

## Fine Needle Aspiration Cytology and Ultrasonography In The Management Of Solitary Thyroid Nodule

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### Summary

**Background:** The incidences of clinically palpable thyroid nodules are 4% to 7% of the adult population, the vast majority of which are benign. It is important to identify preoperatively those that are likely to be malignant

**Patients and methods:** 173 patients with euthyroid solitary thyroid nodule underwent FNAC and U/S examination for their thyroid nodule. Thyroidectomy was done and the result was correlated with histopathology finding.

**Results:** Of the 173 patients studied, the female to male ratio was 6.5:1, malignancy was present in 17.3 % of all solitary thyroid nodule , The cytological diagnosis of benign nodule were confirmed in 115 patients (96%) , while the U/S diagnosis of benign nodules were correct in 130 (92.8%) out of 140 cases

**Conclusion:** Our study showed that U/S and FNAC are important diagnostic tools in the investigation of clinically euthyroid solitary thyroid nodules, they will give optimal results and give chance to do appropriate surgery for benign and malignant thyroid nodule and avoid unnecessary surgery in certain patients without missing any malignancy in others.

**Key words:** Solitary thyroid nodule (STN), Fine needle aspiration cytology (FNAC), Ultrasonography (U/S), Histopathological examination (HPE).

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### Introduction:

The incidence of clinically palpable thyroid nodules are 4% to 7% of the adult population (1, 2, 3).The vast majority of which are benign. Given the different treatment strategies for benign and malignant nodules, as well as the inherent morbidity associated with surgery, better preoperative determination of benign versus malignant nodules is important issue.(4) Much controversy is present on the management of solitary thyroid nodule, the two major issues being the diagnostic workup and the extent of thyroidectomy.(5) Thyroid nodules are about four times more common in women than in men.(6)There was no significant difference in the incidence of malignancy between solitary thyroid nodule and a dominant nodule in a multinodular goiter, McCall report the incidence of malignancy in the solitary thyroid nodule 17% while in the dominant nodule in a multinodular goiter was 13% .(7) In 95% of cases, thyroid cancer presents as a solitary thyroid nodule .However , The majority (90%) of thyroid nodules is benign .(8)Because thyroid nodularity is so common, it would be impossible to operate on every patient with a thyroid mass as the incidence of malignancy is quite low compared with the overall incidence of thyroid

nodularity. The goal of diagnostic work up now is to select those patients for surgery who have a high likelihood of harboring malignancy in the nodule. (9) Many investigations are used to differentiate between benign and malignant nodules so as to avoid surgery in those who don't need it. Among these FNAC and U/S are commonly used in association with clinical features but there are drawbacks of each technique and the final answer to the problem is still elusive. (10) FNA biopsy has proved to be the best way for differentiating benign from malignant thyroid nodule, and during the last two decades has represented the technique of choice in the management of such patients. (8, 11) Ultrasonography with appropriate, experience and modern ultrasonography equipment can be useful in distinguishing cystic from solid mass.(12) Ultrasound guided FNAC of the thyroid is recommended, especially for sampling small, deep nodules or solid remnants of cystic lesions.(13) Features suggestive of malignancy on U/S are hypoechogenicity , incomplete peripheral halo, irregular margins, central microcalcification, increased vascularity, presence of cervical lymphadenopathy and peripheral degeneration in mixed nodule (cystic and solid component).(3,14)

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### Patients and methods:

A prospective study was carried out on 173 euthyroid cases with solitary thyroid nodule (STN)

attending the department of general surgery in Baghdad teaching hospital and Al\_Najaf teaching hospital during the period from July 2001 to April 2006. All patients were submitted to FNAC and U/S. The results of FNAC were interpreted as benign, malignant, suspicious or inadequate aspirate. Sonographically the nodules were evaluated for consistency (solid, cystic or mixed) and for size, location, echo texture, margins, microcalcification, accessory nodules, and associated cervical lymphadenopathy. Features suggestive of malignancy on U/S were hypoechogenicity, incomplete peripheral halo, irregular margins, central microcalcification, increased vascularity, presence of cervical lymphadenopathy and peripheral degeneration in mixed nodule. All the patients were subjected to thyroidectomy and histopathological examination of the specimens. The histopathology reports were correlated with the findings of FNAC and U/S in order to evaluate their sensitivity and specificity of the latter two by statistical methods. Sensitivity: represent the ratio of true positive results to all nodules diagnosed as carcinoma. Sensitivity =  $\frac{TP}{TP+FN} \times 100$  \*TP: True positive, FN: False negative. Specificity: represent the ratio of true negative results to all nodules diagnosed as non carcinoma. Specificity =  $\frac{TN}{TN+FP} \times 100$  \*TN: True negative, FP: False positive. Accuracy =  $\frac{TP+TN}{TP+FP+TN+TP} \times 100$

**Results:**

Out of the 173 patients with solitary thyroid nodule, 150 (86.7%) were females and 23 (13.3%) were males with a ratio of 6.5:1, the ages of the patients ranged from 13 years to 70 years. The FNAC diagnosis of benign thyroid nodule were confirmed by histopathology in 115 (96%). In the 28 cytologically suspicious cases, histopathological examination revealed benign lesion in 20 cases. All the eighteen malignant interpretations on cytology were confirmed by HPE (table 1).

**Table 1: Correlation of FNAC with histopathological diagnosis**

Histopathological diagnosis	Fine needle aspiration cytology				Total
	Benign	Suspicious	Malignant	Inadequate aspirate	
Benign	115 (96.5%)	20 (71.4%)	Nil (0%)	8 (100%)	143 (82.7%)
Malignant	4 (3.5%)	8 (28.6%)	18 (100%)	Nil (0%)	30 (17.3%)
Total	119 (100%)	28 (100%)	18 (100%)	8 (100%)	173 (100%)

Results of histopathological examination of the specimens show that 70.5 % of the STN were colloid goiter and 15% papillary carcinoma as shown in table (2).

**Table 2: Results of histopathological examination of thyroidectomy**

Histopathological diagnosis	Number (%)
Colloid goiter	122(70.5%)
Papillary carcinoma	26(15%)
Follicular adenoma	12(7%)
Thyroiditis	9(5.2%)
Follicular carcinoma	3(1.7%)
Anaplastic carcinoma	1(0.6%)
Total	173 (100%)

The results of U/S examination of the 173 solitary thyroid nodule according to the consistency of the nodule, 122 (70.5 %) were solid, 27 (15.6 %) were mixed and 24 (13.9 %) were cystic in nature. Table (3) showed Correlation of U/S echo texture with malignancy, 21 (17.2%) out of 122 the solid nodules and 8 (29.6%) of 27 of the mixed nodules were subsequently found to harbor malignancy.

**Table 3: Correlation of U/S echo texture with malignancy**

US echo texture	No.	Histopathological diagnosis		Percentage of malignancy
		Benign	Malignant	
Solid	122	101	21	17.2 %
Mixed	27	19	8	29.6 %
Cystic	24	23	1	4.2 %
total	173	143	30	17.3%

The U/S diagnosis of benign nodules were correct in diagnosis of 130 (92.8%) out of 140 cases as shown in table 4.

**Table 4: Correlation of U/S diagnosis with histopathological diagnosis**

Histopathological diagnosis	U/S diagnosis		Total
	Benign	Suggested Malignant	
Benign	130 (92.8%)	13 (39.3%)	143 (82.7%)
Malignant	10 (7.2%)	20 (60.7%)	30 (17.3%)
Total	140 (100%)	33 (100%)	173 (100%)

It was found that sensitivity, specificity and accuracy of FNAC for solitary thyroid nodules was (81.8%), (100%), (97%) respectively, while the sensitivity, specificity and accuracy of U/S was (66.6%), (90.9%), (86.7%) respectively.

**Discussion:**

The overall incidence of malignancy in solitary thyroid nodules varies from 10%-30%. (15) In our study, the overall incidence of malignancy in solitary thyroid nodule was in the middle of the

above figures (17.3%). Our study showed that out of 135 cases found to be non-malignant on histopathological examination (inadequate aspirate excluded from the results), 115 (85 %) were correctly identified negative for malignancy on FNAC. False positive FNAC results were uncommon in other studies and was nil (0 %) in our series and if we add the suspicious result to the total, the percentage of the false positive FNAC will increase to 11%. This finding is consistent with other relatively recent reports that cited an incidence of false-positive FNA biopsy results ranging from 0% to 9 %.( 2) False-negative FNA biopsy results occurred in 4 (3.3%) of our patients. This is also consistent with recent reports that suggest a false-negative rate of 2% to 7%. (2) Our false-negative biopsy results probably represented inadequate sampling as a result of the needle not being placed within the thyroid nodule. The more routine use of ultrasound-guided FNA biopsy has minimized but not prevented the occasional false-negative result. ( 2) Inadequate aspirate was present in 4.6 % of our cases; non diagnostic FNA specimens may be related to the characteristics of the thyroid nodule or inadequate sampling. Thyroid nodules that are sclerotic or calcified and those with large areas of cystic degeneration or necrosis are extremely difficult to aspirate or interpret. An adequate specimen may not be obtained if needle placement is suboptimal. The advent of ultrasound-guided FNA biopsy has improved specimen acquisition, especially in patients with small thyroid nodules or nodules that are difficult or impossible to detect on physical examination. ( 2) The accuracy rate of FNAC was (97%) in our study, whereas in various other studies it has varied from 79% to 98%, depending on the experience of the physician performing FNAC and the experience of the cytologist interpreting the cytology findings. (16) When FNAC reports of 30 patients with thyroid carcinoma were analyzed, it was found that 18 out of 30 cases have a correct preoperative diagnosis, 8 cases were reported as suspicious, and 4 as benign. In our study a (60%) concordance between the histologic and cytologic diagnosis was found, which rose to (86.6%) on inclusion of the suspicious cases as positive cases. Altavilla and Pascale et al. (16) reported in their series a (45.83%) concordance between the histologic and cytologic diagnoses which on inclusion of the suspicious cases as cytologically positive, rose to (70%). The overall sensitivity of FNAC in our study was (81.8%) while the overall specificity was (100%). The sensitivity and specificity of FNAC were (71.43%) and (100%) respectively according to Altavilla et al. (16), (93.5%) and (75%) according to Bauvet et al. (15). Many investigators have attempted to point out ultrasonographic features that would identify lesions with a higher risk of malignancy. The definition of ultrasonographic features as a risk for malignant neoplasms might help to determine optimal

treatment of these lesions. (17) In these patients U/S gave a diagnosis of thyroiditis on the basis of diffuse echo-pattern with multiple diffuse hypochoic areas. Thus, it is not possible to differentiate between thyroiditis and malignancy. Katz and Kane et al. (18) found that U/S was unable to differentiate between thyroiditis and a malignant lesion. Halo sign is not characteristic of benign lesion. In our study, we found the sensitivity and specificity of U/S to be 66.1% and 90% respectively. Waters et al. (19) found that the sensitivity and specificity of U/S in suggesting a malignant- lesion were 74% and 83% respectively. According to Stacul (20) the sensitivity and specificity of U/S was 46%, 73% respectively. Stacul (20) concluding that the thyroid nodules cannot be accurately characterized using grey-scale US or colour-Doppler US. So to increase the accuracy, it needs radiologist with good experience on the thyroid U/S and high resolution machine and guideline for scoring and grading the U/S features which suggest malignancy in solitary thyroid nodule.

#### **Conclusion:**

Our study showed that U/S and FNAC are important diagnostic tools in the investigation of clinically euthyroid solitary thyroid nodules. If combined they will give optimal results and a chance to do appropriate surgery for benign and malignant thyroid nodules as well as avoiding unnecessary surgery in certain patients without missing malignant cases.

#### **References:**

1. Jennifer B, et al. Current status of fine needle aspiration for thyroid nodules. *Advances in Surgery* 2006 ;40: 223-238.
2. Guido M, et al. Fine-needle aspiration of the thyroid and correlation with histopathology in a contemporary series of 240 patients. *The American Journal of Surgery* 2003; 186: 702-710.
3. Rajiv V, et al. Evaluation and management of incidentally discovered thyroid nodules. *Surgical Oncology* 2006;15: 33-42
4. Carrie C, Lubitz, Thomas J, Fahey. *The Differentiation of Benign and Malignant Thyroid Nodules in Advances in Surgery* 2005, vol 39, Mosby, 355-377.
5. Mazzafemi E L. Management of the solitary thyroid nodule. *N.Engl.J.med.* 1993;328:553-559.
6. Neven M. FNAC of the thyroid. *Acta Clin Croat* 2002; 41:123-131.
7. McCall A, et al. The incidence of thyroid carcinoma in solitary cold nodules and in multinodular goiters. *Surgery* 1986;100(6):1128-32
8. Lumachi F, et al. Accuracy of fine-needle aspiration cytology and frozen-section examination in patients with thyroid cancer. *Biomedicine & Pharmacotherapy* 2004; 58: 56-60
9. Kapur. Solitary thyroid nodule. *Indian Journal of Surgery* 1999; 44: 174-179.
10. Watters A.K., Ahiya AT. Role of USG in the

management of thyroid nodules 1992. *Am. J. Surg* ; 164: 654-657.

11. Zygmunt H. Krukowski (), the thyroid gland and thyroglossal tract, *Bailey & Love's: short practice of surgery*, 2004 23rd edition p785.

12. Marqusee E., Benson C.B., Prates M.C. et al. Usefulness of USG in the management of nodular thyroid diseases 2000. *Ann. Intern. Med*; 133 (9): 696-700.

13. Shaha A R . Controversies in the management of the thyroid nodule. *Laryngoscope* 2000; 110: 183-193.

14. Jones A J , Aitman T J. Comparison of FNAC, RNS & USG in the management of thyroid nodules. *Post Grad. Med. J.* 1990; 66: 914-917.

15. Bouvet Nl .Fieldman J. I. Surgical management of the thyroid: patients selection based on the results

of FNAC. *Laryngoscope* 1992;102:1363-1356.

16. Altavilla G., Pascale M. FNAC of thyroid gland diseases. *Acta Cytologica* 1990;34:251-256.

17. Gulcelik N.E., et al. Risk of malignancy in patients with follicular neoplasm predictive value of clinical and ultrasonographic features. *ARCH OTOLARYNGOL HEAD NECK SURG* 2008; 134 (12):1312 -1315.

18. Kats J.F., Kane R.A. Thyroid nodules :sonographic pathologic correlation. *Radiology* 1984;151: 741-745.

19. Watters A.K., Ahiya A.T. Role of USG in the management of thyroid nodules. *Am.J.Surg* 1992; 164:654-657.

20. F. Stacul, et al . US, colour-Doppler US and fine-needle aspiration biopsy in the diagnosis of thyroid nodules. *Radiol med* 2007; 112:751-762.