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

Safa Mezher AL-Obaidi , Kussay M. Abbas Zwain , Hassan H. Zaini

ABSTRACT:

BACKGROUND:

The incidence of clinically apparent thyroid nodules in the general population is 4.5%.The overall incidence of malignancy in solitary thyroid nodule ranges between 10% to 15%. U/S and FNAC are used to differentiate benign and malignant nodules with high percentage of sensitivity and specifity.

OBJECTIVES:

1. To evaluate the utility of FNAC in the preoperative diagnosis of solitary thyroid nodule.

2. To evaluate efficacy of FNAC and U/S in differentiation between benign and malignant nodule.

METHODS:

130 euthyroid patients with solitary thyroid nodule attending the department of general surgery in the teaching hospital in Najaf province during the period from November 2001 to November 2003.

After clinical assessment all our patient underwent FNAC for their thyroid nodule, and then subjected to the U/S examination.

RESULTS:

Out of these130 patients, the female to male ratio was 7:1, correlation of FNAC with HPE showed a sensitivity of 83.3% and specificity of 100%.

CONCLUSION :

Our study as compared to other studies else where showed that U/S and FNAC are very important diagnostic tools in investigation of clinically euthyroid solitary thyroid nodules. They will give optimal results 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).

INTRODUCTION:

The incidence of clinically apparent thyroid nodules in the general population is approximately 4.5%. The overall incidence of malignancy in solitary thyroid nodule ranges between 10% and 30% depending on the selectivity of surgical indications[1,2].

Few subjects in surgery have generated as much controversy as the management of solitary thyroid nodule, the two major issues being the diagnostic workup and the extent of thyroidectomy. [3] Because of the possibility of malignancy, some clinicians especially those in the surgical subspecialties, recommend that all nodules be removed. On the other hand, endocrinologists recommend that FNAC be performed as the initial step of evaluation in order to avoid unnecessary surgery.

Department of surgery College of Medicine, University of kufa .

[4] Thyroid nodules are about four times more common in women than in man.

The majority (90%) of thyroid nodules are benign as malignancy occurs in only 1 in 10 thyroid nodules. [5] 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. [6] At one extreme, the diagnosis of malignancy may be strongly suspected on clinical grounds and such patients generally require open exploration. On the other hand, one finds many patients in whom the history and clinical findings are not so conclusive. [6] Many investigations are used to differentiate 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. [7] Fine needle aspiration cytology (FNAC) has become established as the investigation of choice in discrete thyroid swellings. FNAC has excellent compliance. It is simple and quick to perform in the out-patient department and is readily repeated.This, technique, developed in Scandinavia about 50 years ago, has become popular in the rest of Europe and North America in the last 20 years.[8] Thyroid conditions that may be diagnosed by FNAC include colloid nodules, thyroiditis, papillary carcinoma, medullay carcinoma, anaplastic carcinoma and lymphoma. FNAC often cannot distinguish between a benign follicular adenoma and follicular carcinoma as this distinction is dependent not on cytology but on histological criteria, which include capsular and vascular invasion. There are very few false positives with respect to malignancy but there is a definite false-negative rate with respect to both benign and malignant neoplasia. [8] Ultrasonography with appropriate, experience, modern ultrasonography equipment can be useful distinguishing cystic from solid mass. [9] Ultrasound guided FNAC of the thyroid is recommended, especially for sampling of a small, deep nodule or solid remnant of a cystic lesion. If FNAC of the thyroid is performed without ultrasound guidance, the entire thyroid should be palpated to determine the size and location of any abnormalities the area should be cleansed with alcohol. [10] Features suggestive of malignancy on U/S are-hypoechoic pattern (almost always), incomplete peripheral halo, irregular margins, internal micro calcification, presence of cervical lymphadenopathy and peripheral degeneration in mixed nodule. [11] Features suggestive of benign diseases on U/S are-halo sign (transonic uniform rim surrounding the mass), variable echogenicity, multinodularity, large cystic lesion, diffusely nodular in homogeneous gland and peripheral calcification. [12]

PATIENTS AND METHODS:

A prospective study was carried out on 130 euthyroid cases with solitary thyroid nodule attending the department of general surgery, in the teaching hospital in Najaf district during the period from November 2001 to November 2003. Then all patients were submitted to FNAC and U/S. The results of FNAC were interpreted as benign, malignant, suspicious malignant and inadequate aspirate. Sonographically the nodules were evaluated for size, location, echo texture, margins, presence of halo, calcification, accessory nodules, associated cervical lymphadenopathy and consistency (solid, cystic or mixed) in order to differentiate between benign and malignant nodules. Then, all the patients were subjected to surgery and HPE of the specimens were obtained. Finally, the histopathology reports were correlated with the findings of FNAC and U/S in order to evaluate their sensitivity and specificity by statistical methods. Sensitivity: represent the ratio of true positive results to all nodules diagnosed as carcinoma. Sensitivity = *TP/ TP+FN x100

*TP: True positive, FN: False negative

Specificity: represent the ratio of true negative results to all nodules diagnosed as non carcinoma. Specificity =*TN/ TN +FP x 100

*TN: True negative, FP: False positive

Accuracy= TP+TN/TP+FP+TN+TP x 100

RESULTS:

In this a prospective study of 130 euthyroid cases with solitary thyroid nodule, all patients submitted to FNAC and U/S then the results was correlated with the findings of (HPE).

Out of these 130 patients 114 (87.7%) were female and 16 (12.3%) were male with ratio of 7:1, the ages of the patients range from 13 years to 60 years. The results of FNAC were shown in table (1).

Table 1: Results of FNAC

Classification of aspirate	Number (%)
Benign	83(64%)
Malignant	13(10%)
Suspicious malignant	26(20%)
Inadequate aspirate	8(6%)
Total	130 (100%)

Then, all patients were subjected to surgery and HPE of the specimens was obtained as shown in table (2).

Table 2: Results of histopathological examination

Histopathological diagnosis	Number (%)
Colloid goiter	88(67.7%)
Papillary carcinoma	21(16.2%)
Follicular adenoma	11(8.5%)
Thyroiditis	8(6.1%)
Follicular carcinoma	2(1.5%)
Total	130 (100%)

The cytological diagnosis of benign nodule were confirmed in 80 (96%) of the 83 patients and were disputed in 3 cases (3.13%) which was shown to be malignant. In 26 cytological suspicious cases, HPE revealed benign lesion in 18 cases and malignant lesion in 8 cases. All 13 malignant interpretations on cytology were confirmed by HPE. All 8 inadequate specimens on cytology were shown to be benign on HPE (table 3).

Table 3: Correlation of FNAC with histopathological diagnosis

Histopathological diagnosis	Fine needle aspiration cytology				Total
	Benign	Suspicious	Malignant	Inadequate aspirate	
Benign	80	19	-	8	107
Malignant	3	7	13	-	23
Total	83	26	13	8	130

The 21 cases (91.3%) of papillary carcinoma of thyroid, FNAC revealed papillary carcinoma in 13 cases with a rate of (62%), suspicious malignant in 5 cases (23.8%) and benign in 3 cases (14.2%). Cytology revealed suspicious malignant lesion for the only 2 cases of follicular carcinoma. (Table 4)

Table 4: Correlation of FNAC with histopathological diagnosis in thyroid carcinoma

Histopathological diagnosis	Number	FNAC diagnosis	Number
Papillary carcinoma	21	Papillary carcinoma	13
		Suspicious malignant	5
		Benign	3
Follicular carcinoma	2	Suspicious malignant	2

Table (5) shows the results of U/S examination of the 130 euthyroid according to the consistency of the nodule into (cystic, solid) in order to differentiate between benign and malignant nodules. On U/S examination, 99 (76.2%) of the 130 solitary thyroid nodules were solid, 20 (15.4%) were mixed and 11 (8.4%) were cystic as, Shown in table (5).

Table 5: The results of U/S examination

U/S echo texture	Number (%)
Solid	99(76.2%)
Mixed	20(15.4%)
Cystic	11(8.4%)

Table (6) showed that 16 (16.2%) out of 99 solid nodules and 8 (40%) of 20 mixed nodules were subsequently found to harbor malignancy, none of the cystic nodules showed malignancy.

Table 6: Correlation of U/S echo texture with malignancy

US echo texture	Number	Histopathological diagnosis		% of malignancy
		Benign	Malignant	
Solid	99	83	16	16.2
Mixed	20	12	8	40
Cystic	11	11	0	0

Taking into consideration the various ultrasonographical features, cases were classified into benign, suspicious and malignant categories (table 7).

Table 7: correlation of U/S with HPE

Histopath ological diagnosis	U/S diagnosis			Total
	Benign	Suspicious	Malignant	
Benign	94	13	-	107
Malignant	5	5	13	23
Total	99	18	13	130

The U/S diagnosis of benign nodules were confirmed in 94 (94.7%) out of 99 cases and was disputed in 5 (5.3%) cases by HPE which turned out to be malignant.

In 18 ultrasonographic suspects, HPE revealed benign lesion in 13 cases and malignant lesion in 5 cases.

All malignant interpretations on U/S were confirmed by HPE (table 7). All cases in this study with solitary thyroid nodules on clinical examination. U/S revealed multiple nodule in 42 (32%) of the 130 cases. Thus U/S is most sensitive diagnostic modality to detect nodularity. (Table 8)

Table 8: Assessment nodularity by clinical examination and U/S examination.

Modality	Nodularity	
	Solitary	Multiple
Clinical examination	130	0
U/S	88	42

It was observed that FNAC is (83.3%) sensitive and (100%) specific in detection of malignancy in solitary thyroid nodules whereas U/S is (71.4%) sensitive and (77.7%) specific in the same regard. (Table 9)

Table 9: Sensitivity , specificity and accuracy of various diagnostic modalities

Diagnostic modality	Sensitivity	Specificity	Accuracy
FNAC	83.3%	100%	91.5%
U/S	71.4%	77.7%	75%

DISCUSSION:

The overall incidence of malignancy in solitary thyroid nodules varies from 10%-30% according to Bouvet N1. Fieldman J. I. (1992). [2]In our study, the overall incidence of malignancy in solitary thyroid nodule was (17.7%). Our study showed that out of 107 cases found to be non-malignant on HPE, 80 were correctly identified negative for malignancy on FNAC.

The overall accuracy was (91.5%) in our study, whereas in various other studies it has varied from 79% to 98%, depending on the experience physician performing FNAC and the experience of the cytologist interpreting the cytology findings Altavilla G., Pascale M. (1990). [1, 2] When FNAC reports of 23 patients with thyroid carcinoma were checked, it was found that 13 out of 23 cases has a correct preoperative diagnosis and 7 cases were reported as suspicious and 3 as benign.

In our study a (62.5%) concordance between the histologic and cytologic diagnosis was found which rose to (87%) on inclusion of the suspect cases as positive cases.

Altavilla and Pascale et al. (1999) [1] reported in their series a (45.83%) concordance between the histologic and cytologic diagnosis which on including the suspect cases as cytologically positive rose to (70%).

The overall sensitivity of FNAC in our study was (83.3%) while the overall specificity was (100%) as all malignancies reported on FNAC were correctly confirmed by final HPE.The sensitivity and specificity of FNAC were (71.43%) and 100% respectively according to Altavilla et al. (1990)[1], (93.5%) and (75%) according to Bauvet et al. (1992)[2].

In these patients U/S gave a diagnosis of thyroiditis on the basis of diffuse echo-pattern with multiple diffuse hypoechoic areas. Thus it is not possible to differentiate between thyroiditis and malignancy.

Katz and Kane et al. (1984) also found that U/S was unable to differentiate between thyroiditis and a malignant lesion.

[13] Halo sign is not characteristic of benign lesion as it was seen in only 8 out of 11 (72%) cases of follicular adenoma and was absent in 3 cases of follicular adenoma.

In our study, we found the sensitivity and specificity of U/S to be 71.4% and 77.7% respectively for differentiation between the benign and malignant nodules.In consistency with our study, Waters et al. (1992) found that the sensitivity and specificity of U/S in suggesting a malignant lesion were 74% and 83% respectively. [7] Walker et al. (1985) have shown that the prevalence of multinodularity in clinically solitary thyroid nodules is between 20% and 40% and it has been observed that for a thyroid nodule to be detected by palpation, it must be at least 1 cm in diameter while U/S detect nodules as small as 3 mm in diameter.

[12] Simeone et al. (1982) stated that the detection of more than 1 lesion with U/S reduces the probability of malignancy to (1-6 %).[14] .

CONCLUSION:

1. In our study the sensitivity and specificity of FNAC were 83.3% and 100% specificity. The sensitivity and specificity of U/S were 71.4% and 77.7% respectively.
2. We recommend that U/S and FNAC should be used in routine investigation of clinically euthyroid solitary thyroid nodules.

They will give optimal and significant diagnostic results, and avoid unnecessary surgery in certain patients without missing any malignancy in others.

REFERENCES:

1. Altavilla G., Pascale M. (1990): FNAC of thyroid gland diseases Acta Cytologica 34; 251-256.
2. Bouvet N1., Fieldman J. I. (1992): Surgical management of the thyroid nodule: patients selection based on the results of FNAC. Laryngoscope 102: 1353-1356.
3. Mazzafemi E.L. (1993): Management of the solitary thyroid nodule N. Engl. J. Med. 328: 553-559.
4. Mazzaferri E.L. de Los Santos E.T., Rofagha-Kayhanis (1988): solitary thyroid nodule-diagnosis and management. Med. Clin. North. Am. 72: 1177-1211.
5. Neven Matesa, M. D. M.S., department of oncology and nuclear medicine, Sestre milosrdnice university hospital, Vinogradska 29, HR-10000 Zagreb, Croatia. FNAC of the thyroid. Acta Clin Croat 2002; 41: 23-131
6. Kapur & solitary thyroid nodule. Indian Journal of Surgery 44 (1999): 174-179.
7. Watters A.K., Ahiya A.T. (1992): Role of USG in the management of thyroid nodules. Am. J. Surg. 164: 654-657.
8. Zygmunt H. Krukowski (2004), the thyroid gland and thyroglossal tract, Bailey & Love's: short practice of surgery, 23rd edition p785.
9. Marquesee E., Benson C.B., Prates M.C. et al. (Nov. 2000) usefulness of USG in the management of nodular thyroid diseases. Ann. Intern. Med. 133 (9): 696-700.
10. Shaha A.R. (2000): Controversies in the management of the thyroid nodule. Larynogoscope 110: 183-193.
11. Jones A.J.. Aitman T.J. (1990): Comparison of FNAC, RNS & USG in the management of thyroid nodules, Post Grad. Med. J. 66: 914-917.
12. Walker J., Findlay D. (1985): A prospective study of thyroid ultrasound scan in the clinically solitary thyroid nodules Br. J. Radiol. 58: 617-619.
13. Katz J.F., Kane R.A. (1984): Thyroid nodules: Sonographic pathologic correlation. Radiology, 151: 741-745.
14. Simeone J.F., Daniels G.H. (1982): High resolution real time USG of the thyroid. Radiology, 145: 431-435.