EVALUATION OF FINE NEEDLE ASPIRATION CYTOLOGY [FNAC] AS A SIMPLE AND EFFICIENT TOOL IN THE DIAGNOSIS OF THYROID LESIONS

Khundrakpam Sunitarani Devi¹, Laitonjam Sushila Devi², Themthingla Zimik³, Angelica Laiphprakpam⁴

¹Tutor, Department of Pathology, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, India.

²Associate Professor, Department of Pathology, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, India.

³Postgraduate Trainee, Department of Pathology, Jawaharlal Nehru Institute of Medical Sciences, Imphal, Manipur, India.

⁴Postgraduate Trainee, Department of Surgery, Regional Institute of Medical Sciences, Imphal, Manipur, India.

ABSTRACT

BACKGROUND

Fine Needle Aspiration Cytology (FNAC) has become the dominant method in the evaluation of thyroid swellings as it is a simple, minimally-invasive procedure which provides quick and reliable reports, thereby helping in rapid decision making with excellent patient compliance.

MATERIALS AND METHODS

This is a descriptive study conducted in a tertiary care centre in northeast India from October 2016 to September 2017, consisting of a total of 100 outpatients and inpatients with palpable thyroid lesions. Ultrasonography (USG) and biochemical tests were also done in all cases. Histopathological Examinations (HPE) were also done whenever possible.

RESULTS

In our study, the most common presenting complaint was neck swelling with a maximum number of cases occurring in the 31 - 40 years' age group. Nodular colloid goitre was the most common cause of thyroid swelling. Of the twenty surgical specimens available for HPE with a cytological diagnosis of 10 cases of multinodular goitre (MNG), 4 cases of follicular neoplasm (FN) and 6 cases of papillary carcinoma (PC), histological correlation can be made in 9 cases of MNG (90%), 4 cases of FN (75%) and 6 cases of PC (100%).

CONCLUSION

Despite its pitfalls in making diagnosis in certain cases, FNAC remain as the initial modality in the investigation of thyroid swelling due to its high accuracy, sensitivity and specificity.

KEY WORDS

Fine Needle Aspiration Cytology, Histopathology, Thyroid Lesions.

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BACKGROUND

Thyroid gland is unique among the endocrine glands in having a wide-spectrum of diseases ranging from functional, immunologically-mediated diseases to neoplastic lesions. It is also the largest of all endocrine glands and because of its superficial location it is the only endocrine gland that is amenable to direct physical examination and biopsy.^[1] The enlargement of the thyroid may be diffuse or nodular. In contrast, patient having papillary carcinoma thyroid with lymph node secondaries may remain asymptomatic till a very late stage. Occasionally, the patient may present with obvious metastatic disease with an undetectable primary. The main function of thyroid gland is to regulate metabolism which is done by triiodothyronine (T3) and thyroxine (T4) under the physiological control of thyroid releasing hormone (TRH) and

thyroid stimulating hormone (TSH), released from hypothalamus and pituitary gland respectively. Under normal physiological conditions, T4 is the main secretory product of thyroid gland.^[2-4] Thyroid function can be assessed by x-ray studies, USG, radionuclide imaging and specific tests for thyroid function which include measurement of total as well as free T3 and T4.

The most common clinical finding in thyroid gland is thyroid nodules and its incidence in the general population is 4 - 5%.^[5] Moreover 20% - 48% of patients with single palpable thyroid nodule are found to have additional nodules when investigated by Ultrasound.^[6] The prevalence of thyroid swelling varies considerably depending on a variety of factors that include iodine intake, age, sex, diet, therapeutic and environmental radiation exposure. The primary objective of initial evaluation of thyroid lesions is to distinguish benign nodules from those of cancer which require its removal to limit morbidity and mortality.^[7]

The approach to find out the nature of the thyroid swellings are of clinical examination, thyroid function tests, scintiscan, USG, FNAC and HPE. X-rays are neither sensitive nor cost-effective for detecting thyroid cancer. A dense eggshell calcification, which usually indicates a benign cyst occasionally may occur in thyroid carcinoma.^[8] Hyperfunctional nodule on radionuclide imaging is believed to exclude malignancy, but malignancy is occasionally seen

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Corresponding Author:

Dr. Laitonjam Sushila Devi,

RIMS Doctor's Colony,

Qtr. No. V/4, Lamphelpat-795004,

Imphal, Manipur, India.

E-mail: Sushiladevi@nims@gmail.com

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co-existing with homogenous hot nodule. Thus, the main limitation of radionuclide scanning, regardless of isotope used is that it will not differentiate benign and malignant nodules

FNAC has become a very important and dominant diagnostic method in the evaluation of thyroid swellings as it is a safe, reliable, minimally invasive, cost-effective technique, so provide a quick result and can also be repeated as necessary. Practice guidelines set forth by the American Thyroid Association and National Comprehensive Cancer Network, state that Fine Needle Aspiration (FNA) should be used as an initial diagnostic test because of its superior diagnostic reliability and cost-effectiveness before both thyroid scintigraphy and ultrasonography.^[9]

However, FNAC has limitations in certain situations e.g. scanty sample, loss of histological architecture and inability to distinguish follicular adenoma from a well-differentiated follicular carcinoma. These difficulties can be clearly resolved by histopathological examination of the tissue, as it is a more reliable diagnostic tool and permits a greater diagnostic accuracy than FNAC.^[10]

The aim of this study is to evaluate the prevalence of different types of thyroid lesions by FNAC, evaluation of functional status by biochemical tests along with USG findings for a better understanding of the disease pattern.

MATERIALS AND METHODS

This is a Descriptive study of one-year duration (October 2016 to September 2017), consisting of a total of 100 cases with thyroid lesions who had undergone FNAC after obtaining Ethical Committee clearance and informed consent from the patients. All patients were subjected to USG, biochemical tests (Serum T3, T4, TSH) and serum anti-thyroid antibodies wherever appropriate. HPE could also be done in 20 cases. All patients, irrespective of their age and sex with thyroid swelling presented for FNAC are included in the present study, whereas patients with co-morbid diseases, patients with other associated neck swelling and patients who are not willing to participate in the study are excluded in our study. Statistical analysis was done using frequency distribution and percentage proportion.

RESULTS

The common age group affected was 31 - 40 years (Table 1) and females (88%) are affected more than males (12%), giving a male-to-female ratio of 1: 7.3. The most common clinical presentation was neck swelling (87%) followed by neck discomfort (34%), neck pain (6%) and hoarseness (1%). The sites of involvement were right lobe (40%), left lobe (35%), diffuse involvement (24%) and isthmus (1%).

Multinodular goitre/ colloid goitre was the most common USG findings (25%) followed by thyroiditis (24%), solitary nodule (22%), adenomatous nodule (09%), cystic lesion (17%) and neoplasm (03%). Of the 100 cases with thyroid

swellings, biochemical analysis showed euthyroid, hypothyroid and hyperthyroid in 75%, 20% and 5% of the cases respectively. Cases with hypothyroidism consist of 16 cases of thyroiditis and 4 cases of colloid goitre, whereas hyperthyroid state were observed in 3 cases of thyroiditis and 1 case each of nodular colloid goitre and primary hyperplasia of thyroid.

The FNAC diagnosis of the thyroid swellings are given in Table 2, which show multinodular goitre/ colloid goitre being the most common benign cytological diagnosis (Figure 1), whereas malignancy (Papillary carcinoma) was seen in 6% (Figure 2) of the cases. FNAC smear was unsatisfactory in 1 case (1%). Thyroiditis cases include 21 cases (53.8%) of lymphocytic thyroiditis, 14 cases (38.9%) of Hashimoto's thyroiditis and 4 cases (10.3%) of sub-acute thyroiditis (De Quervain's thyroiditis).

Tests for thyroid antibodies (both anti-thyroglobulin and anti-thyroid peroxidase antibodies) were done in all cases of thyroiditis, which show a significantly high titre in all cases of Hashimoto's thyroiditis, while the antibody titre were normal in all cases of lymphocytic thyroiditis and sub-acute thyroiditis.

Histopathological examination could be done only in 20 cases (20%) and the correlation between FNAC and histological diagnosis of the thyroid lesions are shown in Table 3. One case each of CG/ MNG and follicular neoplasm diagnosed on FNAC turned out to be follicular adenoma and colloid goitre respectively by HPE. All the six cases with a cytological diagnosis of papillary carcinoma (Figure 3) was confirmed on HPE, giving a higher concordance rate (100%) in malignant lesions compared to the benign lesions.

Age in Years	No. of Patients	%
11-20	10	10
21-30	18	18
31-40	26	26
41-50	23	23
51-60	15	15
61-70	06	06
71-80	02	02
Total	100	100

Table 1. Age Incidence of patients with Thyroid Swellings

Cytological Diagnosis	No. of Patients (n= 100)	%
Colloid goitre/ MNG	44	44
Thyroiditis	39	39
Cystic lesion	01	01
Primary hyperplasia	04	04
Follicular neoplasm	04	04
Hurthle cell neoplasm	01	01
Malignancy	06	06
Unsatisfactory	01	01
Total	100	100

Table 2. FNAC diagnosis of Thyroid Swellings

Sr. No.	FNAC Diagnosis	No. of Cases (100)	%	No. of Cases with Surgical Biopsy (11)	Consistent (98)	Non-Consistent (6)	Histological Diagnosis
1a.	Benign: CG/ MNG	44	44	10	9	1	MNG- 9, Follicular adenoma- 1.
b.	Colloid cyst lesions	1	1	-	-	-	-
c.	Thyroiditis	39	39	-	-	-	-
d.	Primary hyperplasia of thyroid	4	4	-	-	-	-

e.	FN	4	4	4	3	1	Follicular adenoma- 3, CG- 1
f.	HCN	1	1	-	-	-	-
2.	Malignant:						
a.	Papillary carcinoma	6	6	6	6	-	Papillary carcinoma- 6
3.	Unsatisfactory	1	1	-	-	-	-
	Total	100	100	11	10	1	

Table 3. Correlation between FNAC and Histological Diagnosis of Thyroid Lesions

Figure 1. FNAC Smear of Colloid Goitre (Giemsa, x 400)

Figure 2. FNAC Smear of Papillary Carcinoma of Thyroid (Giemsa, x 400)

Figure 3. HPE of Follicular Papillary Carcinoma (Giemsa, x 400)

DISCUSSION

Thyroid lesions are quite common. Subclinical (non-palpable) lesions are present in upto 70% of individuals and 90-95% of these lesions have benign histology.^[11] Currently, Fine Needle Aspiration Cytology (FNAC) of the thyroid gland is widely accepted as a safe, reliable, patient-friendly, simple and cost-effective diagnostic procedure and is considered as first-line of investigation in various thyroid lesions as claimed by various authors.^[11-13] Other investigations like USG, thyroid function tests, thyroid scan and estimation of serum anti-thyroid antibodies are also used for the evaluation of thyroid lesions. The main purpose of FNAC along with these various investigative modalities is confirming benign lesions and thereby reducing unnecessary surgical intervention in many benign nodules.

In our study, thyroid lesions are more common in females with a male-to-female ratio of 1: 7.3 which is similar to the findings of Tabaqchali and colleagues.^[14] Study of Manoj et al^[11] and Guhamallick et al^[15] show a M: F ratio of 1: 11.5 and 1: 2.3 respectively.

Thyroid nodules are an uncommon disorder in the paediatric age group and the incidence increases in older age groups. Most of the lesions in the present study were found in the age group of 31 - 40 years with the majority being benign lesions (93%) and female preponderance. Our findings are higher than 60 - 70% rate cited in literature,^[16] but correlates with that of Laurel et al.^[17] According to Guhamallick et al, 41 - 60 years was the common age group with benign lesions as the dominant lesion.^[15] Malignant lesions comprise of 6% in our study. This finding is in agreement with other workers reported in literature.^[16,17] All the malignant lesions are papillary carcinomas affecting more females and right lobe of the thyroid gland. Tabaqchali and co-authors also found females outnumbering males in malignant thyroid lesions.^[14] More involvement of right lobe was also observed in other studies.^[11,14] Higher incidences of malignant lesion were reported by other workers.^[11,18]

Genetic and environmental factors govern the occurrence of thyroid nodules in different areas. The duration of symptoms gives no clue regarding the nature of thyroid swelling. Majority of the patients in the present study presented as swelling (87%) followed by neck discomfort (34%), pain (6%) and hoarseness (1%). In contrast Manoj and colleagues observed neck swelling in 80%, neck pain in 12% and neck discomfort in 8% of the cases in their study.^[11]

USG cannot conclusively differentiate between benign and malignant thyroid nodules. Jen-Der Lin and co-workers have stated that criteria of microcalcifications, absence of halo or hypoechogenicity for malignant nodules results in low specificity.^[19] Therefore, the combined use of USG and FNAC provides better result, especially in small lesions as it helps to avoid giving false negative results.

Thyroid function tests are just a preliminary tool in the evaluation of thyroid nodular lesions and provide information whether thyroid is functioning normally or not. Estimation of serum T3 and T4 help to confirm the clinical diagnosis of hypo/ hyperthyroidism. Measurement of free hormone is thought to give a more precise estimate of thyroid function. However, these tests lack sensitivity and specificity in the diagnosis of thyroid nodule. Detection of thyroid antibodies in significant titres help in the diagnosis of Grave's disease and Hashimoto's thyroiditis.

The cytological diagnosis in the present study is compared with other studies as shown in Table 5.^[11,20,21] Our findings correlate with that of Manoj and co-workers except follicular neoplasm and Hurthle cell neoplasm, which has higher incidence in our study.^[11] Similar correlation is also observed with the findings of Sandhya et al, though there is more benign cystic lesions in their studies.^[20] Shyam et al observed increased incidence of benign cystic lesions, follicular neoplasms as well as carcinoma.^[21]

The histological correlation in our study showed similarity with that of other authors, though there is higher incidence of papillary carcinoma cases which might be because of the less number of histopathological samples in the study period.^[11,14, 22]

In spite of having various advantages, FNAC also has some limitations like specimen inadequacy, specific sampling techniques, skill of individual performing the procedure, experience and skill of the pathologist interpreting the cytological smears and the inherent features of the thyroid lesions being sampled like cystic changes, vascularity, necrosis etc. Rare complications like bleeding, haematoma, transitory vocal cord paralysis, seeding of malignant cells along the needle tract etc. may also occur. However, such complications were not reported in the present study and only one case (1%) was unsatisfactory due to specimen inadequacy. Poor cellularity and sub-optimal preparations in cystic lesions are often misinterpreted as benign lesions and is a common diagnostic pitfall in the cytology. In such cases, USG-guided FNAC results in better sampling with high overall accuracy. Another pitfall in the cytological analysis of thyroid lesions is its inability to differentiate benign from malignant follicular neoplasms, requiring histopathological examination for a definitive diagnosis.

CONCLUSION

FNAC of thyroid in various thyroid lesions provides the most accurate pre-operative diagnosis than any other diagnostic entities. As majority of the thyroid lesions are non-neoplastic which do not require surgery, an initial FNAC will help avoid surgery in these cases. Successful FNAC depends on certain contributing features like experienced aspirator, skilful cytological interpretation and rational analysis based on clinical and cytological information. FNAC can significantly reduce morbidity as well as mortality of patients by its ability to differentiate benign from malignant lesions due to its high accuracy, sensitivity and specificity and therefore its use as a reliable diagnostic test cannot be overemphasised.

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