# Fine Needle Aspiration Cytology (FNAC) Findings of Thyroid Lesions In Correlation with Ultrasonographic (USG) Findings & Thyroid Function Tests (TFT)

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## Abstract

**Introduction:** FNAC is helpful to distinguish between nonneoplastic and neoplastic lesions of thyroid. USG is easily accessible, noninvasive method for imaging various thyroid lesions. FNAC findings of thyroid lesions along with USG findings and TFT are helpful in making accurate diagnosis and management by correlation of it.

**Aims & Objectives:**

- To study the various cytological features of FNAC of thyroid and categorize according the Bethesda system for diagnosis
- Correlation of FNAC findings with USG findings of thyroid lesions
- To access TFT of various thyroid lesions in correlation with FNAC findings.

**Materials and Method:** The present study included total 100 patients with thyroid swelling underwent TFT, USG and FNAC. FNAC was done without local anaesthesia and smears were made. Smears were stained by PAP's stain, H&E stain and MGG stain. Microscopy was done to study cytological features of various thyroid lesions and reporting was done according to TBSRTC.

**Results:** In present study, total 100 patients underwent for TFT, USG and FNAC of thyroid gland. Maximum number of patients was in 31 to 40 yrs age-group and majority were females. According to FNAC, 93 patient had nonneoplastic lesions and 7 patient had neoplastic lesions. Colloid goiter was predominant lesion among Nonneoplastic lesion and Follicular neoplasm was predominant lesion among Neoplastic lesion . On evaluation of TFT, majority patients were in Euthyroid state. Various USG parameters were studied following standard reporting categories and according to USG findings, diagnoses were divided into nonneoplastic lesions(96%) and neoplastic lesions(4%). USG diagnosis of thyroid lesions were correlated with FNAC.

**Conclusion**: FNAC is important diagnostic modality for Thyroid lesions. FNAC findings of thyroid lesions along with USG findings and TFT are helpful in making accurate diagnosis and management by correlation of it.

***Keyword****: FNAC thyroid, USG thyroid, Thyroid function test, Thyroid lesions.*

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## Introduction

Martin and Ellis first reported using FNAC to study the thyroid lesions in 1930,[(1)] it was first commonly used in Sweden during the 1950s and 1960s. Swedish investigators established its utility in the diagnosis of thyroid problems and its correlations with clinical manifestations.[(2)]

The primary objective of thyroid FNAC is to select those patients who require surgery for a neoplastic disorder from those who have a functional/inflammatory abnormality and who can be followed clinically/treated medically.[3]

Methods for assessing thyroid nodules include: [2]

• Clinical history and exploration;

• TFT;

• FNAC;

• USG;

• Thyroid scan.

USG is an easily accessible, noninvasive method to image the thyroid and its pathology. It helps to detect a possible thyroid abnormality at an early stage and also provides differential diagnosis that result in subsequent thorough examination and timely treatment in appropriate cases.[4,5]

USG-guided FNA of thyroid is useful, especially in cystic and multinodular

lesions harboring malignancy. [6]

NCI sponsored Bethesda recommended USG guided FNAC in case of nonpalpable nodule or nodule that has more than 25% cystic component. Other indication of USG guided FNAC is failure to get adequate material in prior aspiration.[7]

In current period, FNAC findings of thyroid lesions along with USG findings and TFT are helpful in making accurate diagnosis and management by correlation of it.

## Aims & Objectives

• To study the various cytological features of FNAC of thyroid and categorize according the Bethesda system for diagnosis

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• To access TFT of various thyroid lesions in correlation with FNAC findings.

## Materials and method

• **Sample**

The present study included total 100 patients referred to cytology section of Pathology department, civil Hospital, Ahmedabad with thyroid swelling.

• **Clinical history**

Age, sex, local examination, USG report, thyroid profile report were collected.

• **Sampling technique:**

o For FNAC, patient is kept in supine position with pillow under neck. Gland is fixed against trachea by one hand and aspiration done without local anaesthesia by moving needle back & forth for several times for short distance in one channel and maintain a negative pressure, until material appears at the cone of needle. Smears are made from aspirated material. Immediately wet smears are fixed in 95% alcohol and for MGG stain smears are air dried.

o **3 techniques are in use for sampling purpose[2]**

**1)Fine needle sampling with aspiration**

2) **Fine needle sampling without aspiration**

3)**Aspiration under ultrasound guidance**

• **Staining**

Wet fixed smears were stained by H&E and PAP stain. Air dried smears were stained by MGG stain. microscopy was done to study cytological features of thyroid lesions.

• **Reporting[8]**

The Bethesda System 2017 for reporting thyroid cytopathology(TBSRTC): recommended diagnostic categories were followed while reporting

(I)Nondiagnostic or unsatisfactory

(II)Benign

(III)Atypia of Undetermined Significance (AUS) or Follicular Lesion of Undetermined Significance (FLUS)

(IV)Follicular neoplasm or suspicious for follicular neoplasm

(V)Suspicious for malignancy

(VI)Malignant

## Results

Total 100 cases of thyroid lesions were evaluated.

In the present study Age and sex wise distribution was as given in Table-1.

In this study, total females were 86(86%) and males were 14(14%).

Female to male ratio was 6.1:1.

The patient's age range was 11-80 years.

Most common affected age group was 21-40 with 49% cases.

**Table-1 age-sex wise distribution (n=100)**

| AGE(YEARS) | MALE No.of case(%) | FEMALE No.of case(%) | TOTAL No. of case(%) |
|---|---|---|---|
| 11-20 | 1(1%) | 6(6%) | 7(7%) |
| 21-30 | 2(2%) | 18(18%) | 20(20%) |
| 31-40 | 7(7%) | 22(22%) | 29(29%) |
| 41-50 | 1 (1%) | 20(20%) | 21(21%) |
| 51-60 | 2(2%) | 8(8%) | 10(10%) |
| 61-70 | 1(1%) | 10(10%) | 11(11%) |
| 71-80 | 0 | 2(2%) | 2(2%) |
| TOTAL | 14(14%) | 86(86%) | 100(100%) |

In present study, FNAC reporting of thyroid lesion was carried out according to TBSRTC was as given in table 2. In present study most lesions were in category II (92%)

**Table- 2 No. of cases according to TBSRTC**

| The Bethesda categories | | No.of cases |
|---|---|---|
| I | Nondiagnostic or unsatisfactory | 0 |
| II | Benign | 92 |
| III | AUS or FLUS | 1 |
| IV | Follicular neoplasm or suspicious for follicular neoplasm | 3 |
| V | Suspicious for malignancy | 2 |
| VI | Malignant | 2 |
| Total No. of case | | 100 |

Distribution of number of cases according to cytodiagnosis and Bethesda category of lesion was as given in table-3.

In this study, nonneoplastic lesions(93%) were more common as compared to neoplastic lesions (7%).

Colloid goiter(28%) was predominant in nonneoplastic group followed by nodular goiter(26%), benign follicular lesion(22%), lymphocytic thyroiditis(10%), granulomatous thyroiditis(3%), Hashimoto thyroiditis(2%), Graves' disease(1%) and AUS/FLUS(1%).

Follicular neoplasm(3%) was seen more frequently than Papillary carcinoma of thyroid(2%) & suspicious for malignancy(2%) among neoplastic group.

**Table-3 distribution according to cytodiagnosis and Bethesda category of Thyroid lesions**

| Cytological diagnosis | Bethesda category | No. of cases(%) |
|---|---|---|
| Colloid goiter | II | 28(28%) |
| Nodular goiter | II | 26(26%) |
| Benign follicular lesion | II | 22(22%) |
| Lymphocytic thyroiditis | II | 10(10%) |
| Granulomatous thyroiditis | II | 3(3%) |
| Hashimoto thyroiditis | II | 2(2%) |
| Graves' disease | II | 1(1%) |
| AUS/FLUS | III | 1(1%) |
| Nonneoplastic lesion :Total | | 93(93%) |
| Follicular neoplasm | IV | 3(3%) |
| Suspicious for malignancy | V | 2(2%) |
| Papillary carcinoma | VI | 2(2%) |
| Neoplastic lesion :Total | | 7(7%) |

Distribution of cases according to Thyroid functional status was as given in table-4.

Majority of patients(56) were in Euthyroid state followed by hyperthyroid(24) and hypothyroid state(20).

**Table-4 distribution according to Thyroid functional status**

| Cytodiagnosis | Euthyroid(n) | Hyperthyroid(n) | Hypothyroid(n) |
|---|---|---|---|
| Colloid goiter | 19 | 6 | 3 |
| Nodular goiter | 11 | 8 | 7 |
| Benign follicular lesion | 12 | 4 | 6 |
| Lymphocytic thyroiditis | 4 | 4 | 2 |
| Granulomatous thyroiditis | 2 | - | 1 |
| Hashimoto thyroiditis | 2 | - | - |
| Grave's disease | - | 1 | - |
| AUS/FLUS | 1 | - | - |
| Suspicious for malignancy | 2 | - | - |
| Papillary carcinoma | 1 | 1 | - |
| Follicular neoplasm | 2 | - | 1 |
| TOTAL | 56 | 24 | 20 |

USG parameters and its incidence were as given in table-5.

In the present study, USG findings were noted and distribution of various findings following standard reporting system were as shown in table 5.

According to USG findings, the sonographic diagnoses were divided into nonneoplastic lesions(96%) and neoplastic lesions(4%) as shown in table-6. USG diagnosis of thyroid lesions were correlated by FNAC. On FNAC, nonneoplastic lesions were 93% and neoplastic lesions 7%.

**Table-5 USG parameters and its incidence**

| **USG parameters** | | **No. of cases** |
|---|---|---|
| Composition | Cystic/almost completely cystic | 4 |
| | Mixed cystic & solid | 70 |
| | Solid/almost completely solid | 7 |
| Echogenicity | Anechoic | 2 |
| | Hperechoic/isoechoic | 20 |
| | Hypoechoic | 25 |
| Shape | Taller than wide | 7 |
| Margin | Smooth | 31 |
| | Ill defined | 12 |
| | Lobulated/irregular | 5 |
| Echogenic foci | Macrocalcification | 1 |
| | Peripheral / rim calcification | 3 |
| | Punctate echogenic foci | 8 |

**Table -6 USG diagnosis**

| **Lesion type** | **USG diagnosis** | | **No. of cases** |
|---|---|---|---|
| Nonneoplastic lesion | Benign | Colloid goiter | 32(32%) |
| | | Multinodular goiter | 25(25%) |
| | | Benign nodule | 10(10%) |
| | | Colloidal cyst | 6(6%) |
| | | Follicular adenoma | 3(3%) |
| | Inflammatory | Thyroiditis | 20(20%) |
| Neoplastic lesion | Malignant | Neoplastic etiology | 4(4%) |
| Total | | | 100(100%) |

Figure 1 to 6 are showing microscopic view of different thyroid lesion.

The microscopic features as described in TBSRTC were observed and results were noted according Bethesda categories.

- **Bethesda category I –_Nondiagnostic or unsatisfactory**

- Cyst fluid only, Virtually acellular smear, smear Obscured by blood, clotting artifact etc. Such cases are reported as Nondiagnostic or unsatisfactory.[8]

- Includes adequacy criteria that is greater than 6 groups of well-visualised follicular cells, with at least 10 cells per group (preferably on a single slide). [7]

- **Bethesda category II- Benign:**

1) **Goiter**:

- **Colloid goiter**: Cytomorphological features are abundant colloid with flat sheet of thyroid follicular cells and macrophages.[7]

- **Nodular goier**: Cytomorphological features are abundant thick/thin colloid with flat sheet of thyroid follicular cells, macrophages. follicular cells in sheet are in poorly cohesive cluster or singly with fragile cytoplasm. Degenerative changes like old blood and cell debris are also seen.[6]

2) **Thyroiditis**:

- **Acute thyroiditis**: Cytomorphological features are degenerated thyroid follicular cells with polymorphs, lymphocytes

And necrosis in background.[7]

- **Chronic lymphocytic thyroiditis**: Cytomorphological features are lymphocytic infiltration in thyroid follicular cells, lymphocytes, plasma cells, scant colloid, multinucleated giant cells and ill formed epitheloid cell granuloma.[7]

- **Hashimoto thyroiditis** : Cytomorphological features are

lymphocytic infiltration in thyroid follicular cells, Hurthle cells, and scanty colloid.[7]

- **Bethesda category III- AUS or FLUS:**

- Cytological-architectural atypia, Hurthle cell AUS and Atypia NOS which can not be classified into benign,suspicious/malignant categories. Such cases are reported as AUS or FLUS.[8]

- **Bethesda category IV- Follicular neoplasm or suspicious for follicular neoplasm:**

- **Follicular neoplasm of thyroid**: Cytomorphological features are abundant cellularity, repeatative microfollicular pattern, 3 dimensional crowded groups, scanty droplet like dense colloid.[7]

- **Bethesda category V- Suspicious for malignancy:**

- If only 1 to 2 characteristic features of malignancy are present only focally, if smear is scant cellular, malignant diagnosis can not be given with certainity – such cases are reported as suspicious for malignancy especially in case of follicular variant of papillary carcinoma of thyroid. Other cases- medullary carcinoma, anaplastic carcinoma of thyroid, NHL and metastatic carcinoma. [7]

- **Bethesda category VI- Malignant:**

- **Papillary carcinoma of thyroid**: Cytomorphological features are papillary arrangement of follicular cells, thick chewing gum like ropy colloid, psammoma bodies, multinucleated giant cells, histiocytes, lymphocytes. Follicular cells show optically clear nucleus, intranuclear grooves and intranuclear pseudoinclusions, fine powdery chromatine.[7]

- **Others**:
  - Medullary thyroid carcinoma
  - Poorly differentiated carcinoma
  - Anaplastic carcinoma
  - Squamous cell carcinoma
  - Carcinoma of mixed features
  - Metastatic carcinoma
  - NHL

## Discussion

In present study, 100 cases of thyroid lesions were evaluated by FNAC in correlation with USG findings and TFT. We have correlated results of our study with several other studies as follows:

In our study, Out of 100 cases, maximum number of cases were between 31 to 40 years of age group, the youngest being 11 years old and the oldest 76 years old. The median age was 38.13 years. This was comparable with other studies: by Ujwala S et al. median age was 40 years.[9], by Sinna E et al. median age was 44 years.[10], by obaid Set al median age was 40 years. [11], by ankush et al. median age was 39 years. [12]

In our study, Out of 100 cases, 86 patients were females and 14 were male. The female to male ratio was 6.1:1. So, females were more commonly affected than males. This was comparable with other studies: by Uma Handa et al. female to male ratio was 6.35:1[13], by Ujwala S et al. female to male ratio was 6.2:1.[9], by sarunya kantasueb et al. female to male ratio was 5.12:1. [14]

In our study, Out of 100 cases, 93 cases were diagnosed as nonneoplastic and 7 cases were diagnosed as neoplastic. This was comparable with other studies: by Chaudhary et al. benign cases were 94% & malignant were 6% [15], by Likhar et al. benign cases were 94.4% & malignant were 2.6%. [16], by ankush et al. benign cases were 88% & malignant were 12%.[12]

In our study, follicular neoplasm(3%) was most common neoplastic lesion. This was comparable with other study done by bharti bhushan et al.(4%) [17], by obaid S et al. (4%).[11]

In our study, Out of 100 cases, majority patients were in Euthyroid state (56

%). This was comparable with other study by Chaudhary et al. majority patients were in Euthyroid state (61.3%).[15]

In our study, according to echogenicity, incidence of hypoechoic lesion was 25%. This was comparable with other study done by ankush et al., incidence of hypoechoic lesion was 30%. [12]

In our study, according to echogenicity, incidence of hyperchoic lesion was 20%. This was comparable with other study done by ankush et al., incidence of hyperchoic lesion was 18%. [12]

In our study, according to USG findings, nonneoplastic lesions were 96% and neoplastic lesions were 4%. Among nonneoplastic lesions, predominant lesion was colloid goiter(32%).

## Conclusion

From our study we can conclude that the cases of thyroid lesions were more common in females.

On FNAC, cases of nonneoplastic lesions were more common than neoplastic lesion. Among nonneoplastic lesions, predominant lesion was colloid goiter.

Most thyroid lesions were euthyroid on evaluation by TFT.

On USG, nonneoplastic lesions were more common than neoplastic lesions and were correlated with FNAC findings.

Thus, FNAC is important diagnostic modality for Thyroid lesion. FNAC along with USG finding & TFT helpful in making accurate diagnosis and further planning for management of thyroid lesion.

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**Conflicts of Interest**: Nil

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