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Original Research Article

The spectrum of thyroid lesions on fine needle aspiration cytology

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ABSTRACT

Background: Fine Needle Aspiration Cytology (FNAC) of thyroid gland is the most common preoperative investigation for diagnosis of thyroid lesions. Though various tests like thyroid profile, ultrasonography and radionuclide scan are available, they are used as adjuvant diagnostic modalities. FNAC is simple, easy to perform, non-invasive and cost-effective procedure. Primary aim is to study the spectrum of various thyroid lesions on FNAC. Also, the study is aimed to categorise the thyroid lesions according to the Bethesda system for Reporting Thyroid Cytopathology (2017).
Methods: This is a retrospective observational study carried out in the pathology department at tertiary care academic institute for a period of three years. FNAC was done in a patient with thyroid swelling by non-aspiration technique. Slides were prepared, fixed in 95% ethyl alcohol and processed with routine stains.
Results: Out of 210 cases, 150 cases (71.42%) were benign lesions, 15 cases (7.14%) were Follicular neoplasm/Suspicious for follicular neoplasm, 14(6.66%) cases were reported as Atypia of undetermined significance, 13 cases (6.19%) were Unsatisfactory/Nondiagnostic, 11 cases (5.2%) were malignant and 7 cases (3.3%) were suspicious for malignancy.
Conclusions: FNAC is the most effective tool for the diagnosis of thyroid lesions. The Bethesda system is used to categorise the thyroid lesions and helps in better communication between clinicians and pathologists for the best surgical and medical management. The number of benign cases were higher and the number of cases in the category of suspicious for malignancy were lower with female preponderance.

Keywords: Fine-needle aspiration cytology, Follicular neoplasm, Thyroid, The Bethesda system

INTRODUCTION

Thyroid swelling is the most common condition encountered in routine practice. It is seen that approximately 67% of people have thyroid nodules that are asymptomatic and non-palpable.[1] Different imaging techniques are used for preoperative diagnosis of thyroid nodules like radionuclide scanning, high-resolution ultrasonography etc.[2] There are several studies to define ultrasound features that may predict benignancy and malignancy.[3] Clinical assessment of thyroid lesions by means of physical examination, thyroid scans and ultrasonography is not completely reliable.[4] Thyroid surgeries can be associated with side effects like lifelong thyroid hormone dependence, hypoparathyroidism and immediate operative risks involved.[5] If correct diagnosis is made, unnecessary surgeries can be avoided. FNAC of thyroid is the most effective tool for guiding the initial management of patient with thyroid nodule. It seems that the diagnostic sensitivity of FNAC of thyroid nodule is 89 to 98% and specificity is 92%.[6] However, there is some "gray zone" of thyroid cytology where the diagnostic efficacy of FNA declines, making it difficult to categorize the nature of the lesion leading to discordant cases.[7] Also, a lack of consistent use of terminology by cytopathologist affected the sensitivity and specificity of

FNA. The cytologic criteria used to evaluate indeterminate FNAs and the terminology used to classify lesions varies between pathologists and between institutions.[8] This led to the introduction of "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC) to improve communication between pathologists and clinicians.[9] TBSRTC was introduced in 2007 in an attempt to standardize international terminology and to categorize morphological criteria in fine needle aspirations (FNAs) from patients with thyroid nodules.[10] A regular interaction between the endocrinologist, sonologist, and cytopathologist helps the clinicians to sort the patients of malignancy with surgery and follow the patients with benign diagnosis without surgery.[10]

METHODS

This was a retrospective observational study conducted in the pathology department at a newly established tertiary health care academic institute in tribal region from August 2016 to September 2019. The study was approved by ethical committee of the institute. The entire procedure of FNAC was explained to the patients and informed consent was obtained from all cases in the study group. A retrospective analysis of 210 cases with thyroid swelling was done.

Inclusion criteria

All patients presenting with thyroid swelling referred by clinician were included in this study. Clinical details like age, sex and relevant investigations like USG, thyroid profile were considered. FNA of thyroid swelling was done using 24 gauge disposable needles under all aseptic precautions. Minimum four slides were prepared for each case. The slides were immediately fixed in 95% ethyl alcohol for a period of 40 minutes. The slides were stained with hematoxylin and eosin and Papanicolaou stain (PAP). In cases where cellularity was scanty, FNAC was repeated. Cytological smears were studied by two pathologists and cytodiagnosis was given.

All the thyroid lesions were categorised according to TBSRTC which includes (Category I)-Non-diagnostic or Unsatisfactory, (Category II)-Benign, (Category III)-Atypia of undetermined significance/Follicular lesion of undetermined significance (AUS/FLUS), (Category IV)-Follicular neoplasm/Suspicious for follicular neoplasm (SFN), (Category V)-Suspicious for malignancy (SFM) and (Category VI)-Malignant.

Statistical analysis

The results were analysed using descriptive statistics.

RESULTS

A total 210 cases of thyroid swellings were aspirated during the study period. Only 197 cases were found to be adequate for reporting. Even after repeated aspiration at different sittings, 13 cases could not be reported because of inadequate samples. In our study, 175 cases were females and 35 cases were males showing female predominance in the ratio of 5:1. Most of the cases were in third to sixth decade. Benign lesions were more common in young age group while malignant lesions were seen in older age group. Majority of the cases were non neoplastic. In the spectrum, various thyroid lesions reported were Adenomatoid nodule, Colloid nodule, Subacute thyroiditis, Lymphocytic thyroiditis, Granulomatous thyroiditis, Graves disease, Follicular neoplasm, Hurthle cell neoplasm, Suspicious for malignancy, Papillary carcinoma, Anaplastic carcinoma and inadequate for interpretation (Table 1).

Table 1: The Spectrum of thyroid lesions.

FNAC Diagnosis	Number of cases	Percentage
Adenomatoid nodule	85	40.47%
Colloid nodule	36	17.14%
Subacute thyroiditis	6	2.85%
Lymphocytic thyroiditis	14	6.66%
Granulomatous thyroiditis	6	2.85%
Graves disease	3	1.42%
Follicular neoplasm	14	6.66%
Hurthle cell neoplasm	1	0.47%
Suspicious for malignancy	21	10%
Papillary carcinoma	7	3.33%
Anaplastic carcinoma	4	1.9%
Inadequate for Interpretation	13	6.19%
Total	210	100%

Table 2: Results according to the Bethesda system for reporting thyroid cytopathology.

Diagnostic category	Number of cases	Percentage
Nondiagnostic/Unsatisfactory	13	6.19%
Benign	150	71.74%
AUS/FLUS	14	6.66%
Follicular neoplasm/ Suspicious for follicular neoplasm	15	7.14%
Suspicious of malignancy	07	3.33%
Malignancy	11	5.23%
Total	210	100%

Again, these diagnoses were categorized according to TBSRTC. Results are as follows: out of 210 cases, 150 (71.42%) cases were benign lesions, 15 cases (7.14%) were Follicular neoplasm/Suspicious for follicular neoplasm, 14 (6.66%) cases were reported as Atypia of undetermined significance, 13 (6.19%) cases were Unsatisfactory/Nondiagnostic 11 cases (5.2%) were malignant and seven cases (3.3 %) were suspicious for malignancy (Table 2). In the nondiagnostic or unsatisfactory category (Category I), all cases were subcategorized as hemorrhage only. There was no single case in subcategory acellular specimen or other (cyst fluid and clotting artefact etc.).

In benign category (Category II) out of 150 cases, 121 cases were reported as consistent with benign follicular nodule (Figure 1) which included adenomatoid nodule, colloid nodule and nodule in Graves' disease. It had follicular cells arranged predominantly in monolayer sheets or occasionally in intact, three-dimensional, variably sized clusters. Microfollicles were present in few cases. Anisonucleosis was seen in some cases but there were no significant nuclear atypia. Cellularity was low to moderate. Low cellularity was seen in 47.8% cases and moderate cellularity in 52.2% cases. Pleomorphism was present only in 2% cases out of 121 cases.

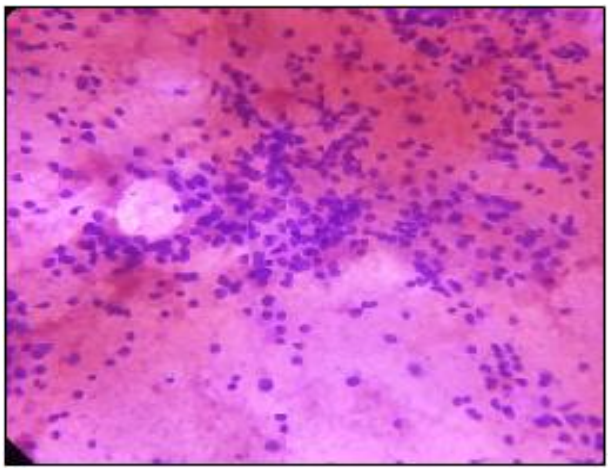

Figure 1: Benign Follicular Nodule- monolayered sheets of follicular cells with colloid background (H and E, 40X).

Hurthle cells were present only in 21 cases. Foam cells (Foamy macrophages) were present in 20.6% cases. 55.6% cases showed blood-mixed colloid background and 42.5% cases showed only colloid. 2.4% cases showed fire flare. Thin colloid appeared as crazy pavement or chicken wire in background. In category of thyroiditis, found lymphocytic thyroiditis (Hashimotos thyroiditis), granulomatous thyroiditis and subacute thyroiditis. 2.5% cases of subacute thyroiditis showed cluster of epithelioid cells, fibrous fragments, lymphocytes, histiocytes and neutrophils against thick and thin colloid. 8.3% cases were of lymphocytic thyroiditis (Figure 2) and showed cells with eosinophilic cytoplasm, lymphocytes impinging on follicular cells on blood mixed colloid background. 4% cases of granulomatous thyroiditis (Figure 3) showed clusters of epithelioid histiocytes and multinucleated giant cells. In this study, AUS/FLUS (Category III) constituted 2.3% cases. Smears showed microfollicles with scant colloid. Follicular cells with cytologic and architectural atypia at places were seen.

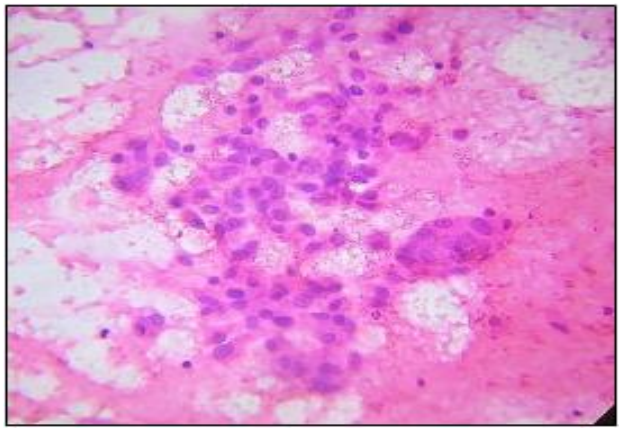

Figure 2: Lymphocytic thyroiditis- Hurthle cells with abundant cytoplasm (H and E, 40X).

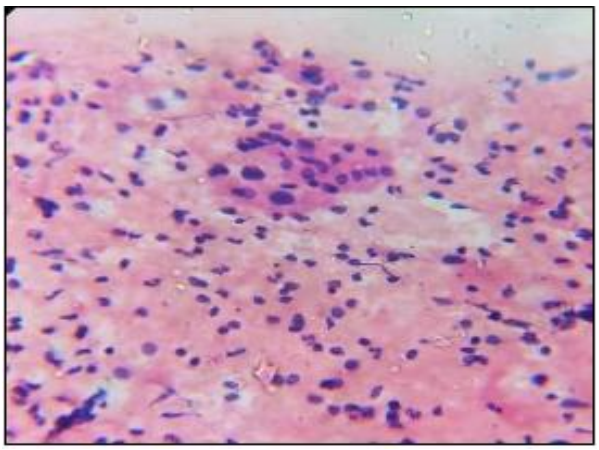

Figure 3: Granulomatous thyroiditis- Smear shows epithelioid granuloma, inflammatory cells and follicular cells.

Around 7.14% of cases were of Follicular Neoplasm or Suspicious for a Follicular Neoplasm (Caterory IV) with cytological features characterised by follicular cells arranged in repeated microfollicular pattern and dispersed singly against scanty colloid (Figure 5, 6). Seven (3.3%) cases were of suspicious for malignancy (Category V). All cases were diagnosed as suspicious for papillary carcinoma showing moderate to highly cellular smears of follicular cells with few features of papillary carcinoma like papillary arrangement of follicular cells, nuclear enlargement and irregular nuclear membrane (Figure 4). Also some sheets of benign follicular cells were seen. Nuclear grooving, nuclear inclusions and psammoma bodies were absent.

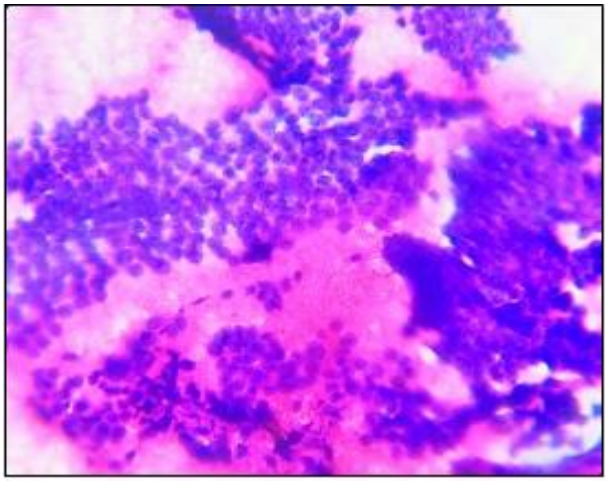

Figure 4: Suspicious of papillary carcinoma crowded group of follicular cells with nuclear enlargement (H and E, 40X).

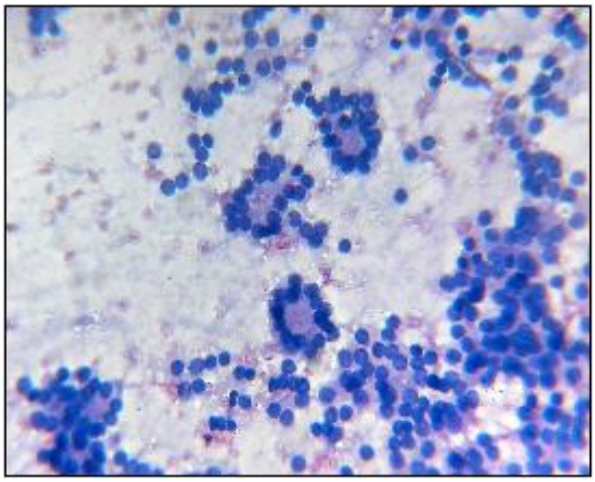

Figure 5: Follicular neoplasm- Smear shows follicular cells in repeated microfollicular pattern. (PAP, 40X).

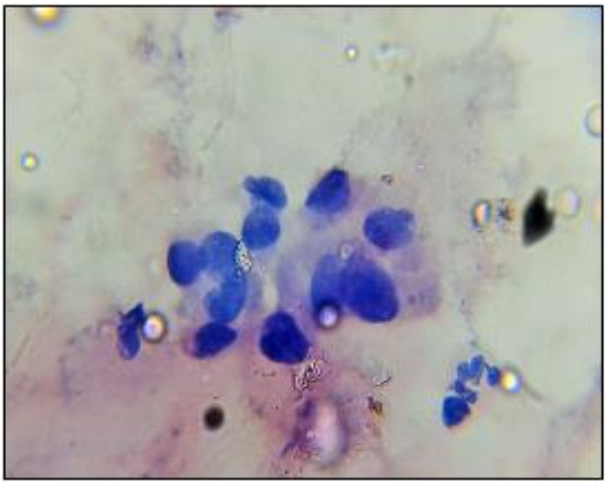

Figure 6: Suspicious for follicular neoplasm- Smear shows nuclear crowding and overlapping of follicular cells (PAP, 100X).

Out of 11 malignant cases, seven cases were papillary carcinoma of thyroid (Caterory VI). Cytology findings were papillary fragments with distinct anatomical border and syncytial sheets with characteristic nuclear features like nuclear groove and intranuclear cytoplasmic inclusions, powdery chromatin and enlarged irregular nuclei (Figure 7). Psammoma bodies were seen in three cases. Four cases were reported as anaplastic carcinoma of thyroid. Smears were highly cellular with cells arranged in loose cohesive groups and lying singly. Nuclei showed enlargement, irregularity, pleomorphism, clumped chromatin, prominent irregular nucleoli and multinucleation. Abnormal mitosis on necrotic and inflammatory background was seen (Figure 8).

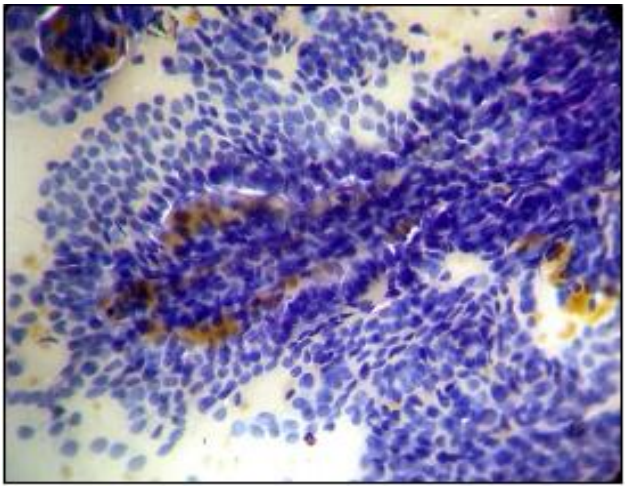

Figure 7: Papillary carcinoma- smear show papillary frond with fibrovascular core (PAP, 40X).

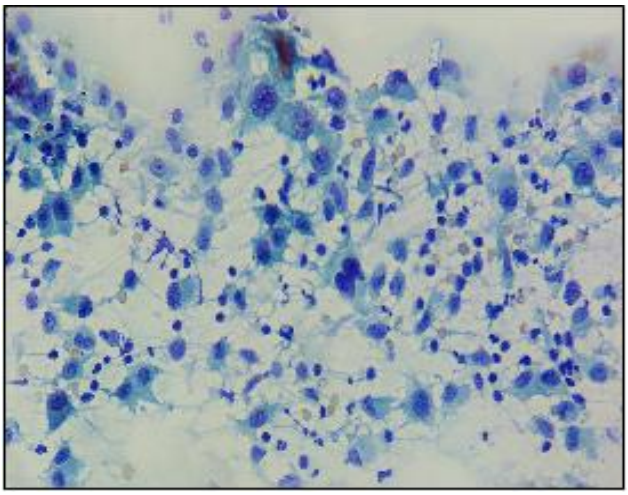

Figure 8. Anaplastic carcinoma- smear shows dispersed cells with pleomorphic nuclei, clumped chromatin and binucleation (PAP 40X).

DISCUSSION

Different classification system had been used for thyroid FNAC before introduction of Bethesda system of thyroid

cytology. TBSRTC complements cytological findings from thyroid FNA and represents a unity among clinicians and pathologists in different areas of medicine.[11] This study was done with the aim to categorize various thyroid lesions and to evaluate the efficacy of the newly proposed six-tier classification system in reporting thyroid FNA results.

In this study, 71.42% of thyroid lesions were in Category II, 7.14% were in Category IV, 6.66% were in Category III, 6.19% were in Category I, 5.2% were in Category VI, 3.3% were in Category V.

Yang et al, found 10.4% cases as unsatisfactory, 64.6% were benign, 3.2% were AUS, 11.6% were follicular neoplasm, 2.6% were suspicious for malignancy and 7.6% were classified as malignant.[12]

Theoharis et al, found 11.1% unsatisfactory, 73.8% benign, 3% indeterminate, 5.5% follicular neoplasm, 1.3% suspicious for malignancy and 5.2% malignant.[13]

Similar study was done by Sarkis et al.[14] They found 12.8% were non-diagnostic, 74.7% benign, 4.7% atypia of uncertain significance, 4.7% suspicious for follicular neoplasm, 0.8% suspicious for malignancy and 2.3% malignant.

In the study of Mehra P and Verma AK, the distribution of various categories from 225 evaluated thyroid nodules was as follows: 7.2% ND/UNS, 80.0% benign, 4.9% AUS/FLUS, 2.2% FN, 3.5% SFM, and 2.2% malignant.[15]

The reason for the lower percentage in the nondiagnostic and FLUS categories can be ascribed to the fact that, in our institute, usually an ultrasound guided FNAC is performed for small nodules or nodules that appear ill defined on palpation, so that the aspirate can be obtained from the exact pathological site. As the cytopathologist performs the FNAC in our institute, all standard procedures were followed to obtain an adequate representative aspirate. These probably have led to a reduction in the nondiagnostic or indeterminate diagnosis, thereby allowing a more specific cytological diagnosis. The rate of undiagnosed cases is affected by many factors like experience of aspirator, criteria for adequacy. The proportion of atypia of undetermined significance varied widely in the literature, ranging from 0.7% to 27.2%.[16]

The number of benign cases is high in our study. The higher rate of benign cases are also seen in other studies.[12,13,17] On cytology, Follicular neoplasms (follicular adenoma, atypical adenoma, and follicular carcinoma) and Hurthle cell neoplasms (Hurthle cell adenoma and carcinoma) cannot be classified as benign or malignant lesions.[18] The similarity of morphologic features between benign and malignant follicular lesions causes discrepancies among cytological and histological data when lesions of follicular pattern are examined.[19]

Authors used suspicious for malignancy (Category V) in only seven cases (3.3 %) of all nodules encountered. This reflects a deliberate attempt by the reporting pathologists to minimise use of this indeterminate category in favour of the more definitive malignant category VI or benign category II. Upadhyaya et al, found that TBSRTC helps in reduction in percentage of indeterminate cases and uniformity in reporting among pathologists.[17] It was found that 7.14 % follicular neoplasm which is comparable to the studies done by Theoharis (5.5%), Sarkis (4.7%) and Mondal SK (4.2 %).[13,14,20]

Percentage of malignancy in study (5.2 %) is correlating with Yang (7.6%),Theoharis (5.2%) and Mondal SK (4.7%).[12,13,20]

CONCLUSION

The FNAC is the most simple, non invasive, cost effective and powerful tool to assess the different thyroid lesions. At the same time, TBSRTC is very useful as a standardized system of reporting thyroid cytopathology, improving communication between cytopathologists and clinicians leading to best management approaches thus avoiding unnecessary surgery and preventing their complications. Thyroid lesions were found predominantly in females with higher number of benign cases and lower number of cases in the category of suspicious for malignancy. USG guided FNA is recommended for impalpable very small thyroid lesions. However, all clinical data along with other investigations such as thyroid profile and thyroid scan should be assessed for definitive diagnosis.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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