ROLE OF FINE NEEDLE CYTOLOGY IN THE DIAGNOSIS OF HEAD & NECK MASS LESIONS
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ABSTRACT: CONTEXT: Although head and neck masses are fairly common clinical presentation, it may be the only, or one of several nonspecific findings in serious illnesses like lymphoma or metastatic cancer. Thus, the need to efficiently differentiate patients with serious illness from those with self-limited disease arises. Fine Needle Aspiration Cytology (FNAC) helps in the early and accurate diagnosis especially where approach for interventional biopsy is limited. AIMS: To diagnose various head and neck mass lesions via FNAC and correlating the results with clinical and histopathological diagnosis. SETTINGS & DESIGN: The study was conducted in Shyam Shah Medical College and associated Sanjay Gandhi Memorial Hospital, Rewa (MP), on 406 patients who presented with head and neck swellings. METHODS & MATERIAL: A complete general and systemic examination was carried out. FNAC was carried out on 406 subjects while biopsy was done for 123 lesions. The predictive value for FNAC was retrospectively correlated with biopsy results. RESULTS: In the current study, 372 diagnoses clinically correlated to 406 cytological diagnoses. The most common head and neck swellings were Cervical Lymph Node lesions (346) followed by Salivary Gland lesions (37), while the remaining 23 were other head and neck lesions. Out of the 123 biopsies performed, 111 were correctly diagnosed by FNAC itself. Inflammatory lesions (301) accounted for 86.99% of all cervical lymph node lesions. Demographic profile revealed a higher tendency of malignant lymph node lesions in Males (68.9%) and in the older (>50years) age group (55.6%); benign lesions were more common in the young (<20years) [26.2%]. Similarly, Salivary Gland lesions (37) were mostly benign (32) and had a male predilection. 100% accuracy was achieved in the diagnosis of adenomas. Among other head and neck lesions, Lipomas were most common (30.4%) achieving a cytological accuracy of 80%. Through this study, the Sensitivity (76.67%), Specificity (94.62%), Positive Predictive Value (82.14%) and Accuracy (90.2%) for FNAC was obtained. CONCLUSION: FNAC achieved a diagnostic accuracy of 90.2%, and provides the advantage of being less complicated, cheap, and produces a faster result compared to biopsy. Its accuracy, thus, matches histopathology in providing an unequivocal diagnosis.

KEYWORDS: Fine-Needle Aspiration Cytology; Histology; Lymph Nodes; Salivary Glands.
MeSH Heading: Biopsy, Fine-Needle; Histology; Lymph Nodes; Salivary Glands.

INTRODUCTION: Pathology has been synonymous with the study of biopsy material for many years. Fine needle aspiration cytology (FNAC) emerged as a new advanced diagnostic tool only in the latter half of the 20th century.¹ although, in head and neck lesions, biopsy is still the standard procedure; there is a delay in the processing and patient inconvenience. It requires interdisciplinary communication between the clinician, radiologist, and pathologist. On the other hand, FNAC is relatively easy, safe, quick, and repeatable method which allows rapid interpretation of the specimen.
Being an office procedure which can be performed with or without the use of a local anaesthetic, it permits an early and efficient treatment planning process.\textsuperscript{2} Cervical lymphadenopathy is a fairly common clinical presentation. It is often a diagnostic challenge to medical professionals. A person with cervical Lymphadenopathy has swollen lymph glands in the neck. Lymph nodes most often swell in response to infection or inflammation. Less commonly, lymph gland swelling can be a sign of cancer.\textsuperscript{3} the physician’s task is to efficiently differentiate the few patients with serious illness from the many with self-limited disease. Masses located within the region of the head and neck, including salivary gland and thyroid gland lesions can be readily diagnosed using FNAC.\textsuperscript{4}

**MATERIALS & METHODS: AIMS:** To diagnose various head and neck mass lesions via FNAC and correlating the results with clinical and/or histopathological diagnosis.

**SETTINGS & DESIGN:** The study was conducted in Shyam Shah Medical College and Associated Sanjay Gandhi Memorial Hospital, Rewa (MP), on 406 subjects. Patients presenting with thyroid swellings were excluded from the study.

**MATERIALS & METHODS:** The study was conducted in Shyam Shah Medical College and associated Sanjay Gandhi Memorial Hospital, Rewa (MP). The 406 patients included were those referred to the Department of Pathology for FNAC from the OPD or wards of the hospital who presented with head and neck masses.

FNAC was performed using 23 gauge needles mounted on disposable 10 ml plastic syringes. Smears were fixed using 95% Alcohol and were evaluated after staining with Hematoxylin and Eosin (H&E). Smears were also air dried for Giemsa staining.

Excisional biopsy was done on 123 patients for histopathological correlation. Material was fixed in 10% buffered formalin overnight and dehydration was carried out using Alcohol. After blotting and solidification, sections were prepared using rotary microtome. These were stained by H&E.

Standard diagnostic criteria.\textsuperscript{5} was employed for the prospective cases:

1. **Cervical Lymph Node Lesions:**
   a) Reactive Hyperplasia.
   b) Tuberculosis.
   c) Metastases.

2. **Salivary Gland Lesions:**
   a) Sialadenitis.
   b) Pleomorphic Adenoma.
   c) Malignant Salivary Gland neoplasm: Acinic cell carcinoma.
   d) Mucoepidermal Carcinoma.
   e) Adenoid cystic carcinoma.
Inadequate smear samples were repeated and therefore there were no inadequate smears. Detailed history, demographic and clinical variables and relevant investigations were recorded on the structured proforma. The cytopathological diagnoses then were compared with the clinical diagnosis and histopathological results of the same excised nodes when available. In cases of discrepancy, histopathologic results were considered the gold standard.

**OBSERVATIONS:**

| Sample                               | Number | Clinical Accuracy (%) | Histological Confirmation | FNAC Accuracy (%) |
|--------------------------------------|--------|-----------------------|---------------------------|-------------------|
| Cervical Lymph Node Lesions          | 346(85.2%) | 319(92.2%)          | 107                       | 99(92.5%)         |
| Salivary Gland Lesions               | 37(9.1%)   | 32(86.5%)           | 10                        | 7(70%)            |
| Other Head & Neck Lesions            | 23(5.7%)   | 21(91.3%)           | 6                         | 5(83.3%)          |
| **Total**                            | **406**   | **372(91.6%)**      | **123**                   | **111(90.2%)**    |

Table 1: Cytological, Clinical and Histopathological Correlation

From the total 406 cases, 372(91.6%) clinically correlated with the cytological diagnosis. The overall accuracy of FNAC with respect to histopathological confirmation was 90.2%.

| Diagnosis                          | Number | Histological Confirmation | FNAC Accuracy (%) |
|------------------------------------|--------|---------------------------|-------------------|
| Inflammatory/Benign                | 301(86.99%) | 81                       | 77(95.1%)         |
| a) Tuberculosis                    | 184(53.2%)  | 51                       | 49(96.1%)         |
| b) Reactive Hyperplasia            | 51(14.7%)   | 19                       | 18(94.7%)         |
| c) Inflammation                    | 66(19%)     | 11                       | 10(90.9%)         |
| Primary Malignant lesion           | 10(2.89%)    | 5                        | 4(80%)            |
| a) Non-Hodgkin’s Lymphoma          | 7(2.0%)      | 2                        | 1(50%)            |
| b) Hodgkin’s Lymphoma              | 3(0.9%)      | 3                        | 3(100%)           |
| Metastasis                         | 35(10.12%)   | 21                       | 18(85.7%)         |
| a) Squamous Cell Deposits          | 27(7.8%)     | 15                       | 13(86.7%)         |
| b) Adenocarcinoma                  | 8(2.4%)      | 6                        | 5(83.3%)          |
| **Total**                          | **346**     | **107**                  | **99(92.5%)**     |

Table 2: Cytological and Histopathological Correlation of Cervical Lymph Node Lesions

FNAC of lymph node was accurate 92.5% of cases on histopathological confirmation. The accuracy was highest for Inflammatory/Benign lesions (95.1%) compared to primary malignant (80%) and metastatic (85.7%) lesions.
Tuberculosis accounted for 53.2% of lesions and FNAC achieved an accuracy of 96.1%. FNAC correlated in 90.1% of cases of inflammation - which comprised 19% of total cases. Reactive Hyperplasia was seen among 14.7% of cases; the FNAC of which diagnosed 94.7% of cases accurately.

Metastases (10.2%) were more frequent than Primary Malignancies (2.9%) and a 100% diagnostic accuracy was achieved in Hodgkin’s Lymphoma.

### Table 3: Age Profile of Benign Cervical Lymph Node Lesions

| Age (yrs.) | Tuberculosis | Reactive Hyperplasia | Inflammation | Total |
|------------|--------------|----------------------|--------------|-------|
| 0-10       | 12(6.5%)     | 28(54.91%)           | 39(59%)      | 79(26.25%) |
| 11-20      | 44(23.9%)    | 17(33.33%)           | 18(27.3%)    | 79(26.25%) |
| 21-30      | 53(28.8%)    | 4(7.84%)             | 5(7.6%)      | 62(20.59%) |
| 31-40      | 43(23.4%)    | 2(3.92%)             | 1(1.5%)      | 46(15.28%) |
| 41-50      | 12(6.5%)     | 0                    | 1(1.5%)      | 13(4.32%)  |
| >50        | 20(10.9%)    | 0                    | 2(3%)        | 22(7.31%)  |
| Total      | 184(61.2%)   | 51(16.9%)            | 66(21.9%)    | 301     |

Reactive Hyperplasia (54.91%) and Inflammation (59%) were most frequently seen in the 0-10yr age group while tuberculosis (28.8%) was highest among the 21-30yr age group.

### Table 4: Age Profile of Malignant Cervical Lymph Node Lesions

| Age (yrs.) | Primary Malignancy | Metastases | Total |
|------------|--------------------|------------|-------|
| 0-10       | 1(10%)             | 1(2.86%)   | 2(4.4%)|
| 11-20      | 4(40%)             | 0          | 4(8.9%)|
| 21-30      | 0                  | 0          | 0      |
| 31-40      | 0                  | 3(8.57%)   | 3(6.7%)|
| 41-50      | 1(10%)             | 10(28.57%) | 11(24.4%)|
| >50        | 4(40%)             | 21(60%)    | 25(55.6%)|
| Total      | 10(22.2%)          | 35(77.8%)  | 45     |

Metastatic lymph node deposits (77.8%) were more common than Primary malignancies (22.2%). However, primary malignancies had a bimodal age distribution in the 11-20yr age group and >50yr age group (40% each) while metastases were frequent among the >50yr age group (60%).

### Table 5: Sex Profile of Cervical Lymph Node Lesions

| Lesion             | Male          | Female        | Total |
|--------------------|---------------|---------------|-------|
| Tuberculosis       | 99(53.8%)     | 85(46.2%)     | 184   |
| Reactive Hyperplasia| 31(60.8%)    | 20(39.2%)     | 51    |
| Inflammation       | 41(62.1%)     | 25(37.9%)     | 66    |
| Primary Malignancy | 7(70%)        | 3(30%)        | 10    |
| Metastases         | 24(68.6%)     | 11(31.4%)     | 35    |
| Total              | 202(58.4%)    | 144(41.6%)    | 346   |

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Reactive Hyperplasia (60.8%), Inflammation (62.1%), Primaries (70%) and Metastases (68.6%) had an overwhelming male affection. In all, malignancies were also more common in males (68.8%). Tuberculosis was somewhat comparable between the sexes at 53.8% (Males) and 46.2% (Females). Thus, all cervical lymph node lesions had a male preponderance (58.4%).

| Diagnosis | Number | Clinical Accuracy (%) | Histological Confirmation | FNAC Accuracy (%) |
|-----------|--------|------------------------|--------------------------|-------------------|
| Benign    |        |                        |                          |                   |
| Adenoma   | 13(35.14%) | 11(84.6%) | 2 | 2(100%) |
| Inflammation | 19(51.35%) | 17(89.5%) | 6 | 4(66.67%) |
| Malignant | 5(13.51%) | 4(80%) | 2 | 1(50%) |
| Total     | 37     | 32(86.5%) | 10 | 7(70%) |

Table 6: Cytological, Clinical and Histopathological Correlation of Salivary Gland Lesions

Most salivary gland lesions were benign in nature (86.5%) and although FNAC correlated with 100% of adenomas on histological confirmation, it only correlated in 60% of inflammatory lesions and 50% of malignancies.

| Age (yrs.) | Inflammation | Benign | Malignant | Total |
|------------|--------------|--------|-----------|-------|
| 0-10       | 3(15.8%)     | 0      | 1(20%)    | 4(10.81%) |
| 11-20      | 3(15.8%)     | 2(15.39%) | 0     | 5(13.51%) |
| 21-30      | 2(10.5%)     | 2(15.39%) | 0     | 4(10.81%) |
| 31-40      | 1(5.3%)      | 6(46.15%) | 1(20%) | 8(21.62%) |
| 41-50      | 2(10.5%)     | 0      | 0        | 2(5.41%) |
| >50        | 8(42.1%)     | 3(23.08%) | 3(60%) | 14(37.84%) |
| Total      | 19(51.35%)   | 13(35.14%) | 5(13.51%) | 37   |

Table 7: Age Profile of Salivary Gland Lesions

While inflammatory (42.1%) and malignant (60%) lesions were more common among the >50 year age group, benign lesions were mostly seen in the 31-40 year age group.

| Lesion       | Male     | Female   | Total |
|--------------|----------|----------|-------|
| Inflammation | 11(57.9%) | 8(42.1%)  | 19    |
| Benign       | 4(30.77%) | 9(69.23%) | 13    |
| Malignant    | 4(80%)   | 1(20%)   | 5     |
| Total        | 19(51.35%)| 18(48.65%)| 37    |

Table 8: Sex Profile of Salivary Gland Lesions

Inflammation (57.9%) and Malignancy (80%) of salivary glands had a significant male predilection, while benign lesions (69.24%) were more common in females.
Other head and neck lesions that FNAC accurately diagnosed were Dermoid cyst (100%) and Lipoma (80%).

Cysts were more frequently seen in the >50 year group (31.25%), while lipomas were most frequent in the 31-40yr age group (71.4%).

Both, cysts (81.25%) and lipomas (85.7%) were more common among males.
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Thus, the diagnostic reliability of cytopathology in comparison to histopathology in the differentiation of malignant from benign head and neck masses can be summarised as:

1. Sensitivity 76.67%.
2. Specificity 94.62%.
3. Positive Predictive Value 82.14%.
4. Negative Predictive Value 92.63%.
5. Accuracy 90.2%.
6. Discordance 9.8%.

DISCUSSION: Overall accuracy of cyto diagnosis in the present study was 90.2%. Similarly, Hafez6 achieved a diagnostic accuracy of 82.2% while Babu7 achieved a diagnostic accuracy of 91%.

The accuracy of the various cervical lymph node diagnoses found in the current study is compared with other studies as shown in the following table:-

| Diagnosis                | Present Study | Hafez6 |
|--------------------------|---------------|--------|
| Reactive Hyperplasia     | 94.7%         | 85%    |
| Granulomatous lymphadenitis | 96.1%     | 70%    |
| Necrotising lymphadenitis | 90.1%         | 83.3%  |
| Metastases               | 90.4%         | 100%   |
| Non-Hodgkins Lymphoma    | 50%           | 75%    |
| Hodgkins Lymphoma        | 100%          | 77.8%  |

Table 13: Comparison of the accuracy of various cervical lymph node lesions with Hafez et al.

Other studies have shown diagnostic accuracy for Metastasis to vary between 87-97. 9% and 82% for lymphomas.8,9

The proportion of each benign cervical lymph node lesion was higher than that found by Pandav.10 Our study found tubercular lymphadenitis, reactive hyperplasia and inflammation in 53.2%, 14.7% and 19% respectively; while their study showed the same in 38%, 22% and 11% respectively.

Wilkinson found metastasis in 90% of all lymph node biopsy in their study while the remaining 10% were lymphomas.11 Similarly, this study revealed metastasis in 77.8% and primaries in 22.2%

Kataria.12 found male preponderance in tuberculosis lymphadenitis (75%) and malignancies (66.67%). Likewise, this study revealed similar results with 53.8% tubercular lymphadenitis and 68.9% malignancies prevailing in the male sex.

While Hafez.6 observed that the peak incidence of benign and malignant lesions in the 3rd & 5th decades respectively, our study showed peak incidence of benign lesions in the 0-10 & 11-20year and malignant lesions in the >50year age group respectively.

Among salivary gland lesions, FNAC accuracy was 50% for malignancies in the current study, while Babu.7 achieved 75% accuracy while Sengupta.13 achieved an accuracy of 96.07%

Cystic, inflammatory and malignant lesions were 35.14%, 51.35% and 13.51% respectively; similar to Senguptas.13 observations of 25.25%, 54.45% and 20.3% respectively. Frequency of
salivary gland lesions were highest in the >50 year age group, similar to Sengupta.\textsuperscript{13} who found maximum number (39.3\%) in the 51-60 year age group. In the current study, males slightly outnumbered females in the ration of 1.05:1; opposite to the Senguptas.\textsuperscript{13} study in which females outnumbered males by a ratio of 1.15:1

Among the other lesions of the head and neck, lipomas were most common, being seen in 7/23 cases; similar to Roy\textsuperscript{14} who found lipomas in 22/70 cases.

On the whole, this study on FNAC arrived at results that are similar to earlier conducted studies, as depicted below:

| Parameter                  | Current Study | Hafez.\textsuperscript{6} | Sengupta.\textsuperscript{13} | Jain.\textsuperscript{15} |
|----------------------------|---------------|-----------------------------|-------------------------------|---------------------------|
| Sensitivity                | 76.67\%       | 90.9\%                      | 87.5\%                        | 92.8\%                    |
| Specificity                | 94.62\%       | 67.2\%                      | 97.6\%                        | 93.9\%                    |
| Positive Predictive Value  | 82.14\%       | 82.6\%                      | 87.5\%                        | 81.2\%                    |
| Negative Predictive Value  | 92.63\%       | 81.3\%                      | 97.6\%                        | 98.4\%                    |
| Accuracy                   | 90.2\%        | 82.2\%                      | 96.07\%                       | -                         |
| Discordance                | 9.8\%         | 17.8\%                      | -                             | -                         |

Table 14: A comparison of various parameters of FNAC between other studies and current study

Thus, studies have revealed a higher Specificity than the Sensitivity of FNAC in the diagnosis of malignant head and neck mass lesions. However, these studies similarly show a higher Negative over a Positive predictive value in the diagnosis of malignant lesions. With an accuracy of 90.2\%, our study also acknowledges FNAC to be a highly reliable technique for the pre-operative diagnosis of head and neck masses.

**RECOMMENDATIONS:** Despite its limitations and pitfalls, FNAC appears as a good first line method for investigating the cases of cervical lymphadenopathy. FNAC used in conjunction with clinical findings, radiological and laboratory investigations can be a cost effective method. Our study also showed FNAC of lymph nodes to be an accurate tool in the diagnosis of lymph node malignancies and can effectively classify salivary gland lesions into cystic, inflammatory and neoplastic lesions. Overall, the accuracy of FNAC in identifying lesions was reasonably good and comparable to the alternative of biopsy.

Hence, in our country, where resources are low, FNAC provides a cost-effective, quick and painless alternative to the gold standard biopsy. Its accuracy in many situations, when applied by experienced and well trained practitioners, matches that of histopathology and should be regarded as an extremely valuable complement to it and is itself becoming just indispensable.

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