



THE ROLE OF FNAC AND ULTRASONOGRAPHY IN DIAGNOSIS OF BENIGN AND MALIGNANT THYROID LESIONS AND THE CHOICE OF OPERATIVE MODALITY- A RETROSPECTIVE CLINICAL STUDY

General Surgery

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ABSTRACT

INTRODUCTION: Ultrasound commonly used to evaluate lumps or nodules found during a routine physical or other imaging exam. Fine Needle Aspiration Cytology (FNAC) is also a commonly used method. Hence this study was conducted for the evaluation of thyroid lesion using ultrasound and fine needle aspiration cytology and their correlation with final histopathological report.

METHODS AND STUDY: A study of 15 cases of suspected thyroid lesions who underwent thyroidectomy (Hemi/Total) in tertiary care centre under general surgery and otolaryngology department was carried out.

CONCLUSION: FNAC is a reliable modality for Bethesda 2 and 6 categories but it is not reliable for Bethesda 3 and 4 categories in predicting the final histopathological outcomes for the lesions. However, it is a more reliable modality than USG in predicting the final histopathological outcomes for the lesions. USG, CT Scan, FNAC and other available modalities should be used synchronously and judiciously in the pre-operative period and for the follow up of the patient after surgery as and when required so as to gain maximum benefit and predict the type of disease as benign or malignant in the pre operative period. USG guided FNAC is a more reliable investigation than either USG or FNAC alone.

KEYWORDS

Thyroid lesions, USG guided FNAC, ultrasonography, biopsy

INTRODUCTION:

The challenge in managing thyroid nodules is to diagnose whether the mass is benign or malignant. Diagnosis of malignancy pre-operatively changes the course of operative methods and provides better and favorable outcomes.

The evaluation of any person suspected of having thyroid disease includes a clinical history, physical examination and a number of laboratory investigations.

Ultrasound (US) examination of the neck is a regularly performed investigation and thyroid lesions are among highly prevalent finding. Imaging features that confer a high positive predictive value and specificity for malignancy are valuable as they enable suspicious lesions to be identified and targeted for pathological analysis (typically fine-needle aspiration cytology, FNAC).

Fine Needle Aspiration Cytology (FNAC) is an easy, rapid and low cost method used for sampling superficial masses like those found in the neck and is generally carried out in the outpatient clinic set up. The trauma caused to the patient is less and carries minimal risk of complications. However it is an invasive procedure and fails to diagnose capsular and vascular invasion.

METHODS AND STUDY:

A study of 15 cases of thyroid lesions who underwent thyroidectomy (Hemi/Total) in tertiary care centre under general surgery and otolaryngology department was carried out. All 15 patients were subjected to an ultrasound examination of thyroid gland. USG guided Fine needle aspiration of the thyroid nodule was performed in all patients. Complete clinical history along with demographic data and pre-operative investigations including FNAC and USG findings along with surgical details and post surgery biopsy findings of recruited subjects were obtained. Relevant comparisons between FNAC and Ultrasonography with post operative biopsy findings were noted. Typical complain at presentation was of swelling in the neck.

RESULTS:

[Table 1: Sonographic features considered for predictability of thyroid lesion]

Echogenicity on USG	No of cases	Biopsy- benign	Biopsy- malignant
Mixed	12	8	4

Hypoechoic	1	0	1
Hyperechoic	1	1	0
Anechoic	1	1	0
Composition on USG			
Cystic	8	7	1
Solid	7	3	4
Shape of lesion on USG			
Taller than wider	12	7	5
Wider than taller	3	3	0
Margins on USG			
Smooth	5	4	1
Ill defined	10	6	4
Lobulated or irregular	0	0	0
Extra-thyroid always extension	0	0	0
Echogenic foci on USG			
None or comet tail artefacts	15	11	4
Macrocalcifications	0	0	0
Peripheral calcifications	0	0	0
Punctate echogenic foci	0	0	0

80% of the nodules had mixed echogenicity as seen on USG with predominantly cystic consistency and component. Most of them were proven to be benign on post-operative histopathological examination.

Taller than wider shape on USG is an indicator of malignancy. In this study, 80% cases on USG showed taller than wider characteristics, out of which 41.6% cases turned out to be biopsy proven malignancies.

Smooth or ill defined margins in USG are considered as benign findings according to ACR TI-RADS score. 33.33% cases had smooth margins and 66.66% cases had ill defined margins. 20% cases with smooth margins on USG turned out to be biopsy proven malignancies and 40% cases with ill defined margins on USG turned out to be biopsy proven malignancies.

Comet tail artifacts (microcalcifications) are suggestive of benign thyroid pathology, when encountered on USG. In this study, 26.66% cases with micro-calcifications on USG turned out to be biopsy proven malignancies.

[Table 2: FNAC grading vs biopsy results]

FNAC grading	No of cases	Biopsy-benign	Biopsy-malignant
Non-diagnostic	0	0	0
Benign	9	9	0
AUS/FLUS	2	0	2
Suspicious for follicular neoplasm	2	1	1
Suspicious for malignancy	0	0	0
Malignant	2	0	2

Grading of FNAC report was done based on Bethesda classification on which 9 patients had benign disease, 2 patients had atypical/follicular neoplasm of unknown significance, 2 patients had high suspicion for follicular neoplasm and 2 patients had malignancy proven with FNAC.

Hemithyroidectomy/Total thyroidectomy006311020002

[Table: 3 Surgical intervention done depending on Bethesda classification]

FNAC grading	Hemithyroidectomy	Total thyroidectomy
Non-diagnostic	0	0
Benign	6	3
AUS/FLUS	1	1
Suspicious for follicular neoplasm	0	2
Suspicious for malignancy	0	0
Malignant	0	2

For patients having Bethesda>4, total thyroidectomy was performed. For patients having Bethesda=3, 50% underwent total thyroidectomy. For patients having Bethesda=2, 66.66% underwent hemithyroidectomy and 33.33% underwent total thyroidectomy. The choice of surgery was also based on whether the patients had unilateral lobe thyroid disease or diffuse involvement of the gland.

[Table 4: Comparison of results of biopsy and USG guided FNAC]

Biopsy	FNAC malignant(S5,6)	FNAC benign(S2,3,4)
Malignant	2	3
Benign	0	10

For FNAC suggestive of Bethesda stage 2,3 and 4, lesions are considered as benign lesions.

For FNAC suggestive of Bethesda stage 6, lesions are considered as malignant.

As per the above table, PPV for FNAC showing malignant lesion is 100% and NPV for FNAC showing benign lesion is 84.61%.

So, for FNAC showing a malignant lesion, there are 100% chances of biopsy showing malignant result. For FNAC showing a benign lesion, there are 84.61% chances of biopsy showing benign result. For Bethesda stage 2 and 6 on FNAC, predictive value for a corresponding biopsy finding is 100%, whereas for Bethesda stage 3 and 4, the reliability of FNAC in terms of predicting nature of thyroid lesion is low.

Sensitivity of USG guided FNAC is 40% and specificity is 100%.

[Table 5: Predictive value of USG for malignant lesions]

Biopsy	USG- MALIGNANT (TR- 3,4,5)	USG- BENIGN (TR- 1,2)
MALIGNANT	5	0
BENIGN	7	3

As per the above table, PPV for USG showing malignant lesion is 41.66% and NPV for USG showing benign lesion is 100%.

So, for USG showing a malignant lesion, there are 41.66% chances of biopsy showing malignant result.

For USG showing a benign lesion, there are 100% chances of biopsy showing benign result.

Sensitivity of USG is 100% whereas specificity is 30%.

The above data is obtained according to the TI-RADS grading with TR1 and TR2 score to be considered to be benign and TR3, TR4 and TR5 score to be considered to be malignant.

DISCUSSION:

Ultrasound imaging is central to the evaluation of most thyroid nodules.

Ultrasound is viewed by many physicians as an extension of the physical examination and is commonly used to assist in FNA.

Advantages of ultrasound over other imaging modalities include portability, cost-effectiveness and lack of ionizing radiation. It is extremely useful in patients who are being managed conservatively because it can reproducibly determine whether a nodule has increased in size or has suspicious characteristics.

Ultrasound findings within a nodule that are considered suspicious for malignancy include microcalcifications, hypervascularity, infiltrative margins being hypoechoic compared with surrounding parenchyma and having a shape that is taller than its width on transverse view.

The decision to perform FNA for a thyroid nodule is made based on a combination of patient factors, ultrasound characteristics and size. In general, nodules that are less than 1 cm in greatest dimension are not evaluated further.

FNA is performed with a small-gauge needle (23 to 27 gauge) and may be performed with capillary or suction technique. Use of small-gauge needles has resulted in a marked decrease in the complication rate while maintaining diagnostic accuracy.

For palpable nodules, FNA biopsy may be performed without image guidance. However, ultrasound guidance may be used for FNA biopsy of palpable lesions, especially for heterogeneous lesions. Ultrasound guidance is recommended for nonpalpable, posteriorly located, or cystic nodules and results in a lower rate of nondiagnostic cytology and sampling error.

FNA permits an analysis of cellular features and does not permit an analysis of tissue architecture. A fine needle by definition is sampling only a small portion of a lesion. Tissue immediately adjacent to or contained within another part of the nodule may harbor malignant cells. The false-negative rate of FNA has been reported to be 1% to 6%. Purely cystic lesions do not require FNA biopsy, but a needle may be used to aspirate the cystic fluid to relieve mass effect.

The three basic indications for resection of thyroid pathology must be considered in every patient. The presence of local compressive or inflammatory symptoms is largely determined by history. The presence of hyperfunction is screened by measuring serum TSH.

If the patient has hyperthyroidism, a RAI uptake scan is used to guide further diagnosis and management. The evaluation for malignancy is based on clinical, ultrasound and FNA findings.

For a patient with a thyroid goiter and local compressive symptoms, it is appropriate to offer resection if the patient is a suitable surgical candidate. Compressive symptoms include dyspnea, wheezing, cough, dysphagia, or a pressure sensation that may be worse in the supine position.

For patients with a unilateral compressive mass and a benign biopsy, hemithyroidectomy and total thyroidectomy are appropriate options.

For patients with bilateral goiter or nodules, total thyroidectomy usually is recommended.

Patients with Hashimoto thyroiditis may report compressive symptoms disproportionately to the size of the thyroid.

Most of these patients experience relief of symptoms after thyroidectomy. However, whenever operating for symptoms of compression or inflammation, the patient must be informed that some or all of his or her symptoms may not be relieved by thyroidectomy.

Previous clinical guidelines recommended total thyroidectomy for nearly all DTCs 1 cm or larger size. As per latest recommendations,

DTCs less than 1 cm in diameter are defined as micro-carcinomas. Surgery is not clearly required for these lesions if there are no clinically involved cervical lymph nodes, no extra-thyroidal extension, and no history of head and neck irradiation. Similarly, if a DTC less than 1 cm is diagnosed after hemithyroidectomy, completion thyroidectomy is not required if there are no clinically involved cervical lymph nodes, no extra-thyroidal extension, and no history of head and neck irradiation. RAI should not be given to patients with low-risk DTCs that are less than 1 cm without any direct extra-thyroidal extension or metastases. For DTCs that are 1 cm or larger, a total thyroidectomy is indicated in situations in which RAI therapy is planned. These situations include DTCs greater than 4 cm in size, DTCs with extra-thyroidal extension, and DTCs with regional or distant metastases. Other factors that may make total thyroidectomy an appropriate consideration are patient and physician preference, age older than 45 years, contralateral nodules, prior irradiation, and familial DTC.⁵ If none of the above mentioned factors are concerns, hemithyroidectomy may be adequate surgical therapy for DTCs that are 1 to 4 cm after discussion with the patient and the physician who will be following the patient long-term. At the present time, many physicians still prefer to offer RAI for many of these cancers, and many of these patients receive total thyroidectomy. In the setting of clinically negative central compartment nodes, a prophylactic dissection is more clearly indicated in higher risk situations, such as tumors that are larger than 4 cm, tumors with gross extra-thyroidal extension, and tumors with lateral neck nodal disease.

Incidence of complications following different types of thyroid surgeries

Patients undergoing total thyroidectomy have a postoperative hypocalcemia incidence of 9.0%, compared with 1.9% following hemithyroidectomy, 14.4% following thyroidectomy plus unilateral neck dissection, 23.4% following thyroidectomy plus bilateral neck dissection. [4]

Transient unilateral vocal cord problems occur in 3.2% cases and in 0.3% cases, it become permanent (post hemi-thyroidectomy). Bilateral vocal cord problems occurred in 0.58% but rarely become permanent. There are significant increases in the incidence of recurrent laryngeal nerve injury in secondary operation (21.7% in secondary vs. 2.8% in primary) , total/near total thyroidectomy (7.2% in total vs. 1.9% in subtotal), non-identification of RLN during surgery (7.6% in non-identification vs. 2.6% in identification) and in malignant disease (12.8% in malignant vs. 2.9% in benign). However, there is no significant difference in the incidence of recurrent laryngeal nerve injury with regards to gender (4.1% in male vs 3.8% in female). [5]

CONCLUSION:

USG is a useful initial non invasive diagnostic modality in evaluation of thyroid lesions. However, it is not reliable in predicting the final histopathological outcomes for the lesions. USG is a subjective technique of evaluation and results depend on the operator.

FNAC is invasive diagnostic modality in evaluation of thyroid lesions. FNAC is a reliable modality for Bethesda 2 and 6 categories but it is not reliable for Bethesda 3 and 4 categories in predicting the final histopathological outcomes for the lesions. However, it is a more reliable modality than USG in predicting the final histopathological outcomes for the lesions.

A larger study with more sample size can be done in future and our study can be used in a meta-analysis to further establish the role of USG and FNAC in diagnosis and management of thyroid diseases.

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