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A study to compare and correlate between FNAC and Histopathological examination of a solitary thyroid nodule

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Abstract

Aim of the study

1. To compare and correlate between FNAC and Histopathological examination of a solitary nodule.
2. To determine the incidence of adenoma, carcinoma, and thyroiditis as a cause of solitary thyroid nodule.

Materials and methods: This prospective observational study was conducted in a total of 50 patients with solitary thyroid nodule admitted and undergone hemithyroidectomy or total thyroidectomy in in NRI medical college chinnakakani, Dept of General Surgery, from November 2018 to March 2020.

Results: A total of 50 patients were observed and analyzed. The study involves 36(72.00%) females and 14(28%) males. The mean age is 45.64±13.08. The sensitivity of FNAC in all the benign and malignant type of thyroid lesions was found to be in the range of 4.00%-34%, whereas the specificity was found to be 62%-100%, the positive predictive value was between 0%-100%, and the negative predictive value was between 43.66%-59.52%for all the lesions detected by FNAC.

Conclusions : Although a majority of the thyroid nodules are benign, a hidden percentage is malignant. Thyroid nodules may be single or multiple. A Solitary thyroid nodule is clinically defined as a discrete palpable swelling present in either the lobes of the thyroid gland or the isthmus. These swelling are often large and develop on the thyroid gland edge, making them easy to palpate and visible.

Keywords: Solitary Thyroid Nodule, FNAC, Sensitivity, Specificity.

Introduction

A thyroid nodule (goiter) refers to a well-defined lesion within the thyroid gland that is palpably or radiologically distinct from the surrounding thyroid gland parenchyma.[1] These are common, seen in about 8.5% of the population. It is a growth or lump in the thyroid gland, presenting as swelling in front of the neck, moving with deglutition, and it is the most common presentation

of iodine deficiency. Its prevalence is more common in women than men (4:1) and advanced ages [2,3]. It is most familiar in the age group between 21-40 years. Many disorders, benign and malignant, can cause thyroid nodules. Besides the infrequent local compressive symptoms or thyroid dysfunction, thyroid nodule's clinical importance is primarily the possibility of thyroid cancer, which occurs in about 5% of all thyroid nodules.

Thyroid cancers are rare, accounting for only 1% of all cancers and about 0.5% of cancer-related mortality [4]. Although a majority of the thyroid nodules are benign, a hidden percentage is malignant. Thyroid nodules may be single or multiple. A Solitary thyroid nodule is clinically defined as a discrete palpable swelling present in either the lobes of the thyroid gland or the isthmus. These swelling are often large and develop on the thyroid gland edge, making them easy to palpate and visible.

The prevalence of these nodules in a given population depends on several factors such as age, sex, diet, iodine deficiency, therapeutic, and environmental radiation exposure. The prevalence of solitary nodule increases with age at a rate of 0.8% per year [5,6]. The majority of palpable thyroid nodules was 4 to 7%, with only 5 to 10% of the malignant [7-10]. The incidence of a solitary thyroid nodule is about 4%. They are discovered by palpation in 3% to 7% [11,12] by ultrasound in 20% to 76% in the general population3,4 and by autopsy in approximately 50% [13,14].

Objectives

1.To compare and correlate between FNAC and Histopathological examination of a solitary nodule.

2.To determine the incidence of adenoma, carcinoma, and thyroiditis as a cause of solitary thyroid nodule

Material and Methods

Patient selection and randomization: This prospective observational study was conducted in a total of 50 patients with solitary thyroid nodule admitted and under gone hemithyroidectomy or total thyroidectomy my in NRI medical college chinnakakani, Dept of General Surgery. A total of 50 patients were recruited from November 2018 to March 2020. Informed consent was obtained from all patients who met the inclusion criteria. The study was approved by the Institutional Ethics Committee. The sample size assumes that the expected incidence of a solitary thyroid nodule is 0.18 percentage. To achieve the 90% power to detect this difference with a significance level of 5%, it is estimated that 50 subjects would be required. With a withdrawal/non-evaluable subject rate of 0%, a total of 50 subjects will be recruited.

Inclusion criteria

- Age group 18 – 70 years.
- Patients found to have a solitary thyroid nodule on clinical examination
- Patient willing to provide consent

Exclusion criteria

- Patients with previous thyroid surgery.
- Patient with thyroid swellings other than solitary nodule of thyroid
- Patients refused to give written consent

Diagnosis and treatment

Between 2018 to 2020, all cases were admitted to the General Surgery department NRI Medical College and General Hospital, Chinakakani, with solitary thyroid nodule which has undergone hemithyroidectomy or total thyroidectomy and examined prospectively. Clinical presentations of all the cases are noted, and patients are subjected to fine-needle aspiration cytology

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preoperatively and histopathological examination postoperatively.

Data collection

According to the study, proforma data was collected thorough physical examination of every patient. A standard set of demographic data and clinical data was collected prospectively for all the patients: Swelling, Pain, Pressure symptoms, Hyperthyroid features, Hypothyroid features, Primary toxicity, Secondary toxicity, Menstrual history, Malignancy symptoms, Past history, Family history, Personal history, General examination, Local examination (inspection), Local examination (palpation), Percussion, Auscultation, Eye signs, Systemic examination, Investigations were recorded.

Follow–up

All the patients were examined at the initial visit, and inspections were repeated according to previously described methods.

Statistical methods

Data were presented as absolute numbers, mean and standard deviation or percentages. Values of continuous variables were expressed as a mean ± standard deviation (SD). Categorical variables are represented as frequency distributions and single rates. Commonly continuous variables were compared using a student t-test, non-normally distributed continuous variables using the Mann-Whitney U test, and categorical variables compared by $\chi 2$ and Fisher's exact test, where appropriate. All statistical tests were two-sided. Results were considered statistically significant and at a level of p-value less than 0.05. All analysis will be performed using SPSS version 23.

Results

It is a prospective observational study admitted with solitary thyroid nodule admitted and undergone hemithyroidectomy or total thyroidectomy. A total of 50 patients were observed and analyzed. The study involves 36(72.00%) females and 14(28%) males. The mean age is 45.64±13.08.

Table 1: Distribution of study population as per age and sex

Age (Range)	Females	Males	All
25-30	7(19.44)	1(7.14)	8(16.00)
31-35	4(11.11)	2(14.29)	6(12.00)
36-40	5(13.89)	1(7.14)	6(12.00)
41-45	6(16.67)	1(7.14)	7(14.00)
46-50	6(16.67)	3(21.43)	9(18.00)
51-55	2(5.56)	0(0.00)	2(4.00)
56-60	4(11.11)	1(7.14)	5(10.00)
>60	2(5.56)	5(35.71)	7(14.00)

The commonest age group in females is 25-30yrs (19.44%), followed by 41-45 yrs (16.67%) and 46-50 yrs (16.67%). In comparison, the commonest age group in males is >60 yrs, followed by 46 -50 yrs.

Table 2: Diagnosis of solitary nodules between HPE and FNAC diagnosis.

	Unit	FNAC	HPE	P-value
Colloid cyst	No	48(96.0)	50(100.0)	0.24
	Yes	2(4.0)	0(0.0)	
Follicular adenoma	No	40(80.0)	31(62.0)	0.03
	Yes	10(20.0)	19(38.0)	

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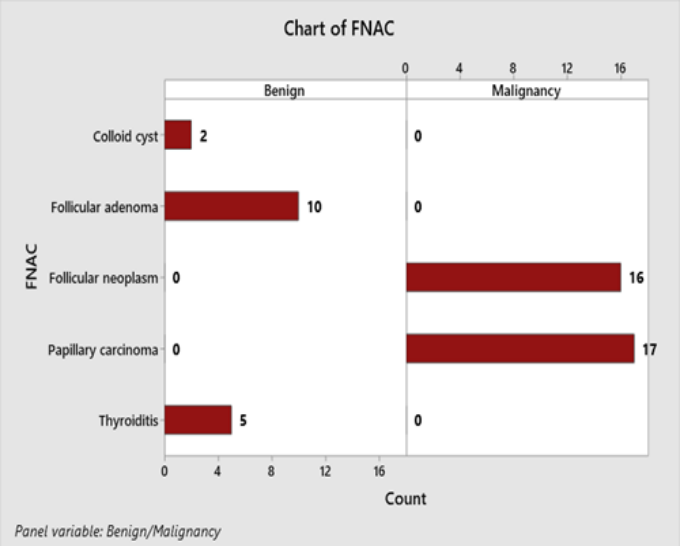
Follicular carcinoma	No	50(100.0)	44(88.0)	0.01
	Yes	0(0.0)	6(12.0)	
Follicular neoplasm	No	34(68.0)	50(100.0)	0.00
	Yes	16(32.0)	0(0.0)	
Follicular variant of papillary carcinoma	No	50(100.0)	49(98.0)	0.50
	Yes	0(0.0)	1(2.0)	
Hashimoto's thyroid	No	50(100.0)	45(90.0)	0.02
	Yes	0(0.0)	5(10.0)	
Multinodular goiter	No	50(100.0)	49(98.0)	0.50
	Yes	0(0.0)	1(2.0)	
Papillary carcinoma	No	33(66.0)	32(64.0)	0.50
	Yes	17(34.0)	18(36.0)	
Thyroiditis	No	45(90.0)	50(100.0)	0.02
	Yes	5(10.0)	0(0.0)	

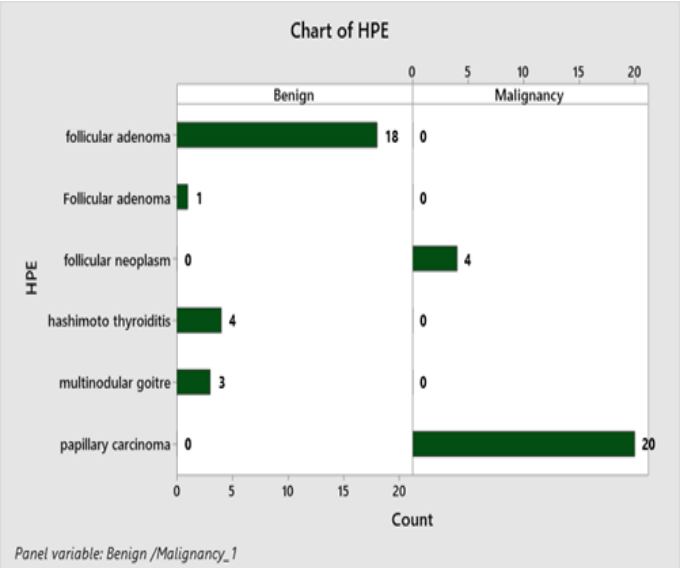
Diagnosis comparison was made between FNAC and HPE investigation (Table 2). Colloid cysts, follicular adenoma was diagnosed in FNAC test in 2 (4.00%), 10(20%) patients and with HPE is none and 19(38%) patients. The follicular neoplasm was diagnosed by FNAC (16(32.00) and none with the HPE test. FNAC did not diagnose Hashimoto's thyroiditis, whereas HPE recorded 5(10.0%). Multinodular goiter was diagnosed by HPE (1(2.00), whereas thyroiditis was diagnosed by FNAC 5(10.00). Papillary carcinoma was diagnosed by FNAC 17(34.00) and HPE 18(36.00).

Figure 1: Diagnosis by FNAC and the presence of benign and malignant nodules.



The etiology of nodules diagnosed by FNAC included both benign and malignancy nodules. 2(11.8) of Colloid cyst,10(58.8) of follicular adenoma, and 5(29.4) of thyroiditis were found to be benign, whereas 16(48.5) patients with follicular neoplasm and 17(51.5) with papillary carcinoma (figure 1).

Figure 2: Diagnosis by HPE and the presence of benign and malignant nodules.



The etiology of nodules diagnosed by HPE included both benign and malignancy nodules. 19 (73.08) patients

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were diagnosed with follicular adenoma, 5 (20.0) Hashimoto's thyroiditis, 1(4.0) multinodular goiter were found to be benign, whereas 6(24.0) patients with follicular carcinoma, 1(4.0) Follicular variant of papillary carcinoma, and 18(72.0) with papillary carcinoma were found to be malignant (figure 2).

Table 3: Validity of FNAC in comparison with HPE.

Diagnosis	Sensitivity	Specificity	PPV	NPV	Accuracy
Colloid cyst	4.00%	100.00%	100.00%	51.02%	52.0%
Follicular adenoma	20.0%	62.0%	34.48%	43.66%	41.00%
Follicular carcinoma	0.00%	88.0%	0.00%	46.81%	44.00%
Follicular neoplasm	32.0%	100.0%	100.0%	59.52%	66.00%
Follicular variant of papillary carcinoma	0.00%	98.0%	0.00%	49.49%	49.00%
Hashimotos thyroid	0.00%	90.0%	0.00%	47.37%	45.00%
Multinodular goitre	0.00%	98.0%	0.00%	49.49%	49.00%
Papillary carcinoma	34.00%	64.0%	48.57	49.23%	49.00%
Thyroiditis	10.00%	100.0%	100.0%	52.63	55.00%

The rationality of FNAC in terms of sensitivity and specificity was evaluated by comparing it with histopathological examination. In colloidal cyst, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were,4.00%,100.00%,100.00%,51.02%,52.0%, respectively. In follicular adenoma, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 20.0%,62.0%,34.48%,43.66%, and 41.00%respectively. In follicular carcinoma, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 0.00%,88.0%, 0.00%, 46.81% and 44.0%, respectively. In follicular neoplasm the Sensitivity, specificity, positive predictive value, negative predictive value and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 32.0%,100.0%,100.0%,59.52%, and 66.00% respectively. In Follicular variant of papillary carcinoma, the Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 0.0%,98.0%,0.0%,49.49%, and 49.0%, respectively. In Hashimoto thyroid, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 0.00%,90.0%,0.00%,47.37%, and 45.00%, respectively. In multinodular goiter, the Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 0.0%, 98.0%, 0.0%, 49.49% and 49.0% respectively. In papillary carcinoma, the Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were 34.0%,64.0%,48.57%,49.23%, and 49.0% respectively. In thyroiditis, the Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy rate of fine-needle aspiration cytology through histopathological diagnosis were

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10.0%, 100.0%, 100.0%, 52.63% and 55.0% respectively. The sensitivity of FNAC in all the benign and malignant type of thyroid lesions was found to be in the range of 4.00%- 34%, whereas the specificity was found to be 62%-100%, the positive predictive value was between 0%-100%, and the negative predictive value was between 43.66%-59.52%for all the lesions detected by FNAC. (Table 3).

Discussion

In our study it was observed that the sensitivity of FNAC in all the benign and malignant type of thyroid lesions was found to be in the range of 4.00%- 34%, whereas the specificity was found to be 62%-100%, the positive predictive value was between 0%-100%, and the negative predictive value was between 43.66%-59.52%for all the lesions detected by FNAC.

In the study by Vojvodich et al. [15], FNAC's overall accuracy was 85.6%, while in the study by Kaur et al. [16], FNAC was found to be 83.3% sensitive and 100% specific. In the study by Davoudi et al. [17], the FNAC accuracy was 85.9%. Specific diagnoses involving follicular histology often cannot be made with needle biopsies alone. Though FNAC is an excellent initial mode of investigation, it is more accurate if frozen sections complement it.

M.D., Mohamed et al. [18] reported that both FNAC and histopathology were done in 100 patients with a solitary thyroid nodule. Out of 100 cases, 86 cases were benign, and 14 cases were malignant on histopathology. On cytology, 84 cases were benign, 11 cases were malignant, and five cases had a suspicious smear; two were (follicular adenoma) false-positive cases. Sensitivity was 100%, specificity was 97.6%, accuracy was 98%, positive predictive value was 87.5%, and the negative predictive value was 100%.

Abhijit S Rayte [19] reported that the FNAC showed 43 patients of colloid goiter comprising 71.67%, followed by follicular neoplasm (18.33%). In diagnosing carcinoma, the sensitivity and specificity of FNAC were 90.9% and 100%, respectively. In diagnosing carcinoma, the sensitivity and specificity of FNAC were 90.9% and 100%, respectively. In the study by Waseer and Sonkhya et al. [20], FNAC's specificity in diagnosing malignant lesions was 100%. Sabu observed similar results. N. Sahal et al. [21] where specificity and sensitivity were 100% and 95%, respectively. There were 7 cases of malignancy out of 60, comprising 11.67% comparable with G. A. Khairy et al. [22]

V Haridas et al. [23] FNAC reported most colloid nodules (61%), followed by follicular neoplasm (20%) and papillary carcinoma (9%). Final HPR showed 53% as a colloid nodule and 27% as papillary carcinoma.

Conclusions

In current study the sensitivity of FNAC in detecting all type of thyroid lesions (benign or malignant) was found to be in the range of 4.00%- 34%, whereas the specificity was found to be 62%-100%, the positive predictive value was between 0%-100%, and the negative predictive value was between 43.66%-59.52%for all the lesions detected by FNAC. The thyroid nodules management requires a combination of clinical evaluation followed by appropriate radiological and laboratory investigations. An individualized approach, rather than a broad algorithm, is increasingly becoming relevant in managing thyroid nodules. Determining STN's nature is very important as aggressive surgery may be regarded as an excessive mode of treatment. Differentiating between benign and malignant lesions and their comprehensive management are the challenges presented by STN. Hence Fine Needle Aspiration Cytology is reasonable an

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excellent diagnostic tool of choice for the initial evaluation of STN. A solitary thyroid nodule is to be evaluated systematically by physical examination, imaging modalities, fine needle aspiration cytology, and histopathology.

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