystic head and neck lesions, observed that lesions such as Warthin tumour, squamous cell carcinoma, mucoepidermoid carcinoma, and schwannoma could produce non-representative aspirates [4].

The clinical significance of this problem is particularly important in adults presenting with lateral cystic neck masses. A cystic cervical lymph node may represent metastatic squamous cell carcinoma, especially from an oropharyngeal primary tumour. Studies evaluating cystic neck lesions have demonstrated lower sensitivity of FNAC than is generally observed for solid head and neck masses [5,6]. Therefore, a benign-appearing or paucicellular aspirate should not automatically be regarded as proof of a benign lesion when clinical or radiological features are suspicious.

Despite these limitations, FNAC remains an invaluable initial investigation. Moatamed et al. demonstrated a specificity of 100% for FNA in cystic neck lesions, although sensitivity was lower at 76%, highlighting its high reliability when a malignant cytological diagnosis is obtained but also emphasizing the possibility of false-negative results [5]. Repeat aspiration, preferably under ultrasound guidance and directed toward the solid or mural component of a cystic lesion, may improve diagnostic yield [4,5].

Histopathological examination remains the definitive method for establishing the final diagnosis and provides an appropriate gold standard for evaluating cytological performance. Cytohistological correlation is therefore important for identifying diagnostic pitfalls and improving FNAC interpretation.

The present prospective study was undertaken to evaluate the cytomorphological spectrum of cystic head and neck lesions in 90 patients and to correlate FNAC findings with subsequent histopathological diagnoses. The study also aimed

to determine the sensitivity, specificity, predictive values, and overall diagnostic accuracy of FNAC for distinguishing benign from malignant cystic lesions.

Aim: To evaluate the diagnostic utility of fine needle aspiration cytology in cystic lesions of the head and neck with histopathological correlation.

Materials and Methods

Study Design and Setting: This prospective observational study was conducted in the Department of Pathology of a tertiary-care teaching hospital in collaboration with the Departments of Otorhinolaryngology, General Surgery, and Radiodiagnosis.

The study included patients presenting with cystic swellings in the head and neck region who underwent FNAC followed by surgical excision and histopathological examination.

Study Population: A total of 90 consecutive patients with clinically and/or radiologically diagnosed cystic lesions of the head and neck were enrolled during the study period. Patients of all age groups and both sexes were eligible.

Inclusion Criteria: Patients presenting with a palpable or radiologically demonstrable cystic or predominantly cystic lesion in the head and neck region were included. Only cases in which adequate cytological material and subsequent histopathological examination were available were considered for final cytohistological correlation.

Exclusion Criteria: Patients who did not undergo histopathological examination, lesions with persistently inadequate material despite repeat aspiration, patients unwilling to participate, and lesions for which complete clinical information was unavailable were excluded.

Fine Needle Aspiration Procedure: After obtaining informed consent and recording relevant clinical details, FNAC was performed under aseptic precautions. The site, size, consistency, mobility, duration, associated symptoms, and relevant lymph-node findings were documented. A 22–25 gauge needle attached to a 10-mL disposable syringe was used for aspiration. For deep-seated or predominantly cystic lesions, ultrasound guidance was used whenever clinically indicated.

In cystic lesions, the fluid was initially aspirated completely, following which residual solid areas or the cyst wall were re-aspirated whenever possible to improve cellular yield. The nature and quantity of aspirated fluid were recorded.

Cytological Processing: Direct smears were prepared immediately. Air-dried smears were stained using May-Grünwald-Giemsa stain, while alcohol-fixed smears were stained by the

Papanicolaou method. Additional special stains were performed wherever required.

Cytological lesions were broadly categorized as inflammatory, developmental/non-neoplastic, benign neoplastic, suspicious for malignancy, or malignant. Cytological diagnoses were made after correlation with available clinical and radiological information.

Histopathological Examination: Surgically excised specimens were fixed in 10% neutral-buffered formalin. Representative sections were processed routinely, embedded in paraffin, sectioned at approximately 3–5 μ m thickness, and stained with hematoxylin and eosin. Histopathological diagnosis was considered the reference standard.

Cytohistopathological Correlation: FNAC findings were compared with the corresponding histopathological diagnosis. For statistical analysis, lesions were categorized as benign or malignant. Suspicious cytological diagnoses were considered positive for malignancy.

True-positive (TP), true-negative (TN), false-positive (FP), and false-negative (FN) cases were identified.

Diagnostic parameters were calculated using standard definitions:

- Sensitivity = $TP/(TP + FN) \times 100$
- Specificity = $TN/(TN + FP) \times 100$
- Positive predictive value = $TP/(TP + FP) \times 100$
- Negative predictive value = $TN/(TN + FN) \times 100$
- Diagnostic accuracy = $(TP + TN)/\text{total cases} \times 100$

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee.

Written informed consent was obtained from all participants or their legally authorized representatives. Patient confidentiality was maintained throughout the study.

Results

A total of 90 patients with cystic lesions of the head and neck who underwent both FNAC and subsequent histopathological examination were included.

Table 1: Age Distribution of Study Participants

Age group (years)	Number (n)	Percentage (%)
≤20	9	10.0
21–30	17	18.9
31–40	25	27.8
41–50	18	20.0
51–60	13	14.4
>60	8	8.9
Total	90	100.0

The largest proportion of patients belonged to the 31–40-year age group (27.8%), followed by 41–50 years (20.0%). Twenty-one patients (23.3%) were older than 50 years.

Table 2: Sex Distribution

Sex	Number (n)	Percentage (%)
Male	38	42.2
Female	52	57.8
Total	90	100.0

A slight female predominance was observed, with a male-to-female ratio of approximately 1:1.37.

Table 3: Anatomical Distribution of Cystic Head and Neck Lesions

Site	Number (n)	Percentage (%)
Thyroid gland	37	41.1
Cervical lymph nodes	22	24.4
Salivary glands	16	17.8
Developmental/other neck cysts	15	16.7
Total	90	100.0

The thyroid gland was the most frequent anatomical site, accounting for 41.1% of cases. Cervical lymph nodes constituted 24.4%, followed by salivary-gland lesions (17.8%).

Table 4: Histopathological Spectrum of Cystic Lesions

Histopathological diagnosis	Number (n)	Percentage (%)
Nodular/colloid goitre with cystic change	25	27.8
Branchial cyst	10	11.1
Warthin tumour	9	10.0
Reactive/inflammatory lymph-node lesion	8	8.9
Thyroglossal duct cyst	5	5.6
Lymphangioma	4	4.4
Epidermoid/dermoid cyst	4	4.4
Benign salivary cyst/retention cyst	4	4.4
Other benign lesions	5	5.6
Papillary thyroid carcinoma with cystic change	7	7.8
Metastatic squamous cell carcinoma	5	5.6
Mucoepidermoid carcinoma	2	2.2
Other malignant lesions	2	2.2
Total	90	100.0

Overall, 74 (82.2%) lesions were benign and 16 (17.8%) were malignant on histopathological examination. Nodular/colloid goitre with cystic degeneration was the most frequent individual diagnosis.

Table 5: Comparison of FNAC and Histopathological Classification

FNAC diagnosis	Histologically malignant	Histologically benign	Total
Malignant/suspicious	14 (TP)	3 (FP)	17
Benign	2 (FN)	71 (TN)	73
Total	16	74	90

FNAC correctly identified 14 of the 16 histologically malignant lesions. Two malignant lesions were incorrectly classified as benign, representing false-negative cases. Three benign lesions were categorized cytologically as suspicious or malignant.

Table 6: Diagnostic Performance of FNAC for Detection of Malignancy

Diagnostic parameter	Value (%)
Sensitivity	87.5
Specificity	95.9
Positive predictive value	82.4
Negative predictive value	97.3
Diagnostic accuracy	94.4
False-negative rate	12.5
False-positive rate	4.1

FNAC demonstrated a sensitivity of 87.5% and specificity of 95.9%. The high negative predictive value of 97.3% indicates good ability to exclude malignancy, although false-negative diagnoses remain clinically important in cystic lesions.

Table 7: Cytohistological Concordance According to Anatomical Site

Site	Total cases	Concordant	Discordant	Concordance (%)
Thyroid	37	35	2	94.6
Lymph nodes	22	19	3	86.4
Salivary glands	16	14	2	87.5
Developmental/other cysts	15	15	0	100.0
Total	90	83	7	92.2

The highest cytohistological concordance was observed in developmental and other benign cystic lesions. Relatively greater discordance was encountered in cervical lymph-node and salivary-gland lesions, reflecting the diagnostic difficulties associated with cystic neoplasms at these sites.

Discussion

Fine needle aspiration cytology is widely accepted as an important initial diagnostic investigation for head and neck masses because of its simplicity, rapidity, cost-effectiveness, and low complication

rate. Nevertheless, cystic lesions remain diagnostically challenging because aspiration may obtain only cyst contents rather than representative lesional cells. The present study evaluated 90 cystic head and neck lesions and demonstrated an overall FNAC diagnostic accuracy of 94.4% for differentiating malignant from benign disease.

In the present study, females constituted 57.8% and males 42.2% of patients. The largest proportion of cases occurred in the 31–40-year age group. The thyroid was the commonest anatomical site, followed by cervical lymph nodes and salivary glands. The distribution of lesions in studies of head and neck FNAC varies considerably according to inclusion criteria, particularly whether thyroid and salivary-gland lesions are included [1–3].

Histopathologically, 82.2% of lesions in the present study were benign and 17.8% were malignant. Cystic nodular/colloid goitre was the commonest lesion. Developmental lesions included branchial cysts, thyroglossal duct cysts, lymphangiomas, and epidermoid/dermoid cysts. Malignant lesions included papillary thyroid carcinoma with cystic degeneration, metastatic squamous cell carcinoma, and mucoepidermoid carcinoma.

Firat et al. evaluated 63 cystic head and neck lesions with histological follow-up and reported that FNAC correctly diagnosed 25 of 36 neoplasms with a cystic component [4]. Non-representative aspirates occurred particularly in Warthin tumours, squamous cell carcinomas, mucoepidermoid carcinomas, and schwannomas. Their findings emphasize that apparently benign cyst contents cannot reliably exclude an underlying neoplasm.

Moatamed et al. investigated 92 cystic neck lesions with histological follow-up and reported an overall sensitivity of 76% and specificity of 100% for FNA [5]. The sensitivity of 87.5% observed in the present series was higher, whereas specificity remained similarly high at 95.9%. Differences between studies may be related to case selection, lesion distribution, aspiration technique, ultrasound guidance, cytopathologist experience, and criteria used for defining positive and negative cytological diagnoses.

A major diagnostic problem in cystic neck lesions is the false-negative result. In the present study, two of 16 malignant lesions were falsely categorized as benign. Cystic degeneration may substantially decrease the number of diagnostic malignant cells in an aspirate. Repeat aspiration from residual solid areas or mural nodules is therefore important when clinical or radiological suspicion persists despite an apparently benign cytological result. Firat et al. similarly recommended repeat aspirations from different

parts of a lesion as a means of reducing false-negative diagnoses [4].

This issue is particularly important for lateral cystic neck masses in adults. Cystic metastatic squamous cell carcinoma can mimic a benign branchial cyst cytologically and clinically. A study comparing diagnostic techniques for lateral cystic neck masses reported an FNA sensitivity of approximately 59%, lower than that of core needle biopsy and frozen section [6]. More recent evidence also emphasizes careful investigation of solitary cystic neck masses in adults because malignancy is an important differential diagnosis, particularly in posterolateral neck lesions [7].

The overall concordance between FNAC and histopathology in the present study was 92.2%. Developmental cystic lesions showed the highest concordance, whereas lymph-node and salivary-gland lesions demonstrated relatively greater discordance. Salivary lesions are particularly problematic because Warthin tumour and low-grade mucoepidermoid carcinoma may be predominantly cystic and yield paucicellular material.

Studies involving broader categories of head and neck masses have generally demonstrated high diagnostic performance of FNAC. A large study reported overall sensitivity and specificity of 92% and 94.4%, respectively, with an accuracy of 93.5% [8]. Shah and Gandhi reported sensitivity of 71.4%, specificity of 98.9%, PPV of 83.3%, and NPV of 97.8% in their prospective comparison of FNAC with histopathology [9]. These findings, together with those of the present study, reinforce the role of FNAC as a highly useful initial diagnostic procedure while highlighting that its results must always be interpreted in the appropriate clinical and radiological context.

The principal limitations of FNAC in cystic lesions are sampling error, hypocellularity, degenerative cellular changes, and overlapping cytomorphology. Ultrasound-guided targeting of mural nodules and solid areas, preparation of cell blocks from cyst fluid where feasible, repeat aspiration of suspicious lesions, and ancillary investigations may improve diagnostic yield.

Conclusion

Fine needle aspiration cytology is a safe, rapid, minimally invasive, and cost-effective diagnostic technique for the initial evaluation of cystic lesions of the head and neck. In the present study, FNAC demonstrated 87.5% sensitivity, 95.9% specificity, 82.4% positive predictive value, 97.3% negative predictive value, and 94.4% overall diagnostic accuracy for detecting malignancy.

Despite its high diagnostic performance, FNAC has important limitations in cystic lesions because malignant neoplasms may undergo extensive cystic degeneration and yield hypocellular or apparently benign aspirates. Particular caution is required when evaluating cystic cervical lymph nodes in adults and predominantly cystic salivary or thyroid neoplasms. Clinical and radiological correlation is therefore essential. Ultrasound-guided aspiration of the solid component or cyst wall, repeat FNAC, and histopathological examination should be considered whenever cytological findings are inadequate, atypical, or discordant with clinical or radiological features.

Overall, FNAC remains an excellent first-line investigation for cystic head and neck lesions and can substantially assist in planning appropriate patient management when its limitations are recognized.

References

1. Tilak V, Dhaded AV, Jain R. Fine needle aspiration cytology of head and neck masses. *Indian J Pathol Microbiol.* 2002;45(1):23-9.
2. Paker IO, Kulaçoğlu S, Eruyar T, Ergül G. Fine needle aspiration cytology of head and neck masses: a cytohistopathological correlation study with emphasis on false positives and false negatives. *Kulak Burun Bogaz Ihtis Derg.* 2013;23(3):163-72. doi:10.5606/kbbihtisas.2013.27048.
3. Ashraf MJ, Raad H, Azarpira N, Khademi B, Shishegar M, Gandomi B, et al. Fine-needle aspiration cytological diagnosis of neck masses. *Acta Cytol.* 2015;59(1):68-76. doi:10.1159/000371412.
4. Firat P, Ersoz C, Uguz A, Onder S. Cystic lesions of the head and neck: cytohistological correlation in 63 cases. *Cytopathology.* 2007; 18(3): x184-90. doi:10.1111/j.1365-2303.2006.00400.x.
5. Moatamed NA, Naini BV, Fathizadeh P, Estrella J, Apple SK. A correlation study of diagnostic fine-needle aspiration with histologic diagnosis in cystic neck lesions. *Diagn Cytopathol.* 2009;37(10):720-6. doi:10.1002/dc.21088.
6. Tandon S, Shahab R, Benton JI, Ghosh SK, Sheard J, Jones TM. Fine-needle aspiration cytology in a regional head and neck cancer center: comparison with a systematic review and meta-analysis. *Head Neck.* 2008;30(9):1246-52.
7. Malignancy and “violated neck” rates in consecutive cohort of 79 adult patients with solitary cystic neck mass: lessons learned and recommendations for clinical practice guidelines. *J Craniofac Surg.* 2024. doi:10.1097/SCS.00000000000010122.
8. Al-Khafaji BM, Nestok BR, Katz RL. Fine-needle aspiration of 154 parotid masses with histologic correlation: ten-year experience at the University of Texas M.D. Anderson Cancer Center. *Cancer.* 1998;84(3):153-9.
9. Shah Y, Gandhi S. A prospective study of comparison between fine needle aspiration cytology (FNAC) with histopathological diagnosis (HPE) in neck masses. *Indian J Otolaryngol Head Neck Surg.* 2023;75(3):14 47-53. doi:10.1007/s12070-022-03461-y.
10. Dejmek A, Lindholm K. Fine needle aspiration biopsy of cystic lesions of the head and neck, excluding the thyroid. *Acta Cytol.* 1990;34(3):443-8.
11. Layfield LJ, Glasgow BJ. Diagnosis of lymph node metastases by fine-needle aspiration cytology. *Arch Pathol Lab Med.* 1993;117:837-41.
12. Fulciniti F, Califano L, Zupi A, Vetrani A. Accuracy of fine needle aspiration biopsy in head and neck tumors. *J Oral Maxillofac Surg.* 1997;55(10):1094-7.
13. Balakrishnan K, Castling B, McMahon J, Imrie J, Feeley KM, Parker AJ, et al. Fine needle aspiration cytology in the management of a parotid mass: a two centre retrospective study. *Surgeon.* 2005;3(2):67-72.
14. Stewart CJ, MacKenzie K, McGarry GW, Mowat A. Fine-needle aspiration cytology of salivary gland: a review of 341 cases. *Diagn Cytopathol.* 2000;22(3):139-46.
15. Howlett DC. Diagnosing a parotid lump: fine needle aspiration cytology or core biopsy? *Br J Radiol.* 2006;79(940):295-7.