ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF FINE NEEDLE ASPIRATION CYTOLOGY (FNAC) IN THYROID SWELLINGS: STUDY FROM A TERTIARY HEALTHCARE FACILITY IN KPK

Imran Khan[1], Khalil Ahmad Orakzai[2], Arif Raza Khan[1], Muhammad Junaid[1], Israr Ud Din[1], Arshad Aziz[1]

[1]Department of ENT, Head & Neck Surgery, Khyber Teaching Hospital, Peshawar - Pakistan
[2]Department of ENT, Head & Neck Surgery, Nowshera Medical College, Nowshera - Pakistan

ABSTRACT

Objectives: To determine the diagnostic accuracy of FNAC done at our institution keeping histopathology as the gold standard for comparison.

Materials and Methods: This study is of a prospective validation design conducted at ENT department of Khyber teaching hospital (MTI) Peshawar ,Pakistan from January 2019 to August 2019. A total of 178 patients were included in the study and data regarding age, gender, FNAC and histopathological report were obtained from the patients along the course of their treatment. The results of FNAC were compared against those of histopathology.

Results: FNACs were done for all the 178 cases included in the study. FNAC indicated thyroid disease in about 49 cases. Our study showed a sensitivity of 79.63% and specificity of 95.16%.

Conclusion:FNAC is a sensitive, specific and accurate procedure and should be used for the preoperative assessment of thyroid patients.

Keywords: FNAC, Thyroid, Preoperative, Validity, Diagnostic Accuracy.

This article may be cited as: Khan I, Orakzai KA, Khan RA, Junaid M, Din IU, Aziz A. Diagnostic accuracy of fine needle aspiration cytology (fnac) in thyroid swellings: study from a tertiary healthcare facility in kpk. *J Med Sci* 2019 Oct;27(4):359-62.

INTRODUCTION

FNAC is considered to be a simple, convenient and economic diagnostic modality for assessing thyroid masses. It performs an important role in the preoperative planning of thyroid masses. Thyroid diseases are common in Pakistan. The prevalence of thyroid nodules in the population is about 4 – 7% in the general population.[1] The prevalence in the adult population is about 4- 10% and about 0.2 – 1.2% in children.[2] About 0.5% out of this proportion is represented by malignant tumors of the thyroid.[1] Nodules and masses of the thyroid are more frequent among the females, the elderly people, those with irradiation history specifically to the head and neck, and in people consuming diet high in goitrogenic substances. Among these masses is a higher proportion of benign lesions which creates a diagnostic and interventional dilemma. Hence, one of the major challenges for a surgeon while preparing for a thyroid surgery is the presumptive identification of the type of tumor and its grade of histological differentiation.[3,4] This identification of the thyroid mass is necessary because different thyroid masses tend to have a more or less different approach to treatment. Apart from this, the level of differentiation also helps to avoid unnecessary exposure to surgery or other treatment modalities. According to Lowhagen and colleagues, almost 80% of cases with thyroid nodules can avoid surgical exploration on the basis of histopathological diagnosis alone.[2] For these reasons and others, Fine Needle Aspiration Cytology has become very popular among surgeons and pathologists during the last two decades. Fine Needle Aspiration Cytology has turned out to be an essential part of thyroid surgeries because of its ability to provide precise morphological diagnosis of thyroid swellings.

There are many other diagnostic modalities for thyroid studies such as ultrasonography, computed

Dr Arshad Aziz (Corresponding Author)
Department of ENT, Head & Neck Surgery, Khyber Teaching Hospital, Peshawar,Pakistan
Email: arshadaziz707@gmail.com
Cell: +92-331-9054496
Date Received: November 27, 2019
Date Revised: December 5, 2019
Date Accepted: December 20, 2019

tomography, thyroid radionuclide scan and positron emission tomography.[5,6] When compared to these modalities, FNAC has the advantage of being simple, more economic, consumes less time, is safe for the fact that it carries a lower chance of complications and is relatively less invasive. An added benefit of FNAC is that it can also be performed in outpatient setup. Moreover, the rest of the investigative modalities show more about the functional status of the thyroid. The American Thyroid Association and National Comprehensive Cancer Network have devised guidelines stating that FNAC be used as an initial diagnostic test.[5]

According to information from different literature, FNAC shows a sensitivity and specificity ranging from 60 – 98% and 70 – 100%, respectively. Bloch et al. made a comparative study between FNAC and histopathology and found that the diagnostic accuracy of FNAC was 91.6%.[7] Mundasad et al. conducted a similar study and found out that FNAC had sensitivity of 52.6%, specificity of 86.6% and diagnostic accuracy of 79.1% for thyroid cancer.[8] Handa et al. had made a similar study which revealed a sensitivity of 97%, a specificity of 100%, a positive predictive value of 96% and a negative predictive value of 100%.[9] This wide variation of sensitivity and specificity among the different publications are mainly due to the difference in the parameters set for the target population. A certain study may include cystic lesions while another institution may have bias in that it will include only cases of follicular variant.[10] The same case also applies to patients with incidental carcinomas on histopathology and patients not undergoing surgery.[3,10,11] Another reason for the difference is the adequacy of the procedure performed.[10] This variability of adequacy may be due to the fact that the procedure was performed by a cytopathologist or a cytotechnologist. One study showed that a cytotechnologist was able to correctly judge 93% of FNAC aspirates while a cytopathologist was able to correctly judge 97% of the same FNAC aspirates.[10]

The purpose of this study was to determine the sensitivity, specificity and diagnostic accuracy of fine needle aspiration cytology of thyroid nodules keeping histopathology as a golden standard in a tertiary healthcare facility of Peshawar which receives patients from the whole province.

MATERIAL AND METHODS

This is a validation study over 7 months from January 2019 to August 2019 which involved 209 patients under treatment at ENT department of Khyber teaching hospital (MTI) Peshawar either as outdoor, indoor or referred cases. Patients were selected for the study on the basis of an inclusion criteria stating that patients claiming of thyroid swelling resulting either in cosmetic or compressive symptoms of any age and any gender were to be included. Data for this study was acquired only from patients who had an FNAC and were later scheduled to have surgery for the thyroid swelling. However, patients having a a) swelling less than 1 cm, b) previous history of surgical intervention or c) exposure to radiation therapy were to be excluded.

The patients received as such after proper history and examination were informed about the study.After informed and written consent, these patients were to be referred to Pathology department of the same institute where a Fine Needle Aspiration Cytology was performed by experienced cytopathologists. Coagulation screening was only done if the patient gave any history of delayed coagulation.They would perform the procedure without any local anesthetic using a 22 gauge needle attached to a 10cc disposable syringe.

The aspirates were then used to make dry and wet smears. The air-dried smears were stained with May Grunwald Giemsa (MGG) while wet smears fixed in 90% alcohol were stained with Hematoxylin and Eosin (H&E). Both kinds of smears were examined under an Olympus light microscope. The patients who had an FNAC were later on scheduled to have surgery for the swelling. The tissue would then be sent for histopathological studies. All the histopathological studies were done by a single pathologist.

The results obtained from both diagnostic modalities were then used to identify true positive, true negatives, false positives and false negatives out of the sample population. There were further used to compute sensitivities, specificities, positive predictive value, negative predictive value and diagnostic accuracy. Registered copies of Microsoft Excel 2013 and SPSS 21.0 were used for this purpose.

$$\text{Sensitivity} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}$$

$$\text{Specificity} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False Positives}}$$

RESULTS

Of the total 209 patients included for the study, 31 patients had either no indication for surgery and were managed medically or had declined surgery and were therefore excluded from the study.

The remaining 178 patients ranged from 34 to 58 years of age and the average age at presentation was 43.19 years. The most common age at presentation was during the 3rd and 4th decades as shown in Figure

1. Majority of these patients were females comprising about 80.34.% (n=143) while the remaining 19.66% (n=35) were males, as shown in Figure 2.In this way the ratio of occurrence among male to female was 1:4.08. FNAC was able to reveal 49 cases as being diseased of which 22.44% (n=11) were shown as malignant and 77.56% (n=38) as benign. Histopathology done later on for each of the patient showed 27.90% (n=12) cases to be malignant while 72.09% (n=31) cases to be benign.

Histopathological studies after surgery further showed that among the 12 cases of malignancy, 66.66% (n=8) were papillary carcinoma, 16.67% (n=2) were follicular carcinoma, 8.33% (n=1) were medullary carcinoma and 8.33% (n=1) were anaplastic carcinoma.

Hemithyroidectomy was performed in 40 cases while near total thyroidectomy were performed in 4 cases. Total thyroidectomy was performed in 5 cases, of which 2 had modified neck dissection done along with the total thyroidectomy. Thyroid replacement therapy was advised for the patients who had total thyroidectomy. The patients who had malignancy and had also gone through total thyroidectomy were referred for radioiodine ablation therapy. Among the patients who were diagnosed with anaplastic thyroid carcinoma, one had lived for 4 months until he developed some complication while the other one was lost to follow-up.

This study produced a sensitivity of 79.63% and a specificity of95.16% for FNAC. Positive predictive value was 87.76% while the negative predictive value was 91.47%. Out of the total 178 cases included into the study, the number of false positive was 6 while the number of false negatives was 11. This leads to a diagnostic accuracy of 90.45%.

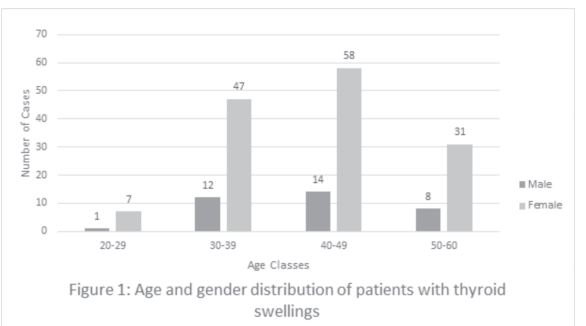

Figure 1: Age and gender distribution of patients with thyroid swellings

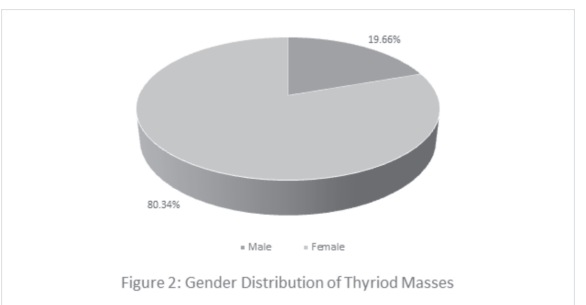

Figure 2: Gender Distribution of Thyriod Masses

Table 1: Statistical Demonstration of Thyroid Biopsy Reports

Test (FNAC)	Disease (Histopathology)	
	Disease Positive	Disease Negative
Positive	43	6
Negative	11	118

Table 2: Validity and Accuracy of FNAC

Sensitivity	Specificity	Accuracy
(TP/ TP+FN)*100%	(TN/ TN+FP)*100%	(TP+TN/n)*100%
79.63%	95.16%	90.45%

DISCUSSION

Over the last two decades, it has been established that FNAC is a simple and convenient technique for the preoperative identification of thyroid swelling.[4,11] The added benefit of being economic and without complications makes it the investigation of choice while diagnosing and managing thyroid swellings.

In this study, thyroid swellings appeared mostly during the 3rd to 6thdecadesof life, with majority of the cases seen during the early 5th decade. Thyroid swellings appeared mostly in females with a female to male ratio of 4.08:1. This finding is consistent with studies done by Bista et al and Khurshidet al which showed a male to female ratio of 4.6:2 and 4:1 respectively.[2,12]

The most common type of malignancy identified using FNAC was papillary thyroid carcinoma (63.63%) followed by follicular (18.18%), medullary (9.09%) and anaplastic (9.09%).Similar findings were produced by Bagga et al showing a majority of papillary (50%) followed by follicular (33.3%) and medullary (16.7%).[13] Esmaili et al in his study found malignancy in 128 cases which comprised of 85 (66.4%) cases of papillary thyroid carcinoma, 14 (10.9%) cases of follicular carcinoma in, 13 (10.1%) cases of medullary carcinoma and 14 (10.9%) cases of undifferentiated carcinoma.[14] Thus, papillary carcinoma turns out to be the most common variant among thyroid nodules.

This study produced a sensitivity of 79.63% and a specificity of 95.16%. These are comparable to findings produced by Bista, Mehmood and Wahid which showed sensitivities of 70%, 79.17% and 82.92% and specificities of 97.5%, 91.40% and 77.50%, respectively.[1,12,15] Khurshid et al produced sensitivity of 85% and

specificity of 90%. The study done by Beneregama et al came up with quite similar sensitivity and specificity of 84.05% and 86.74% respectively.[16]

Diagnostic accuracy according to this study was 90.45%. Bista, Mehmoodand Wahid which showed diagnostic accuracies of 92.1%, 88.89% and 82.92% respectively.[1,12,15] Khurshidand Beneragama came up with diagnostic accuracies of 88% and 85.52% respectively.[2,16]

CONCLUSIONS

FNAC is a sensitive, specific and accurate procedure and should be used for the preoperative investigation and planning of thyroid patients.

RECOMMENDATIONS

FNAC can be used to reduce unnecessary surgeries in patients with thyroid masses. The diagnostic accuracy of thyroid can be improved if ultrasound guidance is used to get an aspirate from the mass with greater accuracy.

REFERENCES

1. Wahid FI, Khan SF, Rehman HU, Khan IA. Role of fine needle aspiration cytology in diagnosis of solitary thyroid nodules. Iranian journal of otorhinolaryngology. 2011;23(65):111.
2. Anwar K, Khan IA, Zada B. The Role of Fine Needle Aspiration Cytology (FNAC) in the Management of Solitary Thyroid Nodules. KMUJ:. 2010;2(2):49-52.
3. Agrawal S. Diagnostic accuracy and role of fine needle aspiration cytology in management of thyroid nodules. Journal of surgical oncology. 1995;58(3):168-72.
4. Kc S, Karki R, Rayamajhi P, Rai K, Piya E. Role of FNAC in the Diagnosis of Thyroid Mailgnancy and its Comparison with Histopathology. Nepalese Journal of ENT Head and Neck Surgery. 2012;3(1):9-10.
5. de la Serna Saravia C, Cuellar F, Day ES, Harach R. Accuracy of Aspiration Cytology in Thyroid Cancer. Acta cytologica. 2006;50(4):384-7.
6. Sirpal Y. Efficacy of fine needle aspiration cytology in the management of thyroid diseases. Indian journal of pathology & microbiology. 1996;39(3):173-8.
7. Bloch M. Fine needle aspiration biopsy of head & neck masses. Otolaryngol Head Neck Surg. 1997;89:62-8.
8. Mundasad B, Mcallister I, PYPER P, CARSON J. Accuracy of fine needle aspiration cytology in diagnosis of thyroid swellings. Cytopathology Supplement. 2003;14.
9. Handa U, Garg S, Mohan H, Nagarkar N. Role of fine needle aspiration cytology in diagnosis and management of thyroid lesions: A study on 434 patients. Journal of cytology. 2008;25(1):13.
10. Poller D, Stelow E, Yiangou C. Thyroid FNAC cytology: can we do it better? Cytopathology. 2008;19(1):4-10.
11. Musani MA, Khan FA, Malik S, Khambaty Y. Fine needle aspiration cytology: sensitivity and specificity in thyroid lesions. Journal of Ayub Medical College Abbottabad. 2011;23(1):34-6.
12. Bista M, Toran K, Regmi D, Maharjan M, Kafle P, Shrestha S. Diagnostic accuracy of fine needle aspiration cytology in thyroid swellings. Journal of Nepal Health Research Council. 2011.
13. Bagga P, Mahajan N. Fine needle aspiration cytology of thyroid swellings: How useful and accurate is it? Indian Journal of cancer. 2010;47(4):437.
14. Esmaili HA, Taghipour H. Fine-needle aspiration in the diagnosis of thyroid diseases: An appraisal in our institution. ISRN Pathology. 2012;2012.
15. Mehmood Q, Ahmad B, Dab RH, Ahmad J, Javed A, Zahra K, editors. Role of fine needle aspiration cytology for neoplastic evaluation of nodular goitre. APMC; 2010.
16. Beneragama D, Jayasuriya W, Samarawickrama R, Rupasingha R, Piyasena M, Dayarathna U, et al. Validity of fine needle aspiration cytology in the diagnosis of thyroid diseases. Journal of Diagnostic Pathology. 2011;5(1).

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Khan I: Main Idea.

Ahmad K: Data Collection.

Khan AR: Overall supervision and final approval.

Junaid M: Statistical data.

Din IU: Data Collection.

Aziz A: Manuscript writing, Bibliography.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.