

**Original Research Article**

# Diagnostic utility of FNAC in thyroid lesions and their histological correlation - A case study

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## Abstract

Fine needle aspiration of thyroid lesions forms the first diagnostic tool in the preoperative evaluation of thyroid lesions. Thyroid diseases are important as these are curable with medical as well as surgical treatment. Enlargement of thyroid called as goiter is the most common manifestation of thyroid diseases. FNAC forms an important role to determine the nature of thyroid lesion whether benign or malignant. It is simple, safe, accurate and cost effective method. This was a prospective and descriptive study done for the period of 2 years from January 2016 to December 2017 in the Department of Pathology at our tertiary care hospital. A total of 100 patients with thyroid lesions came for FNAC, out of which 50 cases were received for histopathological correlation. There were 39 cases of benign thyroid lesions out of which multinodular goiter were the commonest. Papillary carcinoma was the most common malignant lesion amongst 11 cases. Benign lesions presented in younger age group (20-40 years) whereas malignant lesions had bimodal presentation (20-40 years and 40-60 years). Hereby I have analyzed different types of thyroid lesions in different age groups based on cytological evaluation followed by its histopathological confirmation.

## Key words

Multinodular goiter, Thyroiditis, Papillary carcinoma of thyroid.

## Abbreviations used

FNAC - Fine needle aspiration cytology, PCT - Papillary carcinoma of thyroid, MNG - Multinodular goiter, HPE – Histopathological Examination.

## Introduction

FNAC is the safest and most accurate diagnostic tool in thyroid lesions [1]. Its sensitivity is 93.4%, positive predictive value of malignancy is 98.6%, specificity of 74.9% so that it has decreased the number of surgeries done for benign lesions and increased the proportion of malignancies in surgically resected thyroids [1]. Diffuse and multinodular goiter is caused by dietary iodine deficiency which leads to impaired thyroid hormone synthesis leading to compensatory rise in serum TSH level which causes hypertrophy and hyperplasia of thyroid follicular cells and ultimately gross enlargement of thyroid gland [2]. Follicular adenomas present as clinically solitary nodules and the distinction between a follicular carcinoma and adenoma can only be made by histological examination there is no invasion of the capsule or pericapsular blood vessels in adenoma [3]. Carcinoma of thyroid mostly papillary carcinoma occurs mostly in adults with female preponderance [2].

The aim of the study is to increase awareness among patients with thyroid lesions about dietary deficiency of iodine can lead to goiter especially, females are more prone to it, to assess the utility of FNAC as the initial diagnostic tool in patients with thyroid lesions, define diagnostic criteria in interpretation of each thyroid lesion, to subcategorise FNAC thyroid smears into specific entities, to discuss circumstances and conditions in which false negative and false positive diagnosis might occur, to cytologically grade thyroid lesions according to Bethesda system and Revised Papanicolaou system of reporting, to demonstrate impact of FNAC diagnosis on further surgical management of breast masses to compare statistical data in terms of sensitivity, specificity, positive and negative predictive values and diagnostic accuracy.

## Materials and methods

A total of 100 patients with thyroid lesions visited cytology section of our Department of Pathology over 2 year period starting from January 2016 to December 2017 at our tertiary

care hospital. Out of these 50 cases were received for histopathological correlation. After examining the thyroid with the patient sitting upright, the patient should be made to lie supine with a pillow behind the neck for hyperextension which makes the lesion more obvious. After instructing the patient to refrain from swallowing the lesion is needled with a fine needle (25-27G). Needling should be concluded before or as soon as material appears at the hub of the needle, the needle then attached to an air filled syringe and material deposited and smeared on to a clean glass slide. Half of the smears can be air dried for May Grunwald Giemsa (MGG)/ Diff-Quick stain while the rest should be wet fixed in ethanol for Pap stain that brings out nuclear details to advantage. In cystic lesions where fluid appears at the hub of the needle, the needle should be withdrawn and FNA done using 22G needle attached. Classification of thyroid swellings was as per **Table – 1**. Major types of thyroid hyperplastic disorders were as per **Table – 2**. Bethesda system of reporting was as per **Table – 3**. Revised Papanicolaou system of reporting was as per **Table – 4**.

**Table – 1:** Classification of thyroid swellings.

<p><b>Simple goitre (Euthyroid)</b></p> <p>Diffuse Hyperplastic</p> <ul style="list-style-type: none"> <li>• Physiological</li> <li>• Pubertal</li> <li>• Pregnancy</li> </ul> <p>Multinodular goitre</p> <ul style="list-style-type: none"> <li>• Toxic</li> <li>• Diffuse – Grave’s Disease</li> <li>• Multinodular</li> <li>• Toxic adenoma</li> </ul>
<p><b>Neoplastic</b></p> <ul style="list-style-type: none"> <li>• Benign / Malignant</li> </ul>
<p><b>Inflammatory</b></p> <ul style="list-style-type: none"> <li>• Autoimmune                             <ul style="list-style-type: none"> <li>○ Chronic lymphocytic thyroiditis</li> <li>○ Hashimoto’s thyroiditis</li> </ul> </li> <li>• Granulomatous                             <ul style="list-style-type: none"> <li>○ De Quervain’s thyroiditis</li> <li>○ Fibrosing Riedel’s thyroiditis</li> </ul> </li> </ul>
<p><b>Infective</b></p> <ul style="list-style-type: none"> <li>• Acute (Bacterial/ Viral)</li> <li>• Subacute</li> </ul>

**Table – 2:** Major types of thyroid hyperplastic disorders.

1	Dyshormogenetic goitre	Genetically determined error in thyroid hormone metabolism	hypothyroid
2	Grave's disease	autoimmune	hyperthyroid
3	Nodular hyperplasia - [a] endemic goiter, [b] sporadic goitre	Iodine deficiency, nodular hyperplasia	Euthyroid, hyperthyroid or hypothyroid

**Table – 3:** Bethesda system of reporting includes 6 categories.

<ol style="list-style-type: none"> <li>1. Non diagnostic</li> <li>2. Benign</li> <li>3. Atypia of undetermined origin</li> <li>4. Follicular neoplasm/suspicious of follicular neoplasm.</li> <li>5. Suspicious for malignancy</li> <li>6. Malignant thyroid lesions</li> </ol>
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**Table – 4:** Revised Papanicolau system of reporting.

<ol style="list-style-type: none"> <li>1] unsatisfactory</li> <li>2] benign</li> <li>3] atypical cellular lesion</li> <li>4] follicular neoplasm</li> <li>5] suspicious for malignancy</li> <li>6] positive for malignancy</li> </ol>
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## Results and Discussion

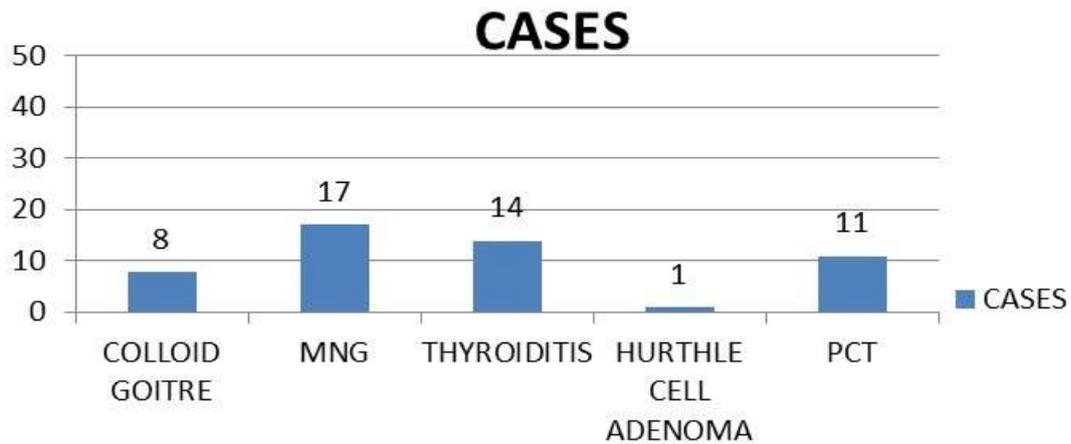
This study was a prospective and descriptive study done for a period of 2 years starting from January 2016 to December 2017 at the department of Pathology of our tertiary care hospital. A total of 100 patients attending cytology section of the department of Pathology in tertiary care centre for FNAC of thyroid lesions, 50 cases were obtained for histopathological correlation. Out of 50 cases, 39 cases were benign including 14 cases of thyroiditis, 17 cases of multinodular goiter, 8 cases of colloid goiter and 11 malignant cases mostly (10 cases) of papillary carcinoma of thyroid mostly follicular variant and 1 case of Hurthle cell adenoma (**Graph - 1**). Age of presentation of thyroiditis was 20-40 years, colloid goiter was 15-60 years, multinodular goiter was 20-40 years, PCT was 20-60 years. There was female preponderance with a total of

40 cases whereas only 10 cases were male which came for histopathological correlation.

FNAC is the safest and most accurate of diagnostic tools in thyroid lesion [1]. In our study, the commonest presenting complaints were enlargement of the thyroid gland (**Figure – 1**) which was painless in most of the cases (36 cases). Few cases of thyroiditis were painful. Enlargement of the thyroid gland or goiter is the most common manifestation of thyroid disease [2]. Lymphocytic thyroiditis present with painless enlargement of the gland with hypothyroidism in middle aged woman [2]. There is sudden or gradual pain in the neck, fever, fatigue, malaise, anorexia and myalgia accompany variable enlargement of thyroid in granulomatous thyroiditis [2].

In the study, the cases which were confirmed on histopathological examination, most of the cases of goiter presented in younger age group. There were bimodal presentation of nodular goiter 12 cases between 20-40 years age group and 5 cases between 40-60 years age group. 5 cases of colloid goiter between age group of 20-40 years and 3 cases between age group of 40-60 years were noted. 2 cases of papillary carcinoma between 40-60 years of age group and 9 cases between 20-40 years of age group were noted. 14 cases of thyroiditis presented in age group of 40-60 years. Acute thyroiditis occur due to Streptococcus hemolyticus, Staph aureus, Pneumococcus [4]. Hashimoto's thyroiditis was most prevalent between 45-65 years of age, granulomatous thyroiditis between ages 30-50 years, subacute lymphocytic thyroiditis can occur at any age but most often seen in middle aged adults with female preponderance [2].

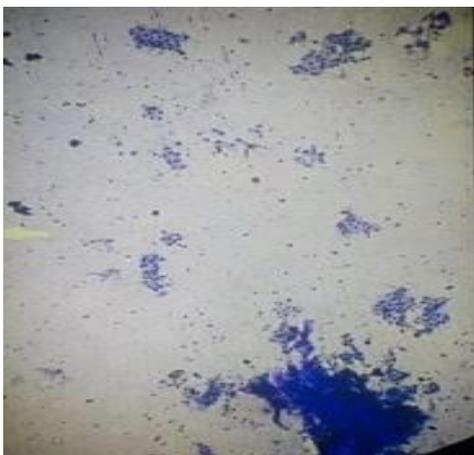
**Graph – 1:** Distribution of cases.



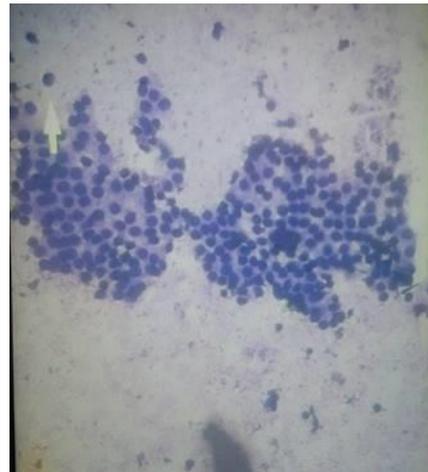
**Figure – 1:** Multinodular goitre- Diffuse Enlargement of thyroid gland.



**Figure – 2:** Multinodular goitre - FNA smear show follicular cells in monolayered sheets and poorly cohesive clusters with fragile cytoplasm and many bare nuclei. Background contains thick and thin colloid.



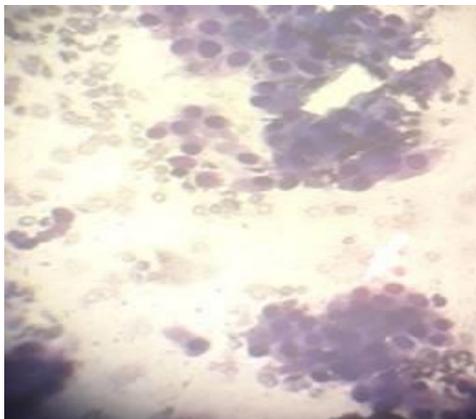
**Figure – 3:** Lymphocytic thyroiditis - lymphoid cells impinging on follicular cells with lymphocytes and plasma cells in the background.



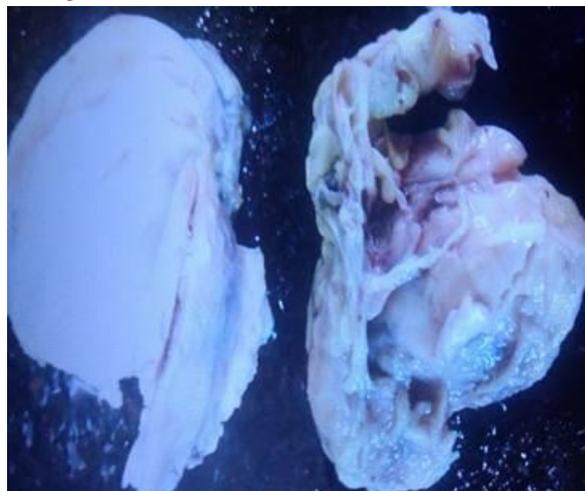
**Figure – 4:** Follicular variant of papillary carcinoma 10X. FNAC smears show follicular cells arranged in microfollicular pattern with finger like papillae, nuclear crowding and overlapping.



**Figure – 5:** Follicular variant of papillary carcinoma 40X. FNAC smears show follicular cells arranged in microfollicular pattern with finger like papillae, nuclear crowding and overlapping.



**Figure – 8:** Gross specimen of papillary carcinoma of thyroid showing one lobe solid, whitish and firm and other lobe show cystic changes.

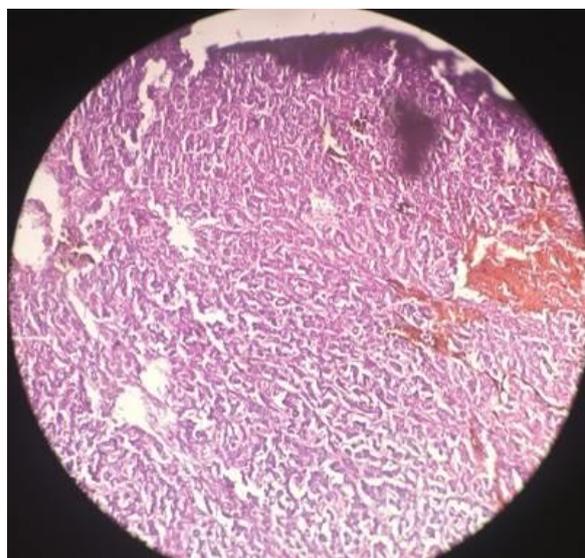


**Figure – 6:** Hurthle cell adenoma 10X. Sheets of oxyphil cells with oval eccentric nuclei and abundant, well defined granular cytoplasm.



**Figure – 9:** HPE of papillary carcinoma of thyroid show papillae, complex, branching and randomly oriented with a central fibrovascular core and a single stratified lining of cuboidal cells. stroma is oedematous and hyaline and contain lymphocytes, foamy macrophages, hemosiderin. Papillae are associated with follicles.

**Figure – 7:** Hurthle cell adenoma 40X. Sheets of oxyphil cells with oval eccentric nuclei and abundant, well defined granular cytoplasm.



There were 40 cases of female with thyroid lesions and 10 cases were male. Grave's disease or diffuse toxic goiter usually presents in adults but can also occur in children [4].

PCT occur at any age but most often in 20-40 years of age group [2]. The main indications of FNAC in thyroid lesions are evaluation of solitary thyroid nodule, diffuse lesion of thyroid, confirmation and categorization of thyroid malignancy, obtain material for ancillary test/prognosis, evaluation of lesions detected initially by imaging, measuring 1-1.5 cm in diameter with features suspicious of malignancy [1].

FNA done from diffusely enlarged thyroid gland (**Figure – 1**) yielded colloid and smears on examination show few benign follicular cells and colloid in the background which is violet, blue or pinkish in colour diagnosed as simple colloid goiter [1]. In case of nodular goiter, follicular cells are arranged in monolayered sheets, poorly cohesive clusters and single cells with background containing few cystic macrophages and thick and thin colloid [1] (**Figure – 2**). In case of lymphocytic thyroiditis, blood mixed aspirate was obtained and smears on examination shown lymphoid cells impinging on follicular cells with background containing blood along with lymphocytes, and plasma cells [2] (**Figure – 3**). Granulomatous thyroiditis showed granulomatous aggregates of epithelioid cells and multinucleate giant cells with numerous nuclei with a dirty background containing colloid, neutrophils, lymphocytes and macrophages [1].

Smears in follicular neoplasm shown follicular cells in clusters, microfollicles and rosette formations with nuclear crowding and overlapping with bloody background [1]. Smears in follicular variant of papillary carcinoma shown microfollicular pattern with finger like papillae with large oval pale nuclei with several intranuclear cytoplasmic inclusions (**Figure - 4, 5**) [4]. Smears in hurthle cell adenoma yielded abundant material consisting of large, polygonal hurthle cells with oval nuclei and abundant granular cytoplasm (**Figure - 6, 7**).

On histopathological examination of slides of endemic goiter shown most of the follicles distended with deeply eosinophilic colloid and lined by a very attenuated layer of small flat

epithelial cells [5]. Small follicles are surrounded by sheets of eosinophilic strands of collagenous fibroblasts which is infiltrated with lymphocytes and multinucleated giant cells in granulomatous thyroiditis [5]. In lymphocytic thyroiditis, follicles are surrounded by a dense infiltrate of closely packed small lymphocytes and histiocytes [4]. In follicular adenoma, follicles are lined by cuboidal epithelium and only few of them are filled with colloid. Gross specimen of Papillary adenocarcinoma of thyroid are mostly solid, whitish and firm and other lobe show cystic changes [4] (**Figure – 8**). On HPE of PCT consist of closely packed convoluted papillae, their surfaces covered with single layer of palisaded cuboidal or low columnar epithelial cells (**Figure – 9**) [4]. In follicular variant of PCT, follicles of fairly uniform shape and variable size filled with deeply eosinophilic colloid lined with a single layer of cuboidal epithelial cells. The lining cells have large ovoid or round vesicular nuclei with coarsely granular pattern [5].

## Conclusion

In this study for the period of 2 years, it was observed that most of the patients with thyroid lesions were diagnosed with benign conditions like colloid goiter, multinodular goiter and thyroiditis and some malignant cases mostly, papillary carcinoma of thyroid. Most of the patients were females. FNA proved to be the initial safest and most accurate of diagnostic tools in thyroid lesions. Reporting was done according to Bethesda system and Papanicolaou system. With this study, I want to spread awareness amongst patients as well as clinicians about the utility of FNAC in diagnosis of thyroid lesions so that number of surgeries done for benign lesions can be decreased and increased proportion of malignancies in surgically resected thyroids.

## References

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