



Fine Needle Aspiration of Thyroid Nodules- A Cyto-Morphologic Approach to Diagnosis

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Abstract

Background: *Thyroid nodular lesions are common clinical problems worldwide for which surgical intervention was the treatment of choice in many cases. Thus, it is challenging for the pathologist to distinguish the neoplastic nodule from non neoplastic ones and further, categorize the malignant tumors wherever possible.*

Objective: *The objective of this study was to cytological evaluation of FNAC based on the Bethesda thyroid FNA classification system in evaluation of thyroid nodules as well as correlate relevant cases them histopathologically.*

Materials and Methods: *This study was conducted over 3 years. Fine needle aspiration was done by palpation or ultrasound guided, using a fine (25 G) needle, and cytological smears were stained by Giemsa, H&E and Papanicolaou stain. The cytological findings were classified according to the BSRTC.*

Results: *Of the 154 cases examined, benign lesions were the most common (92.1%), followed by atypia/follicular lesion of undetermined significance (4.5 %), malignant (3.9%), suspicious for follicular neoplasm/follicular neoplasm (3.9%), and suspicious for malignancy (3.1%). Good cyto-histological correlation (94.4%) was observed. Only 4.5% smears were non-diagnostic.*

Conclusions: *FNAC is a simple, safe and cost-effective diagnostic modality in the investigation of thyroid disease with high specificity and accuracy. Accurately evaluated, it can reduce surgical intervention in many patients. However, histopathological diagnosis of thyroid nodules is still the gold standard for thyroid lesions.*

Keywords: *thyroid, cytology, cytopathology, TBSRTC, FNAC.*

Introduction

Thyroid nodules are raised areas of tissue or fluid which commonly arise within an otherwise normal thyroid gland.^[1] Thyroid nodules are most common presentation of thyroid pathology and are the common worrisome cosmetic presentation in

human beings. Although investigative procedures like thyroid imaging are being regularly used to evaluate thyroid nodules, these are inconsistent in distinguishing benign nodules from malignant ones. With the advent of fine-needle aspiration cytology (FNAC) as a primary investigation tool,

the number of patients who are subjected to thyroid surgeries around the world has been reduced considerably^[4]. FNAC is a well-established, simple, quick and relatively painless procedure^[5]. FNAC is of immense value in identifying most cases of unsuspected thyroid malignancies.^[6] With an average range of sensitivity and specificity around 83% and 92% respectively, FNAC is one of the first choice of most standard investigative procedures for evaluating thyroid nodules.

Historically, terminology for thyroid FNA has varied significantly from one laboratory to the other, creating confusion in some cases and hindering the sharing of meaningful data among multiple institutions. To overcome this, The National Cancer Institute (NCI) hosted the “NCI thyroid Fine Needle Aspiration state of Science Conference” in 2007 to address terminology and other issues related to thyroid FNA. Subsequently the terminology was accepted and is being used around the globe for reporting FNAC of Thyroid cytology. The present study classified thyroid nodules according to the BSRTC based on cellularity, cyto-morphology, architectural patterns, and colloid content in the smears. It also suggested implied risk of malignancy in various Bethesda system-based diagnostic categories^[1].

Materials and Methods

The present study included 154(One hundred fifty two) patients of different age groups who presented with solitary thyroid nodules. The study was conducted in the Department of Pathology, Gauhati Medical College & Hospital, Guwahati, Assam, India. All patients were preceded through detail history, clinical examination, thyroid profile and ultrasonography of the neck. Hot and toxic nodules and diffuse goiters with hyperthyroidism were excluded from the study. Prior to collection of samples consent was taken and the usual risks of the procedure (bleeding, tenderness, infection) explained to the patient.

Fine-needle aspiration was performed guided either by palpation and cytological smears were

prepared and stained using the standard techniques for MGG, H&E, and Pap stains. Imaging studies (USG/CT guided) were consulted wherever required.

Stained smears from all cases were subjected to low power scanning to ascertain the adequacy of material and staining results. Unsatisfactory smears were discarded.

Cytological classification of different categories was made using standard criteria as laid down by TBS System (The Bethesda System of Classification of Thyroid Aspirates, 2007). Histopathological Diagnosis of 64(sixty four) selected specimens was made using standard criteria as described in standard text books. The parameters of diagnostic validity of cytological technique in terms of sensitivity specificity and predictive value were evaluated using statistical calculations.

Ethical Committee clearance: The study was conducted after obtaining due permission from the Institutional Ethics Committee.

Results and Observation

A total no. of 154 cases of thyroid nodules were subjected to FNAC and subsequent evaluation by The Bethesda System for cytological diagnosis. Of these, 136 (89.47%) were female and rest 26 (10.5 %) were male. The M: F ratio was 1: 9.

The youngest one was 10 yrs. old female and the oldest were two females of 70 yrs. Majority of the patients were in the age group of 20–50 years. The median age was 36.42 yrs.

Based on cytomorphological findings (TBSRTC), cases were placed in one of the six diagnostic categories as follows: Category I. Nondiagnostic or Unsatisfactory: There were 7 cases (4.86 %) in this category out of which 4 cases had Cyst fluid only. Rest 3 cases had less than 6 groups of follicular cells and were considered inadequate for evaluation. All the cases were subjected to repeat FNAC under USG guidance.

Category II. Benign: The benign lesions (n=126) included 109 (86.5%) cases of Adenomatous Goitre, Lymphocytic Thyroiditis 12 (9.5 %), and

Granulomatous thyroiditis 5(3.9%). Most of the benign lesions were in the age group of 40 – 49 yrs.

Category III. Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance: There were 7 (3.47%) cases in this group. All the cases belonged to 40 – 59 yrs. age group.

Category IV. Follicular Neoplasm or Suspicious for a Follicular Neoplasm: Five patients (3.47%) were cytologically diagnosed as FN/SFN. All five cases were female of 30 – 39 yrs. age group.

One was placed in the category of Hürthle cell (oncocytic) type as per TBSRTC guidelines.

Category V. Suspicious for Malignancy: There were 4 (four) cases (1.39%) which had cytological

features attributable to Suspicious of Malignancy category. All cases were in the age group 30-39 yrs. and all were Suspicious for papillary carcinoma.

Category VI. Malignant: Malignancy in thyroid was cytologically detected in 5 cases accounting to (3.47%) of the total nodules. One of these was a male and others were females. Of 5 cases three cases were papillary carcinoma, one each of medullary carcinoma and poorly differentiated carcinoma. A case of papillary carcinoma was detected in a 17 yrs.old girl. (Table I & II).

A good cyto-histological correlation (96.8%) was observed and the calculated risk of malignancy for each category was found comparable with the specified range by the TBSRTC.

Table I: Showing Cyto-histological correlation (n=64)

Cytological diagnosis	No. of cases	No. of cases Operated	Histopathological Diagnosis	No. of cases	Cyto-Histo Correlation (Percentage)
Category I : Nondiagnostic or Unsatisfactory	07	NIL	-	-	-
Category II : Benign	126	42	Adenomatous Goitre Lymphocytic Thyroiditis Granulomatous Thyroiditis	39 02 01	92.8 4.76 2.38
Category III : Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance	07	07	Papillary carcinoma Follicular Adenoma	07 06 01	85 15
Category IV : Follicular Neoplasm or Suspicious for a Follicular Neoplasm	05	05	Follicular Adenoma Adenomatous Goitre	04 01	80.0 20.0
Category V : Suspicious for Malignancy	05	05	Papillary Carcinoma Medullary Carcinoma Poorly differentiated carcinoma	05 03 01 01	100
Category VI : Malignant	05	05	Papillary Carcinoma	05	100
Total	154	64		64	

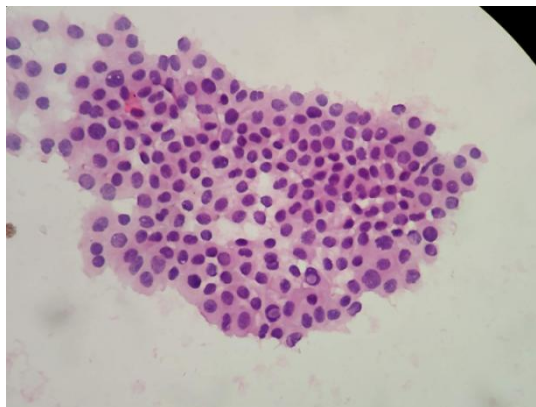


Figure 1: Showing sheets of benign follicular epithelial cells in honeycomb arrangement: Category II (400x)

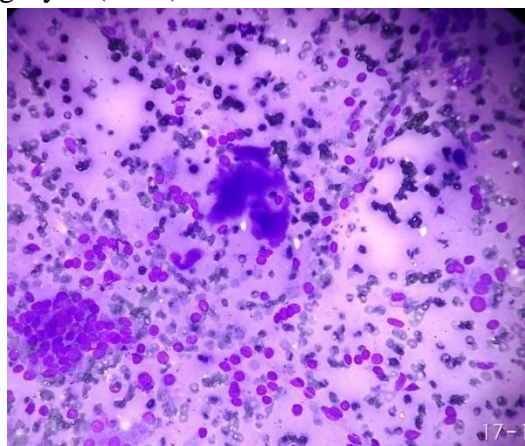


Figure 2: Showing thick colloid with atypical follicular cells: Category-II (x400)

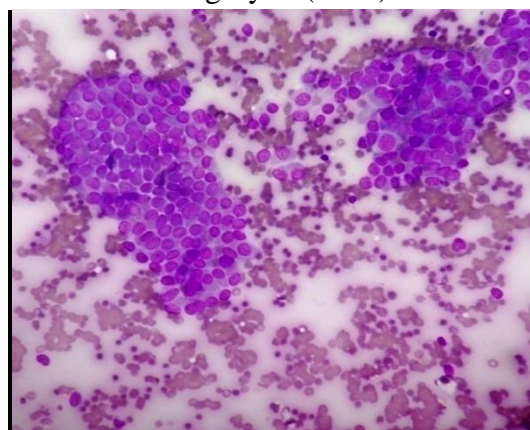


Figure 3: Showing Cytological features of Follicular lesions of Undetermined significance: Category-III (400 x)

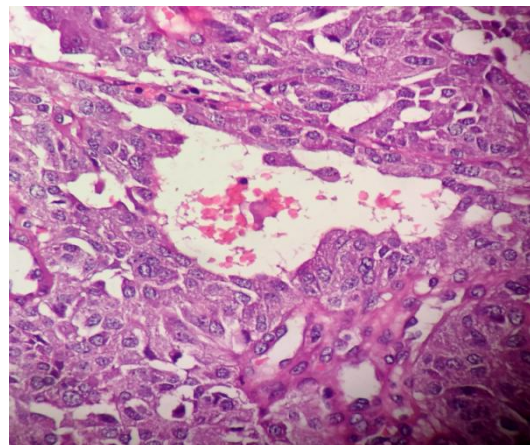


Figure 4: Showing histopathological features of Medullary Carcinoma (400 x)

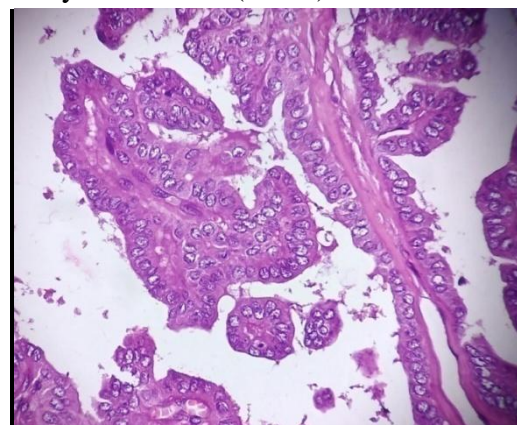


Figure 5: Showing histopathological features of Classical Papillary Carcinoma (400 x)

Discussion

Thyroid nodular lesions are common clinical problems worldwide for which surgical intervention was the treatment of choice in many cases. FNAC has brought down the surgical intervention considerably as Benign and malignant tumours can be confidentially diagnosed by this procedure. A review of studies has shown that FNAC is a well established diagnostic technique in reducing unnecessary surgical procedures in cases of non-malignant lesions of the thyroid [1].

In the present study of 154 cases, a female: male ratio of 8: 1 was observed which correlates with the different studies in India [2,7, 8]. The age range of the patients was 10 – 70 yrs. with an average of 36.4 yrs. Maximum number of cases reported in the 2nd., 3rd. and 4th. decades. Based on cytological findings, the lesions were grouped under different

categories as per guidelines of The Bethesda system for reporting thyroid cytology (2007)^[1, 3].

Nondiagnostic or Unsatisfactory smears (Category I) were observed in 7 cases comprising 4.5% of the total smears which well within the published data of 2 and 20 %. While evaluating the smears, sample adequacy and well prepared smears with well preserved follicular epithelial cells were considered as pre requisites for proper interpretation of Thyroid cytology^[4,5, 6]. Samples with inadequate number of cells, thick smears or smears with cells obscured with blood were reported as Unsatisfactory or Nondiagnostic.

In the present study sixty four cases were subjected to histopathological evaluation on the basis of FNAC categorization.

One hundred twenty six (126) cases were placed in the Category II comprising of benign lesions which include 116 (92.1%), cases of Nodular/Adenomatous Goitre 5 (3.9%) cases of Lymphocytic Thyroiditis and 5 (3.9%) cases of Granulomatous Thyroiditis . No false positive or false negative cytology was observed in this category. Histopathological evaluation was available for 42 cases which comprises 39 cases of Adenomatous goitre and one each of Lymphocytic thyroiditis and Granulomatous thyroiditis with an overall accuracy of hundred percent.

In our study, a diagnosis of Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance (Category III) was made in 7 cases constituting 4.7% of the total thyroid nodules. Different studies reveal 3–18 % of thyroid FNAs as AUS /FLUS^[5, 7, 8]. In all these cases clinical, pathological and radiological findings were correlated before offering a diagnosis. As per TBSRTC diagnosis should be limited to less than 7 % of all thyroid FNAs^[2, 9]. In our study of the 7 cases which underwent surgery, 6 cases were malignant on histopathology. Of these malignant cases, 6 cases were papillary carcinoma which showed cells arranged in papillary patterns (Figure-5) with nuclear clearing and occasional nuclear grooves. The single case

which did not correlate with cytological features was due to presence of occasional intranuclear inclusions and high cellularity^[9, 10].

Follicular lesions or suspicious for follicular lesions (Category IV) are always been a challenging task for cytopathologists. It includes cellular adenomas, follicular adenoma, follicular carcinoma and follicular variant of papillary carcinoma thyroid. As per TBSRTC, Follicular neoplasm refers to a cellular aspirate composed of follicular cells with significant cell crowding and or microfollicle formation. In the present study, 4 cases were diagnosed as follicular neoplasm by FNA. Of these, three turned out to be follicular variant of papillary carcinoma on final histopathology. Data from literature shows 27–68 % of malignancies, in which a diagnosis of follicular neoplasm was made in FNA, are interpreted as papillary carcinoma on histopathology^[6, 10, 11]. This may be due to focal subtle nuclear features of papillary carcinoma in some tumors which were not appreciated on the FNA samples.

Four cases in this study showed confusing cellular smears in non-neoplastic adenomatous nodules. In these cases, the presence of dispersed cells, monolayered sheets of epithelial cells and degenerative changes suggested the possibility of non-neoplastic lesion.

Suspicious of malignancy were diagnosed by FNA in 4 cases. The diagnosis was made in cases which showed some features of malignancy but the findings were not sufficient to make a conclusive diagnosis. The features of papillary carcinoma include nuclear enlargement, powdery chromatin, nuclear membrane irregularity, nuclear grooves, nuclear moulding, intranuclear pseudo inclusions and papillary structures with distinct anatomical borders. In cases where only some of the characteristic nuclear features are present focally, a malignant diagnosis cannot be made with certainty. Such cases were classified as suspicious of malignancy. A good 100 percent cyto-histological correlation could be made in this category as all the 5 cases reveal histological

features of malignancy. There were 3 cases of papillary carcinoma, the others being a case of Medullary carcinoma and a case of poorly differentiated carcinoma each.

A total of 14 cases were finally diagnosed as papillary carcinoma histopathologically. Of these, 6 cases were previously diagnosed as AUS/FLUS, 3 cases were reported as suspicious of malignancy and rest 5 cases were reported as malignancy. In 2 cases false negative diagnosis was given by FNA and these 2 cases reveal features of classical papillary carcinoma on HPE. The probable cause for false negativity may be due to small size of the tumour and presence of benign lesions in the adjacent thyroid tissue^[13,14].

Conclusion

FNAC is a simple, safe and cost-effective diagnostic modality in the investigation of thyroid disease with high specificity and accuracy. This study shows high concordance in all categories as defined by The Bethesda system. A benign FNAC diagnosis should be viewed with caution as false negative results do occur and any clinical suspicion of malignancy even in the presence of benign FNAC should be subjected to histopathological evaluation. Therefore, final diagnosis and treatment pattern should be based upon histopathology.

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Conflicts of interest: There are no conflicts of interest.

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