Diagnostic Utility Of Fine Needle Aspiration Cytology In The Diagnosis Of Head And Neck Lesions With Special Emphasis On Its Limitations

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Abstract

Objective: To determine the efficacy of fine needle aspiration cytology in the diagnosis of head and neck lesions with special emphasis on the limitations.

Methods: This was a retrospective, cross sectional analytical study. Fine needle aspiration cytology was performed on 250 cases presenting with head and neck lesions. The smears were categorized into four categories as inflammatory/reactive, benign, indeterminate and malignant.

Results: Of these were correlated with histopathology in 50 cases in which surgery was performed. Results: Out of 250 cases 125 cases (50%) were from the thyroid, 84 (33.6%) were from the lymph node, 15 (6%) were from the salivary glands and 26 (10.4%) belonged to the miscellaneous group. The overall sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 50%, 100%, 100%, 88.63% and 89.74% respectively.

Conclusion: FNAC is simple, safe and cost effective procedure in delineating the heterogeneous lesions occurring in the head and neck region with certain limitations.

Key words: Fine needle aspiration cytology, head, neck, lesions.

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INTRODUCTION

The history of fine needle aspiration cytology (FNAC) can be traced back to mid nineteenth century when Kun (1847), Lebert (1851) and Menterier (1886) used this technique as an aid to rapid diagnosis of cancer. Subsequently however the technique went into vague, until the work of Durgeon and Patrick (1927), Martin and Ellis (1934), followed by the publication of Dr Papanicolaou (1941) and H Traut (1943), whose work in this field cannot be overemphasized. Since then the expansion of FNAC through 30 years has been enormous and successful. [1](orell)

Today FNAC is used as a preliminary preoperative diagnostic tool for all kind of diseases, in any organ in the body as a guide to rationale treatment. Practically FNAC has an advantage owing to the fact that it is rapid, cost effective, safe and painless. The most important contribution of FNAC lies in confirming a clinically suspicious local recurrence or metastasis of known cancer. [2]

Head and neck lesion encompass a wide plethora of lesions including malignancy (primary and secondary), infectious, inflammatory and degenerative disorders. A preoperative cytological diagnosis of a primary neoplasm may permit more appropriate surgery. The close proximity of the tissues besides the presence of superficial blood vessels and nerves makes FNAC challenging. Incisional biopsy can leave an unsightly scar and also interfere with surgical procedure. The ability of FNAC to diagnose all kinds of lesions including rare and exotic lesions in the head and neck has been confirmed by numerous case reports and case series. However literature study reveals that numerous diagnostic pitfalls do exist, which warrants the pathologist against overdiagnosis in cytopathology. [3]

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The present study was undertaken to determine the efficacy of FNAC in the diagnosis of head and neck lesions with special emphasis on its limitations.

MATERIALS AND METHODS

This was a retrospective cross sectional analytical study conducted over a duration of two years i.e., from January 2012 up to December 2013.

All the cases presenting with head and neck mass lesions for FNAC were included in the study. All the cases in which FNAC material was inadequate for reporting were excluded from the study.

Ethical clearance was obtained from the institutional ethical committee. Informed consent was obtained from the from the parents when FNAC was done on a minor.

A detailed clinical history with complete clinical examination and relevant investigation was obtained from the patients case record. FNAC was done as an OPD procedure by standard technique. For thyroid lesions non aspiration technique was adopted. All the cystic lesions were aspirated to remove the cyst fluid and repeat FNAC was done from the residual swelling. The cyst fluid was centrifuged and sediment was processed as routine FNAC. No local anesthesia was used. 50% of the slides were fixed in Carnoy’s fixative and remaining were air dried. Fixed slides were stained with hematoxylin and eosin and Papanicolaou stain. Air dried smears were stained with Giemsa stain and AFB stain were ever necessary. Histopathology correlation was done where ever possible. All the lesions were subcategorized by cytological findings into four categories as inflammatory/reactive, indeterminate, benign and malignant.

All the data was expressed as percentages. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy was analyzed.

All the data was tabulated and statistical analysis was done by using SPSS software version 16.
RESULTS

Out of 250 patients presenting with head and neck lesions, 125 cases (50%) were from the thyroid, 84 (33.6%) were from the lymph node, 15 (6%) were from the salivary glands and 26 (10.4%) belonged to the miscellaneous group. (Table 1)

Table 2 depicts the Cytological sub categorisation of all the 250 lesions in to four categories

Thyroid

Inflammatory/ Reactive category: Among 125 cases of thyroid lesions, 55 (44%) showed inflammatory pathology at cytology. Out of these 55 cases, 45 (81.81%) were diagnosed as Hashimoto’s thyroiditis, five (9.09%) as lymphocytic thyroiditis and two (3.63%) as dequervain’s thyroiditis.

Malignancy: This category included two (13.33%) cases of thyroid lesions. These were papillary carcinoma and one (50%) as squamous cell carcinoma.

Table 2 depicted the Cytological sub categorisation of all the 250 lesions into four categories

Inflammatory/ Reactive category: Among 22 cases, 12 (54.54%) cases of inflammatory pathology were seen at cytology. Out of these 12 cases, four (33.33%) were pleomorphic adenoma and one (8.33%) as cystic retention cyst.

Malignancy: Malignancy was diagnosed at FNAC in three (1.2%) cases of which two (66.66%) were papillary carcinoma and one (33.33%) was metastatic squamous cell carcinoma to the thyroid. Primary of this metastatic carcinoma was from the esophagus.

Lymphnode

Total number of lymph node aspirates were 84 (33.6%).

Inflammatory/ Reactive category: Included 62 (73.8%) cases, out of these 41 (66.12%) showed reactive lymphadenitis, eight (12.90%) were granulomatous, seven (11.29%) were tuberculotic lymphadenitis (AFB positive) and six (9.67%) cases were interpreted as caseating granulomatous lymphadenitis.

Malignancy: This category included 22 (35.48%) cases. Among these 22 cases, four (18.18%) were interpreted as lymphoma, of which two were sub classified as non Hodgkin’s and two as Hodgkin’s lymphoma. There were 18 (81.81%) cases of metastatic deposits in lymph node.

No case of indeterminate category was diagnosed at cytology

Salivary Gland

Inflammatory/ Reactive category: Out of total 15 (6%) cases, inflammatory lesions included nine cases (60%), of which two were (22.22%) acute sialadenitis, five (55.55%) were chronic sialadenitis, one (11.11%) acute suppurative sialadenitis and one case (11.11%) of sialadenosis.

Benign: Included four (26.66%) cases, of which two (50%) were pleomorphic adenoma, one (25%) basal cell adenoma and one (25%) case of mucoid retention cyst.

No case of indeterminate category was diagnosed at cytology

Malignancy: Two (13.33%) cases were diagnosed as malignancy as cytology – one (50%) as mucoepidermoid carcinoma and one (50%) as squamous cell carcinoma.

Miscellaneous Category

Out of total 26 (10.4%) cases in this category, there were seven cases (26.92%) of soft tissue lesions, 14 (53.84%) cases of skin lesions and others five (19.23%) cases.

Benign: Out of seven cases of soft tissue, five (71.43%) were lipoma and one (14.28%) each of neurilemmoma and pigmented neurofibroma. There were 14 cases of epidermal cyst and two of branchial cyst

Indeterminate: There was one case (3.84%) of epithelial atypia for which histopathology was not available and was lost for follow up.

Malignancy: This category included two (7.69%) cases, one (50%) of squamous cell carcinoma of cheek and one (50%) case of metastatic squamous cell carcinoma to the scalp.

Cyto Histopathologic Correlation

Table 3 depicts cases with cyto histologic discrepancies.

Surgery was performed in 50 (20%) of cases out of total 250 cases which underwent FNAC. Among these 50 cases, concordant diagnosis was obtained in 84% of the cases. Discrepancies were obtained in 13.33% of thyroid lesions, 30% of lymph node lesions and 33% of salivary gland lesions.

Concordant And Discordant Diagnosis

Among the thyroid lesions discordant diagnosis was obtained in four cases, out of these one case of Hashimoto’s thyroiditis was misinterpreted as nodular goitre at FNAC, two cases of papillary carcinoma were misinterpreted as acute suppurative lymphadenitis and interpreted wrongly as colloid goiter with cystic change. One case of follicular adenoma was under diagnosed as adenomatous goiter on cytology.

Among the lymph node lesions, there were three cases of cyto histological discordance. One case of reactive lymphadenitis was misdiagnosed as granulomatous lymphadenitis at cytology. Two cases of lymphoma, one Hodgkin’s and one non Hodgkin’s were misdiagnosed as caseating granulomatous lymphadenitis and necrotizing lymphadenitis respectively.

There was only one case of discordant diagnosis among the salivary gland lesions. This was a case of parotid gland lesion which was reported as inflamed retention cyst at cytology which was reclassified as low grade mucoepidermoid carcinoma at histopathology.

To summarize the result, there five cases of false negative. There was no false positive. The over all sensitivity , specificity, positive predictive value, negative predictive value and accuracy were 50%, 100%, 100%, 88.63% and 89.74% respectively.

DISCUSSION

FNAC has obvious advantages both to the patient and the treating clinicians. It offers a rapid pre-operative diagnosis aiding treating clinicians in proper planning of management. It is a painless and inexpensive procedure. In addition, low risk of aspiration and office procedure are a further advantage. It is eminently useful in countries with scant resources where expertise facilities are not accessible to all. Although most of the time its accuracy is equivalent to that of histopathology, it has to be stressed that cytology is not a substitute for conventional histopathology and that it has certain limitations. [3] The present study was undertaken to determine the efficacy of FNAC in the
Out of total 250 cases in the head and neck region, the most common organ aspirated was thyroid, followed by lymph node, salivary glands and miscellaneous group. In various other series, involving head and neck aspirates, lymph node was the most common site followed by thyroid and other lesions. [4, 5] Thyroid Lesions

Among the thyroid lesions, maximum number of the cases were diagnosed as colloid goiter with or without secondary diagnosis of head and neck lesions. An attempt was made to review and discuss its major limitations.

Table no 1: Depicts site wise distribution of head and neck mass lesions

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Site</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thyroid</td>
<td>125</td>
<td>50 %</td>
</tr>
<tr>
<td>2</td>
<td>Lymph node</td>
<td>84</td>
<td>33.6%</td>
</tr>
<tr>
<td>3</td>
<td>Salivary gland</td>
<td>15</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td>Miscellaneous</td>
<td>26</td>
<td>10.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>250</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table no 2: Cytological subcategorisation of all lesions in to four categories

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Site</th>
<th>Inflammatory/Reactive</th>
<th>Benign</th>
<th>Indeterminate</th>
<th>Malignancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thyroid</td>
<td>55</td>
<td>61</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Lymph node</td>
<td>62</td>
<td>-</td>
<td>-</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Salivary gland</td>
<td>9</td>
<td>4</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Soft tissue and others</td>
<td>16</td>
<td>7</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>142</strong></td>
<td><strong>72</strong></td>
<td><strong>7</strong></td>
<td><strong>29</strong></td>
</tr>
</tbody>
</table>

Table no 3: Depicts Concordant and discordant diagnosis

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Site</th>
<th>Concordant diagnosis</th>
<th>Discordan diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thyroid</td>
<td>26 (86.66%)</td>
<td>4 (13.34%)</td>
</tr>
<tr>
<td>2</td>
<td>Lymph node</td>
<td>7 (70%)</td>
<td>3 (30%)</td>
</tr>
<tr>
<td>3</td>
<td>Salivary gland</td>
<td>2 (66.66%)</td>
<td>1 (33.34%)</td>
</tr>
<tr>
<td>4</td>
<td>Soft tissue and others</td>
<td>7 (100%)</td>
<td>0(%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>42</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

Figure 1: Smears aspirated from thyroid swelling shows only colloid with colloidophages. This case harboured a papillary carcinoma which was missed at cytology (H&E, x 100).

Figure 2: Sections of the specimen shown in figure 1, papillary carcinoma is seen with an area of cystic change (H&E, x 100).
changes, followed by thyroiditis. There were six cases of follicular neoplasm and three cases of malignancy. Histopathological correlation was obtained in 30 cases. Medical management was done in 76% of the cases, where as 24% underwent surgery. Out of these 30 cases, concordant diagnosis was obtained in 26 cases. Among four cases of discordant diagnosis, were two cases of papillary carcinoma missed at cytology as colloid goiter with cystic change. (Figure 1 and 2) Cystic lesions are a major cause of false negative diagnosis in thyroid cytology. Santos e al reviewed 221 cases of surgically resected thyroid nodules out of which 71 (21%) were cystic. They observed that, the only false negative in their study was a cystic papillary carcinoma which yielded insufficient material and concluded that cystic lesions are as likely to harbor malignancy as solid lesions. [6] Cystic change is seen in 25% of papillary carcinoma, 20% of follicular neoplasm and 26% of follicular carcinoma. [2] FNAC has a high false negative rate ranging from 45% to 67% in detecting cystic lesions harbouring malignancy. This low sensitivity is attributed to the sampling error rather than misinterpretation by the pathologist. [7, 8] Ultrasound guided FNAC has gained wide acceptance in thyroid pathology and is useful in cystic lesions wherein aspiration can be done from the thick cyst wall or solid area of a partially cystic lesion, thus yielding high cellularity. US guided FNAC allows proper positioning of the needle in solid and suspicious area and aids in avoiding dilution with cyst fluid. [9]

Major advantage of FNAC in thyroid pathology is the ability to diagnose an inflammatory pathology, thus allowing medical line of management. However a small percentage may be missed due to varying cytomorphology of the lesion and missing the target. [10] In the present study, one case of Hashimoto's thyroiditis was misdiagnosed as colloid goiter due to abundance of colloid. A diligent look at all the slides with appropriate clinical correlation is important to avoid unnecessary surgery. [11]

One of the inherent limitations of FNAC in thyroid is the diagnosis of follicular patterned lesions which encompass a spectrum of lesions from benign to malignant including adenomatous goiter, follicular adenoma, follicular carcinoma and follicular variant of papillary carcinoma. Commonest error is the misinterpretation of follicular neoplasm is adenomatous goiter.[12, 13] Several authors have reported the fact that aspiration from macro follicular or hyper cellular area of a nodular goiter leads to the under diagnosis. [14] A probable remedy is multiple aspirations from different sites. Similarly diagnosis of follicular carcinoma requires histopathological demonstration of capsular and vascular invasion. [15] Careful attention to the nuclear features of grooving and inclusion is mandatory to rule out a follicular variant of papillary carcinoma. Since time immemorial, follicular patterned lesions are a grey zone area and cytology is often unreliable in arriving at an accurate diagnosis. [16]

**Figure 3:** Smears aspirated from the salivary gland showing only mucoid material. No cells are seen. (H& E, x 100)

**Figure 4:** Section of the specimen shown in figure 3, mucoepidermoid carcinoma is seen along with an area of cystic change. Note the lymphoid aggregate seen at the periphery (H& E, x 100).

**Lymph node lesions:**

Out of 84 cases, 74 (84.09%) were treated conservatively based on cytological diagnosis and 10 (11.90%) underwent biopsy. Out of these 10 cases, seven showed cytohistological correlation, i.e., four were diagnosed as tuberculous lymphadenitis and three as reactive lymphadenitis. In rest of the three cases of dissonant diagnosis, one case of reactive lymph node showed granulomatous lymphadenitis at histopathology. The endothelial cells and fibroblasts are a close mimic and easily mistaken for epitheliod cells in cytology smears. A review of the FNAC slides confirmed the error made due to the extensive endothelial proliferation accompanied by drying artifact.

Cervical tuberculosis is one of the important causes of lymphadenopathy in the head and neck region, especially in developing countries. [17] Several studies have attested the role of FNAC accompanied by Ziel Nelson staining in the diagnosis of tuberculous lymphadenitis with a diagnostic accuracy rate of 90-100%. Findings in our study corroborate the same. [18, 19]

One case of Hodgkin's lymphoma was misinterpreted as granulomatous lymphadenitis at FNAC. Granulomata are a well known phenomenon in both Hodgkin's lymphoma & non-Hodgkin's lymphoma (NHL), especially peripheral T cell lymphoma. Granulomata can also occur in other metastatic carcinoma like squamous cell carcinoma, seminoma and malignant melanoma. [20] The authors agree with V Koo, et. al., in their systematic approach of careful examination of FNAC slides with ancillary technique for definitive diagnosis.
Background population of eosinophils and Reed Sternberg cells (RS) in the smears clinches the diagnosis of Hodgkin’s lymphoma. [20] However RS cells and their variants may be sparse in cytology smears and at times obscured by reactive lymphoid population. [21] One case of non Hodgkin’s lymphoma (NHL) was under diagnosed on FNAC as necrotizing lymphadenitis. Satio et al in their study involving 60 consecutive cases of NHL, demonstrated the fact that spontaneous necrosis is not a rare event in NHL and also suggested the significance of this finding in prognostication of patients with NHL. [22]

The diagnostic accuracy of FNAC in lymphnode pathology was 80%. This was in accordance with several other studies, reporting the diagnostic accuracy ranging from 82.2 % to 94.4%. [23]

Salivary gland lesion

Out of total 15 cases of salivary gland lesions, surgery was done in three cases (20%), while medical management followed in the remaining 12 (80%) cases. Among the three cases, one case of mucoepidermoid carcinoma (MEC) and one case of pleomorphic adenomas was confirmed histologically. The false negative rate in the present study was 6.6%, i.e., one case of MEC which was misdiagnosed as inflamed retention cyst at cytology. (Figure 3 and 4) The rate of false-negative diagnosis on cytology reported in literature ranges from 0 % to 37%. [24] The problem of low grade MEC being missed at cytology due to aspiration of mucoid material accompanied by cellular dilution due to cyst fluid has been emphasized in literature. Also low grade MEC may show chronic inflammation adding to the diagnostic dilemma.

Sridharan et al advocate the search for intermediate cells, intracytoplasmic mucin secreting cells and presence of stringy mucin in reaching an accurate diagnosis. [25] Authors support the idea that cystic lesions of parotid gland should not be merely diagnosed a benign and that low grade MEC should be included in differential diagnosis.

Miscellaneous lesions

Out of total 26 cases in miscellaneous category, 19 (73.07%) were treated conservatively while seven (26.93%) underwent surgery. In all the seven cases, cytohistological correlation was obtained and included one case of neurilemmoma, one case of pigmented neurifibroma, two cases of lipoma, two cases of branchial cyst and one case of epidermal cyst. Hence the diagnostic accuracy was 100%.

In the present study, there were five cases of false negative diagnosis out of which three cases were due to cystic lesions in both thyroid and salivary gland. This problematic area can be overcome by ultrasound guided FNAC as to obtain adequate material for accurate diagnosis.

The overall reduction in the sensitivity of FNAC in the present study is attributed to the

1. Cystic lesions in thyroid and parotid gland

2. Overwhelming granulomatous inflammation obscuring the malignant cells in lymphoma.

Limitations of the study: The only limitation of the present study includes less number of cases with cyto histological correlation. However less number of surgical specimens are acceptable in view of the application of FNAC for screening lesions requiring surgical treatment from those requiring medical management, thus avoiding unnecessary surgery.

CONCLUSION

FNAC is a simple, safe and cost effective procedure in delineating the heterogeneous lesions occurring in the head and neck region with certain limitations. Authors advocate the use of USG guided FNAC in cystic lesions in order to accurately sample the representative area and avoid making a false negative diagnosis. Authors also emphasize the need for diligent search of atypical cells in the background of granulomata/necrosis in a lymph node aspirate and to reconsider a repeat FNAC from multiple sites.

REFERENCES


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