



Original Research Article

Role of fine needle aspiration cytology in head and neck lesions at tertiary care hospital: An observational study

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Abstract

Background: The head and neck area may experience a range of congenital, inflammatory, and malignant lesions. FNAC is a straightforward, quick, cost-effective outpatient surgery with a low risk of complications.

Aim and Objective: To assess a range of head and neck lesions and, if feasible, correlate the results with histological diagnoses.

Material and Methods: FNAC procedure was done using 22-23G needle after obtaining written consent from the patients. Smears were stained with H&E and Pap stain. Cyto-histopathological correlation was done wherever possible.

Result: The predominant demographic of patients in this study consisted of females, with a male to female ratio of 0.7:1. The highest occurrence of head and neck mass lesions within this study group was observed in individuals aged 21 to 30 years. Among the 566 cases examined, most aspirates were derived from lymph nodes, totalling 262, which represents 46.2%, followed by Thyroid 137 (24.2%), Soft tissue 135 (23.9%). The least common was Salivary gland lesions constituting 32 (5.7%).

Conclusion: Although, histopathology is gold standard, FNAC is minimally invasive procedure aiding accurate diagnosis, guides appropriate intervention and need for radical surgical management.

Keywords: Cytology, FNAC (Fine needle aspiration cytology), Head and neck swellings, Histopathology.

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1. Introduction

Head and neck swellings account for approximately fifty percent of all sites subjected to cytopathological examination. These lesions primarily encompass both neoplastic and non-neoplastic conditions affecting lymph nodes, the thyroid gland, salivary glands, and various other tissues.¹ Common pathologies observed in the head and neck region include lymphadenitis (which can be reactive, granulomatous, acute, chronic, or tubercular), metastatic carcinoma, lymphoproliferative disorders, thyroid swellings (such as goitre, nodules, cysts, and carcinoma), salivary gland conditions (including sialadenitis, pleomorphic adenomas, and carcinomas), as well as skin and soft tissue lesions like lipomas and various types of cysts. The technique of fine needle aspiration cytology (FNAC) for evaluating head and neck lesions was first introduced by Martin in 1930. Since

then, it has gained widespread acceptance due to the ease of accessing target sites and the minimally invasive nature of the procedure.² The superficial location of head and neck lesions makes them particularly amenable to FNAC, which is a safe, straightforward, and cost-effective diagnostic method. This procedure can be performed quickly as an outpatient service, eliminating the need for hospitalization and minimizing complications.³ FNAC is especially valuable in the evaluation of cervical masses and nodules, as biopsy of cervical swellings should generally be avoided unless all other diagnostic approaches have proven ineffective.⁴ While FNAC does not provide the same level of architectural detail as histological examination, it allows for the collection of cellular material from the entire lesion through multiple aspirations.⁵ This study evaluates the diagnostic accuracy of FNAC for head and neck lesions and its clinical application.

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By comparing FNAC with histopathology, it aims to improve its use as a primary diagnostic tool in this region.

2. Aims and Objectives

1. To evaluate range of head and neck lesions through fine needle aspiration cytology.
2. Additionally, the aim is to establish a correlation with histopathological diagnoses whenever feasible.

3. Material and Methods

The research was conducted at the tertiary care hospital.

3.1. Duration and type of study

The study, was undertaken over the course of one year between September 2022 to September 2023, and hospital-based in nature.

3.2. Study subjects

The study encompassed patients presenting to the Outpatient Department (OPD) of the institute with head and neck swellings. Fine Needle Aspiration Cytology (FNAC) was performed on 566 OPD patients exhibiting such swellings.

3.3. Inclusion criteria

1. All instances of head and neck swellings that were referred for fine needle aspiration cytology from different surgical departments were incorporated.

3.4. Exclusion criteria

1. All cases with inaccessible swellings.
2. Cases wherein consent was not obtained were excluded from the study.

3.5. Methodology

Sampling encompassed all patients presenting with head and neck swellings who fulfilled the selection criteria throughout the study duration, culminating in a total of 566 cases. A comprehensive clinical history was collected from each patient, concentrating on the head and neck swellings, which included inquiries regarding etiology and an exploration of the present, past, and familial history of tuberculosis. The procedure commenced with obtaining the patient's consent after explaining the purpose, methodology, and potential risks involved. The patient was positioned appropriately, and the skin was disinfected with an antiseptic solution, while the palpable swelling was stabilized with one hand. Following aseptic techniques, a 22-23G needle attached to a 10ml syringe was inserted into the swelling. Negative pressure was applied during aspiration, and the collected material was then smeared onto glass slides. These slides were fixed using alcohol. Various relevant stains, including Hematoxylin and Eosin, May Grunwald Giemsa, and Papanicolaou, were utilized. For lymph node swellings exhibiting purulent or cheesy aspirates, or those with a clinical suspicion of tuberculosis, the Ziehl-Neelsen (ZN) stain was employed.

Cytological findings were documented, reported, and correlated with histopathological results.

4. Results

The current investigation included a total of 566 instances of swellings in the head and neck region, all of which were assessed using Fine Needle Aspiration Cytology (FNAC). The analysis revealed that the majority of cases were concentrated in the 21-30 age group, accounting for 124 cases (22% of the total), followed closely by the 31-40 age group with 107 cases (19%) (**Figure 2**). Regarding gender distribution, the study indicated a predominance of female patients, with a male-to-female ratio of 0.7:1, suggesting a higher occurrence of head and neck swellings among females in the studied population. The most frequently aspirated specimens in this study were derived from lymph nodes, which represented 262 cases (46.2%) (**Figure 1**). This finding aligns with the typical presentation of lymphadenopathy in the head and neck area, while thyroid lesions were the second most common, comprising 137 cases (24.2%). Additionally, skin and soft tissue lesions, including those of the scalp, accounted for 135 cases (23.9%), highlighting the significant prevalence of superficial masses in this anatomical region. Salivary gland lesions were less common, totaling approximately 32 cases (5.7%). Notably, the results indicated that a substantial 90.8% (514 cases) of the 566 head and neck lesions were non-neoplastic, suggesting that a large proportion of these swellings were benign or associated with inflammatory conditions, leaving only 9.2% (52 cases) to be classified as malignant.

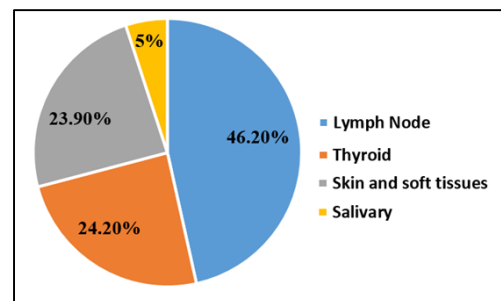


Figure 1: Distribution of lesions according to their site

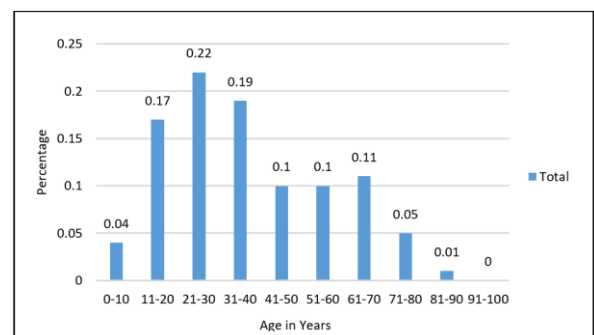


Figure 2: Histogram showing age-wise distribution of the head and neck lesions

Among the cases of lymph node enlargement, the majority were found to be inflammatory, with 219 cases (83%) and small portion of cases 43(17%) were malignant (**Table 1**). Out of inflammatory lesions reactive lymphadenitis 78(30%) were most common indicating that reactive lymphadenopathy due to infections or other stimuli was the most frequently observed inflammation followed by granulomatous lymphadenitis 52(20%) and tubercular lymphadenitis 43(16%). Only 5(2%) cases were of lymphoma (**Figure 3**).

Table 1: Distribution of various Lymph node lesions

Type of lesion	Male	Female	Total	Percentage
Reactive lymphadenitis	38	40	78	30%
Tuberculous lymphadenitis	22	21	43	16%
Granulomatous lymphadenitis	24	28	52	20%
Acute suppurative lymphadenitis	12	19	3	12%
Chronic necrotizing lymphadenitis	7	8	15	6%
Lymphoma	4	1	5	2%
Metastasis	22	16	38	15%
Total	129	133	262	100%

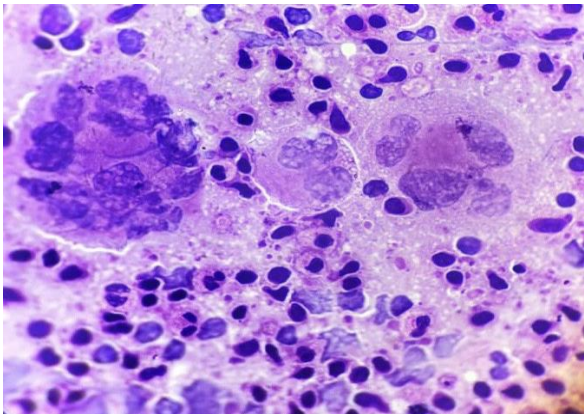


Figure 3: H&E stained smear (high power) showing Reed-Sternberg Cell, Multinucleated tumour giant cell along with polymorphous population of lymphocytes. (Hodgkin's Lymphoma)

Thyroid was second most common site involved. The highest number of patients fell into Bethesda category II, constituting 117(85%) of cases. Among Bethesda category II Colloid goiter was most common diagnosis accounting to about 81(78%), followed by lymphocytic thyroiditis 24(17%) and Hashimoto's thyroiditis. Category IV Follicular neoplasm cases were 9(7%) (**Table 2**). Only 2(1%) cases were of Category VI (**Figure 4**). Furthermore, the gender

distribution revealed a prevalence among females, with a male-to-female ratio of 0.11:1(14/123).

In the realm of salivary gland lesions, the foremost Milan system category was IVA, which the 11 total number of cases included was 31, with Pleomorphic adenoma accounting for 15 cases, which represents 48% of the total. Pleomorphic adenoma emerged as the most prevalent benign tumor among salivary gland lesions succeeded by Category II (**Table 3**). Notably, within this category, an overwhelming 31(97%) were benign, with a minor 1(3%) manifesting malignancy. (**Figure 5**)

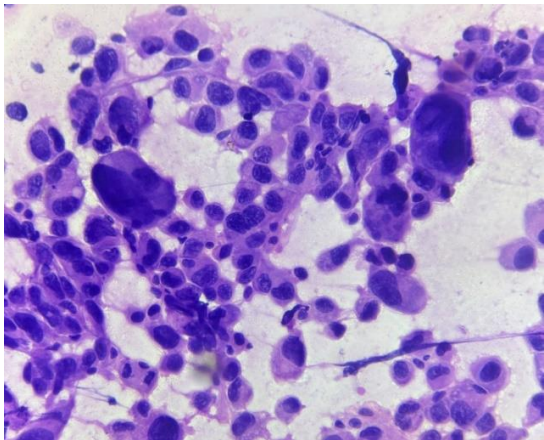


Figure 4: Pap stained smear showing discrete large pleomorphic cells, bizarre cells with scant to moderate eosinophilic cytoplasm. (Anaplastic carcinoma of thyroid – Bethesda Category VI)

Table 2: Distribution of various thyroid gland lesions according to Bethesda system 2017

Type of lesion	Male	Female	Total	Percentage
Category I:	-	3	3	2%
Category II:	10	107	117	85%
Colloid Goitre	9	72	81	78%
Lymphocytic Thyroiditis	-	24	24	17%
Hashimoto's Thyroiditis	1	10	11	8%
Thyroglossal Cyst	-	1	1	1%
Category III:	-	-	-	-
Category IV:	1	8	9	7%
Category V:	1	5	6	5%
Category VI:	2	-	2	1%
Total	14	123	137	100%

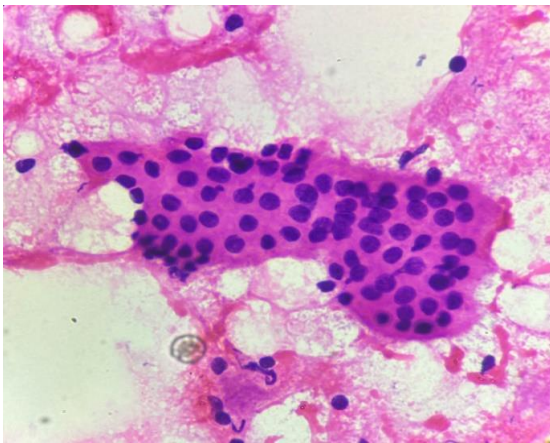


Figure 5: H&E stained smear (high power) showing clusters of acinar cells with abundant eosinophilic cytoplasm & round nuclei; Background: Naked nuclei (Acinic Cell Carcinoma - Category VI)

In the analysis of skin and soft tissue lesions, the most frequently identified lesion was the epidermal cyst, which represented 89 cases, or 66% of the total. This was closely succeeded by lipoma, which accounted for 42 cases, or 31% (**Table 4**). It is important to highlight that all of these lesions were benign. Furthermore, skin and soft tissue lesions, exhibited a higher incidence in males, with a male-to-female ratio delineated at 1.5:1(82/53).

Table 3: Distribution of various Salivary gland lesions according to Milan system 2020

Type of lesion	Male	Female	Total	Percentage
Category I	-	-	-	
Category II	5	9	14	42%
Sialadenitis	4	6	10	31%
Sialadenosis	1	2	3	10%
Ductal Papilloma	-	1	1	1%
Category III	-	-		
Category IV A	5	10		48%
Pleomorphic Adenoma	5	10	15	48%
Category IV B	3			7%
Basal cell adenoma	1	-	1	4%
Warthin's tumor	1	-	1	3%
Category V	-	-		
Category VI				
Acinic cell carcinoma	1	-	1	3%
Total	13	19	32	100%

Table 4: Distribution of various skin and subcutaneous lesions

Type of lesion	Male	Female	Total	Percentage
Lipoma	24	18	42	31%
Epidermal cyst	56	33	89	66%
Benign cystic lesion	1	2	3	2%
Cylindroma	-	1	1	1%
Total	82	53	135	100%

In our study, Histopathology correlation was available in 123 (21.7%) cases. Out of which 8 cases were found to be discrepant (**Table 5**).

Table 5: Cyto-histopathological correlation of discrepant cases

Head & Neck lesions	Cytological diagnosis	Histopathological diagnosis
Lymph Nodes	Granulomatous lymphadenitis	Reactive lymphadenitis
Thyroid Gland	Papillary thyroid Carcinoma	Follicular adenoma
	Oncocytic Neoplasm	Papillary Thyroid Carcinoma
	Colloid goiter	Hashimoto Thyroiditis
	Colloid goiter	Follicular adenoma
Salivary Gland	Pleomorphic Adenoma	Basal cell Adenoma
	Basal cell Adenoma	Adenoid cystic carcinoma
Skin and soft tissues	Benign cystic lesion	Malignant trichilemmal cyst

Among lymph node lesions, only one case inconsistent granulomatous lymphadenitis was found out to be reactive lymphadenitis on histopathology. Since, in some cases of reactive lymphadenitis granulomatous reaction can occur as part of the body's immune response to certain infections or foreign material.

Most of discrepancies were from thyroid. A case of papillary thyroid carcinoma identified through fine needle aspiration cytology (FNAC) was subsequently classified as a follicular adenoma upon histopathological examination. FNAC possesses intrinsic limitations in the diagnosis of follicular thyroid lesions, particularly as it is unable to evaluate capsular or vascular invasion, both of which are critical for determining malignancy. The cytological characteristics of follicular adenomas and specific variants of papillary thyroid carcinoma can be quite similar, making histopathology essential for a conclusive diagnosis, as it can uncover the invasive characteristics associated with carcinoma.⁶

Papillary thyroid carcinoma was misdiagnosed as oncocytic neoplasm on FNAC because oncocytic cells can appear in various thyroid conditions, including PTC. (**Figure 6**) The oncocytic variant of PTC can present with cytological features that resemble a benign oncocytic lesion, leading to a misdiagnosis on FNAC. In this context, oncocytic features may overshadow the classical nuclear changes seen in PTC, such as nuclear grooves or inclusions, making the diagnosis challenging on cytology.

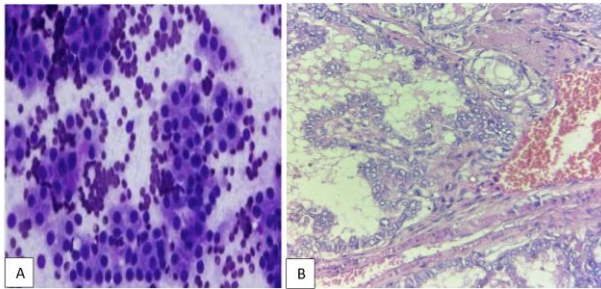


Figure 6: A): Pap stained smear showing clusters of oncocytic follicular cells against hemorrhagic background. (Cytological Diagnosis: Oncocytic neoplasm); B): (Histopathological correlation of above case) H&E stained section showing papillary arrangement, Individual tumor cells are having orphan annie eye nuclei. (Histopathological Diagnosis: Papillary thyroid carcinoma)

In the midst of salivary gland swelling, Cytological findings were consistent with Pleomorphic adenoma but on histopathology revealed it to be Basal cell adenoma. Since, differentiation from cellular pleomorphic adenoma characterized by minimal stroma is not consistently achievable. In a particular instance, adenoid cystic carcinoma was incorrectly identified as basal cell adenoma based on cytological analysis, as adenoid cystic carcinoma represents a critical differential diagnosis due to its malignant characteristics (**Figure 7**). Cytological smears from the trabecular variant of basal cell adenoma exhibit hyaline globules that are similar to those found in adenoid cystic carcinoma.⁷

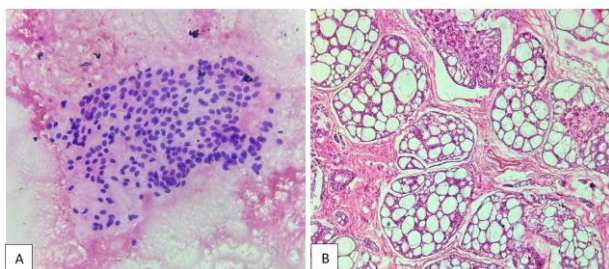


Figure 7: A): H&E stained smear showing sheets of monomorphic basaloid cells against hemorrhagic background. (Cytological diagnosis: Basal cell adenoma); B): Histopathological correlation of above case) H&E stained section showing cribriform arrangement of tumor. (Histopathological Diagnosis: Adenoid Cystic Carcinoma)

Among the cases of skin and soft tissue lesions, there was one notable discrepancy. The initial diagnosis based on

FNAC indicated a benign cystic lesion. However, upon further histopathological examination, it was determined to be a malignant trichilemmal cyst, highlighting the challenges in differentiating between benign and malignant lesions based solely on cytology. FNAC can provide only a small sample from a lesion, which may not reflect the overall characteristics of the lesion, especially if malignant features are confined to certain areas. In cases of trichilemmal cysts, the malignant transformation (if present) might not be represented in the sampled area, leading to a misinterpretation as a benign cystic lesion. Furthermore, FNAC is limited in assessing architectural features like tissue invasion, mitotic activity, or cellular pleomorphism, which are critical to distinguishing benign from malignant processes.

5. Discussion

In the current study, the predominant age group identified was 21 to 30 years, which aligns with findings from previous research done by Shreedevi P et al,¹ Pangotra M. et al,⁹ However, Singh S et al,¹⁰ Raj P. et al¹¹ showed most common age group was 31-40 years. This study showed female preponderance similar to Singh S et al. In present study, maximum number of aspirates were from lymph nodes which is in accordance with other similar studies done by Singh S et al, Shreedevi P. et al, Pangotra M et al, Pawade Y et al,¹² Khetrpal S et al,¹³ Suryavanshi K et al.¹⁴ There was slight disagreement in few studies which were done by Raj P. et al, Hota A et al¹⁵ showing thyroid as preeminent aspirate. Among Lymph Node Swellings, majority of cases were of reactive lymphadenitis which was in correlation with studies done by Raj P. et al, Shreedevi P. et al. some discrepancies have been found with studies done by Singh S. et al where, tuberculous lymphadenitis was most common followed by reactive lymphadenitis. Amid thyroid swellings, (Bethesda category-2) colloid goiter was most common diagnosis similar to Pangotra M. et al, Hota A. et al, Khetrpal S. et al. Within salivary gland lesion, most common lesion was (Milan system category 4A) Pleomorphic adenoma comparable to findings of Raj S. et al whereas, study done by Singh et al showed sialadenitis was the common lesions followed by pleomorphic adenoma and malignant lesions. Among skin and subcutaneous lesions epidermal cyst was most common lesion followed by which was comparable to findings of Suryavanshi K. et al (**Figure 7**).

Table 6: Showing comparison of distribution of head and neck lesions between our study and other studies

Paper	Lymph Node	Thyroid	Salivary gland	Skin and soft tissues
Shreedevi et al ¹	50.32%	44.07%	3.28%	2.3%
Pangotra M et al ⁹	48.2%	20%	7.05%	24.7%
Singh S et al ¹⁰	64%	24%	8%	4%
Raj P et al ¹¹	30%	64.4%	5.1%	0.5%
Pawade Y et al ¹²	48.54%	23.65%	5.8%	21.99%
Khetrapal S et al ¹³	64.1%	16.9%	4.1%	13.8%
Suryawanshi K et al ¹⁴	39.58%	31.25%	18.75%	7.29%
Hota A et al ¹⁵	16.5%	50.6%	15.2%	8.2%
Our study	46.2%	24.2%	5.0%	23.9%

In our study, histopathology correlation was available in 123(21.7%) cases. FNAC demonstrated a high level of accuracy, with sensitivity at 66.6%, with a specificity of 99.1%. The positive predictive value stood at 85.7%, while the negative predictive value was 97.4%. Overall, the diagnostic accuracy reached 96.7%. These statistical findings align closely with those reported by Suryavanshi K. et al.,¹⁴ who noted an overall accuracy rate of 93.02%, alongside sensitivity, specificity, positive predictive value, and negative predictive value of 81.81%, 96.87%, 90.0%, and 93.93%, respectively. Additionally, similar results were observed in the studies conducted by Bhattarai et al¹⁶ and Kumar A. et al.¹⁷ In contrast, Joshi D. et al.¹⁸ reported slight variations in these statistical measures, with sensitivity at 88.89%, specificity at 80.64%, positive predictive value at 66.67%, negative predictive value at 50%, and diagnostic accuracy at 87.13%.

6. Implications for Further Research and Policy

The high diagnostic accuracy of FNAC supports its use as a first-line tool for head and neck lesions, particularly in resource-limited settings. Public health policies should promote its use as an affordable, minimally invasive diagnostic option.

7. Limitation

Histopathological correlation was available for only 123 (21.7%) cases, limiting the ability to fully validate FNAC's diagnostic accuracy across all cases. The study was conducted at a single institution, which may limit the generalizability of the findings to other settings or populations.

8. Conclusion

From present study it can be concluded that FNAC serves as important diagnostic tool with high degree of accuracy. It also aids in guiding appropriate treatment plan whether to locally excise tissue or if there is need for radical surgical excision. Although histopathology is gold standard FNAC can be important first line investigation due to its minimally invasive nature, quick result, affordability and ease of use. FNAC is significant for determining initial treatment

approach, histopathological examination is of great value for confirming diagnosis especially when there are concerns about malignant transformation. Histopathology provides detailed examination of tissue, including architecture and cellular characteristics, making it essential for precise diagnosis and suitable treatment. Consequently, FNAC is an excellent initial diagnostic tool, but histopathology should always be used to confirm diagnosis and guide treatment strategies. FNAC is a valuable first-step diagnostic tool, while histopathology is essential for confirming diagnoses and guiding treatment. Future research should aim to enhance FNAC's accuracy, explore improved sampling methods, and consider combining FNAC with advanced imaging to improve diagnostic precision.

9. Source of Funding

Nil

10. Conflict of Interest

Nil

11. Ethical Committee Approval

The procedure was explained to the patients in detail. FNAC was done only after obtaining written consent from the patients. This study was approved by Institutional Ethics Committee.

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