

Efficacy of fine needle aspiration cytology in Head and Neck lesions

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ABSTRACT

Background: A perplexing diagnostic and therapeutic dilemma is often presented by masses involving glandular and nodal structures of head and neck - lymph nodes, thyroid gland and salivary glands. Fine needle aspiration of such masses is a rapid, direct and safe adjunctive surgical procedure for obtaining material for cytologic analysis.

Objectives: To study the diagnostic efficacy of FNAC in the head and neck lesions and correlate it with histopathology.

Material & Methods: It is a study of 289 cases of head and neck area referred to the Department of Pathology, Govt. Medical College Patiala. The cytological diagnosis was compared with histopathology. The false positive/negative data was analysed to calculate the sensitivity, specificity, positive predictive value, negative predictive value and overall diagnostic accuracy of the study.

Results: The study included 289 cases between 1-70 years in which 59.86% were females and 40.13% were males. Maximum cases were in the age group of 21-30 years. Maximum numbers of cases were from lymph nodes, 139 (48.09%). The overall accuracy was 96.53% with sensitivity of 91.54% and specificity of 98.16%. Positive and negative predictive values were 94.20% and 97.27% respectively.

Conclusion: FNAC is an excellent first line method for investigating the nature of palpable lesions in the head and neck region. It can obviate the need for surgery if the lesion is non-neoplastic.

Key words: Head & Neck lesions, FNAC, thyroid lesions, cervical lymph node lesions

Introduction

The modern method of fine needle aspiration cytology was originally described and was advocated by Martin and Ellis in 1930. [1] Smear obtained by aspiration with the help of 18G needle was studied for the first time by Stewart (1933). The method is applicable to lesions that are easily palpable; for e.g. superficial growth of the skin, subcutis and soft tissues and organs such as the thyroid, breast, salivary gland and superficial lymph nodes. There is no doubt that as Koss 1980 [2] has said "Thin needle aspiration cytology is a procedure whose time has come" and the pathologists not already versed in the technique will come under increasing and compelling pressure to provide it. Presence of a mass involving nodal and glandular structure often poses a diagnostic dilemma for the clinician. Open surgical biopsy yields a definite histopathological diagnosis but mandates an

extensive operative approach which may be inappropriate for best management. Furthermore, when malignant disease is discovered during an open biopsy, the surgeon may be unprepared or be incapable of proceeding with adequate management. Fine needle aspiration cytology of such masses is a rapid, direct and safe adjunctive surgical procedure for obtaining material for cytologic analysis. [3] The present study aims to study the diagnostic efficacy of FNAC and its histopathological correlation in the palpable lesions of head and neck region.

Material and Methods

Fine needle aspiration cytology was undertaken on 289 patients with lesions of head and neck area referred to the Department of Pathology, Govt. Medical College from attached Rajindra Hospital and other hospitals in and around

Patiala The common aspiration targets in head and neck were divided into lymph nodes, thyroid gland, salivary glands and miscellaneous lesions of the neck. The cytological diagnosis was compared with histopathology. FNAC smears were prepared using 20 cc syringe & 22 gauge needle fitted to a Franzen handle and were stained with May Grunwald Giemsa (MGG) and Papanicolaou (PAP) stain. The biopsies subjected to histopathology were stained with Haematoxylin and Eosin.

Statistical analysis

A true positive (TP) aspiration is defined as malignant diagnosis from a lesion determined to be malignant after surgical biopsy. A false positive (FP) is defined as a malignant FNA diagnosis found to be benign after surgery. A true negative (TN) FNA is defined as benign cytological results from a lesion proved to be benign after surgery. A false negative (FN) FNA is defined as benign cytological diagnosis proved to be malignant on histology. The following parameters were analyzed according to the standard criteria:-

Sensitivity: It is defined as the proportion of patients having malignant lesions and positive cytological diagnosis and calculated by $TP / (TP+FN)$.

Specificity: It is defined as the proportion of patients having non malignant lesions and negative cytological diagnosis and calculated by $TN / (TN+FP)$.

Positive predictive value: It is the probability of having malignant lesion with positive

cytological finding and calculated as $TP / (TP+FP)$.

Negative predictive value: It is the probability that a patient did not having malignant lesion with negative cytological finding and calculated as $TN / (TN+FN)$.

Accuracy: It is the proportion of correct results (true positive and true negative) in relation to all cases studied and calculated by $(TP+ TN) / (TP + FP+TN+FN)$

Results

The study included 289 cases ranging from 1-70 yrs of age in which 59.86% were females and 40.13% were males. Maximum number of cases were in the age group of 21-30 yrs. Cases of lymph node lesions were the highest, 139 cases (48.09%), followed by Thyroid lesions 82 (28.37%) cases, followed by Salivary glands 49 (16.95%) and the miscellaneous lesions of the neck 19 (6.57%).

Lymph node Lesions

Of 139 cases of lymph nodes lesions, 48 cases (34.53%) cases were diagnosed as reactive lymphadenitis cytologically, of which 2 cases proved to be of tubercular lymphadenitis and 2 were diagnosed as Hodgkin's disease on histopathology. Of 18 cases (12.94%) of acute inflammatory pathology diagnosed on cytology, 1 case proved to be of metastatic malignancy on histopathology. Of 43 malignant cases (30.93%) diagnosed on cytology, all were confirmed on histopathology. Amongst the malignant lesions, metastatic lesions were highest which included mainly metastatic squamous cell carcinoma. (Figure 1) (Table 1)

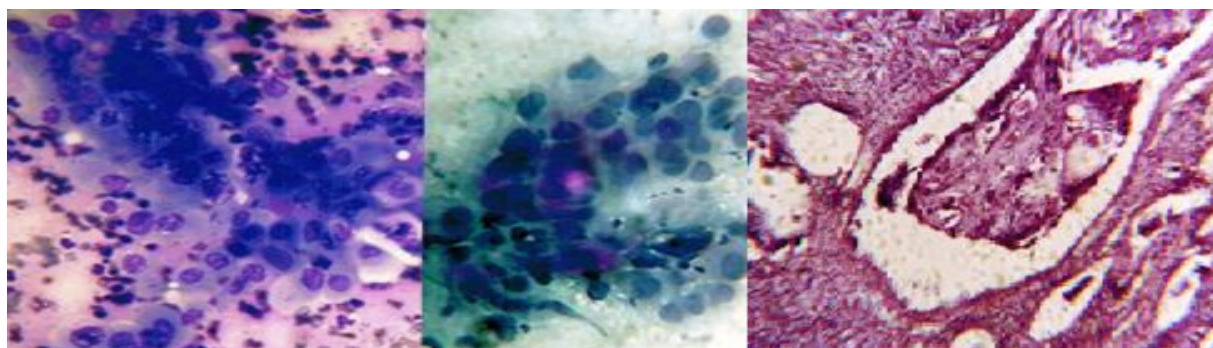


Figure-1 (a) FNAC Secondaries of Squamous cell carcinoma (MGG X 400)

(b) FNAC Secondaries of Squamous cell carcinoma (PAP X 400)

(c) HPE Secondaries of Squamous cell carcinoma (H & E X 400)

Table 1: Cyto - Histopathological correlation in Lymph node lesions

| Cytological Diagnosis | No. of cases (%) | Histopathological Diagnosis | | | | | |
|--------------------------|--------------------|-----------------------------|-----|------------------------|-----------|-----|------------|
| | | Reactive | T.B | Inflammatory pathology | Hodgkin's | NHL | Metastatic |
| Non Neoplastic lesions | 96 (69.06%) | | | | | | |
| • Reactive | 48 | 44 | 2 | - | 2 | - | - |
| • Tubercular | 31 | - | 31 | - | - | - | - |
| • Inflammatory pathology | 17 | - | - | 16 | - | - | 1 |
| Malignant | 43 (30.93%) | | | | | | |
| • Hodgkin's | 9 | - | - | - | 9 | - | - |
| • NHL | 16 | - | - | - | - | 16 | - |
| Metastatic | 18 | - | - | - | - | - | 18 |
| Total | 139 | 44 | 33 | 16 | 11 | 16 | 19 |

Thyroid Lesions

Out of 82 cases (28.37%) of thyroid lesions, 57 cases (69.51%) were having benign non-neoplastic lesions. Of 57 cases diagnosed as benign on cytology, one case of Hashimoto's thyroiditis, proved to be malignant (Medullary carcinoma) on HPE. Another aspirate of cystic degeneration in adenomatous goitre proved to

be papillary carcinoma on histopathology. Out of 6 cases of possibly malignant, 4 were confirmed to be malignant and 2 cases came out to be benign (follicular adenoma). 5 cases of Papillary carcinoma (showing well defined papillae and intranuclear inclusions) (Figure 2), and 2 cases of Medullary carcinoma diagnosed on cytology were confirmed on HPE. (Table 2)

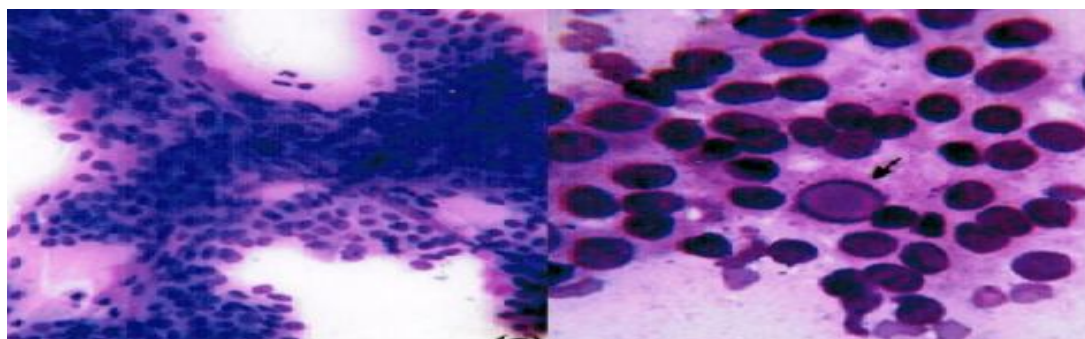


Figure 2 (a) FNAC Papillary carcinoma (MGG X 400) (b) Arrow showing intranuclear inclusions (MGG X 1000)

Table 2: Cyto-Histopathological correlation in Thyroid lesions

| | FNAC Diagnosis | No. of Cases (%) | Histopathological Diagnosis | |
|-----|---|------------------|--|---|
| | | | Benign - 69 | Malignant - 13 |
| 1. | Benign Non Neoplastic Lesions | 57 (69.51) | | |
| a). | Colloid goiter | 25 | Adenomatous Goitre -25 | |
| b). | Colloid nodule | 9 | Colloid Adenoma -7 Adenomatous Goitre -2 | |
| c). | Hashimoto's Thyroiditis | 7 | Hashimoto's Thyroiditis-6 | Medullary Carcinoma-1 |
| d). | Lymphocytic Thyroiditis | 3 | Lymphocytic Thyroiditis-3 | |
| e). | Thyroglossal Cyst | 2 | Thyroglossal Cyst-2 | |
| f). | Cystic degeneration in Adenomatous Goitre | 5 | Cystic degeneration in Adenomatous Goitre-4 | Papillary Carcinoma-1 |
| g). | Nonspecific benign enlargement | 6 | Adenomatous Goitre-5 Follicular Adenoma-1 | |
| 2. | Follicular Neoplasm possibly benign | 12 (14.63) | Follicular Adenoma-12 | |
| 3. | Follicular Neoplasm possibly malignant | 6 (7.31) | 2- Follicular Adenoma | 2- Follicular Carcinoma 2- Follicular variant of Papillary Carcinoma |
| 4. | Malignant | 7 (8.53) | | |
| | Papillary Carcinoma | 5 | 5- Papillary Carcinoma | |
| | Medullary Carcinoma | 2 | 2- Medullary Carcinoma | |
| | Total | 82 | | |

Salivary Gland Lesions

Of 49 cases (16.95%) of salivary glands aspirated and confirmed on histopathology, there were 41 cases (83.67%) of benign lesions, of which Pleomorphic Adenoma was the commonest (24, 48.97%) showing myxomatous/chondroid material and myoepithelial cells. One case of retention cyst diagnosed on cytology proved to be malignant (low grade mucoepidermoid carcinoma) on histopathology. Of total 8 cases (16.32%) of

malignant lesions, there was one case diagnosed as Adenoid cystic carcinoma on cytology, which proved to be Pleomorphic Adenoma on HPE (Table 3). 4 cases of Mucoepidermoid carcinoma, 2 cases of Adenoid cystic carcinoma (showing cellular smears with cells singly and in clusters, hyaline spherical globules with adherent tumour cells, Figure 3) and 1 case of Acinic cell carcinoma proved correct on histopathology.

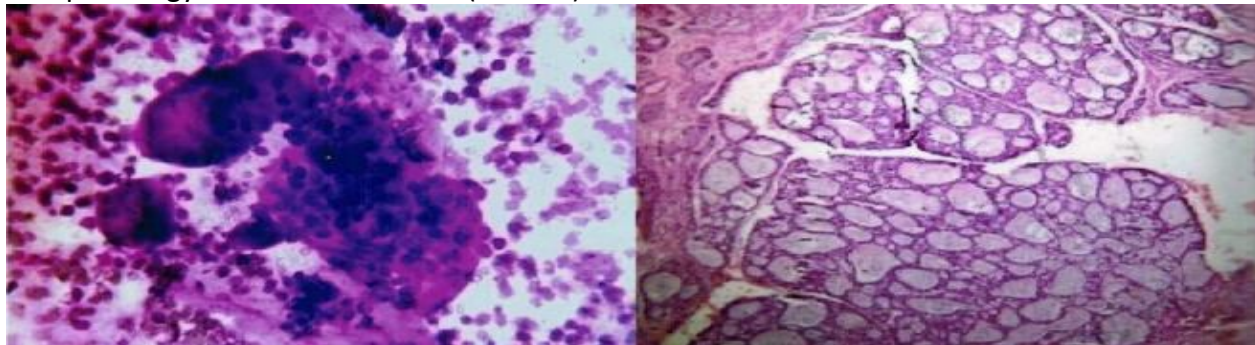


Figure-3 (a) FNAC Adenoid cystic carcinoma (MGG X 400)

(b) Histopathology Adenoid cystic Carcinoma (H & E X 100)

Table 3: Cyto Histopathological correlation in Salivary gland lesions

| Cytological Diagnosis | No. of cases (%age) | Histopathological diagnosis | |
|---------------------------|---------------------|-----------------------------|---------------------------------------|
| | | Benign | Malignant |
| A). Benign | 41 (83.67) | | |
| 1. Neoplastic lesions | 25 (58.13) | | |
| Pleomorphic Adenoma | 24 | 24 | |
| Basal cell Adenoma | 1 | 1 | |
| 2. Non neoplastic lesions | 16 (37.20) | | |
| Inflammatory lesions | 10 | 10 | |
| Retention cyst | 4 | 3 | Low grade Muco-epidermoid carcinoma-1 |
| Lymphoepithelial lesion | 2 | 2 | |
| B). Malignant lesions | 8 (18.60) | | |
| Muco-epidermoid carcinoma | 4 | | Muco-epidermoid carcinoma-4 |
| Adenoid cystic carcinoma | 3 | Pleomorphic -1 Adenoma | Adenoid cystic carcinoma-2 |
| Acinic cell carcinoma | 1 | | Acinic cell carcinoma-1 |
| Total | 49 | 35 | 8 |

Miscellaneous Lesions of the Neck

Of total 19 cases (6.57%) of aspirates from miscellaneous lesions of neck, there was 1 false positive case. On cytology, aspirate from neck

swelling revealed hyperchromatic cells and was reported to be metastatic deposits which on histopathology came out to be Pilomatricoma. (Table 4)

Table 4: Cyto Histopathological correlation in Miscellaneous Lesions of Neck

| Cytological Diagnosis | No. of cases | Histopathological diagnosis | |
|-------------------------------|--------------|---|-----------|
| | | Benign | Malignant |
| A Benign Lesions | 14 (73.68) | | |
| 1.Neoplastic | 9 (47.36) | | |
| Lipoma | 6 | 6 | |
| Hemangioma | 2 | 2 | |
| Parathyroid adenoma | 1 | 1 | |
| 2. Non Neoplastic | 5 (26.31) | | |
| Bening Cystic Lesions of neck | 3 | 3-Aspiration done with no residual swelling | |
| Epidermal Cyst | 2 | 2 | |
| B Malignant Lesions | 5 (26.31) | | |
| SCC | 3 | - | 3 |
| Alveolar rhabdomyosarcoma | 1 | - | 1 |
| Metastatic deposits | 1 | 1 (Pilomatricoma) | - |
| Total | 19 | 15 | 4 |

Of 289 cases analysed, 69 cases were diagnosed as malignant on cytology, of which 4 proved to be false positive. Of 220 cases diagnosed as benign on cytology, 6 cases proved to false negative.

The overall accuracy of 289 cases evaluated was 96.53% with sensitivity of 91.54% and specificity of 98.16%. Positive predictive value and negative predictive value was found to be 94.20% and 97.27% respectively.

Discussion

In the present study, maximum number of aspirates were from lymph nodes (48.09%) followed by thyroid gland (28.39%), salivary glands (16.95%) and miscellaneous lesions of neck (6.57%) which correlated to the study by Tandon et al.^[4]

In this study, there were 139 aspirations from Lymph nodes with 48 cases of reactive lymphadenitis. On histopathology, 44 cases proved to be correct while 2 cases came out to be tubercular lymphadenitis and 2 cases as Hodgkin’s disease. This might be due to wrong interpretation of smears or the needle could

not reach the exact site of lesion. Patra et al^[5] included 113 aspirates in this study group in which 44 aspirates of reactive lymphadenitis were confirmed on histopathology in 34 cases, 5 cases of tubercular lymphadenitis were

missed. They attributed this failure to missing the exact site of lesion and explained that, had they taken aspirates from multiple sites, they might not have missed these lesions.

Table 5: Comparison of Head & Neck Lesions in various studies

| Studies | Lymph nodes | Thyroid gland | Salivary glands | Miscellaneous lesions of neck | Sensitivity | Specificity | PPV | NPV | Accuracy |
|------------------------------------|-------------|---------------|-----------------|-------------------------------|-------------|-------------|--------|--------|----------|
| Peter et al (1989) ^[18] | 61% | 21% | 16% | 3.2% | - | - | - | - | |
| Tandon et al (2008) ^[4] | 41.3% | 29% | 20.2% | 9.5% | 89.5% | 98.5% | 97.3% | 94% | 95.1% |
| Richa et al (2012) ^[9] | 60.8% | 24% | 11.2% | 4% | 89.28% | 90.69% | 86.20% | 92.86% | 90.14% |
| Present study (2013) | 48.09% | 28.37% | 16.95% | 6.57% | 91.54% | 98.16% | 94.20% | 97.27% | 96.53% |

One aspirate of acute inflammatory pathology proved to be of metastatic malignancy on histopathology (false negative). The tumor on histopathology had prominent central necrosis which accounted for the picture resembling acute inflammatory pathology on FNA. Thompson et al^[6] reported that the presence of prominent central necrosis should mandate a careful search for malignant elements.

Two cases of Hodgkin’s disease were missed on cytology and diagnosed as reactive lymphadenitis (False negative). Presence of mixed population of lymphoid cells and plasma cells was the cause of misinterpretation of Hodgkin’s disease as reactive lymphadenitis. Such false negative cases are also present in

review. According to Frable et al^[7, 8] FNAC is used primarily for documentation of residual recurrent lymphoma or to assess the stage of the disease. The use of FNA to render a primary diagnosis of lymphoma remains controversial. The differential diagnosis between prominent follicular hyperplasia and follicular lymphoma grade 1-2 (Centroblastic-Centrocytic) can be very difficult in FNA smears. This is because dendritic reticulum cells associated with centroblasts and centrocytes are seen in both conditions, and that interfollicular areas in follicular lymphoma may contain large number of lymphocytes.^[9]

Of 82 aspirates (28.37%) from thyroid gland, maximum cases were of colloid goiter 25

(30.48%) followed by follicular neoplasm 12 (14.63%) comparable to the study by Richa et al.^[9] One case of Hashimoto's thyroiditis on cytology proved to be Medullary carcinoma on histopathology. This miss was due to cytological diagnostic inexperience in which cells with abundant cytoplasm were misinterpreted as Hurthle cells. One aspirate of cystic degeneration in adenomatous goiter proved to be of papillary carcinoma on histopathology (false negative). The cause was the presence of cystic degeneration in papillary carcinoma. Suen and Quenville^[10] also reported cystic papillary carcinoma being misdiagnosed as benign lesion on cytology.

Of 6 cases of non specific benign enlargement of thyroid given on cytology, 5 cases proved to be of adenomatous goiter and 1 case came out to be follicular adenoma on histopathology. The cytological appearances in colloid goiter form a continuum which merges with those of follicular adenoma and in this grey area cytological criteria alone cannot reliably distinguish between the two.^[11] Two cases diagnosed as follicular neoplasm probably malignant on cytology, proved to be of follicular adenoma on histopathology (false positive). The cytological findings in follicular adenoma and follicular carcinoma are similar. Lowhagen^[12] advocated that a cytological report should only state that a follicular neoplasm is present with no implication of benign or malignant nature. 2 cases of follicular neoplasm probably malignant on cytology, proved to be of follicular variant of papillary carcinoma on histopathology. Kumar et al^[13] considered adenomatous colloid goiter and follicular adenoma in differential diagnosis of follicular variant of Papillary carcinoma due to the presence of microfollicles but the presence of numerous colloid balls with multilayered microfollicles (rosettes) are cytological findings of follicular variant of Papillary carcinoma.

The follicular variant of papillary carcinoma may have well defined follicles containing colloid and cystic papillary tumours often contain abundant colloid. This can cause diagnostic difficulties if smears are poor in cells. Gagneten^[14] stressed the importance of doing multiple aspirations from thyroid swelling in order to obtain representative material from different areas.

In the present study of 49 cases (16.95%) aspirated, there was 1 case diagnosed as retention cyst on cytology, which proved to be of low grade Mucoepidermoid carcinoma on histopathology. Similar findings were noted by Bandyopadhyay et al^[15] False negative diagnosis often occurred in Mucoepidermoid carcinoma because cystic fluid dilutes the tumor cells or because the bland looking tumor intermediate cells are misinterpreted as benign cells. Multiple sampling is important to overcome problems due to selective sampling.

There was 1 false positive case of Adenoid cystic carcinoma which on histopathology proved to be of Pleomorphic adenoma. This might be due to presence of groups of cells in the myxoid stromal background and hyaline globules, features that may be observed in Adenoid cystic carcinoma. Similar false positive case has also been reported in a study by Al-Khafaji et al.^[16]

Among 19 cases (6.57%) of miscellaneous lesions of neck, there was 1 case in which aspirate from neck swelling revealed hyperchromatic cells and was reported to be metastatic deposits, which on histopathology proved to be Pilomatricoma with hyperchromatic basophilic cells and shadow cells. Review of smears revealed presence of basaloid cells and ghost cells. Prominent nucleoli in basaloid cells misled diagnosis to malignancy. Wong et al^[17] studied 16 cases of Pilomatricomas. Only 25% were correctly diagnosed on cytology. The most common pitfall encountered was a false positive or

suspicious diagnosis of carcinoma. All the cases had a polymorphous cellular and non cellular composition on low power examination, including numerous basaloid cells, ghost cells, squamoid cells, foreign body giant cells, mixed inflammatory cells, keratin clumps and granular debris which might be easily mistaken for a malignant necrotic background. The results of this study are comparable with literature.

FNAC is an excellent first line method for investigating the nature of palpable lesions in the head and neck region. It can obviate the need for surgery if the lesions are shown to be non neoplastic or, if the patients belong to poor risk group for surgery. It helps to obtain a pathologic diagnosis of a suspicious mass to guide further diagnostic evaluation and treatment. FNAC is having a high diagnostic rate to differentiate benign and malignant lesions. It is particularly helpful in confirming metastasis of a known malignant disease. To obtain maximum diagnostic accuracy, close cooperation between a trained cytopathologist and an experienced clinician is a must.

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