Original Research Article

Study of diagnostic efficacy of USG versus FNAC for thyroid nodule at a tertiary care center

Prasad Chitnis[1], Wilson Desai[2*]

[1]Associate Professor, Department of Radio Diagnosis,[2] Associate Professor, Department of ENT, Government Medical College, Miraj , Maharashtra, INDIA.
Email: chitnis66@gmail.com, wvdesai@gmail.com

Abstract

Background: Thyroid nodular lesions are commonly seen in iodine-deficient areas in India1. Thyroid nodules are generally palpable swelling in the thyroid gland, majority are asymptomatic of these nodules, 5% are malignant. Recently ultrasonography has emerged as the best method to evaluate the thyroid gland and thyroid nodules. The purpose of this study was to compare diagnostic efficacy of ultrasonography and FNAC in evaluating thyroid nodules. **Material and Methods:** Present study was prospective, observational study conducted in patients with conclusive reports of FNAC and USG of thyroid nodule, coming to our tertiary care center. **Results:** In present study total 106 patients were included. The average age of patients was 36 years. Most common age group was 21-30 years (37 %), followed by age group 31-40 years (25 %). 83 % patients in our study were female. 82 % cases were benign, while only 18 % were malignant as per final cyto-pathological diagnosis. Colloid nodule (63 %) was most common benign lesion, while most common malignancy was papillary carcinoma (11%). Radiologically most common feature for internal composition was solid (44 %) and predominantly solid (44 %). Most lesions were hyperechoic (55 %), well defined margins (78 %), with peripheral halo (76 %), without calcification (73 %), without vascularity (78 %). FNAC had sensitivity (95 %), specificity (100 %), PPV (100 %), NPV (97 %), accuracy (97 %) while USG had sensitivity (92 %), specificity (93 %), PPV (78 %), NPV (96 %), accuracy (92 %). **Conclusion:** USG-thyroid should be considered as a first step and as an investigation of choice in evaluation of thyroid nodule.

Key Words: FNAC thyroid, Thyroid imaging, Thyroid malignancy

Address for Correspondence:
Dr. Wilson Desai, Associate Professor, Department of ENT, Government Medical College, Miraj , Maharashtra, INDIA.
Email:

Received Date: 28/08/2019 Revised Date: 17/09/2019 Accepted Date: 09/10/2019
DOI: https://doi.org/10.26611/10131218

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 12 October 2019

INTRODUCTION

Thyroid nodular lesions are commonly seen in iodine-deficient areas in India[1]. Thyroid nodules are generally palpable swelling in the thyroid gland, majority are asymptomatic of these nodules, 5% are malignant, and the incidence as per recent evidence puts the percentage on the rise[2]. Of all the thyroid nodules, 5 to 15% of them are cancerous[3]. As the majority of palpable thyroid nodules are benign in nature with relative rarity of malignancy, a reliable method for differentiating clinically significant malignant nodules from innocuous benign ones is desirable. Early diagnosis of malignant thyroid nodules is advocated, because of good post-surgical prognosis. Fine-needle aspiration cytology (FNAC) of thyroid nodules is the single most sensitive, specific, and cost-effective method of investigation, considered as the most reliable method for definitive evaluation of thyroid nodules[4,5]. Thyroid cancer management guidelines also recommends conducting FNAC on any thyroid nodule, which is suspected to be malignant[6]. Recently ultrasonography has emerged as the best method to evaluate the thyroid gland and thyroid nodules. It is widely available, relatively inexpensive, non-invasive, has excellent resolution, detects non-palpable and clinically silent nodules, and guides for fine needle aspiration of suspicious nodules[7,8]. The purpose of this study was to compare diagnostic efficacy of ultrasonography and FNAC in evaluating thyroid nodules.

How to cite this article: Prasad Chitnis, Wilson Desai. Study of diagnostic efficacy of USG versus FNAC for thyroid nodule at a tertiary care center. *MedPulse – International Journal of Radiology.* October 2019; 12(1): 39-43. http://www.medpulse.in/Radio%20Diagnosis/

MATERIAL AND METHODS

Present study was prospective, observational study conducted at XXX medical college, XXXX, India. Study was jointly conducted at department of pathology and department of radiodiagnosis. Study duration was one year between July 2018 and July 2019. Approval was taken from our institutional ethics committee. Patients underwent ultrasonographic evaluation of the thyroid gland and detected to have thyroid nodule, were subjected to further evaluation with fine needle aspiration cytology (FNAC). A written informed consent was obtained from all patients for participation in present study.

- **Inclusion criteria**

Patients in whom conclusive reports of FNAC and USG were present, willing to follow up and willing to participate were included in study.

- **Exclusion criteria**

Patients who were not evaluated with FNAC, or had inadequate or indeterminate FNAC reports, inconclusive USG report, not willing to follow up or not willing to participate were excluded from study.

Patients with diffusely enlarged glands with multiple nodules and no intervening normal parenchyma were classified as multinodular goitre were also excluded. A total of 106 patients were considered for the study, satisfying inclusion and exclusion criteria. All scans were performed on Ultrasound equipment using a high frequency 5–12 MHz probe. Patients who underwent surgical excision, specimen were sent for histologic evaluation. FNAC was done as an OPD procedure by pathologist. These ultrasonographic findings were tabulated and correlated with the final pathological diagnosis. The data thus obtained was entered into Microsoft Excel spreadsheet, and the sensitivity, specificity and accuracy for each of the findings were calculated.

RESULTS

In present study total 106 patients were included. The average age of patients was 36 years. Most common age group was 21-30 years (37 %), followed by age group 31-40 years (25 %). 83 % patients in our study were female.

TABLE 1: Distribution of subjects by age and sex

AGE (years)	No. of patients	percentage
Less than 20	6	6%
21-30	39	37%
31-40	27	25%
41-50	17	16%
51-60	9	8%
61-70	6	6%
More than 70	2	2%
TOTAL	106	100%
MALE	18	17%
FEMALE	88	83%
TOTAL	**106**	**100%**

82 % cases were benign, while only 18 % were malignant as per final cyto-pathological diagnosis. Whenever histopathology report was available, that report was considered in final cyto-pathological diagnosis. Colloid nodule (63 %) was most common benign lesion, other were follicular adenoma (8%), Hashimoto's thyroiditis (4%), subacute thyroiditis (2%), cyst (6%). Most common malignancies were papillary carcinoma (11%) followed by follicular carcinoma (4%), medullary carcinoma (2%), anaplastic carcinoma (1%).

Table 2: Final cyto-pathological Diagnosis

Final Diagnosis (FNAC/ HPE)	No. of Cases	Percentage
Benign	87	82%
Colloid Nodule	67	63%
Follicular Adenoma	8	8%
Hashimoto's Thyroiditis	4	4%
Subacute Thyroiditis	2	2%
Cyst	6	6%
Malignant	19	18%
Papillary Carcinoma	12	11%
Follicular Carcinoma	4	4%
Medullary Carcinoma	2	2%
Anaplastic Carcinoma	1	1%

Radiologically features were compared in accordance to cyto-pathological diagnosis. Most common feature for internal composition was solid (44 %) and predominantly solid (44 %). Most lesions were hyperechoic (55 %), well defined margins (78 %), with peripheral halo (76 %), without calcification (73 %), without vascularity (78 %). Malignancy was noted when combination of factors such as solid and predominantly solid internal composition, hypoechoic, ill-defined margins, with peripheral halo, with calcification, with vascularity were present.

Table 3: radiological features

USG Features	Malignant	Benign	Total
Internal composition			
Solid	13	34	47 (44 %)
Predominantly solid	5	17	22 (21 %)
Predominantly cystic	1	12	13 (21 %)
Cystic	0	9	9 (8 %)
Honeycomb	0	15	15(14 %)
Echogenicity			
Hyperechoic	5	53	58 (55 %)
Hypoechoic	14	23	37 (35 %)
Anechoic	0	11	11 (10 %)
Margins			
Well defined	5	78	83 (78 %)
Ill defined	14	9	23 (22 %)
Peripheral Halo			
Present	13	68	81 (76 %)
Absent	6	19	25 (24 %)
Calcification			
Present	15	14	29 (27 %)
Absent	4	73	77 (73 %)
Internal vascularity			
Present	14	9	23 (23 %)
Absent	5	78	83 (78 %)

Statistically we compared diagnostic efficacy of USG and FNAC for evaluation of thyroid nodule. FNAC had sensitivity (95 %), specificity (100 %), PPV (100 %), NPV (97 %), accuracy (97 %) while USG had sensitivity (92 %), specificity (93 %), PPV (78 %), NPV (96 %), accuracy (92 %).

Table 4: Diagnostic Test Statistics of USG and FNAC for evaluation of thyroid nodule

Diagnostic Statistics	USG	FNAC
Sensitivity	92	95
Specificity	93	100
PPV	78	100
NPV	96	97
Accuracy	92	97

DISCUSSION

A thyroid nodule is defined as a discrete lesion within the thyroid gland that is distinguishable from the adjacent parenchyma at USG. In our study, the youngest patient was 16 years old and the eldest patient was 73 years. The average age of patients and age distribution in our study was similar to that of the previous studies[9]. From total of 106 cases, female preponderance (female: male ratio of 4.88:1) was observed in the present study. The observations are similar to the female: male ratio, noted in other studies as 5.9:1, 5.4:1 and 3.4:1 in the studies by Sharma *et al*[10] and Chen *et al*[11] respectively. Basic use of sonography in the thyroid nodule evaluation is to determine the location of palpable neck mass, characterize nodule as benign or malignant, know about extent of thyroid malignancy, and guide fine needle aspiration of the thyroid nodule or cervical lymph node. The categorization of thyroid nodules into benign and malignant nodules by USG is very important as it helps in the further management of the patients with nodular thyroid disease. Ultrasound has become the first-line imaging modality for the evaluation of the thyroid gland due to excellent visualization of the thyroid parenchyma[12]. It is highly sensitive in detective small nodules, calcification, septations, and cysts as well as in guiding fine needle aspiration biopsies. Thyroid nodules are very common and may be observed at USG in 50% of

the adult population[13]. We noted 82 % cases as benign thyroid nodules, while 18 % were malignant. Most common benign pathology in our study was benign colloid goitre seen in 63% cases. In a study by Bumiya and Roopa[14], benign pathology was observed in 90% cases, amongst which the commonest was goitre (66%) patients. A nodule with relatively decreased in echotexture compared to the adjacent strap muscles of the neck is considered hypoechoic. The previous similar studies have revealed that most malignancies demonstrate a hypoechoic nodule, yet most hypoechoic nodules are benign in view of the high prevalence of benign lesions[5,15]. The peripheral halo is usually complete and thin. It is irregular, thick, and incomplete or absent in a malignant nodule and is thought to represent compressed normal tissue due to the rapid growth of the tumor[16]. The most of the studies have reported a low sensitivity and specificity for the presence or absence of a halo[17]. Previous studies noted that well-defined margins, well-defined thin peripheral halo, and wider than tall in shape and absence of calcifications or microcalcifications are the sonographic criteria for predicting benign nature of a thyroid nodule[15,17]. In our study, ultrasound had sensitivity (92 %), specificity (93 %), PPV (78 %), NPV (96 %), accuracy (92 %). In a study by Popli[17] *et al*., the sensitivity was 81.8% and specificity was 87.2%. Fine needle aspiration cytology appears to be a safe, reliable, accurate and cost-effective method which provides valuable information to assist in selection of patients with solitary thyroid nodules for surgery. FNAC also distinguishes the benign from malignant lesions quite effectively preoperatively, it has been proposed as a preoperative screening method of choice[18]. Although needle biopsy can be performed easily, consistently obtaining adequate tissue and processing the specimens to achieve accurate cytopathological interpretation requires expertise and experience[19]. FNAC specimens are classified as malignant, benign, indeterminate (suspicious for follicular or Hurthle cell neoplasm), or insufficient for diagnosis. The effectiveness of FNAB of solitary thyroid nodules may be improved with the use of ultrasound guidance rather than simple palpation[20]. In our study, from 106 patients we had histopathological data of 44 patients. Considering histopathology data as standard, comparing the results of USG and FNAC with the same, we found that Sensitivity of USG was 92% whereas that of FNAC was 92%. In study of Lokhande *et al* sensitivity of USG was 71.43% and of FNAC is 75%. So, these results are much lower than present study[21]. From our results we recommend USG should be first step in diagnosis of suspected thyroid nodule. National Comprehensive Cancer Network (NCCN) suggests all thyroid nodules be evaluated with thyrotropin and USG of thyroid and neck as a first step and prefers FNA (with or without sono-guidance) as an investigation of choice in only suspicious lesions[22].

CONCLUSION

Ultrasound evaluation is non-invasive, readily available, relatively inexpensive and with good resolution it helps to detect non-palpable and clinically silent nodules. USG also guides for fine needle aspiration of suspicious nodules. USG-thyroid should be considered as a first step and as an investigation of choice in evaluation of thyroid nodule.

REFERENCES

1. Pandav SC, Yadav K, Srivastava R, Pandav R, Karmarkar MG. Iodine deficiency disorders (IDD) control in India. Indian J Med Res 2013 Sep;138(3):418–433
2. Cooper DS, Doherty GM, Haugen BR, *et al*; American Thyroid Association (ATA) Guidelines Taskforce on Thyroid Nodules and Differentiated Thyroid Cancer. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19(11):1167–1214
3. Hegedüs L. Clinical practice. The thyroid nodule. N Engl J Med 2004;351(17):1764–1771.
4. Gupta M, Gupta S, Gupta VB. Correlation of Fine Needle Aspiration Cytology with Histopathology in the Diagnosis of Solitary Thyroid Nodule. J Thyroid Res. 2010;2010:1–5.
5. Remonti LR, Kramer CK, Leitão CB, Pinto LCF, Gross JL. Thyroid ultrasound features and risk of carcinoma: a systematic review and meta-analysis of observational studies. Thyroid. 2015;25:538–50.
6. Alam T, Khattak YJ, Beg M, Raouf A, Azeemuddin M, Khan AA. Diagnostic accuracy of ultrasonography in differentiating benign and malignant thyroid nodules using fine needle aspiration cytology as the reference standard. Asian Pac J Cancer Prev. 2014;15(22):10039–43.
7. Nachiappan AC, Metwalli ZA, Hailey BS, Patel RA, Ostrowski ML, Wynne DM, *et al*. The thyroid. Review of imaging features and biopsy techniques with radiologic-pathologic correlation. Radiographics. 2014; 34:276-93.
8. Unnikrishnan AG, Kalra S, Baruah M, Nair G, Nair V, Bantwal [5] G, *et al*. Endocrine Society of India management guidelines for patients with thyroid nodules. A position statement. Indian J Endocrin Metabol. 2016;15(1):02-07.
9. Dhanadia A, Shah H, Dave A. Ultrasonographic and FNAC correlation of thyroid lesions. Gujarat Med J. 2014;69(1):76.
10. Sharma A, Gabriel H, Nemcek AA, Nayar R, Du H, Nikolaidis P. Subcentimeter thyroid nodules: Utility of sonographic characterization and ultrasound- guided needle biopsy. Am J Roentgenol 2011;197(6):1123-1128.
11. Chen G , Zhu XQ , Zou X *et al*. Retrospective analysis of thyroid nodules by clinical and pathological

characteristics, and ultrasonographically detected calcification correlated to thyroid carcinoma in South China. Eur Surg Res 2009;42(3):137–142.
12. Latoo M, Lateef M, Kirmani O. Ultrasonography a useful adjunctive in management of thyroid neoplasms. Indian J Otolaryngol Head Neck Surg 2007;59:13-4.
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. Bumiya RG, Roopa. Ultrasonography of the thyroid lesions correlated with FNAC. Int J of Sci Res 2018;7:33-5.
15. Lee YH, Kim DW, In HS, Park JS, Kim SH, Eom JW, *et al.* Differentiation between benign and malignant solid thyroid nodules using an US classification system. Korean J Radiol 2011;12:559-67.
16. Solbiati L, Charboneau JW, Osti V, James EM, Hay ID. The thyroid gland. In: Wilson SR, Charboneau JW, Rumack CM, editors. Diagnostic Ultrasound. 3rd ed. Missouri: Mosby, Elsevier Inc.; 2005. p. 735-70.
17. Popli MB, Rastogi A, Bhalla P, Solanki Y. Utility of gray-scale ultrasound to differentiate benign from malignant thyroid nodules. Indian J Radiol Imaging 2012;22:63-8.
18. Basharat R, Bukhari MH, Saeed S, Hamid T. Comparison of fine needle aspiration cytology and thyroid scan in solitary thyroid nodule. Patholog Res Int. 2011. 2011:754041.
19. Yip L, Farris C, Kabaker AS, Hodak SP, Nikiforova MN, McCoy KL, *et al*. Cost impact of molecular testing for indeterminate thyroid nodule fine-needle aspiration biopsies. J Clin Endocrinol Metab. 2012 Jun. 97(6):1905-12.
20. Arul P, Masilamani S. A correlative study of solitary thyroid nodules using the Bethesda System for Reporting Thyroid Cytopathology. J Cancer Res Ther. 2015 Jul-Sep. 11 (3):617- 22.
21. Lokhande RB, Gedam BS, Shah Y, Kale V. The accuracy of ultrasonography and fine needle aspiration cytology in the diagnosis of nodular goitre: A prospective analysis of 42 cases. Int J Biomed Adv Res. 2015;6(01):43-6.
22. NCCN Clinical Practice Guidelines in Oncology-Thyroid Carcinoma. Version 2.2017-May17, 2017. NCCN.org.

Source of Support: None Declared
Conflict of Interest: None Declared