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The Role Of Fine Needle Aspiration Cytology (Fnac) In The Swellings Of Head And Neck Region

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Abstract

Background

Fine Needle Aspiration Cytology (FNAC) has emerged as a pivotal diagnostic modality in evaluating head and neck lesions. Its minimally invasive nature, coupled with high diagnostic accuracy, renders it an indispensable tool in clinical practice. FNAC is particularly effective for assessing palpable lesions in regions such as the thyroid, salivary glands, lymph nodes, and superficial soft tissues. The procedure's ability to sample cells from various parts of a lesion through multiple passes increases the likelihood of obtaining representative material, thereby improving diagnostic yield. The technique's safety profile is notable, with minimal trauma and virtually no complications reported. Moreover, FNAC can be therapeutic in certain cystic lesions, where aspiration may alleviate symptoms. The present study was done to study the role of FNAC in the swellings of Head and Neck.

Methodology:

This retrospective study involved 100 patients who attended the Surgery Department of a tertiary care center between May 2024 and May 2025, after receiving approval from the Institutional Ethics Committee. Participants presented with head and neck swellings and were evaluated.

Results:

The majority (75%) were under 40 years old, and lymph nodes represented the most frequently involved site (43%), followed by thyroid (35%). Among lymph node lesions,reactive lymphadenitis predominated (55.8%). Thyroid pathologies were chiefly colloid goitre (51.4%), Salivary gland findings included sialadenitis and sialadenosis (33.3% each). In the soft tissue category, lipomas (43.8%) and epidermoid cysts (25%) were most prevalent.

Conclusion:

FNAC is a useful diagnostic technique for lesions such as the thyroid, salivary glands, and lymph nodes. It's inexpensive and simple to perform as a routine outpatient procedure. It carries a lower risk compared to surgical biopsies, avoiding anesthesia- related complications and reducing both physical and psychological discomfort.

Keywords: FNAC, Diagnosis, Head & neck, Swellings

Introduction

Over the last thirty years, Fine Needle Aspiration Cytology (FNAC) has become an increasingly prominent tool in the initial evaluation of tumors. 1,2 This advancement is largely attributed to systematic comparisons between cytological and histopathological outcomes, backed by well-coordinated laboratory practices. FNAC's applications extend beyond oncology; it is also valuable in diagnosing infections, inflammatory disorders, and degenerative conditions.3 In surgical practice, FNAC

complements intraoperative cytology and delivers diagnostic precision that is often comparable to that of frozen section analysis.4

In the head and neck region, swellings may arise from a variety of causes, including infections, inflammatory responses, cysts, and neoplasms. Given the anatomical complexity and the presence of vital structures such as nerves and blood vessels, performing incisional biopsies in these areas can be hazardous.5,6 FNAC presents a safer, faster, and more economical diagnostic alternative and is frequently chosen as the first-line investigation in these scenarios. It is particularly beneficial for identifying benign lesions or confirming the recurrence or spread of malignancy, which may help avoid unnecessary surgical intervention.7 In cystic lesions, FNAC can also provide therapeutic benefits. It has demonstrated high reliability, with diagnostic accuracy reaching up to 90% in distinguishing between benign and malignant tumors of the salivary glands.5 This study was conducted to evaluate the effectiveness of FNAC in diagnosing swellings located in the head and neck region.

Methodology

This retrospective study was done after obtaining permission from Institutional Ethics Committee involving 100 patients who attended the Department of Surgery at a tertiary care center between May 2025 to May 2024. All individuals presented with swellings localized to the head and neck region and were assessed in the outpatient department of Surgery. Each case began with the collection of a detailed medical history, followed by a comprehensive physical examination of the swelling. Specific characteristics such as the lesion's size, shape, consistency, mobility, and the condition of the overlying skin were meticulously noted.

Previously conducted diagnostic tests, including ultrasonography (USG), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and relevant hematological, biochemical, or serological evaluations, were reviewed and recorded as part of the patient's diagnostic work-up.

The Fine Needle Aspiration Cytology (FNAC) procedure was explained to all patients, and informed written consent was obtained prior to sample collection. The FNAC was carried out under sterile conditions without the use of local anesthesia. A 10 ml syringe fitted with a needle of 22 to 27 gauge depending on the anatomical site of the swelling was used. The needle was inserted at a suitable angle, and multiple in-and-out motions were performed while applying continuous negative pressure. After obtaining the aspirate, suction was released before removing the needle to prevent contamination or injury. Gentle pressure was then applied to the puncture site with sterile cotton to control any potential bleeding or hematoma formation. The aspirated material was immediately fixed in methanol for hematoxylin and eosin (H&E) staining. Additional smears were stained using the Papanicolaou (Pap) method, and a few were air-dried for Giemsa staining.

Results

Table 1: Demographic data Parameter		Frequency
Age (in years)	<10	10
	10-20	17
	21-30	30
	31-40	18
	51-60	6

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	≥61	7
Gender	Male	38
	Female	62

As per the table 1, majority of the cases were distributed below 40 years (75%), followed by >40 years (25%). The mean age of the cases was 27.18 ± 2.3 years.

Table2: Specific organ involved

Specific organ involved	Frequency	Percentage
Thyroid	35	35
Lymph nodes	43	43
Other	16	6
Salivary gland	6	6
Total	100	100

The lymph node is the most commonly involved organ (43%), followed by thyroid (35%), salivary gland (6%) and others in 16% of cases. (Table 2).

Table 3: Distribution of various lymph node lesions

Lymph node lesions	Frequency	Percentage
Reactive Lymphadenitis	24	55.8
Granulomatous Lymphadenitis	7	16.3
Suppurative Lymphadenitis	5	11.6
Necrotizing Lymphadenitis	1	2.3
Lymphoma	1	2.3
Metastasis	4	9.3
Total	43	100

Regarding the lymph node lesions, reactive Lymphadenitis was seen in 24(55.8%) cases, followed by Granulomatous Lymphadenitis in 7(16.3%) cases, and Suppurative Lymphadenitis, 5(11.6%). (Table 3)

Table 4: Distribution of various thyroid lesions

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Thyroid lesions	Frequency	Percentage
Cystic Nodule	3	8.6
Thyroglossal Cyst	1	2.9
Colloid Goitre	18	51.4
Lymphocytic Thyroiditis	9	25.7
Benign thyroid lesion	1	2.9
Follicular Neoplasm	1	2.9
Papillary Thyroid Carcinoma	2	5.7
Total	35	100

Colloid Goitre was seen in 18(51.4%) cases, followed by Lymphocytic Thyroiditis in 9(25.7%) cases, and Cystic Nodule was seen in 3(8.6%) cases. (Table 4)

Table 5: Distribution of salivary gland lesions

Table 6: Distribution of other lesions Other lesions	Frequency	Percentage
Lipoma	7	43.8
Epidermoid Cyst	4	25
Benign spindle cell lesion	3	18.8
Benign inflammatory lesion	1	6.3
Basal cell carcinoma	1	6.3
Total	16	100

Sialadenitis and Sialadenosis were seen in each 2(33.3%) cases, and in each 1(16.7%) case, Benign salivary gland lesions and Warthin's tumour were seen. (Table 5)

Table 6: Distribution of other lesions Other lesions	Frequency	Percentage

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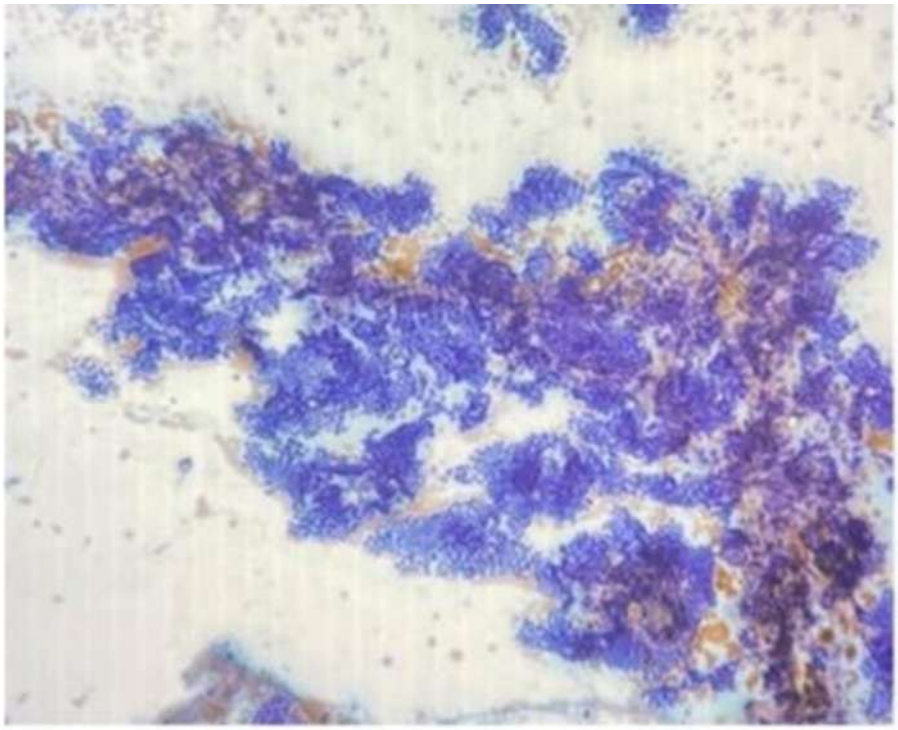
Lipoma	7	43.8
Epidermoid Cyst	4	25
Benign spindle cell lesion	3	18.8
Benign inflammatory lesion	1	6.3
Basal cell carcinoma	1	6.3
Total	16	100

Lipoma was seen in 7(43.8%) cases, and Epidermoid Cyst was seen in 4(25%) cases, Benign spindle cell lesion was seen in 3(18.8%) cases, and in each one case (6.3%), Benign inflammatory lesion and Basal cell carcinoma were seen. (Table 6)

Figure 1: Papillary thyroid carcinoma



Discussion

The predominance of patients under 40 years (75%) in the present study, yielding a mean age of 27.18 ± 2.3 years, similar to a large Nigerian study reported peak FNAC utilization in the 21–30year age group, with lymph nodes and thyroid lesions most frequently sampled.7 Similarly, one Indian tertiary care study noted the highest caseload among patients aged 21–30, reinforcing that young adults comprise a significant proportion of head and neck swelling presentations.8 These observations align with the present findings and suggest that reactive and inflammatory processes, which disproportionately affect younger individuals

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due to greater exposure to infectious triggers are substantial contributors to the FNAC workload.

In the present study, lymph nodes emerged as the most frequently aspirated site (43%), followed by the thyroid gland (35%), salivary glands (6%), with remaining sites such as cysts and soft tissue comprising the remaining 16%. These results are closely aligned with contemporary studies of head and neck FNAC.

A 20232024 retrospective study involving 305 patients found that lymph node aspirates were the most common, followed by thyroid and salivary gland lesions, confirming the predominance of lymphadenopathy in cytopathology practice.9 Similarly, a multicenter descriptive study from India and Nepal reported lymph node involvement in roughly 41– 58% of cases, with thyroid lesions ranking second at around 23–44% and salivary gland aspirates being the least common (near 3–15%).10 These studies collectively highlight a consistent global pattern: lymph nodes dominate FNAC sampling in head and neck swelling cases, largely due to the high prevalence of reactive, tuberculous, or metastatic lymphadenopathy. Thyroid swellings rank next, reflecting the high incidence of goiter, thyroiditis, and neoplasia in outpatient settings. Salivary gland swellings remain less frequent, as FNAC usually identifies smaller numbers of neoplastic and inflammatory lesions in these glands.

In this study, reactive lymphadenitis emerged as the predominant lymph node pathology present in 55.8% of cases followed by granulomatous inflammation (16.3%), suppurative lymphadenitis (11.6%), metastatic deposits (9.3%), and rarer entities like necrotizing lymphadenitis, lymphoproliferative disorders, and lymphoma (each ~2.3%). These findings are in close alignment with recent global data. A four-year retrospective series of 392 lymph node FNACs found reactive lymphoid hyperplasia in 61%, metastatic disease in 15.6%, and granulomatous lymphadenitis in 6.1% of cases.11 Another large-scale Indian study (n=828) similarly reported reactive cases as the most frequent (28.6%), followed by metastatic (27.6%) and granulomatous patterns (11.6%).12 While the proportion of granulomatous cases in our series (16.3%) is modestly higher, it remains within the reported range and likely reflects regional prevalence of tuberculosis and other granulomatous diseases. The observed 11.6% frequency of suppurative lymphadenitis is mirrored in studies from both tropical and temperate regions, which report abscess-forming lesions in 2.6% to 27% of cases, often contingent on local burden of bacterial infection. 13

Metastases comprised approximately 9.3% in the present study, falling slightly lower than other datasets (15–28%) but still supporting FNAC's pivotal role in identifying secondary malignancies promptly.14 Overall, the present study confirms that FNAC effectively captures both benign and malignant lymph node pathologies in head and neck presentations. However, cytological overlaps—particularly in granulomatous and necrotic contexts—mean that where ambiguous or neoplastic features are present, ancillary studies or excisional biopsy remain essential. 14

In the present study of thyroid lesions, colloid goitre was the most prevalent diagnosis (51.4%), followed by lymphocytic thyroiditis (25.7%), cystic nodules (8.6%), papillary thyroid carcinoma (5.7%), with rarer findings such as thyroglossal cyst, benign lesions, and follicular neoplasm each constituting approximately 2.9%. This distribution aligns well with recent global patterns.

Several contemporary studies reaffirm the predominance of colloid (or adenomatous) goitre in FNAC samples. For example, diagnostic series using the Bethesda classification consistently list benign nodular goitre, primarily colloid nodules as the most common cytologic category (Bethesda II).15-17

The high percentage of lymphocytic thyroiditis in the present study (~26%) also reflects current trends, where chronic lymphocytic (Hashimoto's) thyroiditis ranks as the second most frequent benign lesion in FNAC studies.

The present study finding of cystic nodules (8.6%) is in keeping with recent data identifying benign cystic changes as a significant minority, often requiring ultrasound correlation to guide FNAC adequacy. Papillary thyroid carcinoma (PTC), making up approximately 6%, aligns with reported malignancy rates in benign aspiration cohorts; A meta-analyses

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suggest that about 3–11% of thyroid nodules sampled prove malignant, with PTC being the dominant subtype.18 This study observed 5.7% of aspirates reporting PTC is consistent with these global rates.

Additionally, the occurrence of rarer lesions like thyroglossal cysts and follicular neoplasms (~2.9% each) reflects the broader diagnostic challenge. Follicular-patterned lesions pose a specific challenge in FNAC due to the inability to distinguish adenomas from carcinomas cytologically—a limitation noted widely in recent literature and reflected in Bethesda category IV.

Importantly, modern FNAC studies emphasize the method's high sensitivity and specificity, especially when paired with ultrasound guidance. Sensitivity for colloid goitre reaches approximately 90%, although specificity may remain modest (~60–75%), warranting cautious interpretation and clinical correlation. 19

In the present study, inflammatory disorders such as sialadenitis and sialadenosis— each accounted for one-third of the salivary gland FNACs (33.3% each), while benign neoplasms and Warthin's tumor comprised 16.7% each. This distribution aligns with several contemporary analyses of salivary gland aspirates. A 2021–2022 retrospective evaluation noted chronic sialadenitis as the most frequent non-neoplastic lesion (~15%), with sialadenosis and cystic changes closely following (~13.8%). 20 Similarly, a 2018–2020 single-center study reported chronic sialadenitis and sialadenosis making up approximately 34% and 29.7% of inflammatory cases, respectively. These consistent findings underscore the predominance of inflammatory and non-neoplastic conditions in salivary FNACs.21

In contrast, benign neoplastic lesions—particularly Warthin's tumor were relatively uncommon in inflammatory-skewed studies. A meta-analysis of Warthin's tumor cytology reported that approximately 10% of FNACs for salivary swellings were Warthin's lesions. FNAC for Warthin's tumor remains highly accurate, with reported sensitivity and specificity both exceeding 93%, reinforcing its diagnostic value even when less prevalent.22

Moreover, larger multicenter studies of salivary gland neoplasms highlight that benign tumors (pleomorphic adenoma and Warthin's) make up over half of all neoplastic cases, while inflammatory lesions still represent a substantial fraction overall. 23

In the present study, assessing miscellaneous lesions in the head and neck region via FNAC, lipomas comprised the majority at 43.8%, followed by epidermoid cysts (25%), benign spindle cell lesions (18.8%), and, less commonly, benign inflammatory lesions and basal cell carcinoma (each 6.3%).

The predominance of lipomas aligns with evidence from soft-tissue tumor series, where benign adipocytic lesions frequently present in superficial regions including the neck and face. For instance, a tertiary cancer center review reported lipomas as the most common lipomatous tumor in FNAC evaluations of adipocytic lesions, and spindle-cell lipomas (a benign variant) were notable among adult cases in the head and neck area. 24,25 These variants are benign but can mimic more aggressive tumors cytologically, highlighting the value of FNAC to provide a preoperative diagnosis and guide management while avoiding overtreatment.

Epidermoid cysts, accounting for 25% of cases, are reminiscent of findings in recent head and neck swelling studies where developmental and inflammatory cysts represented a large subset. One 2024 study documented epidermoid cysts making up around 50% of developmental neck lesions identified via FNAC. FNAC features—such as anucleated squamous cells and keratinous debris—are typically diagnostic and reduce the need for excision unless symptomatic. 24

Benign spindle cell lesions (18.8%) reflect the diagnostic challenges in distinguishing between benign and malignant spindle-cell processes via cytology. Recent cytology literature underscores FNAC's moderate sensitivity (~76%) and specificity (~54%) in categorizing low-grade spindle cell tumors, yet emphasizes ancillary methods like histopathology and imaging for definitive classification. 25

Conclusion

In this retrospective cohort of 100 patients (mean age 27.2 ± 2.3 years), the majority (75%) were under 40

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years old, and lymph nodes represented the most frequently involved site (43%), followed by thyroid (35%), and salivary glands (6%). Among lymph node lesions, reactive lymphadenitis predominated (55.8%), with granulomatous (16.3%) and suppurative (11.6%) forms next most common. Thyroid pathologies were chiefly colloid goitre (51.4%) and lymphocytic thyroiditis (25.7%). Salivary gland findings included sialadenitis and sialadenosis (33.3% each), with benign lesions and Warthin's tumor each accounting for 16.7%. In the soft tissue category, lipomas (43.8%) and epidermoid cysts (25%) were most prevalent. These results highlight that non-neoplastic lesions, chiefly inflammatory and benign conditions, account for the majority of head and neck swellings, with malignancies being relatively rare. Overall, this study confirms that FNAC is a simple, rapid, cost-effective, and minimally invasive diagnostic technique, providing a high degree of diagnostic clarity particularly for differentiating non-neoplastic from neoplastic lesions. It's strong performance across diverse tissue types supports FNAC's role as a first-line investigation in head and neck swellings, guiding clinical management and reducing the need for more invasive diagnostic procedures.

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