ORIGINAL RESEARCH ARTICLE

# To Compare the Ultrasonographic Findings of Thyroid Nodules with FNAC

**Sholy K Vareed[1], Don Paul Mathew[2]**

[1]Associate Professor, Department of Radiodiagnosis, SNIMS, Chalakka - Kuthiathode Road, North Kuthiathode, Kunnukara, Kerala 683594, [2]Associate Professor, Department of Radiodiagnosis, SNIMS, Chalakka - Kuthiathode Road, North Kuthiathode, Kunnukara, Kerala 683594, India

**Corresponding author:** Dr Don Paul Mathew, Associate Professor, Department of Radiodiagnosis, SNIMS, Chalakka - Kuthiathode Road, North Kuthiathode, Kunnukara, Kerala 683594, India

**DOI:** http://dx.doi.org/10.21276/ijcmsr.2021.6.1.8

**How to cite this article:** Sholy K Vareed, Don Paul Mathew. To compare the ultrasonographic findings of thyroid nodules with FNAC. International Journal of Contemporary Medicine Surgery and Radiology. 2021;6(1):A37-A40.

**A B S T R A C T**

**Introduction:** Thyroid nodules occur with relatively high frequency in the general population. Ultrasonography is the modality of choice for initial characterization of a thyroid nodule. Fine-needle aspiration Cytology is considered to be the most effective and reliable procedure for the diagnosis of malignant thyroid nodules. The present cross-sectional study was conducted to compare the ultrasonographic findings of thyroid nodules with FNAC.

**Material and methods:** The present cross-sectional study was conducted to compare the ultrasonographic findings of thyroid nodules with FNAC over a period of 1 year. All 90 patients were subjected to an ultrasound examination of thyroid gland. Fine needle aspiration of the thyroid nodule was performed in all patients. Ultrasonography diagnosis was correlated with the fine needle aspiration cytology report. Data was collected in a predesigned proforma. Data were analyzed using SPSS Statistics for Windows, Version 17.0. (Chicago, SPSS Inc.). Data associations were considered statistically significant at $P < 0.05$.

**Results:** In the present study 90 patients were subjected to an ultrasound examination of thyroid gland. Of the 90 nodules that were diagnosed by ultrasonography, 58(64.44%) were benign and 17(18.88%) were malignant, 15(16.66%) nodules were described as suspicious for malignancy on USG. The FNAC diagnosed benign nodules in 65(72.22%) patients and malignant nodules in 25(27.77%). The USG findings in these 90 nodules were described as: all the nodules that were diagnosed as malignant in our series were solid or predominantly solid lesions on USG. None of the cystic/predominantly cystic nodules were malignant. The majority of malignant nodules showed hypoechoic internal echo texture, while most benign nodules were hyperechoic. Most of the malignant nodules had ill defined margins, while the majority benign nodules showed, well-defined outline. Microcalcifications were seen in 4 malignant nodules and 7 benign nodules. Macrocalcification was seen in 7 malignancies and in 19 benign nodules. Majority of malignant lesions showed intranodular vascularity within the nodule, while benign nodules predominantly showed a perinodular vascular pattern.

**Conclusion:** The present study concluded that USG is a sensitive and specific modality for assessing thyroid nodules with good overall accuracy in differentiating benign from malignant thyroid nodules but FNAC remains the gold standard for establishing the final diagnosis.

**Keywords:** ultrasonographic findings, thyroid nodules, FNAC.

## 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. Superficial location of thyroid gland makes it amenable to direct physical examination and also 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 nodule is described as an unusual growth of thyroid cells which leads to formation of lump within the thyroid gland. Majority of thyroid nodules being benign, a small proportion of thyroid nodules do contain thyroid cancer.[2] 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.[3] The overall incidence of malignancy in solitary thyroid nodule ranges between 10% and 30%.[1,4] Ultrasonography (US) is considered as the primary method for evaluating thyroid nodules because of its acceptability, cost-effectiveness and safety.[5-7] However, being an operator-dependent method, its use is limited by the technical skill of the operator. In contrast, fine-needle aspiration cytology (FNAC) is considered the gold standard diagnostic test for evaluating thyroid nodules.[8,9] Evaluation of a patient with thyroid nodule requires detailed history and imaging. High resolution ultrasonography (USG) is



ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2019: 98.48 |

the first line investigations in clinically detected thyroid nodules who are biochemically euthyroid. Thyroid imaging recording and data system (TIRADS) is a risk stratification system for classifying thyroid nodules similar to BIRADS scoring for breast lesions. It was first proposed by Horvath *et al.*[10] in the year of 2009 with modified recommendation from Kwak JY *et al.*[11] Recently, thyroid nodules have been classified into 5 TIRADS categories based on 5 descriptors (composition, echogenicity, shape, margin, echogenic foci/ calcification). Each descriptor gives a point, adding all points of all descriptors a numerical value is calculated which gives the TIRADS score. Sonographic findings suggestive of malignancy are solid nodules, hypoechogenicity, irregular margins, microcalcifications, and a shape taller than wide on a transverse view.[11] The present cross-sectional study was conducted to compare the ultrasonographic findings of thyroid nodules with FNAC.

## MATERIAL AND METHODS

The present cross-sectional study was conducted to compare the ultrasonographic findings of thyroid nodules with FNAC over a period of 1 year. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written informed consent was obtained from the patients after explaining the study to the patients. All patients referred for USG of the neck during the study period and who were found to have thyroid nodules larger than 1 cm in size were included in the study. Patients, who refused to participate in the study, with thyroid nodules smaller than 1 cm in size and patients with inconclusive FNAC reports were excluded from the study. All 90 patients were subjected to an ultrasound examination of thyroid gland. Fine needle aspiration of the thyroid nodule was performed in all patients. Ultrasonogram of thyroid was done with the patient in the supine position with the neck extended. FNAC of the nodule was performed and the smears sent for cytology. Ultrasonography diagnosis was correlated with the fine needle aspiration cytology report. Internal consistency of thyroid nodules was classified as solid when the entire nodule was solid without any cystic foci and cystic when the entire nodule was cystic without any solid areas. Predominantly solid nodules were nodules with more than 50% solid areas with scattered cystic areas, and predominantly cystic nodules were nodules that have more than 50% cystic areas with some solid areas. Similarly, echogenicity was defined as hypoechoic, isoechoic, or hyperechoic comparing the echogenicity of the thyroid nodule with the normal thyroid gland. Heterogeneous echogenicity was noted when the same nodule showed mixed echoes. Margins were classified as ill defined when more than 50% of its border is not clearly demarcated. Microcalcification was defined as fine calcification of size 1 mm or less, single or in groups. Macrocalcifications were larger calcific foci and were classified as eggshell calcification (peripheral calcification), coarse calcification, and nodular calcification. The presence of any vascularity was defined as any color Doppler signal pickup in the nodule or periphery of the nodule. Perinodular vascularity was defined as vascularity only surrounding the nodule, and intranodular vascularity was defined as vascularity within the nodule. Data was collected in a predesigned proforma. Data were analyzed using SPSS Statistics for Windows, Version 17.0. (Chicago, SPSS Inc.). Qualitative data were compared using Chi-square test, and quantitative data were compared with independent sample t-tests. Data associations were considered statistically significant at $P < 0.05$.

## RESULTS

In the present study 90 patients were subjected to an ultrasound examination of thyroid gland. Of the 90 nodules that were encountered ultrasonography diagnosed, 58(64.44%) were benign (figure-1) and 17(18.88%) were malignant (figure-2), 15(16.66%) nodules were described as suspicious for malignancy on USG. The FNAC diagnosed benign nodules in 65(72.22%) patients and malignant nodules in 25(27.77%). The USG findings in these 90 nodules were described as: all the nodules that were diagnosed as malignant in our series were solid or predominantly solid lesions on USG. None of the cystic/predominantly cystic nodules were malignant. The majority of malignant nodules showed hypoechoic internal echo texture, while most benign nodules were hyperechoic. Most of the malignant nodules had ill defined margins, while the majority benign nodules showed, well-

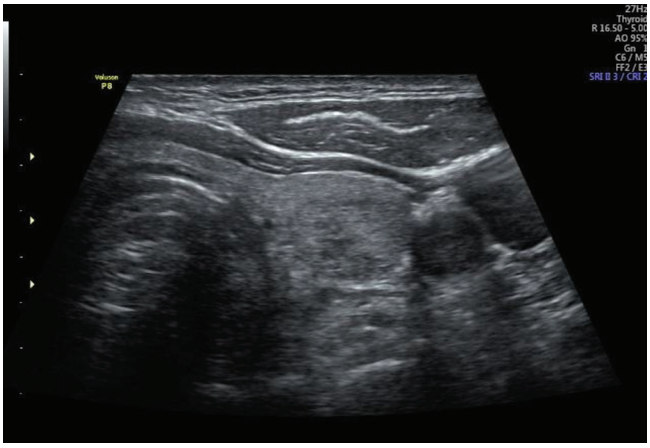

**Figure-1:** Predominantly hyper echoic nodule in left lobe of thyroid gland with peripheral hypo echoic halo. On USG determined as benign with was confirmed on FNAC.

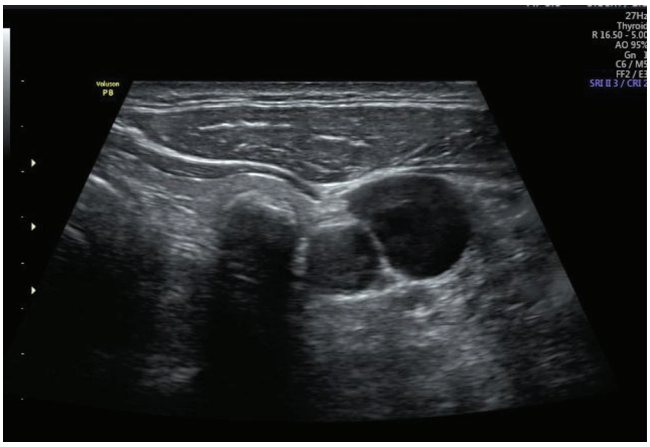

**Figure-2:** Peripherally calcified nodule in left lobe of thyroid gland. On USG determined as suspicious nodule and was confirmed as malignant on FNAC.

| USG diagnosis | N(%) |
|---|---|
| Benign | 58(64.44%) |
| Malignant | 17(18.88%) |
| Suspicious about malignancy | 15(16.66%) |
| Total | 90(100%) |

**Table-1:** Diagnosis by USG

| USG features | Malignant | Benign | Total |
|---|---|---|---|
| Internal consistency | | | |
| Solid | 15 | 38 | 53 |
| Predominantly solid | 12 | 14 | 26 |
| Predominantly cystic | 0 | 6 | 6 |
| Cystic | 0 | 5 | 5 |
| Echogenicity | | | |
| Hyperechoic | 4 | 24 | 28 |
| Hypoechoic | 8 | 18 | 26 |
| Anechoic | 2 | 9 | 11 |
| Heteroechoic | 7 | 18 | 25 |
| Margins | | | |
| Well defined | 6 | 54 | 60 |
| Ill defined | 17 | 13 | 30 |
| Microcalcification | | | |
| Present | 4 | 7 | 11 |
| Absent | 21 | 58 | 79 |
| Macrocalcifications | | | |
| Eggshell | 6 | 11 | 17 |
| Coarse | 1 | 7 | 8 |
| Nodular calcification | 0 | 2 | 2 |
| Vascularity | | | |
| Perinodular | 5 | 18 | 23 |
| Intranodular | 8 | 8 | 16 |
| Perinodular+intran-odular | 2 | 9 | 11 |

Table 2: USG features of various benign and malignant thyroid nodules.

| FNAC diagnosis | N(%) |
|---|---|
| Benign | 65(72.22%) |
| Malignant | 25(27.77%) |
| Total | 90(100%) |

**Table-3:** Diagnosis by FNAC

| Diagnosis | USG | FNAC | |
|---|---|---|---|
| | | Benign | Malignant |
| Benign | 58 | 58 | 0 |
| Malignant | 17 | 00 | 17 |
| Suspicious about malignancy | 15 | 7 | 8 |
| Total | 90 | 65 | 25 |

**Table-4:** Correlation of USG and FNAC diagnosis.

defined outline. Microcalcifications were seen in 4 malignant nodules and 7 benign nodules. Macrocalcification was seen in 7 malignancies and in 19 benign nodules. Majority of malignant lesions showed intranodular vascularity within the nodule, while benign nodules predominantly were showed a perinodular vascular pattern.

## DISCUSSION

The use of high-resolution ultrasound is commonly preferred method for the evaluation of thyroid size and morphology.[12] There are many ultrasound criteria for differentiating benign from malignant thyroid nodules. Such differentiation is important for selecting patients for further FNAC in cases in which malignancy is suspected and to avoid unnecessary biopsy for those with benign criteria. It has been found in literature that no single criteria can predict malignancy, and combination of the known criteria of malignancy gives higher sensitivity and specificity than depending on single ultrasound feature.[13]

In the present study 90 patients were subjected to an ultrasound examination of thyroid gland. Of the 90 nodules that were encountered ultrasonography diagnosed, 58(64.44%) were benign and 17(18.88%) were malignant, 15(16.66%) nodules were described as suspicious for malignancy on USG. The FNAC dignosed benign nodules in 65(72.22%) patients and malignant nodules in 25(27.77%). The USG findings in these 90 nodules were described as: all the nodules that were diagnosed as malignant in our series were solid or predominantly solid lesions on USG. None of the cystic/predominantly cystic nodules were malignant. The majority of malignant nodules showed hypoechoic internal echo texture, while most benign nodules were hyperechoic. Most of the malignant nodules had ill defined margins, while the majority benign nodules showed, well-defined outline. Microcalcifications were seen in 4 malignant nodules and 7 benign nodules. Macrocalcification was seen in 7 malignancies and in 19 benign nodules. Majority of malignant lesions showed intranodular vascularity within the nodule, while benign nodules predominantly were showed a perinodular vascular pattern.

Vyas et al observed that the consistency of most of swellings (58%) were soft while hard swellings were see in all cases of carcinomas.[14]

Seo et al. analyzed a total of 1058 nodules in 824 consecutive patients from which 236 nodules were malignant and found that in multivariate analysis hypoechogenecity, marked hypoechogenecity, spiculated/microlobulated margin, solid content, taller than wide, microcalcification and macrocalcification were predictive of malignancy.[15]

Calcification, especially coarse and rim calcifications and microcalcification, have also been shown to be predictors of malignancy by some studies.[13,16-18]

Increase in vascularity of any type has been established by some other studies to be predictors of malignancy.[13,17]

Ankush et al have found out of 100 (100%) patients, (66%) of benign thyroid swelling by USG while (34%) found malignant lesion. 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.[19]

An investigation reported that precise ultrasonographic-guided aspiration, strict adherence to guidelines for adequacy of the sample, proper cytologic preparation, and most


ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2019: 98.48 |

importantly, expert cytologic analysis, a diagnosis of benign is extremely reliable for thyroid nodules, regardless of size.[20]

## CONCLUSION

The present study concluded that USG is a sensitive and specific modality for assessing thyroid nodules with good overall accuracy in differentiating benign from malignant thyroid nodules but FNAC remains the gold standard for establishing the final diagnosis.

## REFERENCES


1. Altavilla G, pascale M, Nenci 1.FNAC of thyroid gland disease. Acta cytological. 1990;34:251-6.
2. Thyroid Nodules | American Thyroid Association [Internet]. American Thyroid Association. 2019 Available from: https://www.thyroid. org/thyroid-nodules/
3. Matesa N. FNAC of the thyroid. Acta Clincroat. 2002;41:23-131.
4. Bouvet M, Fiedldman JI, Gill GN, Dillmann WH Nahum AM, Russak V, et al. surgical management of the thyroid nodule: patient selection based on the results of FNAC. Laryngoscope. 1992;102:1353-6.
5. Bomeli SR, LeBeau SO, Ferris RL. Evaluation of a thyroid nodule. Otolaryngol Clin North Am. 2010;43:229–38, vii.
6. Kang T, Kim DW, Shin GW, Park JY, Lee YJ, Choo HJ, et al. Utility of preoperative ultrasonography in transferred patients with suspicious malignancy on ultrasonography-guided fine-needle aspiration cytology of thyroid nodules: A single-center retrospective study. Med Sci Monit. 2019;25:6943–9.
7. Wang J, Liu J, Liu Z. Impact of ultrasound-guided fine needle aspiration cytology for diagnosis of thyroid nodules. Medicine (Baltimore) 2019;98:e17192.
8. Siegel R, Naishadham D, Jemal A. Cancer statistics for hispanics/Latinos, 2012. CA Cancer J Clin. 2012;62:283–98.
9. Wienke JR, Chong WK, Fielding JR, Zou KH, Mittelstaedt CA. Sonographic features of benign thyroid nodules: Interobserver reliability and overlap with malignancy. J Ultrasound Med. 2003;22:1027–31.
10. Horvath E, Majlis S, Rossi R, Franco C, Niedmann J, Castro A, et al. An Ultrasonogram reporting system for thyroid nodules stratifying cancer risk for clinical management. J Clin Endocrinol Metab 2009;94:1748-51.
11. Kwak J, Han K, Yoon J, Moon H, Son E, Park S, et al. Thyroid imaging reporting and data system for US features of nodules: A step in establishing better stratification of cancer risk. Radiology 2011;260:892-9.
12. Guth S, Theune U, Aberle J, Galach A, Bamberger C. Very high prevalence of thyroid nodules detected by high frequency (13 MHz) ultrasound examination. Eur J Clin Invest. 2009;39(8):699-706.
13. Frates MC, Benson CB, Charboneau JW, Cibas ES, Clark OH, Coleman BG, et al. Management of thyroid nodules detected at US: Society of radiologists in ultrasound consensus conference statement. Radiology 2005;237:794-800.
14. Vyas CS, Vijayvargiya SC, Porwal S, Gupta R, Swarnkar M. A study of thyroid swelling with clinicopathological parameteres. Int J Biological Med Res. 2013;4(2):3250-2.
15. Seo H, Na DG, Kim JH, Kim KW, Yoon JW. Ultrasound-based risk stratification for malignancy in thyroid nodules: a four-tier categoriazation system. Eur Radiol. 2015;25(7):2153–62.
16. Frates MC, Benson CB, Doubilet PM, Kunreuther E, Contreras M, Cibas ES, et al. Prevalence and distribution of carcinoma in patients with solitary and multiple thyroid nodules on sonography. J Clin Endocrinol Metab 2006;91:3411-7.
17. Sharma A, Gabriel H, Nemcek AA, Nayar R, Du H, Nikolaidis P, et al. Subcentimeter thyroid nodules: Utility of sonographic characterization and ultrasound-guided needle biopsy. AJR Am J Roentgenol 2011;197:W1123-8.
18. Iannuccilli JD, Cronan JJ, Monchik JM. Risk for malignancy of thyroid nodules as assessed by sonographic criteria: The need for biopsy. J Ultrasound Med 2004;23:1455-64
19. Dhanadia A, Shah H, Dave A. Ultrasonographic and FNAC correlation of thyroid lesions. Gujarat Med J. 2014;69(1):76.
20. Porterfield JR, Jr., Grant CS, Dean DS, Thompson GB, Farley DR, Richards ML, et al. Reliability of benign fine needle aspiration cytology of large thyroid nodules. Surgery. 2008;144(6):963-8; discussion 8-9.


**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 20-01-2021; **Accepted:** 14-02-2021; **Published online**: 17-03-2021