

THYROID NODULE: EVALUATION WITH ULTRASOUND AND ULTRASOUND GUIDED FINE NEEDLE ASPIRATION CYTOLOGY :A SERIES OF 217 PATIENTS

By

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ABSTRACT

Aim of Work : In the present study we examined the role of both ultrasonography and fine needle aspiration cytology in patients with thyroid nodules.

Patients and Methods : A retrospective study of 217 patients with thyroid nodules who underwent neck ultrasonography and diagnostic fine needle aspiration cytology preoperatively. Preoperative clinical, ultrasonography and cytological diagnoses have been compared with the histological post-operative assessment.

Results : Thyroid US had sensitivity, specificity and accuracy of 89.7%, 89.4% and 89.4% comparable to FNAC results of 96.6%, 95.7% and 99.5%.

In conclusion : In the present study we evaluated 217 patients for whom histopathology results were available and we found that FNAC gives a sensitivity of 96.6% and specificity of 95.7%. However, a combination of US and FNAC, rather than any single modality, will give optimal results and avoid unnecessary surgery in a great number of patients without missing malignancy.

Key words : thyroid nodule, fine needle aspiration cytology, neck US, sensitivity and diagnostic accuracy

INTRODUCTION

Thyroid nodules are common findings and mostly are benign. When a thyroid nodule is discovered, imaging alone is not usually sufficient to characterize the nodule as benign or malignant (1). Malignant thyroid nodules account for 5% of the thyroid nodules (2). Diagnostic test safely select malignant cases would be valuable to avoid unnecessary surgery on benign nodules (3). It is generally accepted that ultrasonographic features such as irregular shape, spiculated or ill-defined margin, marked hypoechogenicity, presence of micro- or macro calcification and shape (taller in height than its width) are ominous signs of malignancy, yet it is not conclusive for malignancy (4).

Fine needle aspiration cytology (FNAC) has shown excellent results for positively diagnosing cancer, however there is controversy about the reported incidence of false-negative results (3). In the present study we examined the role of both ultrasonog-

raphy and FNAC in patients with nodular thyroid disease.

PATIENTS AND METHODS

This study was approved by the ethics committee of our hospital. Informed consent was not required. We retrospectively reviewed 217 patients had undergone thyroid surgery for nodular thyroid diseases in our general surgery department between 2004 and 2007 for whom preoperative US and FNAC were available. Medical history, findings of physical examination, US findings and FNAC results were obtained from medical records of the patients.

Pertinent findings suggesting malignancy in the history include: age (< 30 years and > 60 years), family history of medullary thyroid cancer, rapid rate of growth, prior history of head and neck irradiation and hoarseness of voice. Pertinent findings suggesting malignancy in the physical examination include: vocal cord paralysis, ipsilateral cervical lymphadenopathy and fixation of the nodule to surrounding tissues.

Ultrasound (US) was performed

using a real-time ultrasonographic scanner (Logic 500 Pro Series, General Electric medical systems, Milwaukee, USA) with a 7-12 MHz linear transducer for morphological study and 4.7 MHz for colour-Doppler evaluation according to a standard procedure. The patients were placed in supine position with the head extended over a pillow.

Sonographically patients were divided into benign and possibly malignant. The following criteria suggest malignancy: presence of microcalcification, solid nature, irregular or blurred margins and intranodular hypervascularity (5).

FNAC was performed as an outpatient procedure without local anesthetic using a 19 gauge needle on a 10 ml disposable syringe. At least two smears were made and stained using the Papanicolaou and May-Grunwald-Giemsa techniques from suspicious nodule/s either US guided or free hand by the surgeons. If the aspirate was fluid smears were made before and after centrifugation. None of these patients developed any type of complications during the procedures.

The aspirates were classified into three categories:

1. *Non-neoplastic* : aspirates were specimens of low or moderate cellularity in a follicular pattern of whole follicles or monolayered sheets, with follicles of varying size, uniform cell nuclei, and a large amount of colloid and with or without features of degeneration or inflammation.
2. *Possibly neoplastic* : aspirates were specimens with increased cellularity in a predominantly microfollicular or trabecular pattern with some loss of cell cohesion and variation in nuclear size, accompanied by little or no colloid.
3. *Malignant* : aspirates were specimens containing either differentiated cells with features characteristic of specific malignant tumors or undifferentiated cells with unequivocally malignant nuclei.

Fluid aspirate with macrophages and scanty normal epithelial cells was classified as non-neoplastic rather than inadequate. We consider non-neoplastic smear as benign and we

consider malignant and possibly malignant as malignant.

The pathologic examination of thyroidectomy Specimens were fixed in buffered formalin embedded in paraffin and stained with haematoxylin and eosin for histological study. The final histological diagnosis on surgical specimens (according to WHO classification) was recorded and classified as benign and malignant. Clinical findings, US and FNAC results were compared to the results of the final histological findings of the excised specimen.

Statistical analysis :

Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC relative to final histological diagnosis were analyzed by SPSS software.

RESULTS

Our study included 217 patients (included 30 males and 187 females; mean age was 39.7 ± 14 years; age range 12: 76 years). In 75 (34.6%) patients the nodules were diagnosed clinically as malignant or suspicious

of malignancy and 142 patients (65.4%) as benign nodules. Clinical diagnosis was sensitive in 86.2%, specific in 73.4%, and accurate in 75.1%. False negative rate was 13.8% and false positive rate was high (66.7%) which means that 23% of the patients were diagnosed falsely as malignant lesion.

US results were recorded to be strongly benign in 171(78.8%) patients and possibly malignant in 46 patients (21.2%). US findings and histopathological findings were compared in (table 1). FNAC results were reported to be benign in 181 patients (83.4%), suspicious to be malignant in 8 cases (3.7%), malignant in 28 patients (13%). FNAC findings and histopathological findings were compared in (Table2). The entire patient diagnosed by FNAC as malignant proved post-operatively to be malignant. Four out of 8 diagnosed to be suspicious of malignancy proved to be malignant. Histopathological reports of the excised specimens revealed 188 (86.6%) patients with benign nodules and 29 patients (13.4%) as malignant nodules (Table 3).

Table 1: sensitivity, Specificity, predictive value and accuracy of US for thyroid pathology

US diagnosis	Histopathology	S	Sp	PPV	NPV	DA
Benign 171(78.8%)	Benign 168(77.4%)	89.7 %	89.4 %	43.5 %	98.2 %	89.4 %
	Malignant 3(1.3%)					
Possibly Malignant 46(21.2%)	Benign 20 (9.2%)					
	Malignant 26(12%)					

S = sensitivity; Sp = specificity; PPV = positive predictive value; NPV = negative predictive value; DA = diagnostic accuracy.

Table 2: sensitivity, Specificity, predictive value and accuracy of FNAC for thyroid pathology

FNAC	Histopathology	S	Sp	PPV	NPV	DA
Benign 181(83.4%)	Benign 180(83%)	96.6%	95.7%	77.8%	99.4%	95.9%
	Malignant 1(0.5%)					
Malignant 36(16.6%)	Benign 8 (3.7%)					
	Malignant 28(13%)					

S = sensitivity; Sp = specificity; PPV = positive predictive value; NPV = negative predictive value; DA = diagnostic accuracy.

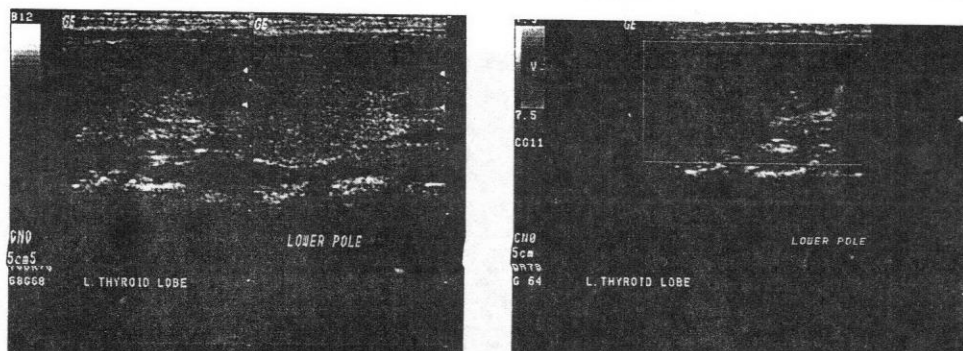


Figure 2: B-mode

A) a well-defined hypoechoic partially solid partially cystic nodule.

B) Colour Doppler showed no intra-nodular colour flow.

Proved to be benign by FNAC & post-operative pathology.

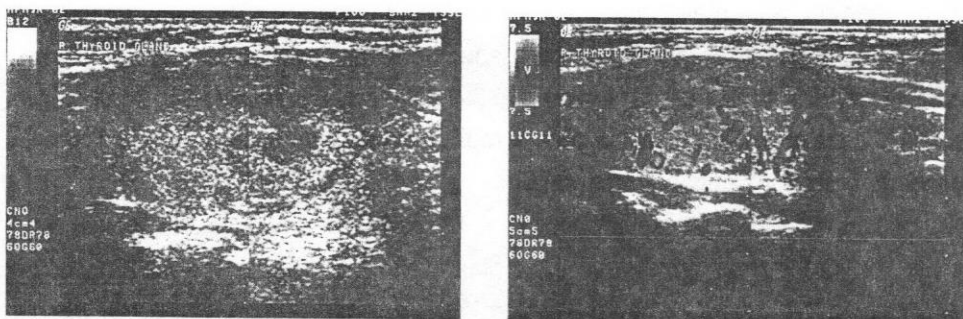


Figure 3: B-mode

A) an ill-defined nodule of mixed (hypo & hyperechogenic) echogenicity.

B) Colour Doppler showed peri & intra-nodular colour flow signals. Proved to be papillary carcinoma by FNAC & post-operative pathology.

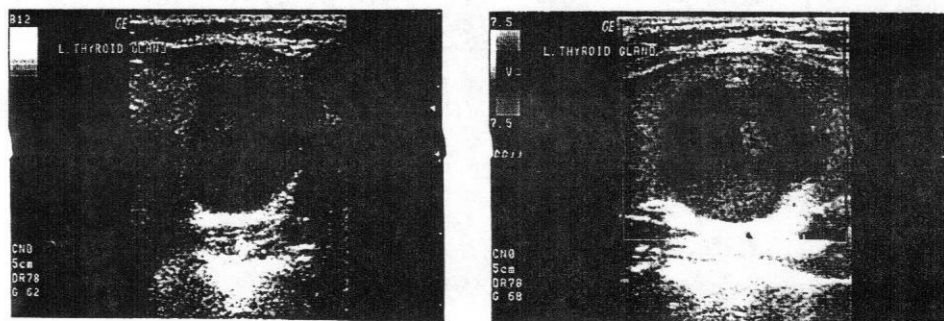


Figure 4: B-mode

A) a well-defined hypoechoic mainly cystic nodule.

B) Colour Doppler showed no intra-nodular colour flow. Proved to be benign by FNAC & post-operative pathology.

DISCUSSION

In the absence of reliable clinical or sonographic signs to differentiate between benign and malignant thyroid nodules, FNAC has assumed a prominent role in the management of palpable thyroid nodules. The procedure is simple, save and can easily be performed as an outpatient procedure (5). The current guidelines have broadened the use of neck US in the routine evaluation of thyroid nodules and became clear in the recent guidelines published by the Society of Radiologists in Ultrasound (SRU) (6), the American Thyroid Association (7).

History and physical findings are always contradictory in differentiating malignant lesions, yet in our study clinical classification had sensitivity, specificity and accuracy of 86.2%, 73.4% and 75.1% comparable to histopathological findings.

US is a non-invasive inexpensive diagnostic tool, plays an important role in thyroid nodules. It has an acceptable sensitivity and specificity and could be an invaluable adjunct in pre- and postoperative settings to reduce the patients discomfort due to misdiagnosis. We found the sensitivity

ty and specificity of US to be 89.7% and 89.4% respectively with an overall diagnostic accuracy of 89.4% for differentiating between the benign and malignant nodules. In consistency with our study (but a little bet lower), Watters & Ahiya, (8) found that the sensitivity and specificity of US in suggesting a malignant lesion were 74% and 83% respectively. They interpreted and emphasized that the US has added advantage of allowing the whole gland to be examined rather than the dominant nodule but was limited by the fact that no features were pathognomonic for malignancy so that it should be regarded as a complementary rather than an alternative investigation to FNAC in the management of solitary thyroid nodules. Jones et al. (9) found the sensitivity and specificity of US to be 75% and 61% respectively while Fukunari (10) found diagnostic accuracy of 81.0%, a sensitivity of 88.9% and a specificity of 74.2 %.US can deliver a diagnostic accuracy over than 90% in thyroid carcinoma, especially papillary carcinoma. However, in the case of follicular carcinoma, neither conventional B-mode US nor FNAC can deliver satisfactory results (11).

The sensitivity of FNAC for the detection of thyroid malignancy has been reported between 80% and 93.5%., Reported specificity has been between 56% and 94%, with overall diagnostic accuracy between 79.6% and 92%.(12-18) Determinations of sensitivity and diagnostic accuracy are affected by how the author of a given study chooses to define and classify suspicious FNAC results. The inclusion of suspicious FNAC diagnoses with clearly malignant FNA cases tends to increase the sensitivity of FNAC for detecting thyroid cancer, while decreasing the specificity and overall accuracy of the test (15,16) In the present study, sensitivity, specificity, and accuracy were 96.6%, 95.7%and 99.5% respectively that is a little bet higher than the reported results.

SUMMARY AND CONCLUSION

In the present study we evaluated 217 patients for whom histopathology results were available and we found that FNAC gives a sensitivity of 96.6% and specificity of 95.7%. However, a combination of US and FNAC, rather than any single modality, will give optimal results and avoid

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