Role of Fine Needle Aspiration Cytology in Head and Neck Masses and Its Correlation with Histopathological Findings in Chittagong Medical College

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Abstract

Background: Fine Needle Aspiration Cytology (FNAC) is a well-practiced simple, safe, rapid, cost effective diagnostic procedure which has been appreciated by clinicians and pathologists worldwide in recent times. The aim of this study is to evaluate the diagnostic accuracy of Fine needle aspiration in head and neck lesions and its correlation with histopathological examination.

Materials and methods: This cross sectional descriptive study carried out in the Department of Pathology, Chittagong Medical College, Chattogram, Bangladesh over a period of one year from 1st January 2017 to 31th December 2017 on 202 consecutive cases who fulfilled the criteria of this study. FNAC were performed in each case. FNAC association with histopathology in available specimen were assessed in selected cases, the histopathological sections were stained with H&E, ZN stains and immunohistochemical stains, where applicable.

Results: The mean age of the patients was 33.71± 16.04 with female predominance 135 (66.8%). It was observed that the incidence of thyroid lesion was the highest followed by lymph node lesion. The overall sensitivity, specificity, accuracy were 92.16%, 85% and 76.06% respectively.

Conclusions: The study found that FNAC is a quick, inexpensive technique to diagnose different types of head and neck swellings. It can be repeated easily if required and it may also help the surgeon to select, guide and modify surgical planning in patients requiring surgery.

Key words: FNAC; Head & neck lesion; Histopathology.

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Introduction

Fine Needle Aspiration Cytology (FNAC) is a minimally invasive safe diagnostic procedure. It is rapid, time saving and the importance and applicability of FNAC is being increasingly appreciated worldwide in recent times.[1] FNAC does not give the architechtural details as in histology but it can provide cell population from the entire lesion.[2] The FNAC procedure has certain inherent limitations also. Specimen adequacy, sampling technique, skill of the aspirator and the experience of the cytopathologists interpreting the aspirates may lead to diagnostic pitfalls. But even if a specific diagnosis can not be made, it can provide cytological categorization of the disease with a list of differential diagnosis to suggest further investigations.[3] Accuracy may vary with the size, site of the lesion, origin of tissue and the nature of the disease process.[4] Head and neck cancer form the 6th most common cancer in the world and the most common cancer in developing countries and the mean age of patients is the fifth and early sixth decades in asian population.[5] Cervical masses are the commonest complaints in Head and Neck region encountered in outpatient practices and these are often diagnostically challenging.[6] Etiology differs with age, sex, and other factors within the same or different geographic area. FNAC is an effective procedure to provide alternative to premature biopsy of masses in head and neck region.[7] The study has been projected to what extent FNAC is reliable as diagnostic tool in detecting various pathological conditions of head and neck regions in relation to statistical parameters eg sensitivity, specificity, accuracy, positive and negative predictive values.

Materials and methods

This cross-sectional study was conducted among 202 patients presenting with head and neck region

masses in Department of Pathology, Chittagong Medical College, Chattogram, during the period of one year from 1st January 2017 to 31st December 2017. All patients were evaluated by FNAC who has given written informed consent for study and previously diagnosed, treated patient, unsatisfactory FNA smear on repeat aspiration, inconclusive, descriptive diagnosis were not included in this study. Head and neck region masses were aspirated with 23-gauze 3cm long needle attached to a 10 ml disposable syringe and after smears preparation fixed in 95% alcohol for Papanicolaou staining. In every clinically suspected cases of lymph nodes, one unstained smear was preserved and later on stained with Zeil –Neelson stain. Smears were interpreted and results recorded. Out of 202 patients histopathological diagnosis was available in 74 patients and rest of the patients with benign findings are reassured. All histopathological sections were stained with Hematoxyllin and Eosin stain. ZN stain were also performed in biopsy specimens of lymph nodes when granulomatous lymphadenitis reported.

The cytopathological diagnosis were compared with the histopathological result of the same excised specimen. In cases of discrepancy, histopathological results were considered as gold standard. For all discordant cases, special attention was focused on the cytomorphological features. The purpose of this study is to critically evaluate the significance of FNAC as a diagnostic tool in head and neck lesions and to assess the frequency of incidences at different site of head and neck region and distribution among inflammatory and neoplastic lesions. The histopathological diagnosis was required to prove or disprove the accuracy of cytological findings and to explain the diagnostic pitfalls as well. Apart from histomorphological pattern analysis, the microbiological staining procedure had also been employed. Histopathological diagnoses were one step further aided by immunohistochemistry in differentiation and subclassification of primary malignancy of lymph nodes and metastatic neck masses of unknown origin.

Data was analyzed by using statistical package for social sciences version 23 for data processing and statistics. Kappa coefficient was used to find out the reliability between FNAC and histo-pathological diagnosis of head and neck lesions. Furthermore, diagnostic accuracy of FNAC on head and neck lesions were measured using histopathology as gold standard. Sensitivity, specificity, positive and negative predictive values were calculated by using respective formulas. Statistical significance and confidence interval were set at $p<0.05$ and 95% level of all analysis.

Protocol was ethically reviewed and approved by the Ethical review Committee of Chittagong Medical College, Chittagong. All the patients included in the study were informed and explained about the nature of study. Informed written consent was taken from all the subjects after full explanation of nature, purpose and potential risks involved.

Results

The age of patients at entry was 1 to 75 years, mean age was 33.71± 16.04 years. Out of 202 patients most of the patients were female 135 (66.8%). Male to female ratio was 1:2. Frequent patients came with the complaints of thyroid gland lesion which was 94 (46.5%) in number followed by lymph node lesion 58 (28.7%).

Table I FNA diagnosis of Head & Neck masses (n=202)

Site	FNA Diagnosis		
	Benign	Malignant	Total
Thyroid	83(41.1%)	11(5.4%)	94(46.5%)
Lymph node	46(22.8%)	12(5.9%)	58(28.7%)
Salivary gland	16(7.9%)	00(0%)	16(7.9%)
Miscellaneous	31(15.3%)	3(1.5%)	34(16.8%)
Total	176 (87.1%)	34(12.8%)	202(100.0%)

Table I showing 176 (87.1%) cases of benign lesions, among them 83 (41.1%) were from thyroid lesions, 46 (22.8%) were from lymph node, 16(7.9%) were from Salivary gland and 31(15.3%) were from miscellaneous lesions. Out of 34 malignant cases, highest number of malignancies noticed in lymph nodes (12 cases) followed by thyroid malignancy (11 cases). There was no malignant case in Salivary gland lesions.

Table II Histopathological diagnosis of Head a& neck masses (n=74)

Site of the lesions	Histopathological diagnosis		Total
	Benign	Malignant	
Thyroid	28(37.8%)	06(8.1%)	34(45.9%)
Lymph node	11(14.9%)	09(12.2%)	20(27.0%)
Salivary gland	08(9.5%)	00(0%)	08(9.5%)
Miscellaneous	10(13.5%)	2(2.7%)	12(17.6%)
Total	57(70.3%)	17(29.7%)	74(100.0%)

Table II showing histopathological diagnosis of 74 cases. Benign cases were 57 in number and rest cases(17 cases) were malignant. Among them, thyroid constitute 28 benign and 06 malignant cases, lymph nodes constitute 11 benign and 09 malignant cases, salivary gland constitute 08 benign cases only and miscellaneous lesions constitute 10 benign and 02 malignant cases.

In FNAC,out of 74 thyroid lesions, most of cases were Benign follicular nodule 73 (77.7%) and in histopathology most of cases were Multinodular goiter 22 (64.7%). In 58 Lymph node lesion, commonly presented with right cervical lymph node 27(46.6%) where most of the FNAC showing Chronic nonspecific lymphadenitis 24(41.4%) and in histopathology most of cases were Granulomatous inflammation,7(35%). ZN stain were done on 22 FNA smears and 07 Histopathological sections which did not show any AFB positivity. In 16 salivary gland lesion, most of cases were Pleomorphic adenoma in both FNA 7(47.1%) and in histopathology 05 (62.5%). Both FNA, 09(26.4%) and Histopathology 02 (16.6%) show highest number of Inclusion cyst in miscellaneous lesions.

Table III Agreement between FNAC and histopathological diagnosis of head and neck lesions (n=74)

Site	No. of cases	Concordant n	Concordant (%)	Discordant n	Discordant (%)	Kappa value	p value
Thyroid							
Benign	28	25	96.2	3	3.8	0.642*	<0.001
Malignant	06	05	62.5	1	37.5		
Total	34	30	79.35	4	20.65		
Lymph node							
Benign	11	11	72.7	0	27.3	0.638*	<0.001
Malignant	9	05	88.9	4	11.1		
Total	20	16	80.0	4	20.0		
Salivary gland							
Benign	08	08	100.0	0	0	1.0**	0.005
Malignant	Nil	00	0	0	0		
Total	08	08	100.0	0	0		
Miscellaneous							
Benign	10	10	100.0	0	0	1.0**	0.001
Malignant	2	2	100.0	0	0		
Total	12	12	100.0	0	0		
Grand total							
Benign	57	54	92.2	3	7.8	0.76*	<0.001
Malignant	17	12	85.0	5	15.0		
Total	74	66	88.6	08	11.4		

**Perfect agreement between tests, *Substantial agreement between testes.

Table IV Diagnostic reliability of FNA in various lesions of head & neck

Statistical parameters	Thyroid lesion (n=34) (%)	Lymph node lesion (n=20) (%)	Salivary gland lesion (n=08) (%)	Miscellaneous lesions (n=11) (%)	All head & neck masses (n=74) (%)
Sensitivity	83.33	62.50	100	100	92.16
Specificity	89.28	100	100	100	85.00
Positive predictive value	62.5	100	100	100	94.00
Negative predictive value	96.15	75.00	100	100	80.95
Accuracy	88.24	82.35	100	100	76.06
Discordance	11.76	17.64	0	0	9.86

*95% CI.

Discussion

In this study FNA was performed in 202 patients presenting with head and neck swellings. It was observed that the most commonly aspirated site of lesion was thyroid. This finding was similar to Chavan and Vasaikar and other studies.[8,3, 7] Though Huq et al and others found highest number of cases affecting and aspirates in lymph nodes.[10-13] Maximum number of patient were in 2nd to 4th decade which was also found in other studies.[7, 11,13,15, 16,17,18] 1/4th of patients with lymph node lesions were in age group 11-20 yrs and another 1/4th found to be within 21-30 yrs.This double peaks was probably due to the benign lesions like reactive changes or Granulomatous inflammation were more common in all age groups. Quite similar age groups

were found in Nasar et al. and Mohanty et al.[19,20] On the other hand a fair number of malignant cases belonged to different age groups. Kumar et al. and Gul et al. demonstrated various age peaks as they subdivided their cases in reactive, granulomatous, abscess, malignant etc (Age group 18-82).[17,18] In Salivary gland lesion, peak age was between 21-30 which was similar with other studies [21, 22]. Female to male ratio of this study was consistent with others. Gul et al. found male predominance.[7,9,18] In this study thyroid was the first dominating site of head and neck lesions and other studies showed highest number of aspirated site were lymph nodes but in all study found female predominace.[10,17,18,20] Equal sex distribution in Salivary gland lesions and males were dominating in miscellaneous lesions. Borgohain et al. and Shetty et al. found female predominance in their study series but Upasana et al. found male predominance in Salivary gland lesions.[16,15,22] This study and other studies observed highest number of Nodular goiter cases in thyroid lesions and Thakur et al. found Colloid goiter followed by thyroiditis in their studies.[7,10,13] Among malignant lesions Papillary carcinoma constitute the highest number in this study which was similar with others.[7,15,16] Among 22 cases of Nodular goiter 20 cases were diagnosed properly whereas, 2 cases were false positive as Follicular neoplasm in FNA. Increase cellularity and scanty colloid may play a role here for misinterpretation of results. Out of 05 Papillary carcinoma 04 cases were correctly diagnosed on FNA and a single case of False negative which was diagnosed as Nodular goiter on FNAC. The false negativity was probably due to missing of nuclear features or cystic or degenerative changes in papillary carcinoma or the needle missing the target site of the lesion. The diagnostic reliability of FNAC on thyroid lesion were quite similar with other studies.[16,23,24] Out of 58 cases of lymph node FNAC most of the cases were reactive lymphadenitis which was similar in other studies followed by granulomatous inflammation, lymphoma and metastasis of known and unknown origin.[6, 19,20,27,29] 20 cases of lymph nodes were available for histopathology, in which maximum number of cases were granulomatous inflammation. Reactive changes usually don't undergo biopsy procedure unless clinically recurrent or suspected for malignancy. Bangladesh is a tuberculosis prone area, for this reason, highest number of the lymph node biopsies revealed granulomatous inflammation. ZN staining of 22 FNA smears and histopathological sections of 07 lymph nodes, neither caseating nor non-caseating sections showed any kind of AFB positivity. Out of 06 lymphoma cases, single Hodgkin's lymphoma was misdiagnosed as reactive changes. The smear lack eosinophilic infiltrate and classical RS cells. Lymphoma cases were subclassified according to working formulation and WHO classification. Single Hodgkin's lymphoma showed CD 30 negativity and CD 20 positivity and concluded as Lymphocyte predominant variant. All the NHL cases showed CD 20 positivity without one case. Due to time consuming expensive procedure, further immunostaining was not possible to employ for a single case. There is probably a chance of losing antigenicity due to improper handling of the fresh specimen. Out of 03 metastatic cases, 1 case of SCC of unknown origin was confirmed by p63 immunostaining. The diagnostic reliability of FNAC on lymph node lesion varied with other studies.[10,19,26,30] A lower value of sensitivity is probably due to misinterpretation of lymphoma cases as reactive changes in FNAC considering increase number of false negative cases. In miscellaneous lesion a wide variety of cases had been encountered, total 34 cases ranges from benign to malignant cases. Most of the cases were cystic lesions and similar with Gul et al. Sreedevi et al. found soft tissue lesions most followed by Epidermal inclusion cyst.[18,11] The diagnostic reliability of FNAC on miscellaneous lesion similar with Uddin et al. and accuracy was 100%.[7] In 16 case of salivary gland most commonly encountered lesion in FNA were Pleomorphic adenoma followed by chronic sialadenitis which was consistent with other studies.[18,22] The diagnostic accuracy of FNAC on Salivary gland 100% was quite similar with others.[21, 22] The higher sensitivity was probably due to the samples lacking malignant cases in salivary gland lesions. The specificity and accuracy seemed to be a bit lower in comparison to other studies.[1,14,27] 06 cases of follicular neoplasm was statistically considered as malignant later on,03 proved to be of benign origin, even a case of papillary carcinoma was considered as benign on FNAC. On the other hand 03 cases of lymphoma were considered as reactive on FNAC influenced the statistical parameters. In this study, although only 74 cases of

specimen were available out of 202 needle aspirates. The lower number of biopsies were probably due to clinician's satisfaction with the cytological diagnosis. Here FNAC has been proven to play a tremendous role in avoiding unnecessary biopsies. Most of the studies documented regarding head and neck masses are either individualized according to the site specific (Deals with individual organ system) or a generalized etiological commentary (Spectrum based).The studies of past tried to associate the FNAC procedure with statistical parameter such as sensitivity, specificity, accuracy etc, but the present study correlates etiological and site specific need of doing of FNAC with epidemiological parameter such as age specific subgroups and sex parameters also. Various factors like faulty technique, central cystic, hemorrhagic and necrotic area devoid of diagnostic cells, small lesions, nonco-operative patients, observers' error influenced the outcome of the study. Yet, awareness of the therapeutic implications and limitations of the cytological interpretation amongst both the clinician and the cytopathologist should enable FNAC to its best advantage.

Limitation

Small sample size and short duration of period.

Conclusion

The study found that there was significant difference in type of lesion according to anatomic site, age groups and sex parameters. FNA technique could differentiate various inflammatory, infectious conditions from neoplastic one, thus avoid unnecessary surgery. Moreover, now a days with increasing cost of medical facilities, any technique which speeds up the process of diagnosis, limits the physical trauma to the patient and saves the expenditure of hospitalization is of tremendous value. It can be repeated easily if required.

Recommendation

A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery. Final diagnosis and treatment plan should be based on histopathology. Success of FNAC depends on experience of the pathologist, familiarities of pathologist with details of the clinical history, physical examination and results of laboratory investigations.

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Contribution of authors

RA-Conception, acquisition of data, data analysis, drafting & final approval.

TK-Data analysis, drafting & final approval.

MIH-Acquisition of data, interpretation of data, critical revision & final approval.

MZR-Design, critical revision & final approval.

Disclosure

All the authors declared no competing interest.

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