Section: Pathology

Original Research Article

DIAGNOSTIC ACCURACY OF FINE-NEEDLE ASPIRATION CYTOLOGY IN HEAD AND NECK MASSES: A RETROSPECTIVE STUDY AT A TERTIARY CARE CENTRE

Prachi,[1] Prashant B M[2]

[1]Post Graduate Resident, Department of Pathology, Karwar Institute of Medical Sciences, India.
[2]Associate Professor, Department of Pathology, Karwar Institute of Medical Sciences, India.

Received *: 17/03/2025*
Received in revised form *: 09/05/2025*
Accepted *: 29/05/2025*

Corresponding Author:
Dr. Prachi,
Post Graduate Resident, Department of Pathology, Karwar Institute of Medical Sciences, India..
Email: prachis809@gmail.com

DOI: 10.70034/ijmedph.2025.2.391

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (2); 2173-2179

ABSTRACT

Background: Head and Neck lesions encompass various conditions, from benign cysts to malignant tumours. Timely and precise diagnosis is crucial for treatment planning. Fine Needle Aspiration Cytology (FNAC) offers a minimally invasive, cost-effective, and swift diagnostic method for assessing these lesions.

Materials and Methods: A retrospective observational study at Karwar Institute of Medical Sciences, from Jan 01 to Sep 30, 2023, involved 269 patients with head and neck masses undergoing FNAC. Data, extracted from requisition forms and cytopathology reports with histopathological co-relation, when possible, was analysed using Microsoft Excel and Jamovi Software version 2.3.28.

Results: In the 269 head and neck lesions studied, 31-40 age group was most common, with females (52%) outnumbering males. Skin and soft tissue cases accounted for 34.2%, most commonly were Epidermoid Cysts (38.1%). Lymph Node cases constituted 30.5%, with 54.9% being Reactive Lymphadenitis. Thyroid disorders made up 28.6%, with Lymphocytic Thyroiditis at 31.2%. Salivary Gland cases were 6.7%, out of which, 47.1% were cases of Sialadenitis. Among the 269 cases, 6.1% were identified as malignant, and within this subset, 3% exhibited lymph node metastasis. FNAC was inconclusive in 5.2% cases. Cyto-histopathological correlation in 23 cases showed 78.3% concordance, mainly affected by sampling error and cytological underdiagnosis due to poorly representative cellular material.

Conclusions: The primary finding of this study exhibits effortless diagnostic capability of FNAC in determining the characteristics of head and neck swellings, establishing its significance as a valuable tool for the initial assessment of such conditions.

Keywords: Head and neck lesions, FNAC, swellings.

INTRODUCTION

Palpable swellings in the head and neck region are among the most frequently encountered clinical conditions faced by practitioners.[1] Neck swellings are a common clinical presentation, easily accessible for diagnostic procedures due to their superficial nature. Often asymptomatic, they are typically noticed incidentally during grooming or by others. A systematic and thorough evaluation is essential to accurately diagnose and manage these masses.[2]

Palpable head and neck swellings encompass a variety of non-neoplastic and neoplastic lesions involving lymph nodes, salivary glands, thyroid, and soft tissues. The diverse tissue types and the prevalence of primary and metastatic neoplasms make this region a common site for Fine Needle Aspiration Technique (FNAC) diagnosis.[3] Neck masses are often benign but can occasionally be malignant, requiring early differentiation for timely diagnosis and treatment to reduce patient morbidity and mortality.[4] Evaluating a neck mass begins with

a thorough history and a complete head and neck examination, focusing on the upper aerodigestive tract. This approach narrows diagnostic possibilities and guides subsequent steps, often following an algorithm.[5]

FNAC is a primary diagnostic tool for head and neck lesions, evolving from a screening method to a powerful diagnostic technique.6 FNAC involves using a 21- or 22-gauge needle and a 10ml syringe to aspirate cells from pathological lesions. It is suitable for sampling superficial organs like the thyroid, breast, and lymph nodes, while deep organs like the lungs, liver, and kidneys require ultrasound or CT guidance. FNAC is an inexpensive, safe, quick, and accurate procedure when performed by experienced professionals.[7] FNAC of the head and neck region is a widely accepted technique known for its high specificity.[8]

FNAC effectively distinguishes non-neoplastic from neoplastic lesions, often eliminating the need for surgical intervention. Advanced techniques such as flow cytometry, cytogenetics, electron microscopy, cell block preparation, and immunocytochemistry have significantly enhanced cytology, evolving it from a screening tool into a robust diagnostic method.[9]

FNAC has evolved over time and provides a comprehensive cellular sample through multiple passes and has become a widely successful primary diagnostic tool for tumours over the past 30 years. But despite its widespread use, published data on its diagnostic accuracy in this regional population are scarce. This study aims to quantify the diagnostic accuracy of FNAC across different lesion types, and identify factors contributing to inconclusive or discordant results.

MATERIALS AND METHODS

Study design, sample size and source of data:

This was a retrospective observational study and data was collected from requisition forms, cytopathology reports, and archived slides of previous palpable head and neck swelling cases undergoing FNAC conducted in Department of Pathology from January 2023 to September 2023 at Karwar Institute of Medical Sciences.

Inclusion and Exclusion Criteria

All the head and neck cases were separated from other lesions aspirated over nine months and data with incomplete demographic details were excluded from the study.

Method of Data Collection

This study included 269 FNAC samples from head and neck lesions, conducted over 9 months. Ethical approval was obtained from the institutional ethics committee, and informed written consent was secured after explaining the research protocol in detail to all participants.

A comprehensive patient history was recorded, focusing on neck swelling and its potential causes. Relevant questions were asked regarding past, present, and family history of conditions.

The procedure was performed in an outpatient setting to minimize patient discomfort and risk of complications. The area to be aspirated was thoroughly cleaned with spirit. FNAC was performed using a 10cc disposable syringe and a 22/23-gauge needle under aseptic precautions. Both aspiration and non-aspiration techniques were utilized as required. Multiple hits were made within the lesion while applying sufficient negative pressure. After aspiration, the needle was removed, and pressure was immediately applied to the site to prevent bleeding or hematoma formation.

The aspirated material was smeared onto two clean glass slides. Depending on the staining protocol, the smears were either wet-fixed or air-dried. Routine staining with Haematoxylin and Eosin and Pap stain was performed. Special stains were applied as required based on the lesion type or clinical suspicion. Three to four smears were prepared by a cytopathologist following standard guidelines. Ziehl-Neelsen staining for acid-fast bacilli was conducted for suspected tubercular lesions. Aspirations were taken from various sites, including lymph nodes, thyroid, salivary glands, and soft tissues. Cytomorphological diagnoses were made based on the pathology observed. Excisional biopsy specimens were fixed in 10% neutral buffered formalin, processed by paraffin embedding, and stained with Haematoxylin and Eosin. Cyto-histopathological correlation was performed in relevant cases.

This minimally invasive technique provided accurate cytological diagnoses with minimal trauma and no complications, ensuring patient safety and comfort throughout the process.

Statistical Analysis

The data collected was analysed using Jamovi 2.3.28. Socio-demographic variables were analysed in terms of mean, standard deviation (SD), frequency (n) and percentage (%). A p-value of <0.05 was taken as statistically significant. Data results were represented in the form of tables and figures.

RESULTS

The study analyzed 269 cases, with patient ages ranging from 2 to 82 years. The mean age of the patients was 39.18 + 18.286 years, indicating that, on average, the study population was in middle adulthood and suggesting that the cases included a diverse age group spanning from early childhood to elderly individuals.

In our cohort of 269 FNACs, we observed a slight female predominance (52% vs. 48%) and a peak incidence in the 31–40 (21.2%) and 41–50 (18.2%) year age groups, with women outnumbering men in both brackets. This mirrors well-documented trends in thyroid and related head–neck lesions:

ultrasound-based studies report a female-to-male prevalence ratio of approximately 3–4:1 for thyroid nodules—largely attributed to oestrogen-mediated proliferative effects on thyroid follicular cells and higher rates of autoimmune thyroiditis in women.[10]

Table 1: Baseline characteristics based on gender distribution

Baseline variables	Females (n=140)	Males (n=129)	p-value
AGE GROUP (in years)			
0 – 10	5 (3.6%)	8 (6.2%)	**0.214**
11 – 20	15 (10.7%)	19 (14.7%)	
21 - 30	20 (14.3%)	23 (17.8%)	
31 – 40	33 (23.6%)	24 (18.6%)	
41 – 50	28 (20.0%)	21 (16.3%)	
51 – 60	16 (11.4%)	15 (11.6%)	
61 – 70	19 (13.6%)	9 (7.0%)	
71 – 80	4 (2.9%)	7 (5.4%)	
81 – 90	0 (0.0%)	3 (2.3%)	
MEAN AGE (in years)	40.43 ± 17.225	37.82 ± 19.348	**0.243**

Table 2: Distribution of lesions based on gender

LESIONS	Female (n=140)	Male (n=129)	
Skin and subcutaneous tissue	33 (23.6%)	59 (45.7%)	**<0.0001***
Lymph nodes	33 (23.6%)	49 (38%)	
Thyroid	69 (49.3%)	8 (6.2%)	
Salivary glands	5 (3.6%)	13 (10.1%)	

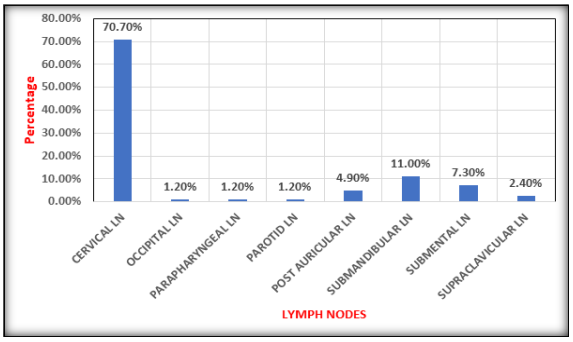

Figure 1a: Distribution of clinical features with respect to site of lesions – Lymph node

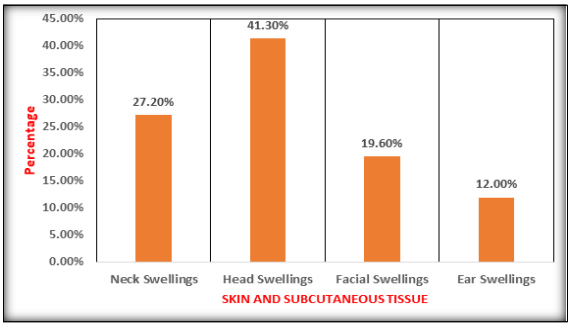

Figure 1b: Distribution of clinical features with respect to site of lesions – Skin & subcutaneous tissue

The distribution of clinical features based on the site of lymph node lesions reveals that cervical lymph nodes were the most commonly affected, accounting for 70.7% of cases. This highlights the prominence of cervical lymphadenopathy in the study population, which could be due to infections, malignancies, or other pathological processes commonly affecting this region. Other lymph node sites were far less frequently involved. Submandibular lymph nodes represented 11% of cases, followed by submental lymph nodes at 7.3%, and supraclavicular lymph nodes at 2.4%, which may indicate rarer involvement typically seen in specific conditions like tuberculosis or metastatic malignancies. Sites such as the post-auricular, occipital, parotid, and parapharyngeal lymph nodes were equally uncommon, each contributing to only 1.2% of cases, potentially reflecting limited pathological involvement in these regions within the study cohort. This data underscores the importance of a thorough clinical examination, with particular attention to cervical lymph nodes in cases of lymphadenopathy (Figure 1a).

The distribution of clinical features associated with lesions affecting the skin and subcutaneous tissue, categorized by anatomical site. The highest prevalence is observed in head swellings, accounting for 41.30% of cases. Neck swellings follow, with a significant proportion of 27.20%. Facial swellings are less common, comprising 19.60% of the cases. The lowest incidence is noted in ear swellings, which represent 12.00% of the total. This data highlights that head swellings are the most frequently encountered (Figure1b).

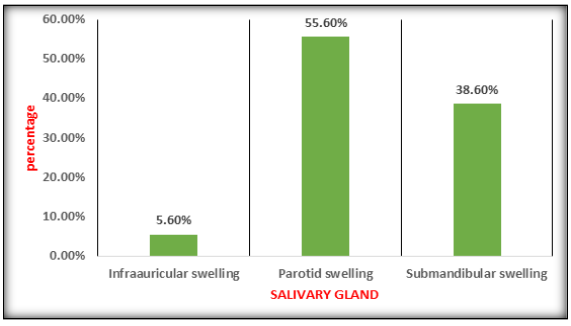

Figure 1c: Distribution of clinical features with respect to site of lesions – Salivary gland

The bar chart (Figure 1c) illustrates the distribution of clinical features related to lesions in the salivary gland. The most common site of involvement is parotid swelling, accounting for 55.60% of cases. Submandibular swelling is the second most frequent, representing 38.60%. In contrast, infraauricular swelling is relatively uncommon, making up only 5.60% of the cases. This data emphasizes that parotid swellings are significantly more prevalent compared to other salivary glands.

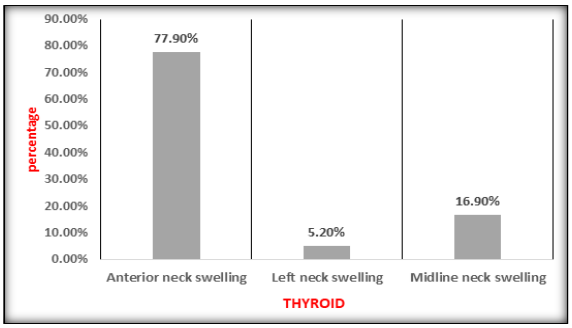

Figure 1d: Distribution of clinical features with respect to site of lesions – Thyroid

Figure 1d shows the distribution of clinical features associated with thyroid lesions. Anterior neck swelling is the most prevalent, accounting for 77.90% of cases. Midline neck swelling follows, representing 16.90%. Left neck swelling is the least common, comprising only 5.20%. This data highlights that anterior neck swellings are overwhelmingly more common in thyroid-related cases compared to other regions of the neck.

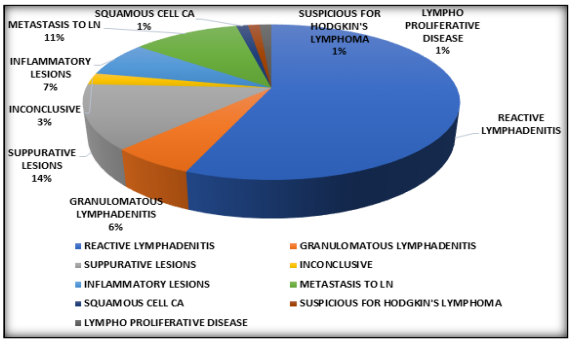

Figure 2a: Distribution of diagnosis of lymph node lesions

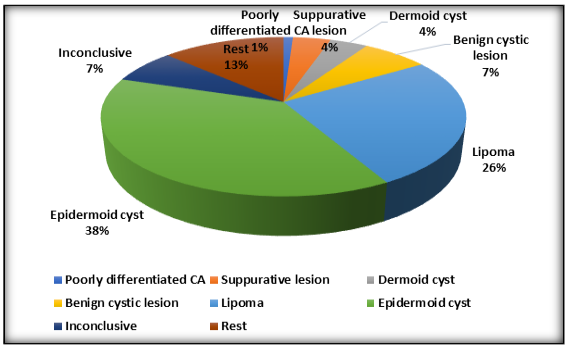

Figure 2b: Distribution of diagnosis of skin and subcutaneous lesions

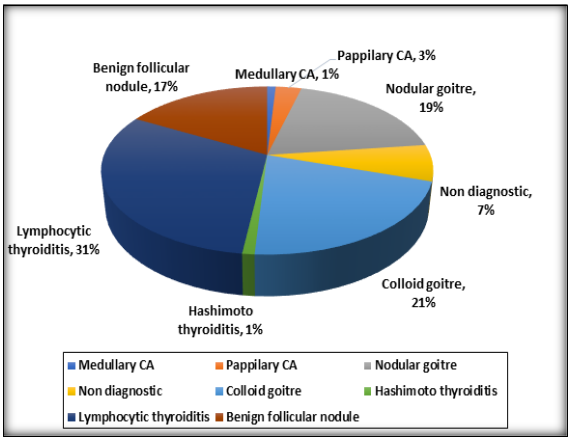

Figure 2c: Distribution of diagnosis of thyroid lesions

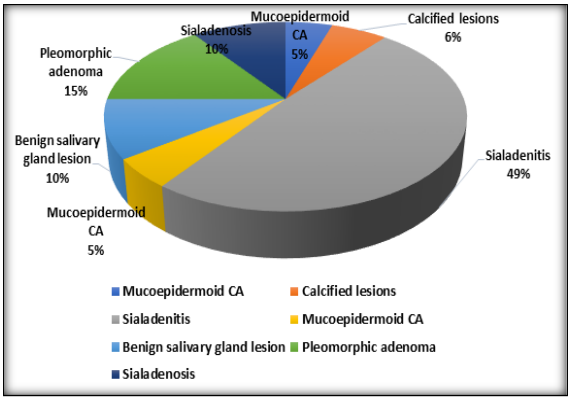

Figure 2d: Distribution of diagnosis of salivary gland lesions

The distribution of diagnosis based on various lesions is depicted in pie chart (figure 2a,2b,2c,2d)
The majority of diagnoses (72%) were accurate and aligned (concordant), while a smaller proportion (28%) showed discrepancies (discordant). The detailed breakdown helps identify specific areas where diagnostic accuracy might be improved, such as inconclusive results or differentiating between similar conditions (e.g., lipomas versus other tumours). This could be used in a clinical or research setting to evaluate diagnostic tools or procedures.

DISCUSSION

FNAC is a simple, quick, and cost-effective method for evaluating superficial head and neck masses, performed with minimal trauma in an outpatient setting. It is particularly useful for early differentiation between benign and malignant pathologies, significantly impacting treatment planning. Additionally, FNAC can serve both diagnostic and therapeutic purposes, especially in cystic swellings.[11]
This retrospective cyto-histological study of head and neck lesions includes swellings from cervical and supraclavicular lymph nodes, thyroid, parotid and submandibular salivary glands, developmental cysts, and other miscellaneous lesions.

In our study, skin and soft-tissue lesions predominated (34.2%) because they lie just beneath the skin and are readily palpated and aspirated. Epidermoid cysts made up 38.1% of these cases; they arise from entrapped epidermal cells in the dermis and are most common on the face, scalp, and neck where pilosebaceous units abound. Their slowly enlarging, painless nodules with a central punctum often prompt early clinical evaluation and FNAC sampling.[12]

Lymph node lesions made up 30.5% of our 269 FNACs, with 54.9% diagnosed as reactive lymphadenitis. This reflects nodes' role as antigen filters—where infection or irritation triggers benign follicular hyperplasia evident on cytology—and the ease of palpating and sampling superficial cervical nodes in the outpatient setting.[13] Similar series report reactive lymphadenitis in roughly half of benign nodal aspirates (48.3%), highlighting both immunologic and practical drivers of this finding.[14]

Thyroid lesions made up 28.6% of our 269 FNACs, reflecting the high background rate of palpable thyroid nodules in the general population. Palpable nodules are found in about 4–7% of adults, and FNAC is the standard first-line investigation for any clinically or sonographically detected thyroid swelling.[15] Within our thyroid group, lymphocytic (Hashimoto) thyroiditis was the most common finding (31.2%). This mirrors other FNAC series in which chronic lymphocytic thyroiditis ranks as the second most frequent thyroid diagnosis—comprising roughly 30–35% of benign thyroid aspirates—and reflects the rising prevalence of autoimmune thyroid disease, especially in middle-aged women.[16,17] Together, the combination of a sizable reservoir of palpable thyroid nodules and the common occurrence of autoimmune inflammation explains why thyroid disorders, and lymphocytic thyroiditis in particular, occupy such a large share of our head–neck FNAC workload.

Salivary gland lesions formed a small but distinct group (6.7% of all FNACs), yet nearly half of these were sialadenitis (47.1%). This high rate of inflammation reflects the gland's vulnerability to obstruction and infection: the long, tortuous ducts—especially of the submandibular and parotid glands—predispose to saliva stasis, stone formation, and bacterial overgrowth, leading to both acute and chronic sialadenitis.[18,19] In addition, inflamed glands are often tender or visibly swollen, prompting patients to seek evaluation and making these lesions easy to palpate and sample in the outpatient setting. Together, these anatomic and clinical factors explain why nearly half of our salivary gland FNACs were inflammatory rather than neoplastic.

Malignant lesions comprised only 6.1% of our 269 FNACs, in keeping with other head–neck series reporting a low overall malignancy rate (2.7–13%) due to the predominance of benign and inflammatory masses.[20] Within this small malignant subset, 3% of all cases demonstrated lymph node metastases on cytology. Early identification of nodal metastasis by FNAC is vital for patient management: combined FNAC and adjunctive FNA-thyroglobulin measurement yields sensitivities up to 75% and specificities over 95% for detecting metastatic carcinoma in cervical nodes.[21,22] Thus, even though malignant lesions are uncommon among head–neck FNAC samples, the ability to detect secondary deposits guides staging, biopsy planning, and timely therapeutic intervention.

In our series, FNAC was non-diagnostic in 5.2% of cases, almost exclusively because of scant or non-representative cellular material. Reported rates of non-diagnostic FNAC range from 3% to 30%, and inadequate sampling—whether due to small lesion size, necrotic or haemorrhagic aspirates, or suboptimal needle placement—is the primary cause. When we compared cytology with subsequent histology in 25 cases, we found an 78.3% concordance rate; the remaining discrepancies reflected both sampling error (e.g., missing focal malignancy in a heterogeneous lesion) and cytological under-diagnosing. These findings highlight the need for meticulous technique—potentially aided by ultrasound guidance and rapid on-site adequacy assessment—and, in equivocal cases, low-threshold referral for core biopsy or excision to secure a definitive diagnosis.

In a study by Shiladaria PB et al,[20] out of 260 head–neck masses, lymph nodes predominated (57.69%), with 53.33% of nodal FNACs revealing tubercular lymphadenitis—highlighting FNAC's value in early TB diagnosis. Thyroid lesions comprised 24.61%, aiding benign–malignant differentiation, while salivary gland and soft-tissue aspirates made up 10% and 6.15%, respectively, reflecting FNAC's versatility across inflammatory and neoplastic conditions. FNAC was non-diagnostic in 2.69%, usually due to scant material, requiring repeat aspiration or excisional biopsy.

In Gupta et al.'s series,[23] of palpable head–neck lesions, lymph nodes were the most common FNAC site (41%), followed by the thyroid (33%), reflecting both the ease of nodal sampling and the high prevalence of thyroid disorders. Cytologically, non-specific reactive changes topped the list (33%), underscoring FNAC's role in diagnosing benign hyperplastic responses to infection or inflammation. Lymphadenitis—including tubercular forms—accounted for 30%, highlighting the burden of TB in endemic regions. Colloid patterns made up 26%, largely representing benign thyroid entities such as multinodular goiter and colloid cysts, while sialadenitis was seen in 12% of salivary gland aspirates. Non-Hodgkin lymphoma also comprised 12% of diagnoses, demonstrating FNAC's utility in early hematolymphoid malignancy detection. Finally, benign cysts (20%), chiefly epidermoid and sebaceous types, further illustrate FNAC's effectiveness in evaluating superficial cystic lesions.

In a study by Sheikh N et al,[24] study analyzed 116 cases of FNAC lesions from patients with head and neck swellings over a 9-month period (May 2019 to January 2020). The findings revealed that cutaneous/subcutaneous swellings accounted for the highest number of cases, comprising 39.65% of the total, all of which were benign. Lymph node lesions were the second most common, making up 35.34%, followed by thyroid lesions at 19.82% and salivary gland lesions at 5.17%. The study highlights the prevalence of benign swellings, particularly in cutaneous and subcutaneous tissues, with lymph nodes being the next most common site of concern.

In a study by Suryawanshi Kishor H et al,[25] included 288 patients with palpable head and neck swellings. The most common site for FNAC aspiration was lymph nodes (39.58%), with tubercular lymphadenitis being the most frequent diagnosis. Thyroid lesions accounted for 31.25%, followed by salivary gland lesions at 18.75%, and soft tissue and miscellaneous lesions at 7.29%. FNAC was inconclusive in 3.12% of cases. The overall accuracy rate of FNAC was 93.02%, with a sensitivity of 81.81% and specificity of 96.87%, indicating high diagnostic accuracy for head and neck lesions.

In a study by Goyal D et al,[26] conducted a study on 100 patients with cystic neck swellings over a period of five years (2008-2013) to compare clinical diagnosis, FNAC, and histopathological reports for diagnostic reliability. They found that a simple clinical examination followed by FNAC and histopathology is an effective, quick, inexpensive, and minimally invasive technique for diagnosing various head and neck swellings. Among the different cystic swellings, thyroglossal cysts were the most common, followed by dermoid cysts.

CONCLUSION

In conclusion, FNAC proved to be an effective and valuable diagnostic tool for evaluating head and neck lesions, with a high diagnostic yield in common conditions such as epidermoid cysts, reactive lymphadenitis, and lymphocytic thyroiditis. However, the study also highlighted the challenges of obtaining representative samples, with inconclusive results in 5.2% of cases and a need for cyto-histopathological correlation in some instances. Despite these limitations, FNAC remains a crucial first-line investigation, particularly for identifying malignancies and guiding clinical management.

REFERENCES

1. Sangavi AKB, Itagi IR, Choudhari SY, Venkatesh U. Evaluation of FNAC of head and neck swellings: A retrospective study. Int J Otolaryngology and Head & Neck Surgery. 2017;189-192.
2. Chitumalla PK. Study of cervical lymphadenitis, correlation between clinical features, FNAC and histopathology of cervical lymphadenitis. Int J Contemporary Med Res. 2016;3(8):2231-4.
3. Orell SR, Sterrett GF, Walters MN-I, Whitaker D: Manual and Atlas of Fine Needle Aspiration Cytology. 2nd edn. New York: Churchill Livingstone; 1992.p. 2-36
4. Badami JP, Athey P (1981) Sonography in the diagnosis of branchial cleft cysts. Am J Roentgenol 137:1245–1248
5. Sudhakar G, Devi KM. Study of ultra sound guided FNAC of liver lesions. International Journal of Contemporary Med Res. 2017;4(7):1621-3
6. Turbat-Herrera EA, Knowles K. Cytology screening or diagnostic tool? Hum Pathol. 1999; 29:1356-1366.
7. Farzana S, Mirza T, Mustafa S, Saima S, Sharafat S. An experimental status of one needle aspiration cytology of head and neck lesions in a tertiary care scenario. Journal of Basic and Applied Sciences 2010;6(2):159-162.
8. El Hag IA, Chiedozi LC, Al Reyees FA, Kollur SM. Fine needle aspiration cytology of head and neck masses. Seven years' experience in a secondary care hospital. Acta Cytol 2003; 47:387–92
9. Klijanienko J. Head and neck and salivary gland. In: Layfield LJ, editor. Atlas of Fine Needle Aspiration Cytology, 1sted. New Delhi: Jaypee Publishers; 2014:11-47.
10. Ding X, Xu Y, Wang Y, Li X, Lu C, Su J, et al. Gender Disparity in the Relationship between Prevalence of Thyroid Nodules and Metabolic Syndrome Components: The SHDC-CDPC Community-Based Study. Mediators Inflamm. 2017; 2017:8481049
11. Prasad P. Comparative study of FNAC and histopathology in diagnosis of thyroid swellings. Indian J Surg. 1992; 54:287-91.
12. Sabhalok SS, Shetty LS, Sarve PH, Setiya SV, Bharadwaj SR. Epidermoid and dermoid cysts of the head and neck region. Plast Aesthet Res. 2016;3:347-50.
13. Gaddey HL, Riegel AM. Unexplained Lymphadenopathy: Evaluation and Differential Diagnosis. Am Fam Physician. 2016 Dec 1;94(11):896-903.
14. 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 Sep;75(3):1447-1453.
15. Sellami M, Tababi S, Mamy J, Zainine R, Charfi A, Beltaief N, et al. Interest of fine-needle aspiration cytology in thyroid nodule. European Annals of Otorhinolaryngology, Head and Neck Diseases. 2011;128(4):159–64.
16. Sood N, Nigam JS. Correlation of fine needle aspiration cytology findings with thyroid function test in cases of lymphocytic thyroiditis. J Thyroid Res. 2014; 2014:430510.
17. Jahnavi M, Swati V. A study of fine needle aspiration cytology findings with thyroid function test, anti-thyroid antibody, and clinical pathological parameters in cases of chronic lymphocytic thyroiditis. Indian Journal of Pathology and Oncology. 2023 Mar 16; 2023:18444.
18. P A, C A, Masilamani S, Jonathan S. Diagnosis of Salivary Gland Lesions by Fine Needle Aspiration Cytology and Its Histopathological Correlation in A Tertiary Care Center of Southern India. J Clin Diagn Res. 2015 Jun; 9(6):07-10.
19. Satarkar R.N., Sangwaiya A., Singh P., Kalhan S., Puja, Saini N. Fine needle aspiration cytology-based spectrum of salivary gland lesions at a teaching institute in north India. Trop J Path Micro 2019;5(12):976-982.
20. Shiladaria PB, Khant VS. Role of FNAC in evaluation and diagnosis of head and neck lesions: A retrospective study at tertiary care center. Int J Clin Diagn Pathol. 2019;2(1):239–42.
21. Liu J, Wang R, Xu C, Zhao R, Wang S, Zhao Q, et al. FNA-Tg improves the diagnostic efficacy of FNAC for PTC lateral cervical LN metastasis. Sci Rep. 2025; 15(1):14057.
22. McKenzie DR, Kliassov EG, Dash RC, Foo W, Jones CK, Jiang X. Pathologist-performed ultrasound-guided fine-needle aspirations of the thyroid: A single institution observational study. Cancer Cytopathology. 2022 Sep;130(9):735–9.
23. Gupta D, Mahajan S, Gupta A, Mahajan D, Hans D. FNAC of Head and Neck Lesions in a Tertiary Care Institute of Jammu-A 3 Year Retrospective Study. JK Science: Journal

of Medical Education & Research. 2023 Apr 10;25(2):108-12.
24. Sheikh N, Khurshid S, Malik A, Muzzafar R. Diagnostic role of FNAC in head and neck lesions: a prospective study. IP J Diagn Pathol Oncol. 2020; 5:93-8.
25. Suryawanshi Kishor H, Damle Rajshri P, Dravid Nandkumar V. Spectrum of FNAC in palpable head and neck lesions in a tertiary care hospital in India-a 3 years study. Indian Journal of Pathology and Oncology. 2015 Jan;2(1):7-13.
26. Goyal D. Study of Cystic Neck Swellings Over A Period of 5 Years. International Journal of Anatomy, Radiology and Surgery, 2015;4(2):1-4.