

# A Prospective Study Comparing Diagnosis of Neck Swellings by Fine Needle Aspiration Cytology with Histopathology

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## ABSTRACT

**Aim:** To correlate the fine needle aspiration cytology findings with histopathology findings of specimens from neck swellings.

**Study Design;** Cross-Sectional Observational

**Setting:** Pathology Department, Chandka Medical College, Larkana

**Period:** June 2021 to June 2023

**Methods:** This study consisted of neck swelling samples received in the Department of Pathology by FNAC or excision. Both Cytology and Histopathology were evaluated by an experienced pathologist. Diagnoses of cytology were compared with the histopathological examination and the data was recorded into groups that comprised of lymph nodes, thyroid gland, and salivary glands. Lesions that did not fit into these groups were classified into as "others". Data was entered and analyzed using SPSS Version-22.

**Results:** There were a total of 261 cases of neck swelling samples received in our department. Most of the cases were due to lymph node (n=104) pathologies notably due to reactive hyperplasia and tuberculosis. The thyroid gland (n=95) was the second most common region for FNAC and most samples showed the diagnosis of colloid goiter followed by follicular adenomas. There were n=30 samples of salivary glands whereas n=32 were classified into others. Overall sensitivity and specificity were variable among the regions of FNAC with the highest being (100%) in the salivary glands and lesions classified into others category.

**Practical Implication:** Comparing neck swelling diagnosis via Fine Needle Aspiration Cytology (FNAC) with Histopathology is vital to validate FNAC's accuracy before definitive treatment. It ensures informed decision-making, avoiding unnecessary surgeries and minimizing risks.

**Conclusion:** FNAC of the neck swellings is a highly accurate technique and provides the first line of diagnosis. However, FNAC does have its own limitations and this technique should always be complemented by a confirmatory histopathology.

**Keywords:** Fine needle Aspiration Cytology, Neck Swellings, Lymph node, Salivary Glands, Thyroid Glands

## INTRODUCTION

Neck swellings are a common clinical finding that can be caused by various underlying pathologies. They could be caused by infections, inflammatory diseases, benign or malignant tumors, or other systemic problems and manifest as palpable masses or lumps in the neck area(1). For the best management and treatment options, it is essential to recognize and correctly diagnose these neck swellings. In this setting, fine needle aspiration cytology (FNAC) has become a useful diagnostic tool that aids in the assessment of neck swellings and offers important details about the underlying pathology(2).

Fine needle aspiration cytology is a minimally invasive diagnostic procedure that involves the collection of cells or tissue fragments from a palpable or radiologically identifiable neck swelling using a fine-gauge needle. The obtained cellular material is then analyzed under a microscope to determine the nature and composition of the lesion. By examining the cellular morphology, the cytologist can often differentiate between various pathologies, such as reactive lymphadenitis, infections, and benign, and neoplastic conditions(3). This information aids in the initial triaging of patients, allowing for appropriate referral to surgical specialties or conservative management, as required. FNAC thus offers several advantages in the evaluation of neck swellings, including its simplicity, cost-effectiveness, and ability to provide rapid results(4).

While FNAC is a valuable diagnostic tool, it has certain limitations. Due to the relatively small sample size and limited architectural information provided by FNAC, the accuracy of the diagnosis may be compromised. In some cases, FNAC may yield equivocal or inconclusive results, necessitating further investigation(5,6). Histopathological examination of excised tissue specimens obtained through surgical intervention provides a more comprehensive assessment of the lesion's nature and extent(7). It allows for a detailed evaluation of tissue architecture, cellular arrangement, and the presence of specific markers or features

indicative of malignancy. Therefore, histopathology serves as the gold standard for definitive diagnosis in cases where FNAC findings are inconclusive or where surgical intervention is warranted. According to study of Khan et al. (2019) which is conducted in KPK, FNAC has a sensitivity of 79.63% and a specificity of 95.16%. While the negative predictive value was 91.47%, the positive predictive value was 87.76%.(29)

The study comparing diagnosis of neck swellings using Fine Needle Aspiration Cytology (FNAC) with Histopathology is significant as it validates the reliability of FNAC as a non-invasive diagnostic tool, aiding in appropriate treatment decisions. It also enhances healthcare cost-effectiveness and patient comfort. However, a research gap lies in the potential variability of FNAC results due to operator expertise and sampling error, warranting investigation into factors affecting its accuracy and the correlation with histopathological findings.

## METHODS

**Study Design:** This was a cross-sectional observational study

**Study Setting:** It was carried out at the Pathology Department, Chandka Medical College, Larkana during the period of June 2021 to June 2023.

**Sample Size:** A total of 100 samples were included in the study.

**Methodology:** The patients included presented with the primary complaint of neck swelling, for which they underwent Fine Needle Aspiration Cytology and Subsequently Histopathological Examination of the Tissue post-surgical excision. The FNAC was carried out by a pathologist using and 23 G needle and the acquired smears were fixed with 95% alcohol and stained with Papanicolaou's stain. After the FNAC the patients underwent respective surgeries of the neck and the tissue samples acquired were fixed in 10% formalin. The samples were then embedded into paraffin blocks and sections were cut that were stained with hematoxylin and eosin. The cytology and the histopathology slides

were all reviewed by an experienced histopathologist and the data was recorded.

**Data Analysis:** The data were entered onto a pre-made proforma and statistical analysis was performed. Software called SPSS version 22 was used for the analysis. It was determined what the test's sensitivity, specificity, and predictive values were.

**RESULTS**

There was a total of 261 patients enrolled in this study. Most of the patients n=100 presented with lymph node swellings followed by swelling of the thyroid gland n=95 as shown in Table 1.

Comparing the swelling of lymph node FNAC versus the histopathology majority of the patients had benign disease whereas only n=3 patients had a malignant disorder. Among the benign patients, the majority of the cases were diagnosed as

Reactive Lymph Nodes in n=54 cases on FNAC whereas on histopathology n=35 cases were confirmed as Reactive Lymph Nodes in n=35 cases and rest were diagnosed as tuberculosis in n=16 cases n=3 as Acute on Chronic Inflammation. Among cases diagnosed with Tuberculosis in lymph nodes on FNAC histopathological examination revealed these as Acute on Chronic Inflammation. as shown in Table 2.

Table 1: Types of Neck Swellings

| Swellings         | Number |
|-------------------|--------|
| Salivary Glands   | 30     |
| Thyroid Swellings | 95     |
| Lymph Nodes       | 104    |
| Others            | 32     |
| Total             | 261    |

Table 2: Comparing Diagnosis of Lymph Node Swellings by FNAC with Histopathology.

| Fnac                          | Numbers | Histopathology                |                      |                         |                        |
|-------------------------------|---------|-------------------------------|----------------------|-------------------------|------------------------|
|                               |         | Acute on chronic inflammation | Reactive lymph nodes | Tuberculous lymph nodes | Metastatic lymph nodes |
| Acute on chronic inflammation | 16      | 13                            | -                    | 3                       | -                      |
| Reactive lymph nodes          | 54      | 3                             | 35                   | 16                      | -                      |
| Tuberculous lymph nodes       | 31      | 31                            | -                    | -                       | -                      |
| Metastatic lymph nodes        | 3       | -                             | -                    | -                       | 3                      |

Table 3. Comparing diagnosis of Thyroid gland swellings by FNAC with Histopathology.

| Fnac                    | Numbers | Histopathology |                    |                         |                     |
|-------------------------|---------|----------------|--------------------|-------------------------|---------------------|
|                         |         | Colloid goiter | Follicular Adenoma | Hashimoto's Thyroiditis | Papillary Carcinoma |
| Colloid goiter          | 72      | 56             | 10                 | 6                       | -                   |
| Follicular Adenoma      | 54      | 10             | 41                 | 3                       | 1                   |
| Hashimoto's Thyroiditis | 31      | 6              | 3                  | 22                      | -                   |
| Papillary Carcinoma     | 3       | -              | 1                  | -                       | 2                   |

Among the cases of Thyroid gland swelling majority of the cases were found to be diagnosed with Collid Goiters in n=72 cases. Histopathological examination on these cases confirmed colloid goiter in n=56 cases whereas n=10 were Follicular Adenomas, and n=6 were Hashimoto's Thyroiditis. Follicular Adenomas were diagnosed in n=54 cases on FNAC. Among these cases The diagnosis of Follicular adenoma was confirmed on n=41 cases, n=10 were found to be colloid goiter, n=3 were Hashimoto thyroiditis where's 1 case was diagnosed with Papillary Carcinoma on Histopathology. There were n=3 cases that were diagnosed as Papillary Carcinoma of the thyroid and among these cases n=2 confirmed the diagnosis with FNAC whereas 1 case was found to be Follicular Adenoma on the Histopathological Examination

Among the cases of Swelling of the Salivary Glands Submandibular Pleomorphic Adenoma, Parotid Pleomorphic Adenoma, and Warthin's Tumor were diagnosed in 13, 15, and 3 cases respectively via FNAC, and all the cases were confirmed by histopathological examination as shown in Table 4.

Table 4: Comparing diagnosis of Salivary gland swellings by FNAC with Histopathology.

| FNAC                                | Number | Histopathology |
|-------------------------------------|--------|----------------|
| Pleomorphic Adenoma (Parotid)       | 13     | 13             |
| Pleomorphic Adenoma (Submandibular) | 15     | 15             |
| Warthin's Tumor                     | 2      | 2              |
| Total                               | 30     | 30             |

Table 5: Comparing diagnosis of Others' swellings by FNAC with Histopathology.

| FNAC              | Number | Histopathology |
|-------------------|--------|----------------|
| Lipoma            | 9      | 9              |
| Epidermal Cyst    | 6      | 6              |
| Branchial Cyst    | 5      | 5              |
| Thyroglossal Cyst | 5      | 5              |
| Dermoid Cyst      | 4      | 4              |
| Cystic Hygroma    | 3      | 3              |
| Total             | 32     | 32             |

In the cases that were classified as others the majority of the patients had the diagnosis of Lipoma in n=9 cases followed by

Epidermal cyst in n=6 cases. All the cases in this category diagnosed by FNAC were confirmed with same diagnosis in histopathology.

In The Statistical Indices, the sensitivity and specificity of the salivary glands and disorders classified in the other category of neck swellings were found to be 100 % as shown in Table 6.

Table 6: Statistical indices for Neck Swellings

| Swellings         | Sensitivity | Specificity | Positive Predictive Value | Negative Predictive Value |
|-------------------|-------------|-------------|---------------------------|---------------------------|
| Salivary Glands   | 100%        | 100%        | 100%                      | 100%                      |
| Thyroid Swellings | 93%         | 62%         | 86%                       | 78%                       |
| Lymph Nodes       | 82%         | 38%         | 49%                       | 74%                       |

Table 7: Cyto-Histopathological correlation of all cases

| Test Results             | Number of Cases | Standard Histopathology |                          |       |
|--------------------------|-----------------|-------------------------|--------------------------|-------|
|                          |                 | Malignant (Positive)    | Non-Malignant (Negative) | Total |
| Malignant (Positive)     | 6               | 5 (TP)                  | 1 (FP)                   | 6     |
| Non-Malignant (Negative) | 255             | 2 (FN)                  | 253 (TN)                 | 255   |
| Total                    | 261             | 7                       | 254                      | 261   |

Whereas the Statistical Indices for the cyto-histopathological correlation of all cases. We found that for malignant cases there were 5 true positives and 1 false positive whereas in benign or nonmalignant cases 253 were labelled as true negatives and 2 were false negatives as shown in Table 7.

**DISCUSSION**

Swelling of the neck region constitutes one of the most common symptoms in patients of the South Asian region. It is a wide spectrum of disorders that encompasses multiple disorders that include infections, and benign and malignant disorders with varying etiologies among many including lymph nodes, Thyroid Gland, and salivary glands(8). To diagnose the conditions FNAC has emerged as a promising tool in the detection of diseases and helps in further

planning for management and treatment however the accuracy of this technique with its sensitivities and specificities are variable in the literature and among different areas of the world(9). The most common site was found to be the lymph node followed by the thyroid gland and salivary glands respectively for which similar findings have been observed in other studies(10,11). Though one of the studies done by Rathod et al showed Thyroid cases to be the most common(12).

Most of the patients with lymph node swellings were reported to have reactive hyperplasia followed by tuberculosis on FNAC of which the majority were found to be confirmed with subsequent histopathology as shown in Table 2. These findings are in accordance with the findings by(13,14) while minorly contrasting findings in the study done by Rammeh et al showed Tuberculous Lymphadenitis to be the most common finding(11).

In the cases with Thyroid disorders as shown in Table 3. Most FNAC showed colloid goiter as the most common disease followed by Follicular Adenomas. These findings are in line with studies done by(12,15) whereas Rammeh et al showed that the majority of the FNACs were nondiagnostic(11).

For the patients who presented with salivary gland swellings studies have reported that the majority of FNACs showed Inflammatory lesions followed by a neoplastic lesion, particularly of benign nature(16,17). However, this completely contrasts with our study where we see neoplastic lesions of the salivary glands.

For the statistical indices the sensitivities, specificities, and positive and negative predictive values were calculated for each group. In the samples with Lymph nodes of the neck region, the values were 82%, 38%, 49%, and 74% respectively in our study. Our values seem to be less compared to other studies. Shariff et al report a sensitivity of 87.5%, specificity of 100%, and efficiency of 98% for FNAC (5). Taye et al. reported that FNAC had an overall sensitivity of 88.2% and specificity of 92% for the diagnosis of lymphoma (18). Prasad and Mohan showed sensitivities, specificities, and positive and negative predictive values of 88.2%, 92%, 91.8%, and 88.5%, respectively(19).

Fine needle aspiration cytology (FNAC) has shown to be a valuable tool for assessing thyroid swellings. According to multiple studies, FNAC exhibited varying levels of sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). In our study sensitivity, specificity, positive predictive value, and negative predictive values were 93%, 62%, 86%, 78% respectively. A study done by Mundasat et al reported a sensitivity of 52.6%, a specificity of 86.6%, in diagnosing thyroid malignancy(20) which is lower compared to our studies whereas other studies have demonstrated higher sensitivity and specificity values, such as 96.4% and 94.4%, respectively in a study done by Hirachand et al(21). Additionally, FNAC has been shown to have a sensitivity of 62.5%, specificity of 97%, PPV of 83.3%, NPV of 91.1% in another study(22). These studies overall highlight the potential variability in the performance outcomes of FNAC in the case of thyroid swellings. Nevertheless, FNAC remains a safe and diagnostic tool for evaluating thyroid patients(23).

FNAC quite accurately distinguished between benign and malignant lesions for the salivary glands. In our cases the statistical indices of sensitivity, specificity, positive predictive value, and negative predictive value) were found to be 100% for the samples of salivary glands. FNAC has been shown to have high sensitivity and specificity in the diagnosis of salivary gland lesions, ranging from 75% to 100% for sensitivity and 94.05% to 100% for specificity, depending on the study. These values are higher as compared to other studies. Piccioni et al. (2009) reported a sensitivity of 81% and specificity of 99% for FNAC in parotid lesions(24). Jha et al. (2020) calculated the sensitivity, specificity, PPV, and NPV of FNAC for salivary gland cytopathology, finding values of 64.28%, 97.01%, 90%, and 86.67%, respectively(25) whereas Manatar and Lisnawati reported the sensitivity of 91.17%, specificity of 97.43%, positive predictive value (PPV) of 96.87%, and negative predictive value (NPV) of 92.68% for FNAC in salivary gland lesions(26). In studies done by Munjal et al showed

a sensitivity of 75%, and a comparable specificity of 100%(27), similarly Rajini T et al showed a sensitivity and specificity of 100% and 97.73% respectively(28).

This could be due to the small sample size and possible differences in technique.

## CONCLUSION

Fine Needle Aspiration Cytology is an easy, inexpensive, and minimally invasive technique that can be used as a first line of investigation in diagnosing neck swellings. The current study demonstrates the highlights of FNAC vs Histology in the diagnosis of neck swellings. FNAC showed to be highly sensitive and specific in our study notably in cases of swelling of the parotid glands and lesions that were classified into other categories. However, there are a few limitations with this technique and histopathology should always be done for confirmatory diagnosis.

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