Original Article

Correlation of Fine Needle Aspiration Cytology with Histopathological Examination of Thyroid Swellings

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ABSTRACT

Introduction: Fine Needle Aspiration Cytology (FNAC) is considered as a simple, minimally invasive, cost effective, readily repeated and quick to perform procedure in the outpatient department with excellent patient compliance. High sensitivity and specificity of FNAC has made it as an initial diagnostic in thyroid swellings. However, it has its own limitation as in cases of lymphoma and follicular adenoma.

Methods: Prospective, observational study including total of 37 patients (7 males and 30 females) with thyroid swellings who presented in department ORL-HNS, National Academy of Medical Sciences (NAMS), Bir Hospital, Kathmandu, Nepal were evaluated pre-operatively with FNAC from August 2017 to July 2018 and these findings were compared with histopathology observations following thyroidectomy.

Results: Out of 37 patients evaluated, 16 (43.20%) were found to have malignancy on histopathological examination (HPE). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of FNAC was 61.5%, 94.4%, 88.9%, 77.3% and 80.6% respectively.

Conclusion: We can conclude that FNAC is a simple, safe and cost-effective diagnostic modality in the investigation of thyroid swellings with high specificity, PPV and accuracy.

Keywords: *Fine needle aspiration cytology, histopathological examination, thyroid swellings*

Introduction

Thyroid gland swelling is one of the commonest presentations in ENT and Head and Neck Surgery Department. The clinical spectrum of thyroid swellings ranges from the incidental, asymptomatic, small, solitary nodule to the large, partly intra-thoracic nodule that causes pressure symptoms. First line of investigations of thyroid swellings includes ultrasonography and FNAC which is used to differentiate between benign and malignant thyroid nodules. Though, FNAC as a method was first published by Leyden in 1883,[1] its use in thyroid lesions was first reported by Martin and Ellis in 1930.[2] American Thyroid Association[3] and National Comprehensive Cancer Network[4] guidelines state that FNAC should be used as initial diagnostic test because of its superior diagnostic reliability and cost-effectiveness. The goal of diagnostic work up is to select those patients for surgery who have a high likelihood of harboring malignancy so as to avoid surgery in those who do not require.

Fine needle aspiration cytology, however, is not without limitations related to specimen adequacy, sampling techniques, skill of performing the aspiration, interpretation of the aspirate, and overlapping cytological features between benign and malignant follicular neoplasm. Cytological evaluation of a small thyroid nodule (less than or equal to 1 cm.) may often be fallacious for which USG guidance may be required for better diagnostic accuracy. Histopathological examination of the removed thyroid swellings is considered to be the most accurate and gold standard method to determine the pathology. This study is carried out with the objective of comparing the findings and diagnostic accuracy of preoperative FNAC in thyroidswellings with postoperative HPE results.

The aims and objectives of this study is correlating the cytological diagnosis and histopathological diagnosis to evaluate sensitivity specificity, PPV, NPV and accuracy of FNAC, thereby its role in pre-operative diagnosis of thyroid

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swellings and planning proper management.

Methods

A prospective, observational study was carried out in ORL-HNS Department, NAMS including 37 patients for a period of 1 year (from August 2017 to July 2018). All patients who presented with the clinical evidence of thyroid swelling were part of study population. The patients were evaluated by thorough clinical examination followed by routine investigations, thyroid function tests, USG and FNAC.

Patients with thyroid swellings who had FNAC as pre-operative investigation and underwent thyroid surgery and histopathological evaluation were included.

FNAC was done by a Consultant Pathologist, by aspirating cells/tissue fragments by making 2-3 passes using a fine needle of length 30-50mm and 22-27 gauge (0.7-0.4mm), and the aspirate was then evenly smeared on slides. One pair was fixed in Isopropyl alcohol containing Coplin jar and then stained in Papanicolaou (Basic) stain, while another pair was air dried and then stained in May Grunwald Giemsa (Acidic) stain, and applied a cover slip after DPX and microscopic examination performed.

After pre-operative preparation and anaesthetic checkup patients underwent surgery and specimen was sent for HPE. The tissue was processed routinely, and paraffin embedded blocks was prepared. Sections were cut at 5–6 micrometer were stained with Hematoxylin and Eosin. Reporting was done by a Consultant Pathologist and findings was compared with FNAC. Sensitivity, specificity, accuracy, positive predictive value and negative predictive value were calculated afterwards.

Results

Majority of patients belonged to 21–30 and 41-50 years' age group comprising of 29.7% of cases in each group. Elderly, more than 60 years' age group comprised of only 2.70% (Fig. 1). The mean age ± SD was 38.89 ± 12.69 years. In this series of 37 patients, females were higher in frequency (n = 30; 81.1%) than males (n = 7; 18.9%) (Fig. 2).

Twenty-one (56.8%) patients were clinically diagnosed as having solitary thyroid nodule and 16 (43.2%) were diagnosed as multinodular goitre (Table 1).

On FNAC, 22 patients (59.4%) were diagnosed with benign disease and 9 cases (24.3%) were diagnosed as malignant in FNAC examination. FNAC diagnosis was not possible in 5.4% of patients due to inadequate sample (Table 2).

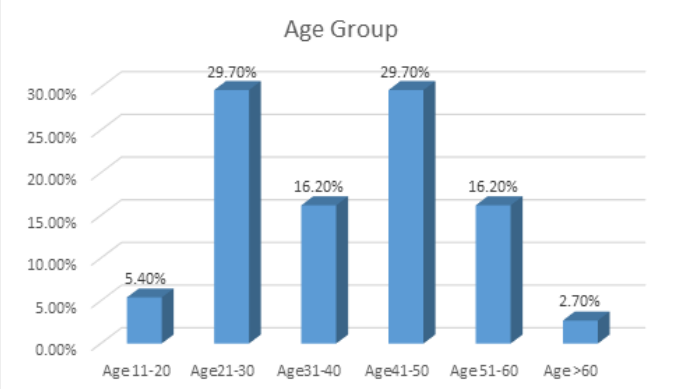

Fig 1: Age distribution

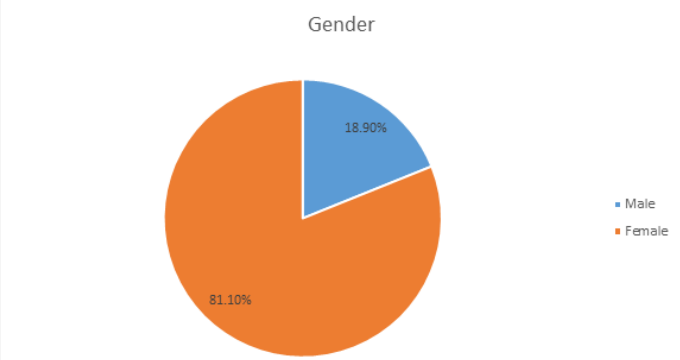

Fig 2: Gender distribution

Table 1. Clinical diagnosis of thyroid swellings

	Frequency		Percent	Valid percent	Cumulative percent
Solitary thyroid nodule	Male	Female	56.8	56.8	56.8
	4	17			
Multinodular goitre	Male	Female	43.2	43.2	100.0
	3	13			
Total	37		100.0	100.0	

Table 2. FNAC diagnosis of thyroid swellings

Classification of aspirate	Frequency	Percentage (%)
Inadequate Sample	2	5.4
Benign	22	59.4
Suspicious	4	10.8
Malignant	9	24.3
Total	37	100

Table 3. Histopathological diagnosis of thyroid swellings

HPE diagnosis		No.	%
Benign (Non-neoplastic)	Colloid goitre	9	24.3
	Multinodular goitre	3	8.1
	Hurthle cell adenoma	2	5.4
	Lymphocytic thyroiditis	3	8.1
	Benign follicular adenoma	6	16.22
Malignant (Neoplastic)	Papillary carcinoma	13	35.1
	Follicular carcinoma	1	2.7
Total		37	100

Table 4. Sensitivity, specificity, PPV, NPV and accuracy of FNAC in detecting thyroid malignancy

Sensitivity	TP/(TP+FN) x 100= 8/13x100	61.5%
Specificity	(TN/TN+FP) x 100=17/18x100	94.4%
Positive Predictive Value	TP/ (TP+FP) x 100= 8 /9 x100	88.9%
Negative Predictive Value	TN/(TN+FN) x 100= 17/22 x100	77.3%
Accuracy	(TN + TP)/ (TN+TP+FN+FP) x 100 =25/31x100	80.6%

Discussion

The age of the patients in this study ranged from 17 to 61 years (range 44). The mean age was 38.89 years and peak age of incidence of thyroid swelling was in third and fifth decades (29.4%). There are variable results regarding the peak age of incidence of thyroid swellings. Sharma et al. observed the peak incidence of thyroid swelling in fourth and fifth decades in his study[5] whereas, the study published by Rout et al. showed the peak incidence of thyroid swellings was in the second and third decades of life.[6]

Majority of the patients in this study were females, 81.1% (n=30). Males were in the order of 18.9% (n=7), thus giving a female to male ratio of 4.28:1. The female to male ratio was 4.3:1 in the study conducted by Nilakantan et al. supporting the current study.[7]

Clinically, 21 patients (56.8%) were diagnosed as solitary thyroid nodule whereas multinodular goitre was 16 (43.2%). Incidence of both solitary nodule and multinodular goitre was higher in female. Malignancy was present in 47.61% of clinically diagnosed solitary thyroid nodules whereas malignancy was present in only in 25% of multinodular goitre. In the study done by Jena et al.[8] Incidence of malignancy was present in 46.2% of solitary thyroid nodule and 22.5% of multinodular goitre which is similar to present study.

FNAC results of this study revealed 22 cases (59.4%) as non-neoplastic thyroid swellings whereas the remaining 9 cases (24.3%) as neoplastic conditions. Four cases were reported as suspicious not being able to distinguish benign from malignant and adequate sample was not present in 2 cases so we have excluded these 6 cases in statistical analysis. In a study conducted by Borgohain et al., they observed that the non-neoplastic thyroid nodules were 60% whereas 30% of were of neoplastic conditions which corresponds to the present study.[9]

In this study, the most common thyroid malignancy diagnosed by histopathology was papillary thyroid carcinoma (PTC). It accounted for 35.13% (13 cases) of all the HPE diagnoses, which represents 81.25% of all thyroid malignancies (Table 3). In a similar study conducted by Hirachand et al.[10] proportion of PTC was found to be 81.25% of the thyroid malignancies which is in accordance with the current study. Colloid goitre was the most common non-neoplastic lesion accounting for 24.3% of all the thyroid swellings confirmed by HPE. Other non- neoplastic lesions were benign follicular adenoma, multinodular goitre,

lymphocytic thyroiditis and Hurthle cell adenoma.

The sensitivity and specificity of FNAC on detecting malignancy was 61.5% and 94.4% respectively. The PPV, NPV and accuracy of FNAC were 88.9%, 77.3% and 80.6% respectively (Table 4). The sensitivity, specificity, PPV, NPV and accuracy of FNAC on detecting malignancy of current study is comparable to the results from the study done by Hajmanoochehri and Rabiee et al.[11] as seen from the table below. Most of the other studies have reported a higher rate of sensitivity and specificity than this study. One of the reasons for this could be because of the small sample size of the current study and exclusion of the inadequate sample and suspicious of malignancy cases from statistical analysis (Table 5). In this study, among 22 benign FNAC diagnoses, 5 cases turned out to be malignant with false negative rate of 22.73%. One reason for occurrence for false negative cytology is coexistence of malignant and benign lesions. In these cases, the aspiration obtained from large benign lesion and adjacent malignant lesions can be missed sometimes. Other reason includes overlap of cyto-morphological features between benign and low grade malignant lesions and misinterpretation of cytology. Out of 9 cases diagnosed as definite malignant cases by cytology, 7 cases turned out as malignant on final histopathology.

Table 5. Comparison of statistical analysis of FNAC in various studies

Author	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Diagnostic Accuracy (%)
Present study	61.5	94.4	88.9	77.3	80.6
Hajmanoochehri and Rabiee et al.	68.4	95.2	83.3	89.6	85.14
Borgohain et al.[9]	82.14	86.81	65.71	94.04	83.60
Ayub et al.[12]	96.39	76.47	95.24	81.25	93.0

Conclusion

FNAC is a simple, safe and cost-effective initial diagnostic modality in the investigation of thyroid swellings with high specificity, PPV and accuracy. FNAC helps to diagnose those patients who can be managed conservatively and prevents unnecessary surgeries. Different studies done so far, suggest that FNAC is an elementary, safe, cost-effective and fruitful initial investigation of choice for thyroid swellings. We conclude that FNAC diagnosis of malignancy is highly significant but a benign FNAC diagnosis should be viewed with caution as false-negative results do occur and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery. So, final diagnosis and treatment modality should be based upon histopathology.

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