

Original Research Article

Ultrasonographic and fine needle aspiration cytology correlation of thyroid gland lesions: a study of 100 cases

Nehal R. Patel*, Alpesh V. Patel, Vaibhav V. Patel, Payal R. Vadher, Manali B. Kakadia

Department of ENT, Smt. Shardaben General Hospital, Ahmedabad, Gujarat, India

Received: 14 December 2018

Revised: 11 January 2019

Accepted: 12 January 2019

*Correspondence:

Dr. Nehal R. Patel,

E-mail: daalmakhani@gmail.com

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ABSTRACT

Background: Thyroid gland is unique among endocrine organs as it is the largest endocrine gland in the body and the first to develop in the fetal life. There is approximately 4-5% incidence of clinically apparent thyroid lesions in general population. The goal of USG and FNAC diagnosis work up now is to select those patients for surgery who have a high likelihood of harboring malignancy in the nodule. Ultrasonography is the single most valuable imaging modality in the evaluation of the thyroid gland. Indications for thyroid USG include evaluation for palpable thyroid lesion or suspected thyroid enlargement and workup of thyroid lesions discovered incidentally. The present study is undertaken to evaluate the utility of FNAC in preoperative diagnosis of various thyroid lesions and to evaluate the efficacy of in USG and FNAC differentiating between benign and malignant lesions.

Methods: A retrospective clinical study, 100patients, in the age group of equal to or above 18 years, with thyroid swellings, referred to the department of ENT, sent for USG and FNAC at radiology and pathology department during the period from July 2014 to July 2016.

Results: Out of 100 cases, 6% were malignant, 94% were benign on grey scale ultrasound. Out of 6 malignant cases 2 cases were confirmed malignant by FNAC.

Conclusions: High resolution grey scale ultrasound has emerged as initial imaging modality of choice for the evaluation of patients with thyroid enlargement. Ultrasound can detect solitary nodule, multiple nodules and diffuse thyroid enlargement. It can also differentiate solid and cystic lesions.

Keywords: FNAC, Ultrasonography, Thyroid swelling

INTRODUCTION

Thyroid gland is unique among endocrine organs as it is the largest endocrine gland in the body and the first to develop in the fetal life amenable to direct physical examination because of its superficial location it allows excellent visualization and evaluation of normal anatomy and pathologic condition by high resolution real-time grey scale sonography. There is approximately 4-5% incidence of clinically apparent thyroid lesions in general population.¹ Thyroid nodules are about four times more common in females than in males. The majority (90%) of

thyroid lesions are benign as malignancy occurs only 1 in 10 thyroid nodules.² The overall incidence of malignancy in solitary thyroid nodule ranges between 10% and 30%.^{1,3} The goal of USG and FNAC diagnosis work up now is to select those patients for surgery who have a high likelihood of harboring malignancy in the nodule.⁴ USG and FNAC are commonly used but there are drawbacks of each technique and the final answer to the problem is still elusive.⁵

Ultrasonography is the single most valuable imaging modality in the evaluation of the thyroid gland.

Indications for thyroid USG include evaluation for palpable thyroid lesion or suspected thyroid enlargement and workup of thyroid lesions discovered incidentally.⁶ In patients with thyroid swellings, gray scale and color Doppler USG are used to evaluate its sonographic features, including size, shape, echogenicity (hypoechoic or hyperechoic), and composition (cystic, solid, hard or soft) and to determine the presence of coarse or fine calcification, a halo and margins, and internal blood flow.⁷ USG report as suggestive of malignancy if the nodule was solid or of mixed solid–cystic variety and a hypoechoic and non-haloed lesion.

FNAC provides the most direct and specific information and specific information about thyroid lesions. The use of FNAC reduces the number of thyroidectomies by approximately 50%, roughly doubles the surgical yield of carcinoma and reduces the overall cost of medical care in these patients by 25%.^{8,9}

The present study is undertaken to evaluate the utility of FNAC in preoperative diagnosis of various thyroid lesions and to evaluate the efficacy of in USG and FNAC differentiating between benign and malignant lesions.

Aims and objectives

- To correlate the high resolution ultrasonography findings with the fine needle aspiration cytology report.
- To confirm the USG and FNAC both the modalities are required before preparing the patient for thyroid surgery.
- To determine sensitivity of high resolution ultrasonography and fine needle aspiration cytology using the histopathology report as reference standard.

METHODS

Type of study

Study was a retrospective study.

Selection criteria

Inclusion criteria

Inclusion criteria were all adult male and female patients with clinically palpable thyroid swellings in lower midline neck or on either side; signs and symptoms suggestive of thyroid disorder (hypo/hyperthyroidism).

Exclusion criteria

Exclusion criteria were all patients who have not given consent for fine needle aspiration cytology; all patients with bleeding diathesis; patient already diagnosed and treated for thyroid lesion; FNAC showing inadequate aspirated material.

Method of collection of data

100 patients, in the age group of equal to or above 18 years, with thyroid swellings referred to the department of ENT, Smt. Shardaben General Hospital, Smt. NHL Medical College, Ahmedabad during the period from July-2014, to July-2016 sent for USG and FNAC at radiology and pathology department respectively.

A structured pre-prepared case proforma was used to enter the patient details, clinical history, physical examination and investigations including thyroid function tests of patients who have met the inclusion and exclusion criteria. The ultrasound examination of the thyroid gland was performed in gray scale and color Doppler modes using a high resolution, 7.5–12 MHz, linear array transducer of TOSHIBA TA 311 Ultrasound machine. This was followed by fine needle aspiration cytology of the thyroid swelling after taking informed consent and after performing a coagulation profile. The high resolution ultrasound findings were correlated with the fine needle aspiration cytology report. In cases where surgery was done, USG and FNAC results were followed up with histopathology report.

Equipment

The ultrasound examination of the thyroid gland was performed using real time 2D gray scale and color Doppler modes using a high resolution, 7.5–12 MHz, linear array transducer of TOSHIBA TA 311 Ultrasound machine.

Examination technique

Both lobes of the thyroid gland including the isthmus were evaluated by TOSHIBA TA 311 machine unit using a 7.5 to 12 MHz linear transducer. With the patient supine and neck hyperextended, the entire gland was examined. Hyperextension of the neck was obtained by placing a pad under the shoulders. The superficial location of the thyroid permits sonographic demonstration of any subtle anatomical changes.

The neck was scanned in sagittal, transverse, and oblique sections to optimally visualize both lobes of thyroid, isthmus, carotid arteries, as well as internal jugular veins. Imaging of the lower poles of thyroid was improved by making the patient swallow. This tended to raise the thyroid gland in the neck.

The region of the carotid arteries and jugular veins laterally and supraclavicular fossa were also examined for any lymphadenopathy.

Scanning technique

Neck palpation: Before beginning the ultrasound scan, patient's neck was palpated to find the size and location

of nodule and tenderness if any. The patient was asked to swallow as the thyroid was palpated.

Scan image size: The image of the thyroid gland was enlarged to fill the entire viewing monitor which included carotids and jugulars in the field.

Transverse scan direction: Beginning transversely in the midpoint of the neck until thyroid tissue was identified. If the size of the thyroid mass was large and if it was not possible to image right and left lobes simultaneously, then two lobes were examined separately and later the texture compared bilaterally.

Longitudinal scan direction: After imaging the carotid artery longitudinally, the probe was slid medially to view the thyroid gland. If needed the transducer was angulated 10–20 degrees medially. This technique was very useful to determine if the mass was within the thyroid gland or extra thyroidal. Most extra thyroidal masses displaced the carotid artery and internal jugular vein medially.

FNAC technique

Before the ultrasound guided FNAC, the neck was hyperextended and the skin was cleansed with povidone – iodine (Betadine) solution. The needle was inserted through the skin of thyroid region in front of the neck at an oblique.

The needle used for thyroid FNAC was standard 1½” 25 gauge, non cutting bevelled edge needle. The needle was attached to a 10ml syringe. After introducing the needle, the needle was moved gently but rapidly through the nodule center under US guidance. Then gentle suction was done by putting the piston of the syringe. If the specimen contained much blood, a non-aspiration technique was used. In this, 25 gauge needle was inserted under ultrasound guidance into the thyroid gland and no suction was applied and this needle was moved in back and forth excursions. Due to capillary action the fluid of cells from the nodule moved into the needle. Such fluid specimen was often less bloody.

Two drops of the aspirate/fluid in the syringe were ejected over a clean slide and with the help of the other blank slide with 60° angle; the aspirate on the first slide was spread on it to form a film of coating on it. The slide making procedure was repeated once more and after smearing the second slide, these slides were put in a jar containing absolute alcohol for fixation. These two slides in alcohol along with container were sent to Pathology department for cytopathological study.

Statistical tool used to analyse data

In our study, out of 100 patients we had histopathological data of 53 patients.

Considering histopatho data as standard, comparing the results of USG and FNAC with the same, we found that Sensitivity of USG was 90.56% whereas that of FNAC was 96.47%.

On performing chi-square test for comparing the findings of USG and FNAC, it was found that two tailed chi-square value was 19.953^a which proved that results were significantly different from one other (p<0.001).

Based on the sensitivity and chi-square value obtained in our study, we can say that USG findings (sensitivity = 90.56%) were more significant as compared to FNAC findings (sensitivity=96.47%) for diagnosis of thyroid swellings.

RESULTS

Out of 100 patients studied, there were 10 males (10%) and 90 females (90%) with male to female ratio is 1:9. So, according to this study, thyroid lesions are commoner in females. The possible reason for this is due to the presence of estrogen receptors in thyroid gland in females.

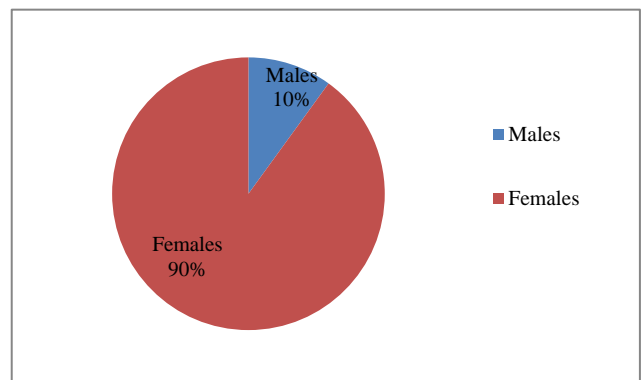


Figure 1: Distribution of cases according to sex.

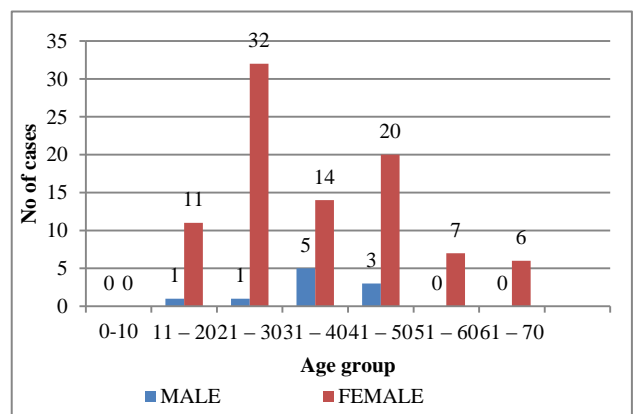


Figure 2: Distribution of cases according to various age groups.

In our study, the youngest patient was 17 years old and the eldest patient was 66 years. The average age of

patients with thyroid lesions according to our study was 36.27 years. So, the thyroid lesions are commoner in females in their active reproductive age group and are uncommon in post menopausal age group.

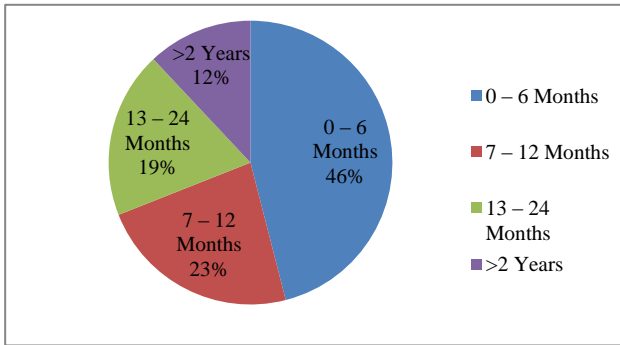


Figure 3: Classification of cases according to duration of swelling.

In this study, 46 (46%) of the 100 cases presented with their clinical complaints dating under 6 months. There were 19 cases presenting with complaints lasting since 2 years of which 2 cases were malignancies (papillary carcinoma). So, most of the patients presented within 6 months either due to cold/heat intolerance or easy fatigability or even cosmetic disfigurement in few cases.

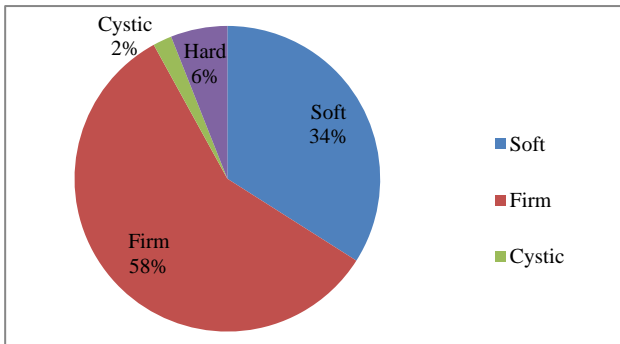


Figure 4: Distribution of cases according to consistency of thyroid swelling.

The majority 58 (58%) of the cases in this study were firm in consistency while 34 cases are soft in consistency of which most of the cases are of colloid goitre. 2 cases are of cystic consistency of which 2 cases are of colloid with cystic changes. Rest of them are hard in consistency of which 2 cases are of malignancy and 4 cases are of suspicious malignancy.

Table 1: Classification of cases according to site of lesion.

Lesion	Number of cases	Percentage (%)
Left lobe	32	32
Right lobe	46	46
Both lobes	22	22
Total	100	100.00

In 46 (46%) cases thyroid lesion is on the right side and 32 (32%) cases thyroid lesion is on the left side. 22 (22%) case involves both the lobes of gland. So in our study most common right side of lobe is involved.

In our study out of 100 cases 36 (36%) cases found to be colloid goitre, hypoechogenicity in 35 (35%) cases and isoechoogenicity in 1 cases. 26 (26%) cases were nodular goitre, 7 (7%) cases were hypoechoic and 19 (19%) cases were isoechoic. 20 (20%) cases were adenomas of which 12 cases showed hypoechogenicity and 8 (8%) cases were hyperechoic. These 8 cases of adenoma with hyperechoic were confirmed benign. 2 cases of hypoechoic nodule found malignancy and 4 cases of hypoechoic adenoma found suspicious malignancy. Out of 12 cases of thyroiditis 2 were hypoechoic and 10 were heterogenous. So it suggests that hypoechogenicity seen in malignant lesions.

Out of these 100 cases 20 (20%) cases were of adenoma, 36 (36%) were colloid goitre, 26 (26%) were nodular goitre, 12 (12%) were thyroiditis, 2 (2%) were malignancy, 4 (4%) case were suspicious malignancy. So in my study most common thyroid lesions are of adenomatous (Table 3).

Table 2: Classification of cases according to echotexture of thyroid nodule.

Echotexture	Diagnosis	Number of cases	%
Hypoechoic	Colloid goitre	35	62
	Nodular goitre	9	
	Adenoma	16	
	Thyroiditis	2	
Isoechoic	Colloid goitre	1	20
	Nodular goitre	19	
Hyperechoic	Adenoma	8	8
Heterogenous	Thyroiditis	10	10
Total		100	100

Table 3: Distribution of cases according to ultrasound diagnosis.

Ultrasound diagnosis		Number of cases	%	
Benign	Non-inflammatory	Adenomatous nodule	20	20
		Multinodular goitre	26	26
		Colloid goitre	36	36
	Inflammatory	Thyroiditis	12	12
Suspicious malignancy		4	4	
Malignancy/carcinoma		2	2	
Total		100	100	

Table 4: Distribution of cases according to FNAC diagnosis.

FNAC diagnosis		Number of cases	%	
Benign	Non-inflammatory	Adenoma	11	11
		Multinodular goitre	24	24
		Colloid goitre	36	36
	Inflammatory	Thyroiditis	12	12
Malignant		Papillary carcinoma	2	2
		Follicular neoplasm	15	15
Total		100	100	

Table 5: Correlation of USG and FNAC diagnosis.

Diagnosis	USG	FNAC		
		Inflammatory	Benign	Malignant
Benign	Inflammatory	12	0	0
	Non-inflammatory	82	82	00
Suspicious malignancy	4	0	4	00
Malignancy	2	0	00	2

In present study there were 11 cases were of adenoma, 24 cases were of multinodular goitre, 12 cases were of thyroiditis, 36 cases were of colloid goitre, 2 cases were of papillary carcinoma, 15 cases were of follicular neoplasm (Table 4).

Table 6: Sensitivity of USG and FNAC.

	USG (n=53)	FNAC (n=53)
Positive	48	51
Negative	5	5
Sensitivity	90.56 %	96.47 %

Table 7: Co-relation of USG and FNAC results.

		FNAC		Total
		Negative	Positive	
USG	Negative	2	3	5
	Positive	0	48	48
Total		2	51	53

In our study out of 100 cases 94 were benign according to USG out of which 12 were inflammatory (thyroiditis) and 82 were non-inflammatory benign lesion of thyroid gland which includes adenomatous nodule, multinodular goitre,

colloid goitre. Out of 100 cases 98 cases were benign according to fine needle aspiration cytology which includes 12 cases of thyroiditis and 86 were non-inflammatory which includes adenoma, multinodular goitre, colloid goitre and follicular neoplasm. 4 cases were found suspicious malignancy in USG which were not confirmed by FNAC and 2 cases were of malignant lesion according to USG features they were confirmed malignant lesion (papillary carcinoma) of thyroid gland (Table 5).

Table 8: Statistical analysis of USG and FNAC.

	Value	Degree of freedom	Asymp. Sig. (2-sided)
Pearson Chi-square	19.953 ^a	1	.000

In our study, out of 100 patients we had histopathological data of 53 patients.

Considering histopatho data as standard, comparing the results of USG and FNAC with the same, we found that Sensitivity of USG was 90.56% whereas that of FNAC was 96.47% (Table 6).

On performing chi-square test for comparing the findings of USG and FNAC, it was found that two tailed chi-square value was 19.953^a which proved that results were significantly different from one other ($p < 0.001$) (Table 8).

Based on the sensitivity and chi-square value obtained in our study, we can say that USG findings (sensitivity=90.56%) were more significant as compared to FNAC findings (sensitivity=96.47%) for diagnosis of thyroid swellings.

DISCUSSION

A total of 100 patients with various thyroid swellings were studied by high resolution ultrasound and with the fine needle aspiration cytology report. For the various thyroid swellings diagnosis according to ultrasound sonography and fine needle aspiration cytology is correlated in our study.

Sex distribution

Out of 100 patients studied, there were 10 males (10%) and 90 females (90%) with male to female ratio of 1: 9. Silverman et al study (1:10.8) also yielded similar findings.¹⁴ So, according to this study, thyroid lesions are commoner in females. The possible reason for this is due to the presence of estrogen receptors in thyroid gland in females. For the same reason, the level of thyroid hormones also changes according to the phase of menstruation.

Age distribution

In our study, the youngest patient was 17 years old and the eldest patient was 66 years. The average age of patients in Ankush et al study is 39 which is nearer to our study 36.27.¹⁵ The age distribution according to our study was similar to that of the previous studies. So, the thyroid lesions are commoner in females in their active reproductive age group and are uncommon in postmenopausal age group.

Duration of swelling

In this study, 46 (46%) of the 100 cases presented with their clinical complaints dating under 6 months. There were 19 cases presenting with complaints lasting since 2 years of which 2 cases were malignancies (papillary carcinoma). So, most of the patients presented within 6 months.

In study of Jain et al also found that majority (67.2%) of patients came with complaint of swelling of duration less than 6 months.¹¹ So, our study also confirmed the findings given by the other studies with respect to duration of swelling. Most of these patients presented within 6 months due to either due to cold/heat intolerance

or easy fatigability or even cosmetic disfigurement in few cases.

Consistency of swelling clinically

The majority 58 (58%) of the cases in this study were firm in consistency while 34 cases are soft in consistency of which most of the cases are of colloid goitre. 2 cases are of cystic consistency of which 2 cases are of colloid with cystic changes. Rest of them are hard in consistency of which 2 cases are of malignancy and 4 cases are of suspicious malignancy.

This observation is in line with the observations of Vyas et al who also observed that the consistency of most of swellings (58%) were soft while hard swellings were seen in all cases of carcinomas.¹⁰ Hard consistency is seen in malignancy, probable reason is either because of loss of elasticity in the malignant tissues or because of the microcalcifications.

Echotexture of thyroid lobe and nodule

In our study out of 100 cases 36 (36%) cases found to be colloid goitre, hypoechogenicity in 35 (35%) cases and isoechogenicity in 1 cases. 26 (26%) cases were nodular goitre, 7 (7%) cases were hypoechoic and 19 (19%) cases were isoechoic. 20 (20%) cases were adenomas of which 12 cases showed hypoechogenicity and 8 (8%) cases were hyperechoic. These 8 cases of adenoma with hyperechogenicity were confirmed benign. 2 cases of hypoechoic nodule found malignancy and 4 cases of hypoechoic adenoma found suspicious malignancy. Out of 12 cases of thyroiditis 2 were hypoechoic and 10 were heterogenous. So it suggests that hypoechogenicity seen in malignant lesions.

In study of Krishna et al, out of 80 cases 45 (56.25%) cases were colloid goitre.¹⁶ Almost 35 of these lesions were hyperechoic, 3 of the cases were isoechoic, and associated cystic changes cystic changes were there in 7 cases. 15 cases of follicular neoplasm were found to be hyperechoic. 8 cases of thyroid cyst found cystic changes. 10 cases of thyroiditis were hypoechoic. 5 cases of malignancy showing predominantly hypoechogenic lesion.

Correlation between USG and FNAC

In present study, out of 100 (100%) patients we found 94 (94%) of Benign thyroid swelling by USG while 6 (6%) found malignant lesion. In addition diagnosis by FNAC, out of 6 (6%) malignant lesion 4 (4%) patients diagnosed as benign rest 2 (2%) patients are confirmed to be malignant.

Similar study done by Ankush et al have found out of 100 (100%) patients, (66%) of benign thyroid swelling by USG while (34%) found malignant lesion.¹⁵ In addition

diagnosis by FNAC, out of (66%) benign lesion (64%) patients diagnosed as benign rest (2%) patients are confirmed to be malignant, same as out of (34%) malignant lesion (24%) patients diagnosed as benign rest (10%) patients are confirmed to be malignant.

In our study, out of 100 patients we had histopathological data of 53 patients. Considering histopatho data as standard, comparing the results of USG and FNAC with the same, we found that Sensitivity of USG was 90.56% whereas that of FNAC was 96.47%.

In study of Lokhande et al sensitivity of USG was 71.43% and of FNAC is 75%. So, these results are similar to present study.¹⁷

CONCLUSION

High resolution duplex ultrasonography is a safe, non-invasive, less time consuming, easy to perform, repeatable modality that causes minimal discomfort to the patient. Most importantly, it does not employ any ionising radiation which is harmful to the patient. Ultrasound is the gold standard for assessing the morphological structure of the gland along with the gland size. Color Doppler evaluation is a useful adjunct to gray scale ultrasound in the evaluation of thyroid swellings. Intralesional vascularity with an RI <0.4 is helpful in diagnosing malignant lesions while perilesional vascular pattern is helpful in diagnosing benign lesions. USG followed by FNAC increases the accuracy to diagnose various thyroid lesions so by which unnecessary thyroid gland surgery can be avoided. Ultimately High Resolution USG is better non invasive tool for diagnosis of various thyroid swellings and can also differentiate between benign and malignant lesion. FNAC also as confirmatory as USG. So both diagnostic modalities are required before planning the patient for thyroid surgery.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Patel NR, Patel AV, Patel VV, Vadher PR, Kakadia MB. Ultrasonographic and fine needle aspiration cytology correlation of thyroid gland lesions: a study of 100 cases. Int J Otorhinolaryngol Head Neck Surg 2019;5:319-25.