

ROLE OF FINE NEEDLE ASPIRATION CYTOLOGY AND THYROID SCINTIGRAPHY IN EVALUATION OF SOLITARY THYROID NODULE; A COMPARATIVE STUDY

Ayesha Qaiser, Muhammad Zubair, Muhammad Sohail Babar Niazi, Waqarul Hassan Zaidi, Salma Gul

Combined Military Hospital, Rahim Yar Khan Cantonment, Pakistan

ABSTRACT

Objective: To determine the sensitivity and specificity of fine needle aspiration cytology and thyroid scintigraphy in solitary thyroid nodule taking histopathology as the gold standard.

Study Design: Cross-sectional study

Place and duration of study: This study was carried out at Histopathology departments of Army Medical College Rawalpindi and Fatima Jinnah Medical College Lahore over a period of one year.

Patients and Methods: This study included 115 patients with solitary thyroid nodules (STNs) presented as outdoor patients. After thyroid function tests and thyroid scintigraphy, Fine needle aspiration cytology was carried out, followed by the histopathological examination of surgical specimens.

Results: On thyroid scintigraphy, 90 patients (78.3%) had cold nodules and 25 patients (21.7%) had hot nodules. On FNAC 54 patients (47%) had benign lesions, 48 patients (41.7%) had indeterminate lesions and 13 patients (11.3%) had malignant lesions. On histopathology, 103 patients (89.6%) were confirmed to have benign lesions and 12 patients (10.4%), malignant lesions. After comparison of results of thyroid scintigraphy and FNAC with histopathology, the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of thyroid scintigraphy were 78.6%, 21.4%, 12.2%, 88%, and 28.7% respectively whereas those of FNAC was 75%, 97.1%, 94.8%, 75% and 97% respectively.

Conclusion: Fine needle aspiration cytology is very accurate and much better than thyroid scintigraphy in the evaluation of solitary thyroid nodule.

Key Words: Fine needle aspiration cytology (FNAC), solitary thyroid nodule (STN), Thyroid scintigraphy.

This article can be cited as: Qaiser A, Zubair M, Niazi MSB, Zaidi WH, Gul S. Role of fine needle aspiration cytology and thyroid scintigraphy in evaluation of solitary thyroid nodule; a comparative study. Pak J Pathol. 2018; 29(1): 8-11.

INTRODUCTION

About 7% adult populations have palpable thyroid nodules [1]. Women are affected more than men especially with advancing age [2]. Most of these thyroid lesions are benign with few malignant cases [3]. There is higher incidence of thyroid cancer in patients with previous exposure to ionizing radiations [1].

Solitary thyroid nodule is palpable swelling in thyroid gland which is otherwise normal in appearance [4]. In most of the cases they occur due to cystic change in colloid goiter. Different tests can be employed to identify benign and malignant thyroid lesions, include radioisotope scintigraphy, fine needle aspiration cytology (FNAC) and histopathology of the thyroid.

Due to high cost of Iodine-131 scintigraphy, FNAC has become more effective mean of diagnosing thyroid lesions. Moreover, thyroid scintigraphy has got good sensitivity (86.6%) but

lesser specificity (53%) [5]. It is mostly avoided in patients with non-toxic thyroid nodules. FNAC is inexpensive and it has got greater sensitivity (98%) and specificity (70%) in diagnosing solitary thyroid nodule [1]. It helps in differentiating benign from malignant thyroid cold nodules [6].

Although we cannot differentiate certain thyroid lesions using FNAC like follicular adenoma from follicular carcinoma thyroid [7], however it still serves as a basic diagnostic test for detecting malignant thyroid lesions preoperatively [8].

The objective of this study was to determine the sensitivity and specificity of FNAC and thyroid scintigraphy in STN, taking histopathology as the gold standard.

The rationale of the study was that FNAC is more helpful in evaluation and definitive diagnosis of solitary thyroid nodule as compared to thyroid scintigraphy. It helps in rapid decision making for better treatment options.

MATERIALS AND METHODS

This cross-sectional comparative study was performed at departments of histopathology Army Medical College Rawalpindi and Fatima Jinnah

Correspondence: Dr. Muhammad Zubair, Consultant Pathologist, Combined Military Hospital, Rahim Yar Khan, Pakistan

Email: mzubair84@hotmail.com

Received: 12 Nov 2017; Revised: 02 Feb 2018; Accepted: 8 Mar 2018

Medical College Lahore over a period of one year (1st Feb 2009 to 31st Jan 2010). A total of 115 cases of solitary thyroid nodule were selected using non-probability purposive sampling technique. Patients included were both males and females, with age range from 20-60 years. Patients with diffuse goiter or diagnosed thyroid disease previously were excluded from the study. Study was performed at two centers however; bias was reduced by strict compliance to inclusion and exclusion criteria. All the demographic data, history and signs and symptoms were recorded from patients. Thyroid scintigraphy was performed and cases with solitary thyroid nodules underwent FNAC. These cases were followed after surgery for histopathology. Results were compared for thyroid scintigraphy, thyroid FNAC, and histopathology, taking histopathology as the gold standard.

Data were assessed using SPSS 19. The variables included demographic information, baseline investigations, thyroid scintigraphy, and thyroid profile. Mean and standard deviation were calculated for quantitative data. Frequency and percentages were calculated for qualitative data e.g results of thyroid scintigraphy, FNAC and histopathology. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated using 2 x 2 tables

RESULTS

Age of patients ranged from 28 to 60 years, with the mean age being 43.12 ± 9.04 years. The patients were predominantly females (56.2%, n=65) and (43.8%, n=50) were males.

Clinically symptoms like palpitations were present in 18.3% (n=21) patients. Tremors were seen in 8.7% (n=10) and tenderness in 4.3% (n=5) patients. Thyroid nodule was mobile in 97.4% (n=112) patients. In 70.4% (n=81) patients the thyroid nodule size ranged between 1 and 5 cm and in 29.6% (n=34) the size was 6 to 10 cm.

Cold nodules were predominant (78.3%) on thyroid scintigraphy as compared to hot nodules. Results of FNAC showed mainly benign 47%, then malignant cases (41.7%), however, histopathological evaluation showed mostly benign cases (89.6%) as given in Table-I.

Comparing results of thyroid scintigraphy with histopathology there were more false positive (79 cases) results. Sensitivity of thyroid scintigraphy was found to be high (78.6%) with low specificity as shown in table-II.

Similarly comparing results of FNAC with histopathology, out of 115 patients, 100 patients were true negative and only 3 false positive. Sensitivity and specificity were also high, 75% and 97.1% respectively as explained in table-II.

Table-1: Results of thyroid scintigraphy, FNAC, and histopathology (n=115).

	Number of patients	Percentage (%)
Thyroid scintigraphy		
Hot Nodule	25	21.7
Cold Nodule	90	78.3
FNAC		
Benign	54	47
Malignant	13	11.3
Indeterminate	48	41.7
Histopathology		
Benign	103	89.6
Malignant	12	10.4

Table-2: Comparison of results of thyroid Scintigraphy and FNAC taking histopathology as the gold standard (n=115).

	Thyroid scintigraphy	FNAC
True positive (TP)	11	9
True Negative (TN)	22	100
False Positive (FP)	79	3
False Negative (FN)	3	3
Sensitivity	78.6%	75%
Specificity	21.4%	97.1%
Diagnostic accuracy	28.7%	94.8%
Positive predictive value (PPV)	12.2%	75%
Negative predictive value (NPV)	88%	97%

DISCUSSION

Thyroid scintigraphy and FNAC serve important role in preoperative assessment of patients with STN, however there are few limitations. Aim of this study was evaluation of diagnostic accuracy of thyroid scintigraphy and FNAC in 115 patients.

False negative results may be due to error in sampling or misinterpretation of cytology specimen. However, true frequency of false negative results are difficult to calculate because, only few patients (approximately 10%) with benign results undergo surgery [9]. Most studies suggest a true false negative rate below 5%, if all cases undergo histopathological examination. In our study, 2.6% (n=3) patients showed false negative FNAC results, which

is in uniformity with other studies that suggest 2% to 7% [10] and 1% to 16% false negative results [11].

A false positive cytology may result in surgical overtreatment. False positive FNA cytology results were found in only 2.6% (n=3) patient. These results are consistent with other studies having similar range of false positive results 0% to 9% [12]

The specificity of FNAC Thyroid ranges from 72% to 100% and its sensitivity from 65% to 99% [11]. In our study sensitivity for diagnosis of cytological malignancy was 75%, specificity of 97.1%, a PPV of 94.8 %, a NPV of 75% and diagnostic accuracy of 97%. These results are consistent with other studies [13]. A study by Ikram et al [14] showed 100% sensitivity and specificity for malignancy which is higher than our study. This is because they do not have false positive results owing to small sample size.

This study also confirms the results of study performed by Afroze et al [15], which showed 61.9% of sensitivity, 99.3% of specificity, 92.8% of PPV, 94.74% of NPV and 94.5% of diagnostic accuracy.

These findings are different than our study which may be because they had considered suspicious cases as positives or negatives. In another study by Safirullah et al [16] the sensitivity was 94.2% with a higher male to female ratio which differs from our study with 56.2% (n=60) females and 43.8% (n=55) males. Husain et al [17] reported even higher female to male ratio of 6.9:1.

Bapat et al [18] reported a sensitivity of 100% and specificity of 24 % for thyroid scintigraphy which coincides with this study. These findings suggest that thyroid scintigraphy has higher sensitivity for diagnosing thyroid malignancy. In a study conducted by Lee JK (2006) [19], the diagnostically relevant findings were, sensitivity (100%), specificity (75%), and accuracy (80%). They were able to achieve much better results in their study as compared to mine. Nevertheless, our study authenticates the usefulness of thyroid scintigraphy in the solitary thyroid nodule. Khalid AN [20] also showed the significance of thyroid scintigraphy and FNAC in management and diagnosis of STNs.

The ability of a hyperfunctioning (hot) nodule to rule out malignancy in a STN would make the thyroid scintigraphy a useful investigation complementary to FNAC. Hence both the investigations when performed in the diagnosis of STN are complimentary towards each other. However, FNAC should be advised for every patient to rule out malignancy. Keeping in view the simplicity, economy, sensitivity, specificity and accuracy of

FNAC procedure it should be adopted as primary investigation to assess thyroid diseases in all hospitals across our country.

CONCLUSION

Thyroid scintigraphy is more sensitive and less specific while FNAC is more specific and less sensitive in diagnosing thyroid malignancy. In evaluation of solitary thyroid nodule FNAC is more helpful in definitive diagnosis than thyroid scintigraphy. Along with other clinical information FNAC can help in deciding best form of treatment of solitary thyroid nodule.

AUTHORS CONTRIBUTION

Ayesha Qaiser: Research work, sample collection and write up.

Muhammad Zubair: Research Analysis, concept and literature review.

Muhammad Sohail Babar Niazi, Waqarul Hassan Zaidi, Salma Gul: Literature review

REFERENCES

1. Mahar S A, Husain A, Islam N. Fine needle aspiration cytology of thyroid nodule. Diagnostic accuracy and pitfalls. *J Ayub Med Coll.* 2006; 18:26-8.
2. Spinos N, Terzis G, Crysanthopoulou A, Adonakis G, Markou KB, Vervita V et al. Increased frequency of thyroid nodules and breast fibroadenomas in women with uterine fibroids. *Thyroid.* 2007;17: 1257-9.
3. Delbridge L. Solitary thyroid nodule: current management. *ANZ J Surg.* 2006; 76:381-6.
4. Welker MJ, Oriov D. Thyroid nodules. *Am Fam Physician.* 2003; 67:559-66.
5. Sharma R, Chakravarty KL, Tripathi M, Kaushik A, Bharti P, Sahoo M, et al. Role of 99mTc-Tetrofosmin delayed scintigraphy and color Doppler sonography in the characterization of solitary thyroid nodules. *Nucl Med Commun.* 2007; 28: 847-51.
6. Raza S, Saeed Z, Raza H, Ahmed M. FNAC in the management of solitary thyroid nodule. *Professional Med J.* 2006; 13: 596-603.
7. Sial KH, Mangi BA. Efficacy of fine needle aspiration cytology (FNAC) in detecting lesions of solitary thyroid nodule. *Pak J Surg.* 2003;19: 17-20.
8. Karger S, Engelhardt C, Eszlinger M, Tönjes A, Herrmann F, Müller P, et al. Cytology and mRNA expression analysis of fine needle aspirates of thyroid nodules in an East German region with borderline iodine deficiency. *Horm Metab Res.* 2006; 38: 662-7.
9. Gharib H, Goellner JR. Fine needle aspiration biopsy of the thyroid: an appraisal. *Ann Intern Med.* 1993; 118: 282-289.
10. Goldstein RE, Netterville JL, Burkey B, Johnson JE. Implications of follicular neoplasms, atypia, and lesions suspicious for malignancy diagnosed by fine needle aspiration of thyroid nodules. *Ann Surg.* 2002; 235: 656-64.
11. Caraway NP, Sniego N, Samaan. Diagnostic pitfalls in thyroid fine needle aspiration: a review of 394 cases. *Diagn Cytopathol.* 1993; 9: 345-50.
12. Liel Y, Ariad S, Barchana M. Long-term follow up of patients with initially benign thyroid fine needle aspiration. *Thyroid.* 2001; 11: 775-8.

13. Leonard N, Mekher DH. To operate or not to operate the value of fine needle aspiration cytology in the assessment of thyroid swellings. *J Clin Pathol.* 1997; 50: 941-3.
14. Ikram M, Hyder J, Muzaffar S, Hasan SH. Fine Needle Aspiration cytology (FNAC) in the management of thyroid pathology - the Aga Khan University Hospital experience. *J Pak Med Assoc.* 1999; 49: 133-5.
15. Afroze N, Kayani N, Hasan SH. Role of fine needle aspiration cytology in the diagnosis of palpable thyroid lesions. *Indian J Pathol Microbiol.* 2002; 45: 241-6.
16. Safirullah, Mumtaz N, Khan A. Role of fine needle aspiration cytology (FNAC) in the diagnosis of thyroid swellings. *J Postgrad Med Inst.* 2004; 18: 19.
17. Hussain N, Anwar M, Nadia N, Zulfiqar Ali. Pattern of surgically treated thyroid disease in Karachi. *Biomedica.* 2005; 21:18-20.
18. Bapat RD, Shah SH, Relekar RG, Pandit A, Bhandarkar SD. Analysis of 105 uninodular goiters. *J Postgrad Med.* 1992; 38: 60-1.
19. Lee JK, Liu RS, Wu SY, Huang WS, Chou MC. Thallium-201 scintigraphy in evaluating thyroid nodules following equivocal fine-needle aspiration cytology. *Nuklearmedizin.* 2006; 45:201-5.
20. Khalid AN, Hollenbeak CS, Quraishi SA, Fan CY, Stack BC Jr. The cost-effectiveness of iodine 131 scintigraphy, ultrasonography, and fine-needle aspiration biopsy in the initial diagnosis of solitary thyroid nodules. *Arch Otolaryngol Head Neck Surg.* 2006; 132:244-50.