FINE NEEDLE ASPIRATION CYTOLOGY OF THYROID LESIONS AND THYROID PROFILE – A CORRELATIVE STUDY

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ABSTRACT Introduction: The Fine Needle Aspiration Cytology (FNAC) is a simple, safe, cost-effective, minimally invasive procedure for diagnosing thyroid nodules/swelling. Clinicians usually evaluate thyroid function by estimating T3, T4 and TSH levels for therapeutic planning. This study assessed the importance of FNAC in diagnosing thyroid diseases, and FNAC findings were correlated with clinical features and thyroid profile. **Materials and Methods:** The study was designed as a prospective cross-sectional hospital-based (laboratory investigation) study for 2 months (from 17th July 2017 to 16th September 2017). Fifty cases of thyroid swelling attending the Pathology Department for FNAC were included in the study. For Each case, a thyroid profile was done. **Result:** Total 50 patients with thyroid swelling were included in the study, of which 46 were female (92%) and 4 were male (8%). The male to female ratio was 1:12.5. Mean age was 45.44 ±16.02 years. Out of 50 patients, 35 (70%) had diffuse thyroid swelling, 9 (18%) had left lobe, and 6 (12%) had right lobe involvement. All the 50 patients with thyroid lesions had a common complaint of neck swelling. In addition, some had associated dysphagia (12 cases, 24%) and/ or dyspnoea (6 cases, 12%), and only 2 had hoarseness of voice. Among 38 cases of non-neoplastic lesions, colloid goitre was the commonest, comprising 20 cases (52.63%), followed by 11 cases (28.95%) lymphocytic thyroiditis, 4 cases (10.53%) of granulomatous thyroiditis and 3 cases (7.89%) of follicular hyperplasia. Among 12 cases of neoplastic lesions, papillary carcinoma was the commonest consisting of 7 cases (58.33%), followed by follicular neoplasm (4 cases, 33.33%) and 1 case of Hurthle cell neoplasm. Most of the colloid goitre cases were euthyroid (60%), lymphocytic thyroiditis was commonly associated with hypothyroidism (45.5% cases), and most cases of granulomatous thyroiditis were euthyroid (50%). All the patients with follicular hyperplasia had hyperthyroidism. Most of the cases with papillary carcinoma were euthyroid (3 of 7, 42.86%) followed by subclinical hypothyroid state (2 cases, 28.57%) and one case of each hypothyroidism and subclinical hyperthyroidism. The follicular neoplasm was commonly associated with the euthyroid state (75% cases). One case of Hurthle cell neoplasm had hyperthyroidism. **Conclusion:** The superficial thyroid gland makes it easy to perform fine needle aspiration. Similar thyroid disease shows variable hormone profiles in different patients and stages of the disease. Hence, FNAC of thyroid lesions in conjunction with thyroid hormonal analysis helps properly assess and manage patients with thyroid lesions.

KEYWORDS Thyroid lesion, thyroid hormone profile, fine needle aspiration cytology

DOI: 10.5455/IJMRCR.172-1646639086
First Received: March 7, 2022
Accepted: August 15, 2022
Associate Editor: Ivan Inkov (BG);
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Introduction

Thyroid lesions are frequently encountered with an annual incidence rate of 4-8%.[1,2] A thyroid nodule is a disc lesion within the thyroid gland, which is radiologically distinct from surrounding thyroid parenchyma. They may be discovered by palpation during a general physical examination or with radiographic studies performed for medical evaluations, such as carotid duplex ultrasound (US), computed tomography (CT) scans and magnetic resonance imaging (MRI) studies.[3] Final diagnosis requires cytological study or histological examination.[4] The thyroid gland is superficial and easily accessible and is an ideal site for Fine needle aspiration cytology (FNAC). It also guides in therapeutic planning and reduces the rate of surgery for benign thyroid lesions. FNAC of thyroid lesions in conjunction with thyroid hormonal analysis helps properly assess and manage patients with thyroid lesions.[5] This study aimed to determine cytomorphological patterns of various thyroid lesions and to correlate FNAC reports with clinical findings and thyroid hormone profiles in the cases of thyroid lesions.

Materials and Methods

The study was designed as a prospective cross-sectional hospital-based (laboratory investigation) study for 2 months (from 17th July 2017 to 16th September 2017). Approval from Institutional Ethics Committee was obtained on 9th June 2017. Fifty cases of thyroid swelling attending the Pathology Department for FNAC were included in the study. The patients with no definitive swelling, those who failed to cooperate, with inadequate aspirations, and those receiving antithyroid drugs or thyroid supplements were excluded from the study.

After obtaining informed consent, a detailed history was taken, and a thorough clinical examination along with swelling character/ measurements was carried out. Fine needle aspiration was conducted using the standard protocol followed worldwide.[6]

From the aspirated material, four smears were prepared. Smears were air dried and fixed in 95% alcohol (alcohol fixation for Papanicolaou staining mainly). Fixed smears were stained with Leishman stain; in special cases, Papanicolaou (PAP) staining was done. Slides were examined thoroughly using a compound light microscope. All the findings were noted, and a cyst diagnosis was given. Simultaneously, expert laboratory technicians performed thyroid function tests using the Vidas hormone analyzer in the college's biochemical and viral research laboratory. Estimated values of patients' thyroid profiles were compared with laboratory reference values of hormones like TSH (0.25-5 μIU/ml), T4 (60-120 nmol/l) and T3 (0.92-2.33 nmol/l). Accordingly, patients were categorized as euthyroid, hypothyroid, hyperthyroid, subclinical hypothyroid and subclinical hyperthyroid. Finally, the FNAC report correlated with each case's thyroid profile.

Results

A total of 50 patients with thyroid swelling were included in the study, of which 46 were female (92%), and 4 were male (8%). Male to female ratio was 1:12.5 [Fig 1]. In the present study youngest patient was of 19 years, and the oldest was of 85 years. The mean age was 45.44 ±16.02 years. Thyroid lesions were maximum in the 41-60 years age group (22 cases, 44%), followed by 21-40 years age group (18 cases, 36%). Thyroid lesions were less common below 20 years and above 80 years [Fig 2].

Out of 50 patients, 35 (70%) had diffuse thyroid swelling, 9 (18%) had left lobe, and 6 (12%) had right lobe involvement [Fig 3]. All the 50 patients with thyroid lesions had a common complaint of neck swelling. In addition, some had associated dysphagia (12 cases, 24%) and/ or dyspnoea (6 cases, 12%), and only 2 had hoarseness of voice. Three patients had pain/tenderness in the thyroid gland, and 2 had cervical lymphadenopathy. Two patients with cervical lymphadenopathy were cases of papillary carcinoma [Fig 4].

Out of 50 cases, 38 (76%) were non-neoplastic thyroid lesions, and 12 (24%) were neoplastic [Fig 5]. Among 38 cases of non-neoplastic lesions, colloid goitre was the commonest, comprising 20 cases (52.63%), followed by 11 cases (28.95%) lymphocytic thyroiditis, 4 cases (10.53%) of granulomatous thyroiditis and 3 cases (7.89%) of follicular hyperplasia [Table 1]. Among 12 cases of neoplastic lesions, papillary carcinoma was the commonest consisting of 7 cases (58.33%), followed by follicular neoplasm (4 cases, 33.33%) and 1 case of Hurthle cell neoplasm [Table 2].

The majority of neoplastic and non-neoplastic thyroid lesions were common in the 21-60 years age group, and both were common in females. Out of the total 7 cases of papillary carcinoma, 5 were in 21-60 years age group, and 2 were 61-80 years old. Among 4 cases of follicular neoplasm, 3 were in the 21-60 age group and one in 61-80 years. One case of Hurthle cell neoplasm was in a female patient of the 41-60 age group [Table 3].

Non-neoplastic lesions were common in the case of diffuse or bilateral thyroid involvement. Among 38 cases of non-neoplastic lesions, 33 had diffuse swelling, 3 had left lobe swelling, and 2 had right lobe swelling. Neoplastic lesions were common in single lobe involvement. Out of 12 cases of the neoplastic lesion, 10 had single lobe involvement [Table 4].

Most of the patients were euthyroid, and subclinical hyperthyroid was minimum. Among 50 cases, euthyroid was 46% (23 cases), hypothyroid was 20% (10 cases), hyperthyroid was 14% (7 cases), subclinical hypothyroid was 16% (8 cases), and subclinical hyperthyroid 4%, i.e. 2 cases [Fig 6]. Most of the colloid goitre cases were euthyroid (60%), lymphocytic thyroiditis was commonly associated with hypothyroidism (45.5% cases), and most cases of granulomatous thyroiditis were euthyroid (50%). All the patients with follicular hyperplasia had hyperthyroidism.

Most of the cases with papillary carcinoma were euthyroid (3 of 7, 42.86%) followed by subclinical hypothyroid state (2 cases, 28.57%) and one case of each hypothyroidism and subclinical hyperthyroidism. The follicular neoplasm was commonly associated with the euthyroid state (75% cases). One case of Hurthle cell neoplasm had hyperthyroidism [Table 5].

Discussion

Thyroid enlargement is a common occurrence in most regions of the world. India has the world's biggest goitre belt in the sub-Himalayan region. In this 2 months study, 50 cases of thyroid swelling underwent FNAC, and all had thyroid hormone assay.

In the present study, among 50 cases, 92% (46 cases) were female, and the rests were male. A comparable observation was found in many studies.[5,7] It is because thyroid disorder is female-prone due to estrogen receptors in the thyroid tissue.[8]

The most common age group in the present study was 41-60 years (44%), followed by 21-40 years (36%). The study by Gupta et al. and Siddegowda et al. showed that the maximum number of patients with thyroid lesions were in the 21-40 age group.[4,5]

In this study, most thyroid lesions had diffuse involvement of the thyroid gland (70%). Eighteen percent (18%) had left lobe

Table 1 Distribution of non-neoplastic thyroid lesions.

Serial no.	Cytological diagnosis	Number of cases	Percentages
1	Colloid goitre	20	52.63%
2	Lymphocytic thyroiditis	11	28.95%
3	Granulomatous thyroiditis	4	10.53%
4	Follicular hyperplasia	3	7.89%
Total		38	100%

Table 2 Distribution of neoplastic thyroid lesions.

Serial no.	Cytodiagnosis	Number of cases	Percentage
1	Papillary carcinoma	7	58.33%
2	Follicular neoplasm	4	33.33%
3	Hurthle cell neoplasm	1	8.33%
Total		12	100%

Table 3 Age and sex wise distribution of different thyroid diseases diagnosed cytologically.

Non-neoplastic lesion	**Age group(in years)**										**Total**
	0-20		21-40		41-60		61-80		>80		
	M	F	M	F	M	F	M	F	M	F	
Colloid goitre	-	-	-	7	-	9	-	4	-	-	20
Lymphocytic thyroiditis	-	1	-	4	1	5	-		-	-	11
Granulomatous thyroiditis	-	1	-	1	-	1	-	-	-	1	4
Follicular hyperplasia	-	-	1	1	-	1	-	-	-	-	3
Neoplastic lesion	**Age group (in years)**										**Total**
	0-20		21-40		41-60		61-80		>80		
	M	F	M	F	M	F	M	F	M	F	
Papillary carcinoma	-	-	-	2	-	3	2	-	-	-	7
Follicular neoplasm	-	-	-	2	-	1	0	1	-	-	4
Hurthle cell neoplasm	-	-	-	-	-	1	0	-	-	-	1

Table 4 Thyroid gland part involvement and cytodiagnosis.

Non-neoplastic lesion	**Site of thyroid gland involvement**			**Total**
	Diffuse	**Left lobe**	**Right lobe**	
Colloid goitre	17	1	2	20
Lymphocytic thyroiditis	9	2	0	11
Granulomatous thyroiditis	4	0	0	4
Follicular hyperplasia	3	0	0	3
Total	33	3	2	38
Neoplastic lesion	**Site of thyroid gland involvement**			**Total**
	Diffuse	**Left lobe**	**Right lobe**	
Papillary carcinoma	0	4	3	7
Follicular neoplasm	1	2	1	4
Hurthle cell neoplasm	1	0	0	1
Total	2	6	4	12

Table 5 Relation of thyroid profile with different thyroid diseases.

Cytological diagnosis	Thyroid Profile				
	Euthyroid	Hypothyroid	Hyperthyroid	Subclinical hypothyroid	Subclinical hyperthyroid
Colloid goitre	12	3	2	2	1
Lymphocytic thyroiditis	3	5	0	3	0
Granulomatous thyroiditis	2	1	0	1	0
Follicular hyperplasia	0	0	3	0	0
Papillary carcinoma	3	1	0	2	1
Follicular neoplasm	3	0	1	0	0
Hurthle cell neoplasm	0	0	1	0	0
Total	23	10	7	8	2

involvement, and twelve percent (12%) had right lobe involvement. In a histopathological study of thyroid lesions and correlation with ultrasonography and thyroid profile in the western zone of Rajasthan, single lobe involvement was more commonly encountered (84%). The right lobe was mainly affected (49%).[4]

This study found that all the 50 patients with thyroid lesions had a common complaint of neck swelling. Some had associated dysphagia (12 cases, 24%) and/ or dyspnoea (6 cases, 12%), and only 2 had hoarseness of voice. Three patients had pain/tenderness in the thyroid gland, and 2 had cervical lymphadenopathy. Two patients with cervical lymphadenopathy were cases of papillary carcinoma. Similar findings were observed by Kumar et al. in their study.[9]

In the present study, we have diagnosed thirty-eight (38) non-neoplastic cases (76%) and twelve (12) neoplastic cases (24%) by FNAC. A correlative study of FNAC thyroid with thyroid hormone profile found that out of 150 cases, 9 (6%) were neoplastic, and the rest were non-neoplastic (94%).[10] Another study was conducted for cytological assessment of thyroid lesions using FNAC along with an assessment of thyroid hormones and cyto-histopathological correlation on 350 cases of thyroid lesions, out of which 333 (95.14%) cases were non-neoplastic, and 17 (4.86%) were neoplastic.[5]

In the present study, among non-neoplastic lesions, colloid goitre was most commonly encountered (52.63%). A correlative study of FNAC thyroid with thyroid hormone profile was conducted in the pathology department, AJ institute of medical college, Mangalore, from May 2011 to May 2013, for 2 years. In that study, out of 150 patients, 98 (65.33%) were diagnosed with colloid goitre.[10] In this study highest neoplastic lesion was papillary carcinoma (58.33%), followed by follicular neoplasm (33.33%). A similar result was reported in studies conducted by Chetan et al. and Keh et al. [12,13]. In contrast, some studies reported the highest percentage of follicular neoplasm followed by papillary carcinoma.[5,7]

FNAC has a good diagnostic role in many thyroid lesions, especially papillary carcinoma and lymphocytic thyroiditis. FNAC is considered a screening test for thyroid follicular carcinoma, and these smears are reported as follicular neoplasm or suspicious for follicular neoplasm. A commonly described pitfall in diagnosing papillary carcinoma is the presence of cyst along with papillary carcinoma. These lesions require high suspicion and careful examination of nuclear features in long-standing goitre cases.[11]

In our study, most non-neoplastic thyroid lesions presented diffuse thyroid enlargement (33 out of 38 cases). In contrast, neoplastic lesions were predominantly in single involvement (6 involved left lobe, 4 right lobes and 2 diffuse). A retrospective study on 61 patients found 75.4% of solitary thyroid nodules to have a neoplastic pathology and 34.4% to be malignant.[13] In our study, most patients with colloid goitre (12 out of 20, 60%) had euthyroid status. Similar findings were reported by Chaudhary et al.[10] Enlargement of the thyroid or goitre is caused by impaired thyroid hormone synthesis, which is most often the result of dietary iodine deficiency leading to increased TSH levels. Increased TSH stimulates the thyroid follicular cells, causing compensatory hypertrophy and hyperplasia, which culminates in the gland's gross enlargement. Anatomic increase in thyroid size leads to increased hormonal production and achievement of euthyroid status in most individuals.[14]

In the present study, most of the patients (5 of 11, 45.5%) with lymphocytic thyroiditis were hypothyroid. Lymphocytic thyroiditis progresses over a period of time to subclinical and then clinically overt hypothyroidism. However, in some cases, it may be preceded by a transient hyperthyroid state due to destruction of follicles and subsequent rise in the free T3 and T4 along with fall in TSH and diminished radioactive iodine uptake.[14]

In our study, out of 4 cases of granulomatous thyroiditis, 2 were euthyroid, 1 case of each hypothyroid and subclinical hypothyroid was found. As in other cases of thyroiditis, transient hyperthyroidism may occur, followed by transient hypothyroidism. Usually, patients become euthyroid within 6- 8 weeks due to the self-limiting nature of the disease.[14]

In the present study, all 3 cases of follicular hyperplasia were hyperthyroid. In a correlative study of FNAC and hormonal profile of thyroid, in Mangalore, among 8 cases of follicular hyperplasia, 4 were hyperthyroid, 2 were euthyroid, and 2 were subclinical hyperthyroid.[10]

In this study, most of the cases with papillary carcinoma were euthyroid (3 of 7, 42.86%) followed by subclinical hypothyroid state (2 cases, 28.57%) and one case of each hypothyroidism and subclinical hyperthyroidism. The follicular neoplasm was commonly associated with the euthyroid state (75% cases). One case of Hurthle cell neoplasm had hyperthyroidism. Similar findings were reported by Chaudhary et al.[10]

Despite the limited resources, we had a high satisfaction rate of smears, and FNAC proved an important diagnostic modality. Furthermore, the ability of FNAC to differentiate benign from malignant lesions, except for follicular neoplasm, aids in

deciding the management algorithm with the biochemical tests helping in making a decision on the use of combined medical and surgical modalities in individual cases.

Conclusion

Thyroid lesions are one of the commonest diseases. Thyroid lesions are common in females. Thyroid diseases are more common in the 20-60 years age group. The superficial thyroid gland makes it easy to perform fine needle aspiration. All the fine needle aspiration diagnoses must be viewed in the light of the clinical picture and thyroid hormone profile to minimize the risks of a false-negative report. The ability of FNAC to differentiate benign from malignant lesions, except follicular neoplasm, aids in deciding the management algorithm with the biochemical tests helping in deciding on the use of combined medical and surgical modalities in individual cases. Early and accurate diagnosis reduces surgical intervention, morbidity and mortality.

Similar thyroid disease shows variable hormone profiles in different patients and stages of the disease. Although maximum cases of colloid goitre have euthyroid status, most lymphocytic thyroiditis has hypothyroid status. Hence, FNAC of thyroid lesions in conjunction with thyroid hormonal analysis helps properly assess and manage patients with thyroid lesions.

Funding

This work did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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