

Original article

Insight to thyroid lesions by Fine Needle Aspiration Cytology:

A hospital based study

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Abstract:

Introduction:

Fine needle aspiration cytology (FNAC) is a valuable adjunct to pre-operative screening in the diagnosis of thyroid nodules, and in most cases, it can distinguish between benign and malignant lesions.

Keywords: Cyto-histopathological correlation, fine needle aspiration cytology, thyroid lesions

Introduction:

Thyroid lesions are very common in daily clinical practice. Its prevalence in adults ranges from 4% to 10% and from 0.2% to 1.2% in children.¹ Only 5%–30% of the thyroid swellings are malignant and require surgical intervention, while a majority fall under benign category.² Accurate diagnosis of thyroid lesions is therefore of utmost importance for appropriate clinical management of these patients and to avoid unnecessary surgical interventions. In this context, FNAC serves an indispensable role in preoperative diagnosis of thyroid lesions. Fine needle aspiration cytology (FNAC) is a valuable adjunct to pre-operative screening in the diagnosis of thyroid nodules, and in most cases, it can distinguish between benign and malignant lesions. Fine needle aspiration cytology is a minimally invasive technique with least chance of complication. It is a time saving, cost effective and reliable test used to

distinguish between benign and malignant thyroid lesions. Although it cannot serve as a substitute for conventional histopathology, it should be considered as an essential component of investigative procedure to design the management protocol before subjecting the patients blindly into operative procedures.³ It bridges the gap between clinical evaluation and final surgical pathological diagnosis in the majority of cases and thus helps to reduce unwarranted surgeries. As a result, recently the incidence of malignancy at thyroidectomy has increased from 5-10% to 30-50%.^{4, 5} However, it is worth mentioning that the success of FNAC is contingent upon many important contributing factors like experience in performing aspiration, adequate sampling, skillful cytological interpretation and a rational analysis based on correlation of cytological and clinical information in the context of an individual patient.⁶

Aim:

1)To study the different cytological pattern in thyroid lesion by FNAC and confirmation of the diagnosis by histopathological study

2)To distinguish between benign and malignant thyroid lesion and minimize surgical intervention.

Material and method:

The study was carried out in the Department of Pathology, Assam Medical College and Hospital, for a period of two years. FNA was performed in 295 patients, presenting with thyroid swelling referred from the various departments. All the patients were carefully examined and the mobility of the thyroid during swallowing was noted. The presence of any other associated neck swelling was also examined. After explaining the entire procedure and obtaining consent from the patients, the FNA procedure was undertaken. The patients were made to lie supine with their necks extended for better accessibility. A 23 gauge needle was employed and the material was obtained by either with or without aspiration technique. Two to three passes were made in each case to minimise sampling error. In the case of cystic nodules, the cysts' contents were aspirated, centrifuged, and slides were made from the sediment for cytological analysis. Any residual mass in that area were further subjected to aspiration to obtain the actual parenchymal tissue. In case of heterogeneous lesions or when cells could not be retrieved by direct aspiration, ultrasound guided aspiration was done. During the procedure no major complications like penetration into the trachea, laryngeal nerve

palsy, or hematoma were recorded. The smears were stained with hematoxylin-eosin, Papanicolaou and May-Grünwald-Giemsa (MGG) stains and the results were categorized as per the recent Bethesda classification into unsatisfactory/non-diagnostic, benign, follicular lesion of undetermined significance (FLUS)/ atypia of undetermined significance (AUS), suspicious for malignancy and malignant. The FNAC diagnoses were correlated with clinical features, radiological investigations, hormonal findings and subsequent histological examination of the thyroid specimens. Cases with cyto-histological disparity were re-evaluated. The sensitivity, specificity and diagnostic accuracy of FNAC in diagnosing thyroid lesions were calculated.

Observation and results-

During the span of two years, 295 patients presented with thyroid swelling. Majority of the patients were adults in third or fourth decade with age group ranging from 22 years to 76 years. Females outnumbered males with a F: M ratio of 9:1. Majority of cases presented with nodular thyroid swelling and more commonly involving the right lobe while few cases had diffuse involvement. Painless swelling was the most common presenting complaint whereas only few cases complained of pain or difficulty during swallowing or breathing. The smears prepared were evaluated and cytological diagnoses were divided into six categories as per the recent Bethesda classification for reporting Thyroid cytopathology. A smear comprising of at least 6 groups of benign follicular cells with each

group comprising of at least 10 cells were considered adequate. Smears containing abundant colloid even if 6 groups of follicular cells were not identified were also taken to be adequate. Among 295 patients, 9 patients had an unsatisfactory aspirate. Aspiration was repeated on these 9 patients which was ultrasound guided. On repeat FNA, diagnostic aspirate was obtained in 6 patients and 3 aspirates were again found to be unsatisfactory. The three unsatisfactory aspirates were found to be hemorrhagic. Benign category comprised of colloid goiter, adenomatous goiter, different types of thyroiditis and Grave's disease and maximum

number of cases were recorded in this group. Atypia of undetermined significance included those grey zone cases which did not justify the criteria of either being completely benign or fulfil all the conditions to be labelled as follicular neoplasm. None of the cases in the present study represented this group. 7 cases were cytologically diagnosed as follicular neoplasms/suspicious of follicular neoplasms. All malignant lesions without any overt follicular architecture were included in the malignant category which included 4 cases of papillary thyroid carcinoma and 1 case of medullary carcinoma of thyroid

Results:

The cytological diagnosis distribution as **per the Bethesda classification for reporting**

Thyroid cytopathology:

FNAC diagnosis		No. of cases
Unsatisfactory/non-diagnostic		3
Benign	Colloid Goitre	269
	Thyroiditis	8
	Graves disease	3
AUS/FLUS		0
FN/SFN		7
Suspicious for Malignancy		0
Malignant	Papillary carcinoma	4
	Medullary carcinoma	1

FNAC: Fine needle aspiration cytology, AUS: Atypia of undetermined significance, FLUS: Follicular lesion of undetermined significance, FN: Follicular Neoplasm, SFN: Suspicious for follicular Neoplasm,.

Out of 295 cases examined by cytological analysis, 75 thyroid specimens were received for histopathological evaluation. The FNAC diagnostic categories were compared with corresponding histopathological diagnoses.

Cyto-histological concordance was found in 73 cases (97.3%), whereas 2 cases were discordant(2.6%). Out of 2 cases reported as benign on cytology, one case was diagnosed as papillary carcinoma and other as follicular carcinoma thyroid on histopathology. 7 cases of follicular neoplasm showed complete concordance with histopathological examination and were diagnosed postoperatively as follicular adenoma -5 cases

and follicular carcinoma-2 cases. In malignant category, histopathology was available for all 5 cases and concordance by FNAC was (100%). 4 cases were diagnosed as papillary carcinoma and one as medullary carcinoma.

False negative FNAC result was noted in two cases but no false positive test was found in our study. The diagnostic accuracy, sensitivity and specificity for malignancy were 97.3%, 85.7% and 100% respectively in our study.

Discussion- Nowadays, FNAC is practiced all over the world as an investigation of choice not only for thyroid lesions but also other swellings like salivary glands, breast lesions, soft tissue and lymph



Fig 1:- Papillary thyroid carcinoma with prominent intranuclear cytoplasmic inclusions(shown by green arrow) and nuclear overlapping(MGG stain,1000x)

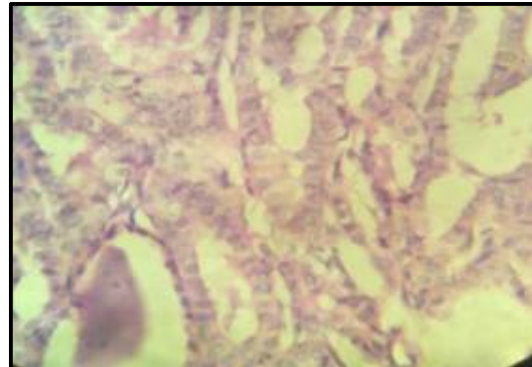


Fig 2:- Papillary thyroid carcinoma with Orphan Annie eye nuclei showing overlapping and prominent nuclear nuclear grooves(H&E stain,40X)

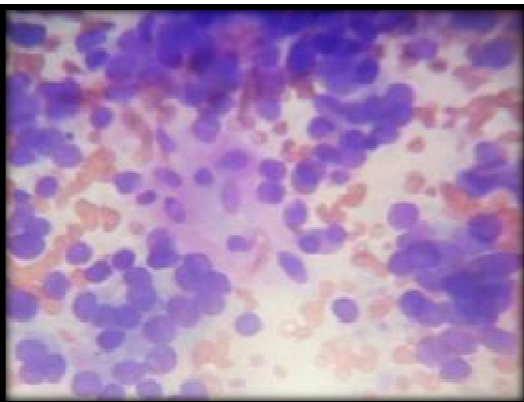


Fig 3:- Follicular Neoplasm with repetitive microfollicles in a background of scanty colloid(MGG,1000x)

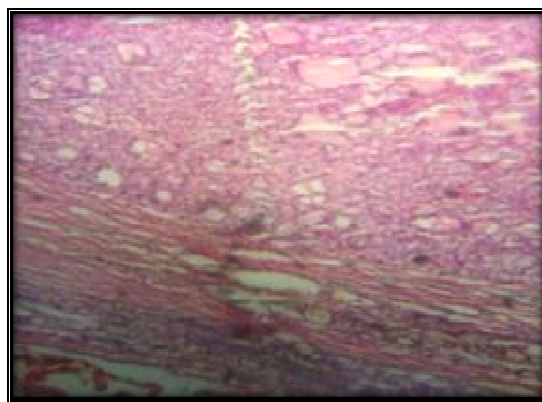


Fig 4:-Follicular adenoma with tightly packed follicles and intact capsule(H&Estain.10X)

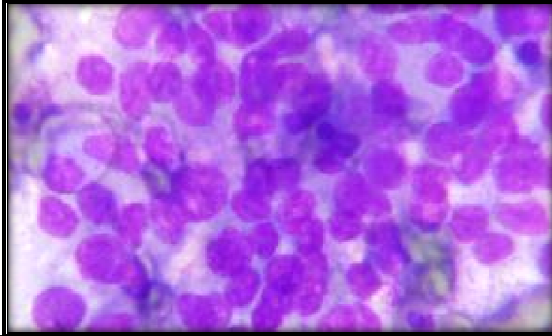


Fig 5:-Medullary thyroid carcinoma showing loosely cohesive cells with stippled chromatin(MGG,1000X)

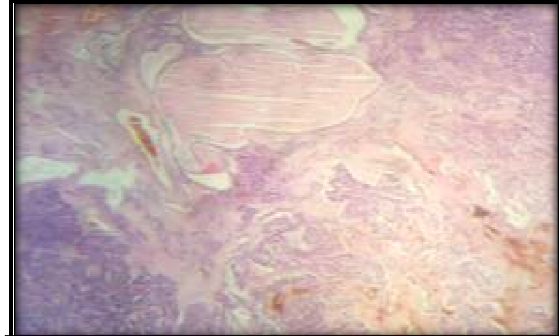


Fig 6:-Medullary thyroid carcinoma showing nests of cell separated by fibrous septa and presence of amyloid like material(H&E,10X)

nodes.⁷ Being a tertiary care centre, this institute caters a large population, representative of the general population of upper Assam. The present study was undertaken to evaluate thyroid lesions preoperatively with the help of FNAC and to correlate its interpretation with the histopathological examination which is the gold standard in order to determine the usefulness and diagnostic accuracy of this technique. The FNAC of the thyroid gland was performed in 295 cases, out of which histopathological specimen of 75 patients were received during the study period. In the present study, most of the patients were in the third and fourth decade which is similar to the studies conducted by other authors.^{5,8,9} Females were more affected than males in this study, which showed concordance with the related studies of similar kind.¹⁰⁻¹²

The inadequacy rate in the present study after repeat ultrasound guided aspiration was 1%. Previous studies have shown the variable

percentage of inadequate material ranging from 0% to 25%.^{13,14} Ideally unsatisfactory or non-diagnostic sample should be limited to no more than 10% of thyroid FNAs.^{15,16,17}

Inadequate FNA specimen can occur as a result of sampling error, faulty technique and in highly vascular or focal lesions. Ultrasound guided sampling reduces the non-diagnostic test result.¹⁸ Also it is important to aspirate the residual lump after removing the cyst fluid to increase adequacy and to overcome the possibility of an erroneous diagnosis of benign lesion. The reason for lower percentage in the non-diagnostic and atypical follicular lesion of undetermined significance categories in the present study can be attributed to the fact that ultrasound-guided FNAC is being performed by cytopathologist after thorough sampling of the lesion for appropriate site and at least 2 to 3 passes from various sites in the lesion, thus reducing the percentage of non-diagnostic aspirate..

In the present study, the cyto-histological concordance rate was achieved in 73(97.3%)

cases whereas 2(2.7%) cases showed discordance and these observations were comparable to a similar study conducted by Mittal *et al.*¹⁹

In the present study, 2 cases which were diagnosed as colloid goiter on FNAC, turned out to be neoplastic on histopathological examination, one follicular carcinoma and the other papillary carcinoma. Cytological examination in the first case showed moderate cellularity consisting of loosely cohesive clusters of thyroid follicular cells dispersed in a background of moderate amount of colloid favouring a diagnosis of colloid goiter. Histological features were consistent with follicular carcinoma showing capsular invasion. Cytological differentiation between follicular neoplasm and adenomatoid nodular goiter is often difficult.³ Also, inability to distinguish between follicular adenoma and follicular carcinoma is one of the greatest pitfalls in cytological diagnosis of thyroid lesions. Aspiration, in this case, was probably done from colloid or from a rich macrofollicular area of the lesion. However, adequate sampling from various areas of the lesion could have revealed cytological features like increased cellularity with nuclear crowding and overlapping, repetitive uniform microfollicular patterns, with scanty or no colloid which would have favoured the diagnosis of follicular neoplasm over adenomatoid goiter beyond doubt.

Cytological examination in the second false negative case revealed low cellularity with abundance of colloid and cystic macrophages, which led to misinterpretation as a colloid

goiter with cystic change and was finally diagnosed on histopathological examination as papillary carcinoma of thyroid with cystic degeneration. An accurate diagnosis was deferred probably because of faulty sampling from cystic areas resulting in the paucity of neoplastic follicular cells. Cystic change in thyroid lesions have always been a common diagnostic pitfall in cytology.⁷ Hence, it is recommended to prepare 4-6 smears from different areas of the lesion to reduce sampling error as well as to employ ultrasound guided FNAC in cystic and heterogeneous lesions to increase overall accuracy.²⁰ Strict adherence to the criteria laid down deciding specimen adequacy in the recent Bethesda classification could help to reduce markedly the erroneous diagnosis in such cases.²¹

False negative cases are of great concern because these indicate every possibility to miss malignant lesion.²² False negative cytology results may cause delay in treatment and hence adversely affect the outcome in patient with thyroid cancer.²³

In the present study, the diagnostic accuracy was 97.3%, sensitivity 85.7% and specificity was 100%. In a study conducted by Yang J *et al.*²⁴ sensitivity and specificity of FNAC in thyroid lesions were found to be 94% and 98% respectively which was comparable with our studies.

Conclusion- :

FNAC is simpler, cost effective, time saving and accurate preoperative diagnostic modality in investigation of thyroid diseases. It is a safe outpatient procedure which is minimally invasive and can be easily repeated due to

patient compliance. FNAC can significantly reduce mortality as well as morbidity of patients by making early and accurate distinction between benign and malignant thyroid lesions by virtue of its high accuracy, sensitivity and specificity. However, outcome of successful FNAC is dependent on several critical factors such as experienced aspirator, minimal sampling error, skilful cytological interpretation as well as rational analysis based on clinical and cytological information in the context of an individual patient. Therefore, a benign FNAC diagnosis should be viewed with caution as false negative

results do occur and these patients should be followed-up with thorough investigation. Diagnostic pitfalls or inconclusive FNA diagnoses occurs predominantly due to overlapping cytologic criteria between adenomatoid nodules, follicular neoplasms, and follicular variants of papillary carcinomas. These loop holes should always be considered while diagnosing a thyroid lesion by cytological examination and in case of any doubt raising a suspicion of malignancy, final diagnosis and treatment pattern should be based upon histopathology.

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