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# STUDY OF USG GUIDED FNAC IN THE DIAGNOSIS OF THYROID LESIONS PRESENTING AS SOLITARY NODULE WITH HISTOPATHOLOGICAL CORRELATION

Pathology

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## ABSTRACT

**Background:** Diagnostic workup in solitary thyroid nodule entails screening patients with high likelihood of malignancy. Large body of world literature attests to the accuracy and advantages of FNAC.

**Objective:** To study cytological features of solitary thyroid nodules with ultrasound guided FNAC and studying the correlation of cytological findings with histopathological findings.

**Methodology:** Fifty patients having solitary thyroid nodule underwent USG guided FNAC and histopathological examination during two years of study period. Cytological features of solitary thyroid nodules were reported using Bethesda classification and the findings compared with histopathological examination.

**Observations:** The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of USG guided FNAC in solitary thyroid nodule evaluation were reported at 77.7%, 96.7%, 93.3%, 88.2% and 89.8% respectively. The Kappa statistic was 0.7725. ($p<0.001$)

**Conclusion:** High correlation was observed between USG guided FNAC and histopathological examination for solitary thyroid nodule.

## KEYWORDS

FNAC, Solitary Thyroid Nodule, Histopathology

## INTRODUCTION:

Thyroid gland has always been intriguing for clinicians and researchers alike due to vast array of developmental, inflammatory, hyperplastic and neoplastic disorders. Thyroid nodules, in particular, present challenge in their diagnosis, evaluation and management. They are a frequently encountered entity in clinical practice, with reported prevalence of 4% by palpation, 33-68% by ultrasound examination and 50% on autopsy series[1]. While approximately 95% of thyroid nodules are benign, certain historical, laboratory and sonographic features raise suspicion of malignancy[2].

A localized thyroid enlargement with rest of the thyroid apparently normal is clinically defined as 'Solitary Nodule of Thyroid' and there are major issues in their management w.r.t. diagnostic work-up and extent of thyroidectomy[3,4]. True solitary thyroid nodules (STN) occur in 4-7% of the adult population, more common in females and are malignant in approximately 5-20% of the cases[5]. Thyroid nodularity being so common and incidence of malignancy relatively low, it would be impractical to operate on every patient with a thyroid mass. So the goal of diagnostic workup now is to screen patients with high likelihood of harbouring malignancy in the nodule[4].

There is a large body of world literature attesting to the accuracy and advantages of FNAC, with note for need of caution in interpretation with attention to meticulous technique[1-3]. But the debates and dilemmas regarding appropriate evaluation and management of thyroid nodules still exist. The need to address these issues and to provide a clinically applicable and cost-effective approach was the prompt for the present study. We attempted studying cytological features of solitary thyroid nodules with determining sensitivity and specificity of ultrasound guided fine needle aspiration cytology (FNAC) in their diagnosis along with studying the correlation of cytological findings with histopathological findings.

## METHODOLOGY:

Study type- Prospective observational study
Study setting- Tertiary care government hospital
Study Period- Two years (September 2013-September 2015)
Study Population- Fifty patients diagnosed clinically as having 'solitary thyroid nodule' and undergoing FNAC as well as histopathology

**Exclusion Criteria-**

- Patients with diffuse enlargement of thyroid
- Patients with multinodular goiter
- Patients with no opinion possible on cytology
- Refusal to give consent

**Sample size calculation-**

- Based on previous similar study by Gupta et al[6],
- Prevalence of colloid goiter in solitary thyroid nodule= 56%
- Absolute precision- d= 15%
- Desired confidence interval= 95%
- Calculated minimal sample size required for the study- 44.

Hence 50 cases were included for the present study.
After written informed consent, subjects included in the study were enrolled after due exclusions. All study patients underwent detailed history-taking and clinical examination prior to procuring sample for cytological study. Serum TSH was assessed before FNAC for knowing functional status of thyroid gland and 0.4-3.5 micro IU/ml was considered as the normal range.

Ultrasound (USG) guided FNAC of all the participants were conducted in the department of radiology under the expert guidance of a senior radiologist (co-investigator). The results were categorised into 6 diagnostic categories according to The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)[7]. Histopathological examinations were then undertaken on the surgical specimens. Finally, FNAC results were compared with the definitive histological diagnosis. Cases with cyto-histological were revaluated. After exclusion of the non-diagnostic results, cytological evaluation results were classified as positive and negative. According to TBSRTC, cystic lesions, benign lesions and lesions belonging to AUS/FLUS category were considered as negative; while FN/SFN, suspicious for malignancy and malignant lesions were classified as positive. Patients with negative cytological examination and diagnosed as carcinoma, follicular adenoma or Hurthle cell adenoma on histopathological examination were considered as false-negative. Patients with positive cytological examination and diagnosed as colloidal goitre on histopathological examination were considered as false-positive. The specificity and sensitivity and positive and negative predictive values of cytological diagnosis were calculated against the histopathological diagnosis.

Pearson's Chi-square test was applied for comparison along with calculation of Spearman's correlation coefficient. The data was analysed using STATA (version 13.0) software.

The protocol of project was submitted to institutional ethics committee and the project was started after approval.

## RESULTS:

A total of 50 patients having solitary thyroid nodule had undergone USG guided FNAC as well as histopathological examination during two years of study period.

Maximum cases (17, 34%) belonged to 31-40 years age group, followed by 21-30 years age group (16, 32%). Mean age was calculated to be 38.06 + 12.24 years. Maximum patients were females (40, 80%). Serum TSH estimation revealed a majority of patients to be euthyroid (42, 84%), with 2 (4%) patients being hyperthyroid and 4 (8%) patients hypothyroid.

As per Bethesda categorization, out of 50 cases studied, maximum (28, 56%) were found benign on cytological examination. Four (8%) cases belonged to first category, of which 3 were cyst fluid only and no opinion was possible in one case. Three (6%) belonged to third category (AUS). These cases were diagnosed as nodular goiter. Nine (18%) patients were found to have follicular (6) or hurthle cell (3) lesions, 2 (4%) were suspicious for malignancy (papillary thyroid carcinoma) and 4 (8%) cases had malignant disease (3- Papillary thyroid carcinoma, 1- Medullary thyroid carcinoma).

Histopathological examination revealed 31 (62%) patients to be having non-neoplastic disease, with 11 (22%) patients having adenoma (8- Follicular, 3- Hurthle cell) and 8 (16%) having malignancy. Papillary thyroid carcinoma was the commonest malignancy diagnosed (5, 10%), with one case each of follicular carcinoma, Hurthle cell carcinoma and medullary carcinoma identified in the study.

Out of 50 cases, cyto-histopathological correlation was done in 49 cases, with one case being excluded to non-confirmatory opinion on cytology. Five discordant cases were identified. Four of those five cases with colloid goiter/nodular goiter diagnosis on cytology proved to be neoplastic on histopathology. One case belonging to V category of Bethesda (suspicious for papillary carcinoma) proved to be colloid goiter on histopathology.

Out of the 50 cases, 8 were diagnosed as malignant on histopathology, giving us the overall malignancy rate of 16%. One follicular variant of papillary carcinoma was diagnosed as benign on cytology making the malignancy rate of benign category as 3.6%. No malignancy was identified in category I and category III. Two out of 9 cases (22.2%) in category IV were diagnosed as malignant; while malignancy rates of categories V and VI were 50% and 100% respectively.

**Table 1** describes comparison of non-neoplastic lesions diagnosed by cytology with their histopathological diagnoses. In all, 34 cases were diagnosed as non-neoplastic on cytology. On histopathology, 30 out of 34 cases were confirmed to be non-neoplastic (True Negative). Four cases were classified as false negative, which included 2 follicular adenomas, 1 Hurthle cell adenoma and 1 follicular variant of papillary carcinoma.

**TABLE 1: Comparison of non-neoplastic lesions diagnosed by cytology with their histopathological diagnoses**

| Cytological findings | Number of Cases | Histopathological findings | Number of cases | Remark |
|---|---|---|---|---|
| Colloid Cyst/ Colloid Goiter/Nodular Goiter | 34 | Colloid Goiter | 25 | True Negative (30) |
| | | Colloid Cyst | 2 | |
| | | Nodular Goiter | 2 | |
| | | Hashimoto Thyroiditis | 1 | |
| | | Follicular Adenoma | 2 | False negative (4) |
| | | Hurthle Cell Adenoma | 1 | |
| | | Follicular variant of Papillary Carcinoma | 1 | |

As for comparison w.r.t. neoplastic lesions, Bethesda categories IV, V and VI were included in the neoplastic group in this study. Among 9 follicular/Hurthle cell neoplasms, 7 came out to be adenomas and 2 were carcinomas. Out of 2 patients belonging to suspicious category, 1 was papillary carcinoma only and the other was diagnosed as colloid goiter (False Positive). All 4 cases belonging to malignant category were confirmed to be malignant on histopathology. Overall, there were 14 true positives and 1 false positive in the study. **(Table 2)**

**TABLE 2: Comparison of neoplastic lesions diagnosed by cytology with their histopathological diagnoses**

| Cytological finding | Number of Cases | Histopathological finding | Number of cases | Remark |
|---|---|---|---|---|
| Follicular Neoplasm | 6 | Follicular Adenoma | 5 | True Positive |
| | | Follicular Carcinoma | 1 | True Positive |
| Hurthle Cell Neoplasm | 3 | Hurthle Cell Adenoma | 2 | True Positive |
| | | Hurthle Cell Carcinoma | 1 | True Positive |
| Suspicious for malignancy | 2 | Papillary Carcinoma | 1 | True Positive |
| | | Colloid Goiter | 1 | False Positive |
| Malignancy | 4 | Papillary carcinoma | 2 | True Positive |
| | | Follicular Variant of Papillary Carcinoma | 1 | True Positive |
| | | Medullary Carcinoma | 1 | True Positive |

**TABLE 3** demonstrates statistical comparison of findings on cytology and histopathology in study cases of solitary thyroid nodule.

**TABLE 3: Statistical comparison of findings on cytology and histopathology**

| Cytological Finding (test being evaluated) | Histopathological Finding (Gold Standard) | | Total |
|---|---|---|---|
| | Neoplasm | Non-neoplasm | |
| Neoplasm | 14 | 1 | 15 (30.6%) |
| Non-neoplasm | 4 | 30 | 34 (69.4%) |
| | 18 (36.7%) | 31 (63.3%) | 49 |

Thus the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of USG guided FNAC in solitary thyroid nodule evaluation are reported at 77.7%, 96.7%, 93.3%, 88.2% and 89.8% respectively. The Kappa statistic was calculated at 0.7725, with p-value being highly significant (<0.001).

## DISCUSSION:

The present study was conducted with the objective of assessing the cytological features of solitary thyroid nodules using Bethesda diagnostic categories and comparing the findings with the gold standard, i.e. histopathological examination. A total of 50 patients underwent USG guided FNAC and histopathology.

The mean age of 38.06 years in our study is similar to the age reported by Gupta et al[6] and Arul P et al[8] (38.72 and 38.22 years respectively). The commonest age group of 31-40 years was also common to all the studies. The female preponderance (4:1) observed in our study was expectedly observed by previous similar studies[6,9,10]. The finding of majority of patients being euthyroid (84%) was also observed by Sheikh et al[11] and Basharat et al[12], who reported >90% patients to be euthyroid with no cases of hypothyroidism.

In our study, more than half of cases (56%) belonged to benign category (colloid goiter) by cytology. Quddus et al[9] observed 77% of cases to be benign on cytology, while Kaur et al[4] reported non-neoplasm at 64%. On histopathological examination, majority (58%) of the solitary thyroid nodules were confirmed to be non-neoplastic in nature. The incidence & profile of non-neoplastic nodules in our study matches closely with the study by Gupta et al[6], who reported 56% of cases as colloid goiter and 4% cases as Hashimoto thyroiditis. Among the non-neoplastic category, follicular adenoma was the commonest lesion (16%) with 3 cases of hurthle cell adenoma. This was also comparable to findings of Gupta et al[6] and Arul P et al[8], who reported adenomas in 20% and 25.36% of cases respectively.

Among the malignant categories, cytologically, papillary carcinoma was most commonly diagnosed (3 cases) along with one case of medullary carcinoma. On histopathological examination also, most common lesion diagnosed was papillary carcinoma in 5 (10%) cases, including 2 cases of its follicular variant. This finding sits well the

study of Kumari et al[5], who reported papillary carcinoma in 8.8% cases. The percentage of malignancy in solitary thyroid nodule in our study was 16%. This sits well the findings of Kaur et al[4], who reported malignancy rate of 18% in their study of 50 solitary thyroid nodules. Gupta et al[6] put this figure at 20%, while highest malignancy rate (27.5%) was observed by Quddus et al[9].

The sensitivity, specificity, diagnostic accuracy, positive predictive value and negative predictive value of USG guided FNAC in solitary thyroid nodule evaluation in our study were observed to be 77.7%, 96.7%, 93.3%, 88.2% and 89.8% respectively. Kessler et al[13], in a similar study, reported the sensitivity, specificity and accuracy of 79%, 98.5% and 87% respectively. Sheikh et al[11] observed cytology to be highly sensitive (100%) and with 100% negative predictive value; while Kumari et al[5] observed USG uided FNAC to be a test of confirmatory nature, with specificity and accuracy of 100% each. A very high FNAC in our study may be attributed to the fact that maximum diagnoses were possible on the first aspiration itself. Reduced repeat aspirations reduces the risk of regenerative atypia being reported as falsely positive.

In conclusion, high correlation was observed between USG guided FNAC and histopathological examination for solitary thyroid nodule in the present study. The FNAC; being less invasive, cost-effective and less resource-intense; may be advocated at-large as the measure for preoperative tissue diagnosis in case of solitary thyroid nodule.

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