

Cytomorphological Study of Various Thyroid Nodules as per Bethesda Criteria

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ABSTRACT

BACKGROUND

Thyroid nodules are common and occur in 4 % - 7 % of the general population. Diseases of the thyroid are of great importance because they are most amenable to medical or surgical management. The benefit of thyroid fine needle aspiration (FNA) derives in large part from the ability to make a reliably benign interpretation that avoids unnecessary surgery. A uniform reporting system for thyroid FNA will facilitate effective communication among cytopathologist and the referring physician and allow easy and reliable sharing of data from different laboratories for national and international collaborative studies. For uniformity of reporting cytological smears "The Bethesda System for Reporting Thyroid Cytopathology" was recommended and the smears were divided into 6 diagnostic categories. We wanted to know the age and sex distribution and prevalence of various thyroid lesions as per Bethesda diagnostic criteria. We wanted to study the cytological and morphological features of thyroid lesions by fine needle aspiration cytology (FNAC).

METHODS

The present study is a prospective type of descriptive study, carried out from January 2016 to December 2017 at Andhra Medical College, Visakhapatnam. A total of 1291 cases were evaluated and classified according to Bethesda system of cytopathology. FNAC was done and the smears were immediately fixed in isopropyl alcohol and stained with haematoxylin and eosin.

RESULTS

In the present study a total of 1291 cases was analysed out of which 1193 were benign, 13 were AFLUS, 32 were follicular neoplasms, 10 were suspicious of malignancies and 36 malignant. All the lesions were classified as per Bethesda diagnostic criteria.

CONCLUSIONS

FNAC is a simple and cost-effective procedure which guides the clinical practitioner to choose the right form of treatment for the patient subsequently avoiding unnecessary surgery and ensuing morbidity.

KEYWORDS

Thyroid, Cytopathology, FNAC, Bethesda, Follicular Neoplasm, Benign, Malignant

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BACKGROUND

Thyroid disorders are one of the most common endocrine disorders after diabetes mellitus,¹ with the prevalence of 4 - 7 % in general adult population.² Fine needle aspiration (FNA) is a preliminary diagnostic procedure which is helpful in differentiating benign from neoplastic lesions avoiding unnecessary surgery. To avoid reporting confusion and for better clarity of communication and uniformity of terminology, the Bethesda system of thyroid cytopathology has been adopted (TBSRTC). Using TBSRTC, the cytopathologist can communicate thyroid FNA interpretations to the referring physician in terms that are succinct, unambiguous, and clinically useful.³ The new 2017 Bethesda system divides thyroid cytopathology into six general categories. Each category has an implied cancer risk, which ranges from 0 to 3 % for the "benign" category to virtually 100 % for the "malignant" category.⁴

Bethesda System for Reporting Thyroid Cytopathology - Recommended Diagnostic Categories

1. Nondiagnostic or unsatisfactory - cyst fluid only virtually acellular specimen and others.
2. (Obscuring blood, clotting artefact, etc.)
3. Benign - Consistent with a benign follicular nodule (includes adenomatoid nodule, colloid nodule, etc),
4. Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context, consistent with granulomatous (subacute) thyroiditis and others.
5. Atypia of undetermined significance or follicular lesion of undetermined significance.
6. Follicular neoplasm or suspicious for a follicular neoplasm specify if Hurthle cell (oncocyctic) type.
7. Suspicious for malignancy - Suspicious for papillary carcinoma,
8. Suspicious for medullary carcinoma, Suspicious for metastatic carcinoma, suspicious for lymphoma and other.
9. Malignant - Papillary thyroid carcinoma, poorly differentiated carcinoma, medullary thyroid carcinoma, undifferentiated (anaplastic) carcinoma, squamous cell carcinoma, carcinoma with mixed features (specify), metastatic carcinoma, non-Hodgkin lymphoma and other.

Criteria for Adequacy

A minimum of six groups of well-visualised (i.e., well-stained, undistorted, and unobstructed) follicular cells, with at least ten cells per group, preferably on a single slide. Exceptions for this are solid nodules with cytological atypia or inflammation and colloid nodules

METHODS

The present study is a prospective type of descriptive study, carried out at Andhra Medical College, Visakhapatnam,

which is a tertiary referral hospital, for a period of 2 years from Jan 2016 to December 2017. The study population comprised of 1290 patients who presented with the history of swelling of thyroid and referred from the departments of surgery, medicine & ENT for FNAC of the thyroid swelling.

Inclusion Criteria

All the new cases with thyroid swelling referred to the department of pathology for FNAC during this period were included in the study.

Exclusion Criteria

Recurrent lesions and cases on therapy were excluded from the study.

The FNAC was done as an out-patient procedure after explaining the details of the procedure to the patient and taking an informed written consent. All the patients were clinically examined in detail according to the proforma and a careful palpation of the thyroid gland was done to judge precisely the location for FNAC. Aspiration of the thyroid gland was done under aseptic conditions with the patient lying in supine position, with the head comfortably positioned on pillow, so as to make thyroid nodule prominent. Needles of 22 - 25 gauges were used. The non-aspiration technique was used, and the smears were prepared. Smearing is by the usual method through the two-stage method of concentration of particles. A minimum of four slides were smeared with the aspirate, two for May Grunwald Giemsa (MGG – air dried) and two for haematoxylin eosin (HE) (Wet smears). Slides for wet smears are fixed in 95 % ethyl alcohol for 15 to 20 min. while the other were air dried. H & E staining method after fixation, wet smears are dipped in haematoxylin for 6 to 8 minutes. Then rinsed in weak (1 %) acid alcohol solution to remove excess stain (differentiation), followed by bluing in mildly alkaline water. The smear is then counter stained with eosin Y. Giemsa staining method; air dried smears are first fixed in pure methanol (2 - 3 dips) and again air dried for 30 sec. The smear is then flooded with 5 % Giemsa stain solution for 20 to 30 minutes.

Then flushed with tap water and allowed to dry. Stained smears are studied under light microscopy. Whenever fluid was obtained, all the contents were aspirated using a syringe attached to the aspiration needle. Macroscopic examination of the fluid was done and then centrifuged. Smears were prepared from the sediment and stained for light microscopy.

Statistical Analysis

Statistical analysis was carried out using Microsoft Excel and SPSS version 17. Data was entered in Ms Excel and analysed using SPSS 17 software to obtain the percentages of the various thyroid lesions as per the Bethesda criteria.

RESULTS

The age of the patients ranged from 5 years to 85 years with a mean age of 35 years. Maximum number of lesions were seen in patients in the age group of 31 - 40 years (N = 375, 29 %) followed by 21 - 30 years and 41 - 50 years. Least number of lesions was seen in the patients of age group 81 - 90 years.

Age	Male	Female	Total	Percentage
0 - 10	2	10	12	0.92 %
11 - 20	19	149	168	13 %
21 - 30	11	339	350	27.11 %
31 - 40	22	353	375	29 %
41 - 50	17	216	233	18 %
51 - 60	24	87	111	8.6 %
61 - 70	4	29	33	2.5 %
71 - 80	1	7	8	0.6 %
81 - 90	-	1	1	0.07 %
Total	100	1191	1291	100 %

Table 1. Age and Sex Distribution of FNAC Thyroid Lesions

In the present study, a female predilection was seen. It was observed that 1191 (92.2 %) cases were females and 100 (7.8 %) cases were male. Male to female ratio was noted to be 1:11.91.

Category	Bethesda Diagnostic	Number of Lesions	%
I	Unsatisfactory	7	0.5 %
II	Benign	1193	92.04 %
III	Atypia of undetermined significance	13	1 %
IV	Follicular neoplasm / suspicious for a follicular neoplasm	32	2.5 %
	Suspicious for malignancy	36	2.8 %
Total		1291	100 %

Table 2. Number of Lesions in Various Bethesda Diagnostic Categories

Category-I included 7 cases (0.5 %) with inadequate smears for reporting. 1193 cases constituting 92.4 % were benign and were included under category-II. Only 13 cases (1 %) were category-III i.e. atypia of undetermined significance. Category IV included 32 cases constituting 2.5 %. Only 10 cases (0.8 %) were included under category V. 36 cases were reported to be malignant that constituted 2.8 %.

Non-Neoplastic Lesion	Number of Cases	Percentage among Thyroid Lesions
Benign follicular nodule	859	66.53 %
Thyroiditis	334	25.8 %
Total	1193	92.4 %

Table 3. Distribution of Lesions in Benign Category

Out of 1291 cases, a total of 1193 cases were non neoplastic. Benign follicular nodule constituted about 859 (66.53 %) of cases which included nodular goiter, colloid goiter, adenomatous hyperplasia. About 334 (25.8 %) cases were of thyroiditis which included Hashimoto's / lymphocytic thyroiditis and a single case of granulomatous thyroiditis

Malignant Lesions	Number of Cases	Percentage among Thyroid Lesions
Papillary	30	2.3 %
Anaplastic carcinoma	5	0.3 %
Medullary carcinoma	1	0.07 %

Table 4. Distribution of Malignant Lesions

Malignant lesions include 30 cases of papillary carcinoma, 5 cases of anaplastic carcinoma and a case of medullary carcinoma.

DISCUSSION

Thyroid enlargement, whether diffuse or in the form of a nodule, needs a battery of investigations, mainly to rule out the possibility of a neoplasm or thyroiditis. FNAC is usually the first line of investigation and other investigations like ultrasound examination (USG), thyroid function tests, thyroid scan, and antibody levels are done subsequently with an aim to select the patients who require surgery and those who can be managed conservatively.

In the present study the mean age of thyroid lesions was 35 years. In the study of Handa et al.⁵ Gupta et al.⁶ Murali et al.⁷ Sameep et al.⁸ in their respective studies found 37.6 yrs., 38.7 yrs., 51.2 yrs. and 38.5 yrs. Our data correlated with other studies except for one study by Murali et al.⁷ in which they observed mean age of 51.2 years. Murali et al.⁷ showed higher mean because of large sample with varied age groups.

In this present study, the male to female ratio is 1:11.9. In Handa et al.⁵ Gupta et al.⁶ Murali et al.⁷ Sameep et al.⁸ iv Renuka et al.⁹ in their respective studies found M:F of 1:6.3, 1:11.5, 1:4.8, 1:11.5 and 1:9, There was the predominance of female patients in all studies. Our study shows good correlation with Gupta et al.⁶ and Sameep et al.⁸

Bethesda Diagnostic Criteria	Jack Yang et al. ¹⁰	Aili Guo et al. ¹¹	I.V. Renuka et al. ⁹	Present Study
I	10.4 %	7 %	17 %	0.5 %
II	64.6 %	79 %	70.56 %	92.4 %
III	3.2 %	3 %	1.95 %	1 %
IV	11.6 %	5 %	4.2 %	2.5 %
V	2.6 %	4 %	2.6 %	0.8 %
VI	7.6 %	2 %	2.8 %	2.8 %

Table 5. Distribution of Cases in Bethesda Categories in Different Studies

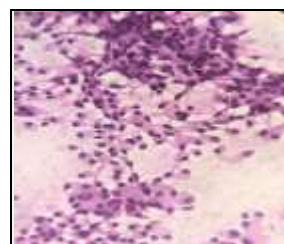


Figure 1.
Medullary Carcinoma Thyroid
FNAC Smears Showing Sheets of
Spindle and Plasmacytoid Cells
(H & E 40X)

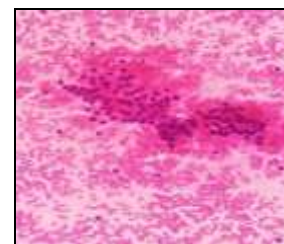


Figure 2.
Benign Follicular Nodule of
Thyroid, FNAC Smears Showing
Thyroid Follicular Cells
Arranged in Sheets with
Follicle Formation (H & E, 40X)

Number of cases in the category II was high when compared with other studies. The smaller number of cases

diagnosed as AUS in the present study could be explained by the strict adherence to diagnostic criteria and the cytopathologist efforts in our practice setting to avoid ambiguity and keep the use of AUS to a minimum. The original TBSRTC recommended that an effort be made to limit its use to approximately 7 % or fewer of all thyroid FNAs. It could be seen that there was good correlation of malignant lesions of present study with I.V Renuka et al.⁹ The variability of various lesions could be due to studies being conducted on different population of various countries and variable influences of geographical, environment, dietary and hereditary factors.

CONCLUSIONS

FNAC is a simple and cost-effective procedure which is an established first line diagnostic test for thyroid lesions and has proved to be a most valuable modality for preoperative distinction of benign from malignant nodules and to confirm the diagnosis. Even though FNAC is highly sensitive in diagnosing thyroid lesions, it has its own set of limitations. Understanding the pitfalls in FNAC of thyroid like inadequate specimen, inaccurate selection of specimen site, interpretation errors, may improve the FNA accuracy. Adopting Bethesda criteria for reporting thyroid lesions reduces the interobserver variability and allows consistency in reporting. Further the Bethesda system is useful for planning of the surgery as the risk of malignancy can be predicted.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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