e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(4); 389-393

Original Research Article

A Diagnostic Efficacy of Ultrasonography and FNAC in Evaluating Thyroid Nodules: AComparative Study

Balaram Prasad[1], S. K. Suman[2], Amit Kumar[3]

[1]Senior Resident, Department of Radiodiagnosis, Indira GandhiInstitute of Medical Science, Patna, Bihar, India

[2]Professor and HOD, Department of Radiodiagnosis, Indira GandhiInstitute of Medical Science, Patna, Bihar, India

[3]Associate Professor, Department of Radiodiagnosis, Indira GandhiInstitute of Medical Science, Patna, Bihar, India

Received: 15-02-2024 / Revised: 14-03-2024 / Accepted: 27-04-2024
Corresponding Author: Dr. Balaram Prasad
Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to compare diagnostic efficacy of ultrasonography and FNAC in evaluating thyroid nodules.

Methods: The present study was prospective, observational study conducted at in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical science, Patna, Bihar, India for the period of 2 years. In present study total 100 patients were included.

Results: The average age of patients was 36 years. Most common age group was 21-30 years (36%), followed by age group 31-40 years (26%). 80% patients in our study were female. 83% 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 (64%) was most common benign lesion, other werefollicular adenoma (7%), Hashimoto's thyroiditis (5%), subacute thyroiditis (2%), cyst (4%). Most common malignancies were papillary carcinoma (10%) followed by follicular carcinoma (6%), medullary carcinoma (2%), anaplastic carcinoma (1%). Radiologically features were compared inaccordance to cyto-pathological diagnosis. Most common feature for internal composition was solid (46%) and predominantly solid (21%). Most lesions were hyperechoic (54%), well defined margins (78%), with peripheral halo (76%), without calcification (73%), without vascularity (77%).

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 guidesfor fine needle aspiration of suspicious nodules. USG-thyroid should be considered as a first stepand as an investigation of choice in evaluation of thyroid nodule.

Keywords: FNAC thyroid, Thyroid imaging, Thyroid malignancy

Introduction

Thyroid disorders are the second most common endocrine disorders in Nigeria with a prevalence of 1.6%. [1] Nodular thyroid diseases are relatively common and found in 3-7% of the population worldwide. [2] The primary goal of thyroid nodule evaluation is to determine if a nodule is malignantor benign and whether it will or will not require surgery. In contrast to the high prevalence of thyroid nodules, thyroid cancer is rare, as fewer than 7% of all nodules are malignant and it is critical that they be identified accurately. [3] The superficial location of the thyroid gland makes it suitable for high frequency sonography which is the imaging modality of choice. [4] The role of FNAC in evaluating euthyroid patient with thyroid nodule cannot be overemphasized as it reduces the unnecessary thyroidectomy for patients with benign nodules. [5] However, the combination of insufficient access to pathologists and the variable standards of pathology in sub-Saharan Africa undoubtedly mean that a significant proportion of cancer patients are receiving untimely diagnosis. [6]

The majority (90%) of thyroid lesions are benign as malignancy occurs only 1 in 10 thyroid nodules. [7] Most of thyroid nodules need evaluation to diagnose and treat them at the early stage. Alarge number of invasive and non-invasive investigations like ultrasonogram (USG), fine needle aspiration

cytology and thyroid nuclear scan are available for evaluation of thyroid swellings. Thepurpose of USG and FNAC is to pick the patients having malignancy for surgical intervention. The majority of thyroid nodules are readily detected by high resolution ultrasound (HRUSG). [8-10] FNAC provides very conclusive information about thyroid lesions. The use of FNAC reduces thenumber 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%. [11,12] But there arelimitations for both USG and FNAC in the diagnosis of thyroid malignancies and still there is a doubt which one is more efficacious. [13]

The aim of the present study was to compare diagnostic efficacy of ultrasonography and FNAC in evaluating thyroid nodules.

Materials and Methods

The present study was prospective, observational study conducted at in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical science, Patna, Bihar, India for the period of 2years. In present study total 100 patients were included. 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 obtainedfrom 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 fromstudy.

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, andthe sensitivity, specificity and accuracy for each of the findings were calculated.

Results

Table 1: Distribution of subjects by age and sex

Age groups in years	N	%
Less than 20	7	7
21-30	36	36
31-40	26	26
41-50	15	15
51-60	9	9
61-70	5	5
More than 70	2	2
Male	20	20
Female	80	80

The average age of patients was 36 years. Most common age group was 21-30 years (36%), followed by age group 31-40 years (26%). 80% patients in our study were female.

Table 2: Final cyto-pathological Diagnosis

Final Diagnosis (FNAC/ HPE)	N	%
Benign	82	82
Colloid Nodule	64	64
Follicular Adenoma	7	7
Hashimoto's Thyroiditis	5	5
Subacute Thyroiditis	2	2
Cyst	4	4
Malignant	18	18
Papillary Carcinoma	10	10
Follicular Carcinoma	6	6
Medullary Carcinoma	2	2

83% 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 (64%) was most common benign lesion, other were follicular adenoma (7%), Hashimoto's thyroiditis (5%), subacute thyroiditis (2%), cyst (4%). Most common malignancies were papillary carcinoma (10%) followed by follicular carcinoma (6%), medullary carcinoma (2%), anaplastic carcinoma (1%).

Table 3: Radiological features

USG features	Malignant	Benign	Total
Internal composition Solid	12	34	46
Predominantly solid	5	16	21
Predominantly cystic	1	12	13
Cystic	0	8	8
Honeycomb	0	12	12
Echogenicity			
Hyperechoic	4	50	54
Hypoechoic	14	22	36
Anechoic	0	10	10
Margins			
Well defined	4	74	78
Ill defined	14	8	22
Peripheral Halo			
Present	12	64	76
Absent	6	18	24
Calcification			
Present	14	13	27
Absent	4	69	73
Internal vascularity			
Present	14	9	23
Absent	4	73	77

Radiologically features were compared in accordance to cyto-pathological diagnosis. Most common feature for internal composition was solid (46%) and predominantly solid (21%). Most lesions were hyperechoic (54%), well defined margins (78%), with peripheral halo (76%), without calcification (73%), without vascularity (77%). 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 4: Diagnostic Test Statistics of USG and FNAC for evaluation of thyroid nodule

Diagnostics statistics	USG	FNAC
Sensitivity	92	95
Specificity	93	100
PPV	78	100
NPV	96	97
Accuracy	92	97

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 %).

Discussion

Thyroid gland is the earliest to develop in the foetus. There is approximately 4-5% incidence of clinically apparent thyroid lesions in general population.[14] The prevalence of thyroid nodules varies from 19 to 67% and increases with age, affecting about 50% of the population older than 40 years of age.[15] Thyroid nodules are more common in females than in males which is about four times. Thyroid lesions become vulnerable particularly in countries where iodine intake in diet is low.[16]

The average age of patients was 36 years. Most common age group was 21-30 years (36%), followed by age group 31-40 years (26%). The average age of patients and age distribution in our study was similar to that of the previous studies.[17] 80% patients in our study were female. The categorization of thyroid nodules into benign and

malignant nodules by USG is very important asit 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.[18]

83% 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 (64%) was most common benign lesion, other werefollicular adenoma (7%), Hashimoto's thyroiditis (5%), subacute thyroiditis (2%), cyst (4%). Mostcommon malignancies were papillary carcinoma (10%) followed by follicular carcinoma (6%), medullary carcinoma (2%), anaplastic carcinoma (1%). In a study by Bumiya and Roopa[19], benignpathology 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.[20] 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.[21]

Radiologically features were compared in accordance to cyto-pathological diagnosis. Most common feature for internal composition was solid (46%) and predominantly solid (21%). Most lesions were hyperechoic (54%), well defined margins (78%), with peripheral halo (76%), without calcification (73%), without vascularity (77%). Malignancy was noted when combination of factors such as solid and predominantly solid internal composition, hypoechoic, ill-definedmargins, with peripheral halo, with calcification, with vascularity were present. 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 %). 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.[22] Although needle biopsy can be performed easily, consistently obtaining adequate tissue and processing the specimens to achieve accurate cytopathological interpretation requires expertise and experience.[23]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 thyroidnodules may be improved with the use of ultrasound guidance rather than simple palpation.[24]

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. Ogbera A, Fasanmade O, Adediran O. Pattern of thyroid disorders in the SouthWesternregion of Nigeria. Ethnicity and disease. 2007; 17(2):327–330.
2. Ishigaki S, Shimamoto K, Satake H, Sawaki A, Itoh S, Ikeda M, et al. Multi-slice CT of thyroid nodules: comparison with ultrasono graphy. Radiation medicine. 2003;22 (5):346– 353.
3. Papini E, Guglielmi R, Bianchini A, Crescenzi A, Taccogna S, Nardi F, et al. Risk of malignancy in non-palpable thyroid nodules: predictive value of ultrasound and color-Doppler features. The Journal of Clinical Endocrinology & Metabolism. 2002;87(5):19 41–1946.
4. Tessler FN. Tublin ME.111 Thyroid sonography: current applications and future directions. AJR. 1999;173(2):437–443.
5. Dean DS, Gharib H. Fine-Needle Aspiration Biopsy of the Thyroid Gland. 2019.
6. Fleming K. Pathology and cancer in Africa. E cancer medical science. 2019;13:945.
7. Matesa N. FNAC of the thyroid. Acta Clincroat. 2002;41:23-31.
8. Lee MJ, Hong SW, Chung WY, Kwak JY, Kim MJ, Kim EK. Cytological results of ultrasound‑guided fine‑needleaspiration cytology for thyroid nodules: Emphasis on correlation with sonographic findings. Yonsei Med J. 2011;52:838-44.
9. Yeung MJ, Serpell JW. Management of the solitary thyroid nodule. Onchologist. 2008;13: 105-12.
10. Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, 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;19:1167-214.

11. Korum N, Ascii C, Yilmazlar T, Duman H, Zorluoglu A, Tuncel E, et al. Total thyroidectomy: changing trends in surgery. Int Surg. 1997;82:417-9.
12. Mazzaferri EL. Mnagement of a solitary thyroid nodule. New England J Med. 1993;328 :553-9.
13. Watters AK, Ahiya AT. Role of USG in the management of thyroid nodules. Am J Surg. 19 92;162:654-7.
14. Altavilla G, Pascale M, Nenci 1.FNAC of thyroid gland disease. Acta Cytological.1990; 34:251-6.
15. Cosgrove D, Barr R, Bojunga J, Cantisani V, Chammas MC, Dighe M, et al. WFUMB guidelines and recommendations on the clinical use of ultrasound elastography: Part 4. Thyroid. Ultrasound Med Biol. 2017;43(1):4-26.
16. Polyzos SA, Kita M, Avramidis A. Thyroid nodules—stepwise diagnosis and management. Hormones (Athens). 2007;6(2):101-19.
17. Dhanadia A, Shah H, Dave A. Ultrasonographic and FNAC correlation of thyroid lesions. Gujarat medical journal. 2014 Mar;69(1):75-81.
18. Latoo M, Lateef M, Kirmani O. Ultrasonography a useful adjunctive in management of thyroid neoplasms. Indian Journal of Otolaryngology and Head & Neck Surgery. 2007 Mar;59:13-4.
19. Bumiya RG, Roopa. Ultrasonography of the thyroid lesions correlated with FNAC. Int J of Sci Res 2018;7:33‑5.
20. 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 20 11;12:559-67.
21. 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.
22. 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.
23. 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.
24. 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.