

Cyto-histopathological and clinico-radiological evaluation of thyroid lesions

Sandhya M Rani¹, Dhanraj S Reddy¹, Srinivas K Rao²

¹Department of Pathology, MNR Medical College and Hospital, Sangareddy, Medak, Telangana, India.

²General Physician, Srinivasa Hospital, Sainikpuri, Secunderabad, Telangana, India.

Correspondence to: Sandhya M Rani, E-mail: drksandhyarani@yahoo.co.in

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Abstract

Background: Thyroid swellings are commonly encountered in the surgical practice and accurate preoperative evaluation of thyroid disorder becomes mandatory for proper management of the patient and to avoid unnecessary surgery.

Objective: This study designs to evaluate the clinico-radiological, cyto-histopathological findings, and the accuracy of fine needle aspiration cytology (FNAC) procedure in various thyroid lesions.

Materials and Methods: This prospective study comprises total 147 cases with thyroid lesions referred to cytology laboratory, and gland morphology studied by ultrasonography (USG). FNAC, FNC, and cyst fluid methods were used for specimen collection.

Result: USG examination of thyroid lesions is a more accurate and sensitive diagnostic modality to detect thyroid nodularity. The overall sensitivity and specificity in our study was 83% and 96.42%, respectively, and accuracy of the FNAC in comparison with histopathological examination was 93.8%, and 81.64% thyroid FNACs were cytologically benign, and colloid goiter occupies 58.5%.

Conclusion: The procedure has acceptable sensitivity and specificity in a wide range of patients in the experienced hands and hence, can be followed as a preoperative diagnostic modality in the management of patients with thyroid lesions, thus reducing the number of surgeries.

KEY WORDS: Thyroid lesions, FNAC, ultrasonography (USG), histopathology

Introduction

Thyroid disorders are the most common endocrine diseases of great importance because most of them are amenable to medical and surgical management. Thyroid lesions are challenging tasks to modern clinician in judging the nature, and thereby, advocating precise and adequate management. Thyroid lesions become vulnerable particularly in countries where iodine intake through diet is low.^[1]

A solitary thyroid nodule is defined as a palpable single, clinically detected nodule in the thyroid. They cause more concern because of high probability of malignancy in them, which can range from 5% to 35% of all solitary thyroid nodules.^[2] Diffused thyroid lesions are those that are associated with conditions affecting entire gland such as hyperplasia and thyroiditis. Nodular lesion comprises those disorders that produce a clinical nodule and consists of non-neoplastic hyperplasia as well as benign and malignant tumors.^[3]

Neoplasms of the thyroid are a relatively uncommon disease. They constitute only 0.7% of all cancers in the female and 0.2% in the male population. However, there has been an increase in the incidence of thyroid neoplasms in India and abroad.^[4] Striking advances in various disciplines of medicine and science as applied to the study of thyroid lesions have led to a better understanding and management of many thyroid disorders.^[5]

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In spite of great advances in the understanding of thyroid tumors, there are problems and unanswered questions related to it. The great variety and the wide range of aggressiveness of thyroid cancers continue to complicate both diagnosis and management. Evaluation of different methods of therapy continues to be a problem, partly because thyroid cancers are uncommon.^[6] In India, there are 216,000 new cases of thyroid malignancies per year^[7] and hence, the role of properly evaluating thyroid lesions is significant.

Different imaging techniques are now used for preoperative diagnosis of thyroid nodules such as radionuclide scanning and high-resolution ultrasonography. However, fine needle aspiration cytology (FNAC) is still regarded as the single most accurate and cost-effective procedure, particularly if ultrasound is used as a guide for better sample collection,^[8] especially for cystic lesions.^[9]

This study aimed to evaluate clinico-radiological and cyto-histopathological profile of different thyroid lesions.

Materials and Methods

A prospective study was carried out in the department of pathology, MNR Medical College and Hospital, Sangareddy, Telangana, India, during the one and a half year period from 2013 to 2015. Total 147 cases with thyroid lesions referred to cytology laboratory were considered for this study. Detailed clinical history was procured from each patient by designed pro forma before obtaining a sample for cytological study.

Inclusion Criteria

All those patients having thyroid lesions, irrespective of their age and sex, referred for cytological study from Ear Nose Tongue and Surgery Outpatient Department (OPD), and admitted to ward were selected.

Exclusion Criteria

Patients who were not willing for ultrasonography (USG)-guided/unguided FNAC of their thyroid lesions even after explaining the purpose, utility, and consequence of the procedure were excluded from the study.

The gland morphology is studied by USG. USG was performed for all the cases to distinguish cystic and solid lesions. On echogenic pattern to distinguish benign from malignant thyroid lesions. The echogenicity of thyroid nodule refers to its brightness compared with the normal thyroid parenchyma.

A nodule is characterized as hypoechoic, isoechoic, hyperechoic, or anechoic. Hypoechoic is associated with thyroid malignancy.

Specimens were obtained for cytological study by one of the following techniques: FNC - Fine needle capillary sampling technique (non-aspiration based), FNCB - Fine needle capillary biopsy. The average number of FNC passes recommended for adequate sampling of thyroid swelling is two to five.

Normal Thyroid Aspirate

The normal thyroid is usually not sampled. Aspiration may yield epithelial cells, nonepithelial cells, and noncellular materials.

Normal Structures

Follicular epithelial cells, colloid, C-cells, cartilage, tracheal epithelium, skeletal muscle constitute the normal structures.

Fixation and Staining

For the standard staining procedure hematoxylin and eosin (H&E), Papanicolaou (PAP), and May-Grunwald-Giemsa (MGG) were used for the cytological smears.

Cell Pattern Approach

Out of the total thyroid FNACs, the solitary thyroid nodules diagnosed on USG were subjected to cell pattern analysis. Cases in which sample was inadequate were excluded from the study.

In our study for pattern analysis, the smears from solitary thyroid nodules were reviewed by cytologists, who were blind to the routine cytological and histopathological diagnosis. The final provisional diagnosis on cytopathology was given out in the following manner: benign, atypia of undetermined significance, neoplasm, suspicious of malignancy, and malignant.

Result

This study was carried out over 2 Years (April 2013 to June 2015). in the department of pathology, MNR Medical College and Hospital, during April 2013 to June 2015. It was a prospective analysis of 147 cases with thyroid lesions referred to cytology OPD.

Of all cases in this study, 2% cases belonged to the age group 0–10 years, 7% cases to 11–20 years, 22% cases to 21–30 years, majority of 32% cases belonged to 31–40 years, 18% cases to 41–50 years, 12% cases to 51–60 years, and 7% cases to 61–70 years. Majority of the cases in this study belonged to 21–50 years and cases below 10 years were only 2%. Age of the youngest patient in this series was 3 years; there were two patients with cytological diagnosis of thyroglossal cyst and colloid cyst, respectively.

Aspiration of the content from lesions was most of the time hemorrhagic in 52.40% of cases, followed by blood mixed colloid in 41.24% of cases, and frank colloid in nature in 6.36% of cases.

USG of thyroid was done in all of the 147 cases. Table 1 shows that of the 147 cases, the maximum number of thyroid cases that were investigated on USG was diagnosed as MNG - Multinodular goitre accounting for 61.24% of cases. Colloid goiter in a solitary nodule was diagnosed in 20.40% of cases on USG of thyroid [Table 1].

The results in Table 2 show that 81.64% of the thyroid FNACs were cytologically benign and colloid goiter occupied 58.5%. Under the malignant category, there were seven cytologically

Table 1: Percentage of ultrasound diagnosis of cases

USG diagnosis	No. of cases	Percentage (%)
Thyroglossal cyst	6	4.08
Thyroiditis	14	9.52
Solitary colloid goiter	30	20.40
MNG	90	61.24
Neoplasm	6	4.08
Hyperplastic thyroid nodule	1	0.68
Total	147	100

USG, ultrasonography; MNG, Multinodular goitre.

Table 2: Distribution of various conditions by routine cytological diagnosis among cases

Cytological reporting	No. of cases	Percentage (%)
Colloid cyst/cystic colloid nodule	20	13.60
Colloid goiter	86	58.5
Hyperplastic nodule/adenomatoid goiter	3	2.04
Thyroglossal cyst	5	3.40
Infected cystic lesion	1	0.68
Granulomatous thyroiditis	2	1.36
Lymphocytic thyroiditis	4	2.72
Intra-thyroid reactive lymph node	1	0.68
Follicular neoplasm	3	2.04
Papillary carcinoma	4	2.72
Anaplastic carcinoma	2	1.36
Medullary carcinoma	2	1.36
Insular carcinoma	1	0.68

Table 3: Diagnostic categorization of thyroid FNACs

Categories	Total no. of cases	Percentage (%)
Group A: Benign	120	81.64
Group B: Atypia with undetermined significance	2	1.36
Group C: Suspicious for neoplasm	3	2.04
Group D: Suspicious for malignancy	2	1.36
Group E: Malignant	9	6.12
Group F: Inadequate/nondiagnostic	11	7.48
Total	147	100

FNAC, fine needle aspiration cytology.

diagnosed cases: four cases of papillary carcinoma, two cases each of anaplastic carcinoma and medullary carcinoma, and a single case of insular carcinoma, respectively. Also in the inadequate/nondiagnostic category, there were 11 cases comprising 7.48% [Table 3].

Discussion

Thyroid enlargement, whether diffused or in the form of a nodule, leads to 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 such as ultrasound examination, thyroid function tests, thyroid scan, and antibody levels are carried out subsequently with an aim to select the patients who require surgery and those that can be managed conservatively.^[6,7]

USG examination of thyroid is more accurate and it is a sensitive diagnostic modality to detect thyroid nodularity.^[10,11] It has been a consistent observation, according to published literature, that the risk of thyroid cancer was less with multiple nodules than with the solitary nodules.^[12] High resolution

real-time USG is far better than the clinical examination in detecting thyroid nodularity. Simeone *et al.*^[13] stated that the detection of more than one lesion with USG reduces the probability of malignancy to 1%–6%. Walker *et al.*^[14] have shown that the prevalence of multinodularity in clinically solitary thyroid nodules was between 20% and 40%.

Jayaram and Orell^[15] suggested that the average number of needle passes recommended for adequate sampling of thyroid lumps is two to five. As thyroid gland is a highly vascular organ, with each impending trauma the chances of aspirating hemorrhagic fluid rises each time, so they advised to keep the number of aspirates to minimum. Maximum number of patients yielded good cellularity on FNAC/FNC done once (53% cases). Least number of cases (6.36% cases) were colloid in nature mainly seen in cystic thyroid lesions.

There was a variation between different rates calculated by various authors. The overall sensitivity and specificity in our study was 83% and 96.42%, respectively. The accuracy of the FNAC in comparison with the histopathological examination was 93.8%. Bukhari *et al.*, Flanagan *et al.*, and Chao *et al.* observed that the sensitivity, specificity, and accuracy of FNAC were 85%, 90%, and 87%; 81.7%, 56.4%, and 82%; and 86.1%, 59%, and 64.6%, respectively. In this study, the overall specificity and accuracy were better compared with others and the sensitivity was slightly lower. They, however, reported that in various studies conducted on the said subject, as reported in the literature, sensitivity of the thyroid FNAC ranged from 65% to 99% and specificity from 72% to 100%, depending on the proficiency of both the aspirator and the interpreter.

Lingegowda *et al.*^[16] by their pattern analysis approach on solitary thyroid nodule cases had lower sensitivity but slightly higher specificity and efficacy as compared with our study in diagnosing malignant conditions. Bommanahalli *et al.*^[17] by their pattern analysis approach on goiter cases had higher sensitivity but slightly lower specificity than our study. In our study, there was a little difference in the diagnostic parameters between the routine cytological reporting and cell pattern approach for cytodiagnoses of thyroid lesions.

The study by Aravinthan *et al.*^[18] had the highest accuracy rate (98%) of cyto-histological correlation for diagnosing malignant lesions. Accuracy rate ranged from 86.1% to 98%. In our series, an accuracy rate of 93.8% was obtained by routine cytological reporting, which was closest to El Hag *et al.*^[19]

In our study, the sensitivity and specificity to diagnose malignancy by routine cytological reporting was slightly higher than that of cell pattern approach. The efficacy and false positive rate were higher by cell pattern approach than by routine cytodiagnoses whereas false negative rate was higher by routine cytodiagnoses as compared with cell pattern analysis. On the whole, FNAC evaluation prevents unnecessarily putting the patient “under the knife.” Hence, FNAC of thyroid swellings would reduce the need for surgical confirmation.

Conclusion

Thyroid cytology proves to be a reliable, simple, and cost-effective first line diagnostic procedure with high patient acceptance and without complications. The results of thyroid cytology must be assessed in conjunction with the clinical findings and other investigations, such as TFT - Thyroid function test and USG findings, in view of the possibility of false negative or false positive cytological diagnosis. Our study also demonstrates the feasibility and applicability of cell pattern analysis in applying pattern analysis in the interpretation of thyroid cytology. Application of systematic pattern analysis study has allowed reliable accuracy and easy reproducibility. However, the sensitivity and specificity to diagnose malignancy by routine cytological reporting was slightly higher than that of cell pattern approach in STN lesions because of the lower sample size of USG-detected STN - solitary thyroid nodule cases in our study. We conclude that pattern analysis was better suited for beginners in cytopathology.

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