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Research Article

INFLUENCE OF FINE NEEDLE ASPIRATION CYTOLOGY (FNAC) IN THE ANALYSIS OF MALIGNANT THYROID NODULES

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Abstract:

Aim: The aim of this study is to determine the importance of fine needle aspiration in the diagnosis of malignant thyroid nodules.

Place and Duration: In the ENT and Surgical Unit-II of Nishtar Hospital Multan for one-year duration from August 2019 to August 2020.

Material and methods: The trial consisted of 82 patients with a single thyroid nodule who met the inclusion criteria. Our study included 82 cases involving 57 women and 25 men, with a female to male ratio of 2.28: 1. The age of the patients ranged from 16 to 65 years, and the mean age was $42.56 \pm SD 11.60$ years. Most patients reported in the 3rd and 4th decades, and then in the 5th and 2nd decades. The diagnostic performance of fine needle aspiration cytology (FNAC) in this study was 82.92%, sensitivity 88.09%, specificity 77.50%, and positive predictive value 80.43%. After collecting a detailed history, thorough examination, appropriate examination and informed consent, fine-needle aspiration cytology was performed in all cases by the same cytopathologist. The thyroid gland was operated on and the samples were examined by the same histopathologist. Statistical analysis was performed using the Statistical Program for Social Sciences (SPSS version 11).

Results: One hundred and twenty-six patients entered the study, of whom 77 (61%) were women and 49 (39%) were men. The mean age was 26.9 ± 7.7 years. As many as 79.4% of patients complained about cosmetic effects, 39.7% for respiratory problems and 4.8% for olfactory problems. The cause of the doctor's claim was significantly related to the age and sex of the patients, as well as the experience of surgeons.

Conclusion: FNAC is a key principle in the diagnosis of a single thyroid nodule as it is a safe, minimally invasive and cost-effective diagnostic tool.

Key words: cytology of fine-needle aspiration, histopathology, solitary thyroid nodule

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INTRODUCTION:

The incidence of thyroid disease is common in Pakistan, and a single thyroid nodule is a serious diagnostic dilemma for the treating surgeon. A thyroid nodule occurs in 4-7% of the population. Malignant thyroid tumors account for less than 0.5% of all cancers. Although single thyroid nodules are common in women, they're more likely to be malignant in men. Currently, various imaging techniques are used for preoperative diagnosis of a single thyroid nodule, such as radio-nucleotide scanning, high-resolution ultrasound, etc., but fine-needle aspiration cytology is considered one and the most cost-effective procedure. Fine-needle aspiration cytology of malignant thyroid nodules showed sensitivity and specificity in the range of 65–98% and 72–100%, respectively. While there is extensive worldwide literature stating the accuracy and usefulness of thyroid cytology, there is also evidence pointing to possible limitations and pitfalls of this procedure. Thyroid fine-needle aspiration cytology is now a recognized first-line diagnostic test for diffuse thyroid lesions as well as single thyroid nodule, the main purpose of which is to confirm a benign lesion and reduce unnecessary surgery. Virtually any thyroid disease can be represented as a nodule, and it is usually not possible to distinguish a benign from a malignant thyroid nodule by any non-invasive procedure. The use of FNAC in the treatment of the thyroid gland is unparalleled in popularity because it is mainly associated with the cosmetic complications and technical difficulties of thyroid surgery, and a relatively small number of true tumors in patients with thyroid nodules. The main goal of FNAC assessment of these nodules is to identify nodules with malignant potential and promptly treat them, taking into account the limitations of open biopsy and the advantages of FNAC.

MATERIALS AND METHODS:

This descriptive study was conducted at the ENT and Surgical Unit-II of Nishtar Hospital Multan for one-year duration from August 2019 to August 2020. It included 82 cases of single solid thyroid tumors that met inclusion criteria.

Admission Criteria:

1. Male and female patients.
2. All age groups.
3. Lump of thyroid secretion.

Exclusion Criteria:

1. Non-discrete neck masses.
2. Spilled goiter.
3. Multinodular goiter.

This study was approved by the hospital's ethics committee. The diagnostic criterion for a single thyroid nodule was a triple assessment, including clinical, radiological and tissue diagnostics. Informed consent was taken. The technique, risks, benefits, outcomes, and complications of the procedure were discussed with all patients. A detailed interview was taken and the patient was carefully examined. The mucosa lining of the upper gastrointestinal tract was examined and a systemic examination was performed. Routine tests were performed in all cases. Ultrasound, radioiodine scans, thyroid function tests, computed tomography, magnetic resonance imaging and endoscopy were performed when indicated. Fine-needle aspiration cytology was performed in all cases by the same cytopathologist. The thyroid gland was operated on and the samples were examined by the same histopathologist. Statistical analysis was performed using the Statistical Program for Social Sciences (SPSS version 11). Frequencies and percentages for qualitative variables are presented, and the mean + SD for quantitative variables. All relevant information was documented in a pre-designed proforma. Sensitivity, specificity, positive predictive value and negative predictive value were calculated for fine needle aspiration cytology using histopathology as the gold standard.

RESULTS:

Our study included 82 cases of a single thyroid nodule meeting the inclusion and diagnosis criteria. There were 57 females and 25 males, with a female to male ratio of 2.28: 1. Patients' age ranged from 16-65 years, and the mean age was 42.56 + SD 11.60 years. Most patients reported in the 3rd and 4th decades, and then in the 5th and 2nd decades (Figure 1).

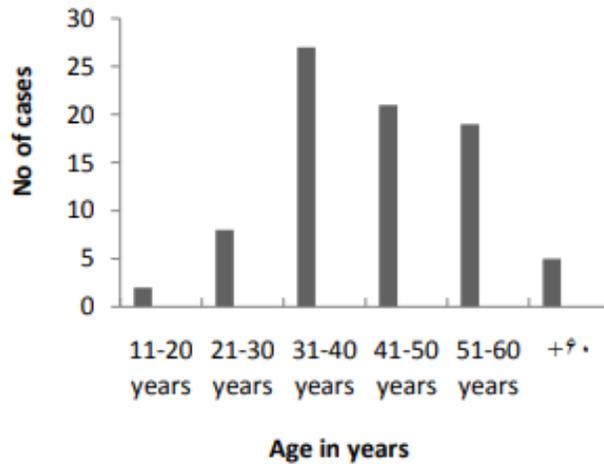


Fig 1: Age-wise distribution of patient (n=82).

The main complaints of these patients were neck edema (100%), vocal cord paralysis (6.09%), difficulty breathing (4.87%) and dysphagia (Table 1). The size of the thyroid nodule ranged from 2 - 7.2 cm, with an average of 4.40 +/- 1.93 cm. A single nodule was present mainly in the right thyroid lobe (64.63%), the isthmus was the least affected.

Table 1: Clinical features of patients (n=82).

S. No	Symptom/ Sign	NO. of cases	Percentage
1	Neck Swelling	82	100%
2	Vocal Cord Palsy	05	6.09%
3	Difficult Breathing	04	4.87%
4	Dysphasia	03	3.65%
5	Hoarseness	02	2.43%
6	Weight Loss	02	2.43%

In this study, the FNAC of a single thyroid nodule showed that 42 cases (51.21%) were nodular goiter, 13 cases (15.85%) were benign cysts among benign lesions, and 13 cases (15.85%) were follicular cancer, 8 cases (9.75%) papillary carcinoma, and in 2 cases, neoplasm was suspected (Table 2).

Table 2: FNAC of thyroid nodule (n=82).

Diagnosis on FNAC	Patients		
	No. of cases		% Age
Non neoplastic lesions	Nodular goiter	42	70.73
	Benign cyst	13	
	Lymphocytic thyroiditis	3	
Neoplastic lesions	Follicular carcinoma	13	29.26
	Papillary carcinoma	8	
	Hurthle cell lesion	1	
	Suspicious of neoplasm	2	

In our histopathological examination of the thyroid nodule, there were 40 cases (48.78%) of the colloidal nodule, 10 cases (12.19%) of benign thyroid cyst and 1 case of Hashimoto's thyroiditis among benign conditions, while neoplastic

lesions accounted for 13 cases (15, 85%) follicular adenoma. , 10 cases (12.19%) colloidal adenoma followed by papillary carcinoma, 3 cases (3.65%) and 2 cases of follicular cancer (Table 3).

Table 3: Histopathology of thyroid nodule (n=82).

Diagnosis on histopathology		Patients		
		No. of cases		% Age
Non neoplastic lesions	Solitary colloid nodule	40	53	64.63
	Benign thyroid cyst	10		
	Ch. Lymphocytic thyroiditis	2		
	Hashimoto's thyroiditis	1		
Neoplastic lesions	Follicular adenoma	13	29	35.36
	Colloid adenoma	10		
	Hurthle cell adenoma	1		
	Follicular carcinoma	2		
	Papillary carcinoma	3		

The diagnostic value of FNAC in this study was as follows: 37 cases (45.12%) were true positive and 31 cases (37.80%) were true negative. In this study there were 9 false-positive cases (10.97%), 5 cases were follicular neoplasm after FNAC, while histopathologic examination revealed benign thyroid disease, 3 cases were papillary carcinoma, biopsied with benign thyroid cyst (tab .4).

Table 4: Table of frequency of diseases in this study (n=82).

Test result (FNAC)	Gold standard test (BIOPSY)		Total
	Disease	No disease	
Positive	37	9	46
Negative	5	31	36
Total	42	40	N=82

Table 5: Diagnostic comparison between FNAC and histopathology for solitary thyroid nodule (n=82).

Cytological diagnosis	Histological diagnosis	Frequency	Remarks	
Follicular neoplasm	Follicular adenoma	15	37	True Positive
	Follicular carcinoma	11		
	Hurthle cell lesion	1		
	Papillary carcinoma	7		
Suspicious neoplasm	Papillary carcinoma Colloid adenoma	3		
Follicular neoplasm	Nodular goitre with hyperplasia	3	9	False Positive
	Ch. Lymphocytic thyroiditis	2		
	Papillary carcinoma	3		
	Suspicious of neoplasm	Hashimoto's thyroiditis		
Nodular goiter	Solitary colloid nodule	19	31	True Negative
	Benign cystic lesion of thyroid	9		
	Ch. Lymphocytic thyroiditis	2		
	Hushimoto's thyroiditis	1		
Nodular goiter	Papillary carcinoma	2	5	False Negative
	Benign cystic lesion of thyroid	1		
	Ch. Lymphocytic thyroiditis	1		
	Nodular goitre with hyperplasia	Follicular adenoma		

Table 6: Diagnostic yield of FNAC in diagnosis of solitary thyroid nodule (n=82).

Accuracy	Sensitivity	Specificity	PPV	NPV
82.92%	88.09%	77.50%	80.43%	86.11%

In our study, 5 cases (6.09%) were false-negative, 3 cases were benign thyroid disease with papillary cancer diagnosed by histopathology, and 2 cases (2.43%) were diagnosed as lymphoma and follicular adenoma by histopathology (tab. .5).

DISCUSSION:

FNAC-based detection of single thyroid lesions remains a challenge, despite tireless efforts to establish cytological and clinical criteria for the diagnosis of follicular neoplasms and to distinguish between benign and malignant lesions. Nevertheless, it is widely accepted that FNAC is currently the best and most reliable diagnostic tool for the pre-operative management of patients with such lesions. Thyroid lump is more common in women than in men. 57 women and 25 men took part in this study, with a female-to-male ratio of 2.28: 1, which is comparable to the research carried out in Poland and abroad. In this study, the majority of patients were in the 3rd and 4th decades, which is consistent with the studies of Bukhari *et al*. In this study, the FNAC result was as follows: in 58 cases (70.73%), non-neoplastic lesions were found, in which according to the study Korah found mild changes in 69%, while some studies found mild changes in 50% of cases. Among benign lesions, nodular goitre was the most common (51.21%), which is consistent with the Gupta study, in which 39 cases (52%) had nodular colloid goitre and Saddique. thirty cases (50%) reported as nodular goitre. Another common FNAC finding among benign lesions was a benign cyst in 13 cases (15.85%), which differs from the Abu-Salem study with thyroid cysts in 43 cases (8.3%). Malignancies in this study were 29.26%, which is comparable to the Gupta study with malignancies 26% and the Baloch study with malignancies 29% (n-110). Among neoplastic diseases, follicular carcinoma was the dominant, accounting for 15.85%, which differs from the Pai study, where malignancy was found in 15 cases (23%). In the histopathological examination, non-neoplastic changes constituted 64.63%, and neoplastic changes 35.36%, while in the Mehmood examination, histopathology showed non-neoplastic changes in 79.49% and neoplastic changes in 20.51%. Among neoplastic changes in histopathology, follicular adenoma was found in 13 patients (15.85%), while in Tabaqchala's study, follicular adenoma was found in 60 patients (25.10%). In FNAC, 8 cases (9.75%) were diagnosed as malignant, and histopathology confirmed benign nodular goitre, and one case was suspected in the FNAC study and confirmed as Hashimoto's thyroiditis by histopathology, which is comparable to the study by Ghariba, who reported false negative

from 1% to 11%, false positive rate from 1% to 8%. In this study, the diagnostic performance of FNAC for a single thyroid nodule adjusted for sensitivity, specificity, PPV, and NPV was 88.09%, 77.50%, 80.43%, and 86.11%, respectively. In the literature, the diagnostic efficiency of FNAC varies from 50% to 95%. Kumar showed sensitivity and specificity of 77% and 100%, respectively. In the Moos study, the FNAC recovery was as follows: sensitivity 77.7%, specificity 98.9%, positive predictive value 87.5% and negative predictive value 97.8%. Similarly, Abu-Salem tested a specificity of 99% and a sensitivity of 93%. Tariq reported sensitivity of 75%, specificity of 97.6%, PPV 85.71%, and NPV 95.34%. Saddique demonstrated a sensitivity of 75%, a specificity of 95.83%, a positive predictive value of 81.81%, and a negative predictive value of 93.81% in his studies. Similarly, Alam reported sensitivity of 100% and specificity of 95.12%. My results are lower than the Korah study which reported 88%, 98%, 100% and 100%, in terms of sensitivity, negative predictive value (NPV), specificity and positive value predictive (PPV). The FNAC result in the Mehmood study showed a sensitivity of 79.17% and a specificity of 91.40%. In my study, the accuracy of FNAC was 82.92%, which is comparable to Bukhari studies with an accuracy of 87%, Pai accuracy of 89%. However, the accuracy of my study is greater than the Gupta study revealed an accuracy of 13.3%.

CONCLUSION:

FNAC has a key principle in the diagnosis of a single thyroid nodule as it is a safe, minimally invasive, and cost-effective diagnostic tool for the pre-operative evaluation of patients with thyroid nodules that helps the surgeon to treat these nodules.

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