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Role of Fine Needle Aspiration Cytology in Diagnosis of Thyroid Lesions at Tertiary Care Centre

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ABSTRACT

The main role of fine needle aspiration cytology (FNAC) lies in differentiating between a malignant and benign thyroid lesions as it greatly influences the treatment decision. The current study was undertaken to evaluate the cytology-histopathology correlation and to analyze the cause of diagnostic errors with an eventual aim to improve diagnostic accuracy. A review was conducted of FNAC of diffuse or nodular thyroid lesions performed on 222 patients over a period of one year. The cytological results were correlated with clinical features and subsequent histopathological examination of the patients. The most frequently encountered lesion was the colloid goiter in 154 (69.36%) cases followed by thyroiditis in 34 (15.31%) cases and two (0.9%) thyroglossal cysts . In the neoplastic group, 10 (4.5%) cases were reported as follicular/oncocytic cell neoplasms, five (2.25%) as suspicious of malignancy and two (0.9%) as malignant tumors. FNAC is a minimally invasive, highly accurate and cost-effective procedure for the assessment of patients with thyroid lesions. It also helps in differentiating lesions that require surgery from those that can be managed otherwise.

INTRODUCTION

Thyroid cancer is the most common endocrine malignancy, constituting 0.1-0.2% of all cancers in India with an age-adjusted incidence more common in females[1]. The incidence of clinically apparent thyroid swellings in the general population is 4-5%[2]. The prevalence of goiter is more than 40 million in India with more than 2 billion globally[2]. The vast majority of thyroid nodules are non-neoplastic lesions and only <5% are malignant. Clinical features alone cannot distinguish between benign and malignant nodules[4,5]. Thyroid FNA has been widely used as a first line investigation to assess thyroid nodules, as it is rapid, cost effective, safe and reliable[6]. The routine use of fine needle aspiration cytology (FNAC) in the assessment of thyroid nodules has reduced the number of patients subjected to thyroidectomy for benign diseases of the thyroid. As a result, the incidence of malignancy at thyroidectomy has increased. Palpable thyroid nodules are more common in women compared to men[3]. Fine-needle aspiration cytology (FNAC) of the thyroid gland is now a well-established, first-line diagnostic test for the evaluation of diffuse thyroid lesions as well as of thyroid nodules with the main purpose of confirming benign and neoplastic lesions and thereby, reducing unnecessary surgery[2]. It has been observed that thyroid FNAC smears terminologies vary significantly from one laboratory to other, sometimes from one cytologist to other in the same institution. This is creating confusion in some cases and has become an obstacle in sharing information amongst different institutions. This issue of terminology related to thyroid cytology was addressed at National Cancer Institute (NCI) which hosted "NCI thyroid FNA state of the science conference" which led to the formation of "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC). The TBSRTC system is presently being widely used in US and several European Countries, and in India also it is gaining acceptance[6].

Aims and Objectives: The study aimed to assess thyroid abnormalities using fine-needle aspiration cytology (FNAC) according to the Bethesda reporting system and to compare these cytological findings with histopathological results.

MATERIAL AND METHODS

Place of Study: Department of Pathology , Swami Ramanand Teerth Rural Government Medical Collage and Hospital, Ambajogai, Dist. Beed, Maharashtra.

Study Period: January 2022 to December 2022.

Inclusion Criteria: All ages and gender with thyroid nodule or swelling.

Exclusion Criteria: All the cases having neck swelling other than thyroid.

The study included 222 patients, both indoor and outdoor, who presented with thyroid swelling at the Department of Surgery and ENT over a one-year period from January 2022 to December 2022. Data from the 222 patients who underwent FNAC during the study period were collected, including details such as age, sex, FNAC results and histopathological diagnosis. The original slides corresponding to these cases were also reviewed. Pathologist performed all FNAC aspirations and cytological diagnosis was made. All the postoperative specimens were sent to the same cytopathologist for histopathology diagnosis. All the FNAC reports were correlated with histopathology diagnosis. No blinding was done. The procedure was done by cytopathologists in all the cases. Prior to aspiration, a physical examination was carried out to note the mobility of the thyroid during swallowing and the presence of any enlarged cervical lymph node. The patients were made to lie supine with their necks stretched up. A 23-gauge needle attached to a Franzen's handle was used, either without or with aspiration by a 20ml disposable syringe. Smears prepared were air dried and stained with May-Grunwald-Giemsa (MGG) and wet smears were stained with Papanicolaou. Histopathological examination of these specimens was done. After noting the detailed gross examination, 3-10 tissue bits were selected from representative areas for routine paraffin sections, which were stained by H and E. The cytological results were correlated with clinical features, thyroid function tests and histopathological examination. Descriptive statistics were done to evaluate our results.

RESULTS AND DISCUSSIONS

(Fig 1)(a) FNAC from thyroid swelling 40x : PAP stained smear show round monomorphic follicular cells with scanty cytoplasm in small cluster, singly scattered in background of colloid material suggestive of colloid goiter. (b) Histopathology microscopy 40x : show large follicles filled with colloid and lined by flattened follicular epithelium (colloid goiter). (Fig 2) : Cytology of Chronic lymphocytic thyroiditis (Bethesda Category 2) 40x: PAP stained smear show oncocytic cells having centrally placed nuclei and abundant eosinophilic cytoplasm with lymphocytic infiltration in the background of scanty colloid. (Fig. 3) (a) Bethesda cat 6: Papillary carcinoma 40× Follicular cells show intra nuclear pseudo inclusions (b) Histopathology of papillary carcinoma of thyroid 40x : microscopy show branching papillae having fibrovascular stalk covered by a single layer of cuboidal cells having ground-glass nuclei. (Fig 4) (a)(b) Histopathology of anaplastic carcinoma of thyroid 40x: Sections studied show tumor tissue in solid sheet. Tumor cells are oval to spindled having hyper chromatic, pleomorphic nuclei. Also show

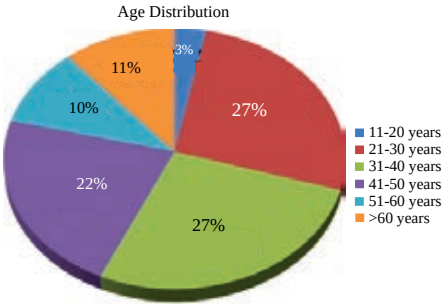

Fig. 1: Diagram showing age wise distribution of cases

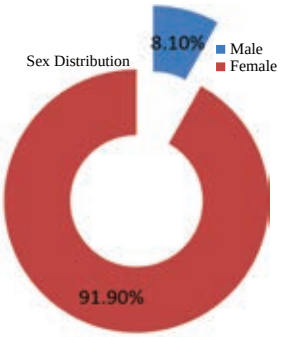

Fig. 2: Diagram showing sex wise distribution of cases

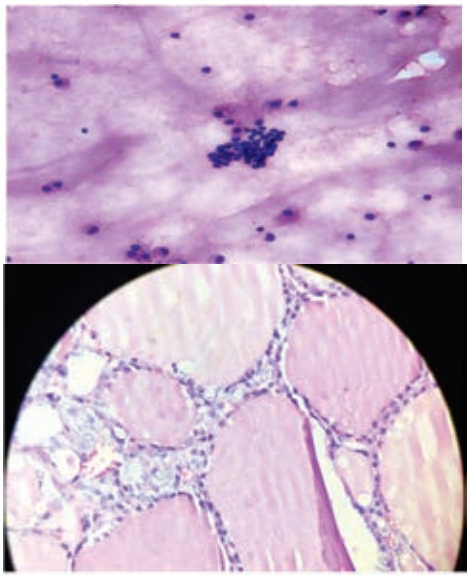

Fig. 1 : (a) FNAC from thyroid swelling 40x: PAP stained smear show round monomorphic follicular cells with scanty cytoplasm in small cluster, singly scattered in background of colloid material suggestive of colloid goiter. (b) Histopathology microscopy 40x: show large follicles filled with colloid and lined by flattened follicular epithelium (colloid goiter)

bizarre cells, mitotic figures, necrosis. (Fig 5) Cytology of follicular neoplasm 40x: singly scattered and

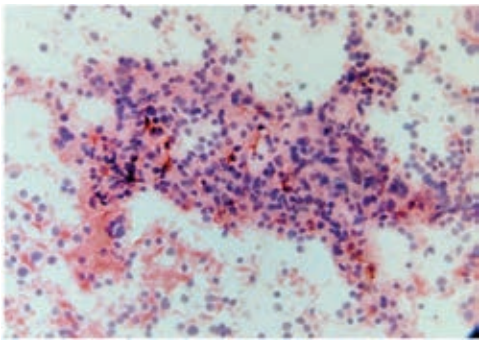

Fig. 2: Cytology of Chronic lymphocytic thyroiditis (Bethesda Category 2) 40x: PAP stained smear show oncocytic cells having centrally placed nuclei and abundant eosinophilic cytoplasm with lymphocytic infiltration in the background of scanty colloid

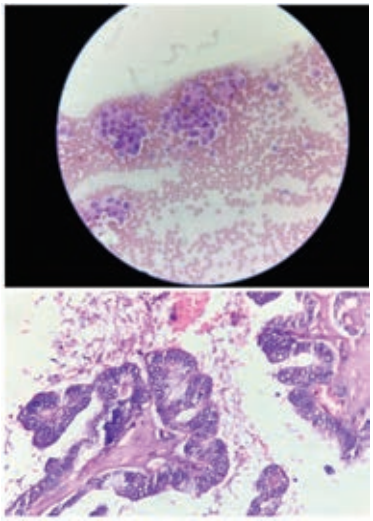

Fig. 3: (a) Bethesda cat 6: Papillary carcinoma 40× Follicular cells show intra nuclear pseudo inclusions (b) Histopathology of papillary carcinoma of thyroid 40x: microscopy show branching papillae having fibrovascular stalk covered by a single layer of cuboidal cells having ground-glass nuclei

crowded, overlapping follicular cells forming micro follicle. Some nuclear atypia present. (Fig 6) (a) Histopathology of follicular adenoma 4x : follicular pattern tumor surrounded by a thick capsule, compressed normal thyroid. (b) Histopathology of follicular adenoma 40x: cellular tumor with compact micro follicles with small round nuclei.

Thyroid FNAC was initially started by Martin and Ellis in 1930. It is usually the first line of investigation and a minimally invasive diagnostic procedure whose essential role is to diagnose and distinguish benign from malignant lesions. Fine needle aspiration cytology is widely accepted as the primary diagnostic method

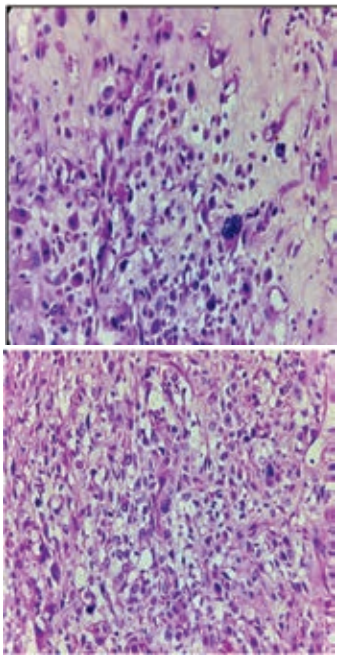

Fig. 4: (a)(b) Histopathology of anaplastic carcinoma of thyroid 40x: Sections studied show tumor tissue in solid sheet. Tumor cells are oval to spindloid having hyperchromatic, pleomorphic nuclei. Also show bizarre cells, mitotic figures, necrosis

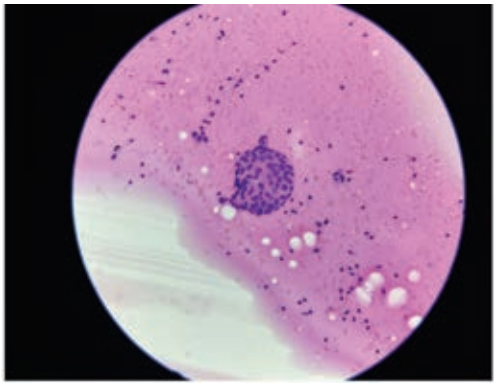

Fig. 5: Cytology of follicular neoplasm 40x: singly scattered and crowded, overlapping follicular cells forming micro follicle. Some nuclear atypia present

for thyroid lesions. However, the lack of standardized terminology poses a significant challenge in interpreting FNA reports, leading to confusion among physicians. The TBRTC system was developed following the Bethesda meeting, involving cytopathologists, endocrinologists, surgical pathologists, radiologists and surgeons. Its aim is to establish a universal reporting system that facilitates mutual understanding between cytologists and physicians, aiding in the prediction of prognosis by

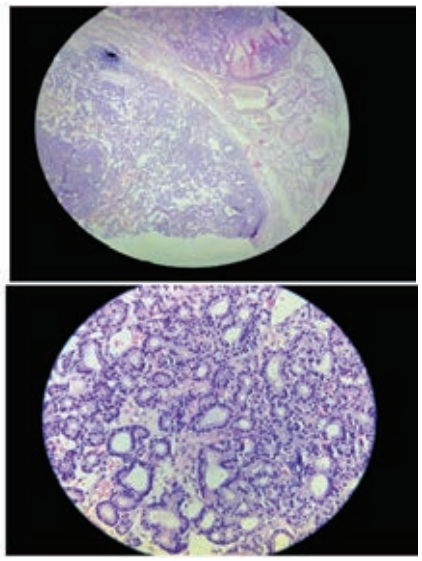

Fig. 6: (a) Histopathology of follicular adenoma 4x : follicular pattern tumor surrounded by a thick capsule, compressed normal thyroid. (b) Histopathology of follicular adenoma 40x : cellular tumor with compact microfollicles with small round nuclei

assessing the malignant potential of each category. In the present study there was a female predominance with F:M ratio of 11:1. Age of the patients ranged from 11-70 years and majority of the patients were in the 21-40 years age group. The most frequently encountered lesion was the colloid goiter in 154 (69.36%) cases followed by thyroiditis in 34 (15.31%) cases and two (0.9%) thyroglossal cysts. In the neoplastic group, 10 (4.5%) cases were reported as follicular/oncocytic cell neoplasms, five (2.25%) as suspicious of malignancy and two (0.9%) as malignant tumors. In the current study, an effort was made to reclassify the 222 cases using the newly proposed six-tier diagnostic classification system for reporting thyroid FNA results. The categories include Non-diagnostic (ND) with 09 cases (4.05%), Benign (BN) with 196 cases (88.28%), Follicular neoplasm (FN) with 9 cases (4.05%), Follicular lesion of uncertain significance (FLUS) with none reported, Suspicious of malignancy (SM) with 5 case (2.25%) and malignant with 2 cases (0.9%).

In our study, benign cases are maximum which is similar to other studies (Table 4). In our study, category II benign lesions encompassed a range of conditions including simple colloid goitre, colloid goitre with cystic change, adenomatous goiter, hashimoto thyroiditis, acute thyroiditis, thyroglossal cyst. Class IV comprised follicular neoplasm and oncocytic neoplasm. Within the malignant Class VI category, we identified papillary carcinoma, anaplastic carcinoma. Our study was compared with those by Parikh *et al*.[7]. Uma *et al*.[9].

Table 1 : Age and sex distributation of cases by "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC)

	CATEGORY 1		CATEGORY 2		CATEGORY 3		CATEGORY 4		CATEGORY 5		CATEGORY 6	
Age group (years)	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**
<10	-	-	-	-	-	-	-	-	-	-	-	-
11-20	-	-	-	7	-	-	-	-	-	-	-	-
21-30	-	3	2	50	-	-	-	2	1	1	-	-
31-40	-	2	4	51	-	-	1	2	-	-	-	-
41-50	-	3	2	37	-	-	-	4	-	3	-	-
51-60	-	-	3	19	-	-	-	-	-	-	-	-
>60	1	-	2	19	-	-	-	1	-	-	2	-
Total	1	8	13	183	-	-	1	9	1	4	2	-
% Cases	4.05%		88.28%		00%		4.5%		2.25%		0.9%	

Table 2 : fnac results of 222 patients

FNAC diagnosis	**no. of patients**
Non-diagnostic	09
Benign cases	
Colloid goiter	154
Adenomatous goiter	06
Thyroglossal cyst	02
Hashimoto thyroiditis	30
Acute thyroiditis	04
Atypia of undetermined significance (AUS) or Follicular lesion of undetermined significance(FLUS)	00
Follicular neoplasm	09
Oncocytic cell neoplasm	01
Suspicious of malignancy	05
Malignant cases	
Papillary carcinoma	01
Medullary carcinoma	00
Anaplastic carcinoma	01
Malignant tumor-NOS	00
Metastatic carcinoma	00

Table 3 : correlation between fnac and histopathology

	histopathology		
FNAC	**benign**	**malignant**	
Non diagnostic	09	09	00
Benign	196	196	00
Follicular/ oncocytic neoplasm or Suspicious for follicular neoplasm(FN /SFN)	10	10	00
Suspicious	05	05	00
Malignant	02	00	02

Table 4 : comparison to other studies

Lesions	**Parikh *et al***	**Uma *et al* 4**	**Bhatta *et al***	**Pattanashetti *et al.***	**Our study**
Non diagnostic/Unsatisfactory	19	22	-	09	09
Benign	207	381	77	145	196
FN/SFN	8	14	3	9	10
Suspicious for malignancy	-	-	-	1	05
Malignancy	6	17	10	9	02
Total	240	434	90	173	222

and Bhatta *et al*.[8]. Pattanashetti *et al*.[6]. It was observed that most cases were benign lesions, consistent with findings in other studies. The prevalence of follicular neoplasms/Suspicious for follicular neoplasms in our study was 4.5%, higher than reported in other studies. Malignant cases in our study accounted for 0.9%, showing considerable variation compared to other studies, which reported rates ranging from 2.5-11.1%.

CONCLUSION

FNAC is a minimally invasive, highly accurate and cost-effective procedure for the assessment of patients with thyroid lesions. It also help to facilitates better communication among cytopathologists and surgeons, differentiating lesions that require surgery from those that can be managed otherwise.

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