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## The Assessment of Specificity & Sensitivity of FNAC in Thyroid Lesions in Erbil

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### ABSTRACT

**Background and Objectives:** Fine needle aspiration cytology is regarded as the gold standard investigation in diagnosis of thyroid swellings. The aim of this study was to determine the accuracy of Fine needle aspiration cytology in detection of thyroid swellings in our surgical unit and to assess the correlation between preoperative cytodiagnosis and postoperative histopathological diagnosis.

**Methods:** Between years 2000-2003, 389 patients underwent thyroid operation by single consultant surgeon for thyroid lesions, 156 patients had preoperative Fine needle aspiration cytology; 6(3.84 %) patients had "unsatisfactory" samples so excluded from the study. the remaining 150 patients were enrolled in this study. Fine needle aspiration results were compared with definitive histological diagnosis following thyroid operation.

**Results:** Fine needle aspiration cytology done for 156 patients, 6 patients had been excluded, analysis revealed 132 (84.6%) non-neoplastic, 14(8.97%) neoplastic and 4 (2.56%) suspicious aspirates,. Of the 150 cases included in the study Histological analysis showed 130(86.66%) benign, 14(9.33%) malignant specimens, 2(1.3%) were false-negative. Fine needle aspiration cytology in this study had a sensitivity, specificity and accuracy rate of 90%, 100%, and 75% respectively for diagnosing thyroid malignancy.

**Conclusions:** The results are comparable with the current published data and demonstrate that FNA cytology in our hands is accurate investigation for preoperative diagnosis for the detection of thyroid malignancy

**Key words:** Thyroid swellings, FNA, Accuracy

### INTRODUCTION:

Fine needle aspiration cytology (FNAC) is safe, easy to perform. Economic and an accurate procedure used in the diagnosis of thyroid Le-sions, particularly in the presence of cold nodule <sup>1</sup>. It is a well established out-patient procedure used in the primary diagnosis of palpable thyroid swellings <sup>2</sup>. Currently this technique is practiced world-wide and it is the investigation of choice in thyroid, breast, and lymph node swellings <sup>3</sup>. The technique has been shown to be simple, the limitations include false negative results, false positive results and a proportion of FNA results that are not obviously benign or malignant and fall into the indeterminate

Published data suggest FNA has an overall accuracy rate around 75% in the detection of thyroid malignancy <sup>5</sup>. The aim of this study was to determine the accuracy of FNA cytology in detection of thyroid swellings in our surgical unit and to assess the correlation between preoperative cytodiagnosis and postoperative histopathological diagnosis. The application of this method in Iraq was not reported before. The following study was carried out in order to evaluate its practicality and effectiveness by using both cytological and histopathological examination.

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**MATERIALS AND METHODS:**

Fine needle aspiration cytology was performed using aspirate and non-aspirate techniques on each thyroid swelling. The cytological sample was assessed by two consultant pathologists and was classified as inadequate, non-neoplastic, neoplastic, suspicious or indeterminate. The procedure was performed on 156 patients (137 female and 19 male, the mean age was 35.5 years, with a range of 13 - 70 years ) admitted to Rizgary teaching Hospital with different thyroid lesions Between 2000-2003. Two techniques were used to perform FNAC; (1) Aspiration technique when a 23-gauge needle was connected to a 10-ml syringe mounted on a syringe holder. Multiple needle passes were made within the lesion 3-4 times at varying angles and depths and with constant negative pressure (never emerging outside the skin). Before final withdrawal, the negative pressure was released prior to the needle emerging from the skin. The cytological material was transferred on to glass slides. (2) Non-aspiration technique a similar 23-gauge needle was passed into the lesion 3-4 times in the same manner except that negative pressure was not used. After withdrawal, the needle was connected to a 10-ml syringe containing air and cytological material was transferred on to slides. All patients subsequently had a thyroid resection and a definitive diagnosis was reached. FNAC and histology specimens were analyzed by two pathologists. Immediately after the procedure, firm pressure is applied to the biopsy sites. When the procedure is finished, an adhesive bandage is applied, and the patient is allowed to sit for a few minutes before dismissal. The aspirated material then smeared on 2-4 slides, fixed in 95% alcohol and stained by papanicolaou and May -Grunwald Giemsa stains. The cytological findings were compared with the histological results whenever a biopsy was taken. FNAC results were classified in to four groups: a)

inadequate cellular material), b) Non neoplastic (including multinodular goiter, colloid goiter, thyroiditis), c) Neoplastic (papillary, anaplastic, lymphoma), d) Suspicious (suggestive / suspicious of neoplasm – follicular neoplasm) .Histology specimens were classified as non-neoplastic and neoplastic. Pre-operative FNAC results were then compared with the definitive histological diagnosis

**RESULT:**

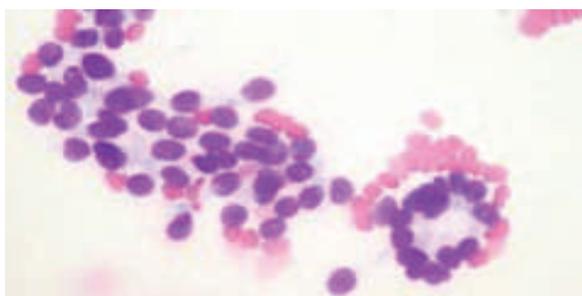
The comparison between cytological and histo-pathological diagnosis was possible in 150 cases only who underwent subsequent thyroid surgery. 14 cases were malignant by cytological examination, confirmed histopathologically as malignant, 132 cases were benign cytologically, by histopathological examination 130 cases were benign and two cases were malignant with false negative results (figure 1-A& B), 4 cases were suspicious cytologically, proved to be malignant by histopathology. Therefore the sensitivity was 90% the specificity was 100%, and the overall accuracy was 98.6% (table 1).

The nature of these lesions was as follows (Table 2).

One-hundred eighteen cases diagnosed cytologically as colloid goiter , histopathologically as nodular colloid goiter, some cystic degeneration was found within the colloid goiter .Fourteen cases were diagnosed cytologically as benign follicular cells, histopathologically were diagnosed as follows: 2 cases microfollicular adenoma, 2 cases as lymphocytic thyroiditis 8 cases as diffuse hyperplastic thyroid tissue and 2 cases as follicular carcinoma two cases were diagnosed cytologically as undifferentiated malignant cells histopathologically was diagnosed as malignant lymphoma.12 cases were diagnosed cytologically as malignant cells, histopathologically were diagnosed as papillary carcinoma, 4 cases were diagnosed cytologically as suspicious cells, proved histopathologically to be papillary carcinoma (Figure2 -A&B).

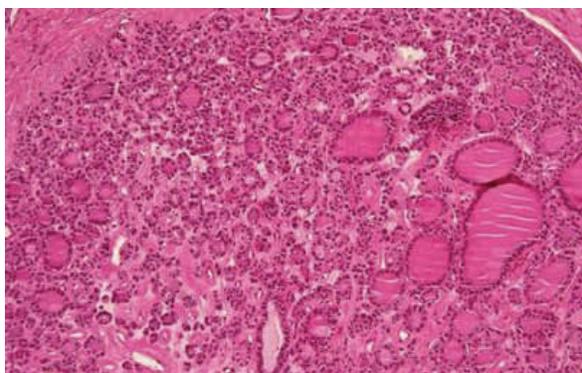
**Table (1):** Comparison between cytological and histological diagnosis.

| Cytological  | diagnosis | Histological diagnosis |                             |
|--------------|-----------|------------------------|-----------------------------|
| Benign       | 132       | 130                    | Malignant 2(false negative) |
| Suspicious   | 4         | -                      |                             |
| Malignant    | 14        | -                      | 4<br>14                     |
| <b>Total</b> | 150       | 130                    | 20                          |



**Figure (1 ) A:** Follicular neoplasm An FNA was obtained from a small thyroid nodule in the patient is a 63-year-old woman. She presents with a 3x1cm thyroid nodule. Aspiration obtained 0.5cc of fluid; the nodule was not decompressed.

No serious complications such as tumor seeding, nerve damage, tissue trauma, or vascular injury have been reported in this study. Needle puncture caused slight pain and some skin discoloration at the aspiration site in 7% of patients. However, a minor hematoma occurred in 1% in patient on anticoagulants or salicylates which does not preclude FNA biopsy. Post aspiration hemorrhage within a cystic lesion occurred in 0.5%, and in 1 patient after FNA biopsy, developed severe pain from bleeding into the nodule that warranted surgical excision.

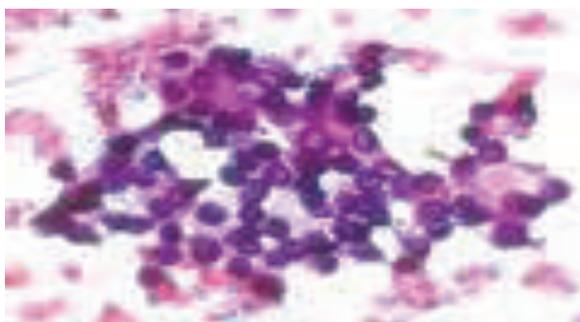


**Figure (1)B:** the above patient histopathology shows Infiltration of the capsule, vascular invasion, and/or neoplastic extension into the adjacent parenchyma are regarded as prerequisites for the diagnosis of follicular carcinoma

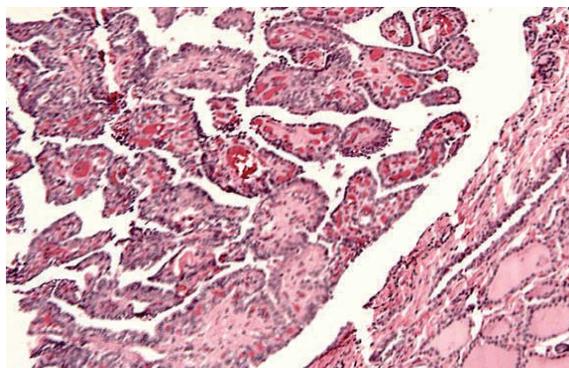
**Table(2):** Cytological results of aspirated thyroid lesions compared with the histological findings.

| No.of cases | Cytological diagnosis                                       | Histological diagnosis                                   |
|-------------|---|--|
| 118         | Colloid goiter  | Nodular colloid goiter                                   |
| 2           | Benign follicular cells                                     | Micro follicular adenoma                                 |
| 2           | Benign follicular cells                                     | Lymphocytic thyroiditis                                  |
| 82          | Benign follicular cells<br>Undifferentiated malignant cells | Diffuse hyperplasic thyroid tissue<br>Malignant lymphoma |
| 12          | Malignant cells   | Papillary carcinoma                                      |
| 4           | Suspicious cells  | Papillary carcinoma                                      |
| 2           | Benign follicular cells                                     | Follicular carcinoma                                     |
| 150         | <b>Total</b>  |  |

**Figure (2)A:** cases was diagnosed cytological as suspi-cious cells, proved histopathologically to be papillary carcinoma (FIG 3 B).



**Figure (2)B:** same patient diagnosed cytological as suspi-cious cells proved histopathologically to be papillary carcinoma Neoplams shown here exhibits numerous papillae having a fibrovascular stalk covered by a single to multiple layers of cuboidal epithelial cells. Also note normal follicles with colloid

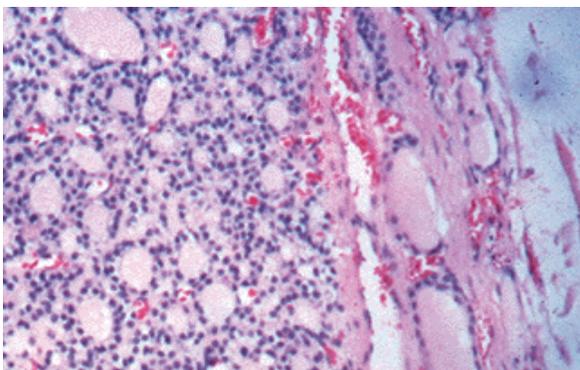


**Table(3):** Comparison between sensitivity and specificity of our study with other studies [17].

| Authors and years                     | Sensitivity | specificity |
|---------------------------------------|-------------|-------------|
| Haruna A. Nggada, Alhaji B. Musa,2003 | 98%         | 100%        |
| E. Razmpa, H. Ghanaati, 2000          | 92.3%,      | 88.1%       |
| Mustapha I.A. Khalil 2001             | 85%         | 88%.        |
| The Present study 2003                | . 90.0%     | 100.0%      |

**Figure (3):** Epithelial cells in a follicular arrangement suggesting adenoma, but which could be from a follicular

carcinoma.

**Figure (4):** Follicular and microfollicular adenoma. The nodule shows micro follicles, is sharply circumscribed by a delicate even fibrous capsule, and there is no invasion of the capsule or blood vessels

### DISCUSSION:

Fine needle aspiration cytology is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings<sup>6</sup>. The technique is safe simple and quick with a low complication rate and helps to select people preoperatively for surgery<sup>7</sup>. Cytological study of FNAC of thyroid lesions from 150 patients in this study showed a sensitivity of 90% and specificity of 100%.which is more or less similar to other studies done before and during the same period (table 3). The comparative study between cytological and histopathological diagnosis were in agreement in all the malignant cases where as in the benign .One-hundred thirty two cases were diagnosed cytological as benign while histopathological examination revealed that 130 were benign and two were malignant (false positive) (table 1). Four cases were suspicious cytologically, proved to be malignant by histopathology, and these results are expected particularly with small tumors and when there is associated degenerative or inflammatory change in adjacent thyroid tissue. Limitation of thyroid FNAC we faced in this study, when there is a group of lesions which overlap benign and malignant features, for instance, the distinction between a cellular colloid goiter and a

impossible. The differential diagnosis of thyroid nodules is now easily accomplished by fine needle aspiration cytology in 60-90% of the cases, allowing a significant reduction in the number of thyroid surgeries performed for thyroid nodules. Two cases diagnosed cytologically as benign follicular cells while histopathological diagnosis revealed Follicular carcinoma as a result cytological diagnosis of follicular adenoma vs. carcinoma was not possible on FNA and diagnosis was dependent on histological assessment for capsular/vascular invasion, Infiltration of the capsule, vascular invasion, and/or neoplastic extension into the adjacent parenchyma are regarded as prerequisites for the diagnosis of follicular carcinoma [12-14]. Another limitation of thyroid FNAC is the large number of inadequate aspirates [15]. Published data suggest inadequate sample ranges between 9-31% [16]. In our study the inadequate sample rate was 3.84%. The most important factors include experience of the aspirator and the criteria used to define a satisfactory sample. In the published data, the sensitivity and specificity of thyroid FNAC in detecting lesions ranges from 85-98%, and 88-100 % respectively (Table 3).

Inadequate specimens are labeled "nondiagnostic" or "unsatisfactory" accounted for 3 % of specimens in this study comparing with other similar studies which accounts between 2%-20%. Factors influence nondiagnostic rates for FNA results, including the skill of the operator, vascularity of the nodule, criteria used to judge adequacy of the specimen, and the cystic component of the nodule (36-39). Overall, we mean by a satisfactory smear it should contain at least 6 clusters of well-preserved cells, with each group consisting of at least 10 to 15 cells. False-negative results mean missed malignancy occurred in 4 patients (2.6%) comparing with similar studies in which rates generally vary from 1.5% to 11.5%<sup>17,20,26,28</sup>. The false-negative rate is defined as the percentage of patients with "benign" cytology in whom

False-negative rates are lower in centers experienced with the procedure and with cytologic interpretation by expert cytopathologists. False-positive results occurred in 2 patients 1.3% comparing with other similar studies in which False-positive rates varies from 0% to 8% [20, 26, 27]. A false-positive diagnosis indicates that a patient with a "malignant" FNA result was found benign on histological examination. The experience as well as the expertise of the cytopathologist is critical in avoiding pitfalls. Determining the adequacy of an aspirate, cellular atypia, application and interpretation of immunostains and differentiation of lymphocytic thyroiditis from lymphoma are but a few of these problems. To improve sampling, aspirates should be obtained from multiple sites of the nodule rather than repeatedly from a single spot. Larger nodules are more likely to yield false-negative results. The absence of malignant cells in an otherwise acellular specimen does not exclude malignancy. It is good practice to biopsy all accessible nodules in a multinodular gland. In patients with multiple nodules, FNA is best performed with US, selecting nodules for FNA when US features are suspicious<sup>1</sup>,

#### CONCLUSION:

<sup>2</sup>.

FNAC is a simple, safe and cost-effective diagnostic modality in the investigation of thyroid disease with high specificity and accuracy. The suspicious and indeterminate results prove to be an area of uncertainty often resolved by diagnostic surgical resection. Fine needle aspiration cytology in this study had sensitivity, specificity rate of 90.0%, and 100.0% respectively for diagnosing different thyroid l e s i o n s . FNAC is very valuable and minimally invasive procedure for the preoperative assessment of patients with thyroid nodules the technique can be standardized and useful results obtained thereby

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histopathological diagnoses.

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