

## Diagnostic Accuracy of FNAC in Solitary Thyroid Nodule A Single Institutional Experience

Nagesh Biradar<sup>1</sup>, Badareesh Lakshminarayana<sup>2</sup>, Saumya Bhagat<sup>3</sup>, Raghavendra Biradar<sup>4</sup>

**Author's Affiliation:** <sup>1</sup>Assistant Professor, <sup>2</sup>Associate Professor, <sup>3</sup>MBBS Intern, Department of General Surgery, Kasturba Medical College, Manipal, Udipi 576104, Karnataka. <sup>4</sup>Intern, BGS Global Institute of Medical Science and Research, Bengaluru 560060, Karnataka, India.

### How to cite this article:

Nagesh Biradar, Badareesh Lakshminarayana, Saumya Bhagat, Raghavendra Biradar/Diagnostic Accuracy of FNAC in Solitary Thyroid Nodule A Single Institutional Experience/New Indian J Surg. 2021;12(4):233-236.

### Abstract

**Background:** In this study, we aimed to evaluate the value of FNAC in the diagnosis of solitary thyroid nodule, and assess the correlation with the histopathology. **Materials and Methods:** Prospectively FNACs of 90 cases of solitary thyroid nodule was compared with histopathology from July 1 2013 till June 31 2015. **Results:** The sensitivity and specificity of FNAC in our study is 77.7% and 98.7 respectively, the positive predictive value and negative predictive value is 87.5% and 97.5% respectively. **Discussion:** In our study, FNAC is proved to be an invaluable tool for pre-operative diagnosis of thyroid lesions, and its Bethesda system concords with histopathology results.

**Keywords:** Solitary thyroid nodule; Fine needle aspiration cytology; Thyroid malignancy; Sensitivity; specificity.

### Introduction

Solitary thyroid nodules are present in about 4% individuals in the United States, while thyroid cancer has a much lower incidence of 40 new cases per 1 million. Abnormalities of the thyroid gland are frequently encountered during clinical practice, either by physical examination of the patient

or incidentally during radiographic evaluation. Here, our focus lies on the solitary thyroid nodule (STN), which is a discrete swelling in an otherwise palpable gland.<sup>1</sup> Through palpation itself, its incidence in the American population is 4%-7%, while ultrasound scanning detects 20%-76% of these cases.<sup>2</sup> In a majority of patients, the STN is a benign lesion such as an adenoma, a degenerative nodule, or secondary to thyroiditis.<sup>3</sup> However, the possibility of thyroid cancer cannot be ignored as the incidence of malignancy in a STN ranges from 4.7% to 18.3%.<sup>4</sup>

Fine Needle Aspiration cytology (FNAC) has quickly become the most valuable test in evaluating patients with a thyroid nodule as it is safe, reliable and cost effective. It is the most appropriate investigation to define the nature of a thyroid nodule and decide about the need for surgical intervention.<sup>5-7</sup> Through our study, we attempt to derive a correlation between pre-operative FNAC reports and post-operative histopathology, thereby testing the accuracy of our diagnosis in terms of sensitivity and specificity. However, the definitive diagnosis of thyroid malignancy in a Solitary thyroid nodule is through post-operative histopathological evaluation of the lesion.

### Materials and Methods

This study has been reviewed and approved by the Kasturba Medical Hospital, Manipal review board.

**Corresponding Author:** Nagesh Biradar, Assistant Professor, Department of General Surgery, Kasturba Medical College, Manipal, Udupi 576104, Karnataka.  
**E-mail:** nageshsurgery@gmail.com

Case material for the present clinicopathological study of Solitary thyroid nodule is obtained from the patients admitted in Kasturba Hospital Manipal from July 1st, 2013 till June 31st, 2015. It is a prospective study consisting of 90 cases of solitary thyroid nodule proven by ultrasound and substantiated by histopathology, whereas patients with multinodular goitre or diffuse thyroid swelling have been excluded. All the patients diagnosed with solitary thyroid nodule satisfying the above-mentioned criteria have been involved and taken informed consent. Cases were studied in detail clinically and recorded as per proforma. Routine investigations and specific investigations including FNAC, thyroid profile, indirect laryngoscopy, Ultrasound of neck were done in all cases. All the specimens obtained were subjected to histopathological examination. Patients were grouped according to different variables like age, sex, FNAC reports and histopathological reports. Variables were analysed using IBM SPSS software version 26, and Z test was done for the comparison of proportion. The study was compared with previous similar studies conducted elsewhere and conclusions were drawn.

## Results

Demographically, it was noted that the incidence of solitary thyroid nodule was highest between the 4th and 5th decade (28.88%). Moreover, women are significantly more affected than men with a ratio of 3.1:1. All patients presented with a swelling in the neck.

**Table 1:** FNAC Diagnosis.

	FNAC	No. Patients	%
Thy 1	Non-diagnostic	7	7.77
Thy 2	Benign	57	63.33
Thy 3	Follicular neoplasm	18	20
Thy 4	Suspicious	4	4.44
Thy5	Malignant	4	4.44
	Total	90	100

**Table 3:** FNAC and Histopathology correlation.

HPE → FNAC ↓	Colloid nodule	Thyroiditis	Adenoma	Papillary carcinoma	Follicular carcinoma	Medullary carcinoma	Total
Non-diagnostic	4	-	3	-	-	-	7
Benign	44	6	7	-	-	-	57
Follicular lesion	-	-	16	-	2	-	18
Suspicious	-	-	1	2	-	1	4
Malignant	-	-	-	4	-	-	4
Total	48	6	27	6	2	1	90

Additional features such as change in voice, dyspnoea, pain and cervical lymphadenopathy were noted in a minority that aided a clinical diagnosis. The distributions of initial cytological diagnoses according to Bethesda categories (Table 1) were as follows: benign in 57(63.33%) cases which included 51 colloid nodule and six thyroiditis, follicular neoplasm in 18(20%) cases, malignant in four(4.44%) which included four papillary carcinoma, Suspicious in four(4.44%) and non-diagnostic in seven(7.77%) cases. On the basis of FNAC, all benign patients (57) underwent hemi thyroidectomy. Patients with follicular neoplasm underwent hemithyroidectomy with frozen section, and completion thyroidectomy was performed in two patients with follicular carcinoma. Malignant or suspicious of malignancy patients underwent total thyroidectomy followed by central or functional neck dissection. Central neck dissection was performed in all patients along with total thyroidectomy, but functional dissection was performed only in case of radiological or clinical evidence of enlarged cervical lymph nodes.

**Table 2:** Histopathological Diagnosis.

HPE Report	No. Patients	Percentage (%)
Colloid nodule	48	53.33
Thyroiditis	6	6.6
Adenoma	27	30
Papillary carcinoma	6	6.6
Follicular carcinoma	2	2.2
Medullary carcinoma	1	1.1
TOTAL	90	100

Histopathological analysis and the results obtained (Table no. 2) showed 90% of the cases studied are benign in origin which included 48 colloid nodule, six thyroiditis and 27 adenoma, and 10% were proven malignant which included six papillary carcinoma, two follicular carcinoma and one medullary carcinoma. The correlation between cytological and histological diagnoses is given in (Table no.3). of the 90 patients included in the

study, seven were non-diagnostic (Bethesda-1) by FNA out of which histopathology reported as colloid nodule in four patients and adenoma in three patients.

**Table 4:** Comparison of FNAC with Histopathology.

FNAC Finding	HPE Finding		Total
	Malignant	Benign	
Malignant cells present	7	1	8
Malignant cells absent	2	80	82
Total	9	81	90

Of the 57 benign (Bethesda-2) Cytologies, histopathology reported as colloid nodule, thyroiditis and adenoma in 44, 6 and 7 patients respectively. Histopathology confirmed adenoma in 16 patients and follicular carcinoma in two patients in patients with Bethesda-3 cytology. of the seven suspicious cytologies (Bethesda-4), histopathology confirmed papillary carcinoma in two patients, and adenoma and medullary carcinoma in one patients each. All four patients in Bethesda-5 category had papillary carcinoma in histopathology.

The sensitivity and specificity of FNAC in our study is 77.7% and 98.7% respectively, and the positive predictive value and negative predictive value is 87.5% and 97.5% respectively.

It is evident from the results that the FNAC failed to diagnose malignancy in two patients (22%). So both the patients underwent hemithyroidectomy initially followed by completion thyroidectomy on obtaining the frozen section results. In one patient FNAC was suggestive of malignancy, so total thyroidectomy was carried out as FNAC was the preferred diagnostic tool in our study, but histopathology showed opposing results.

It is worth mentioning that the incidence of malignancy in our study is 10%, and papillary carcinoma is the most common histopathological type accounting for about 6.6% of all solitary thyroid nodules.

## Discussion

Thyroid malignancy accounts for about 1% of all malignancies.<sup>8</sup> Early diagnosis and treatment increases the life expectancy as thyroid nodules have low malignancy potential, and malignancies are slowly progressive. FNAC is an apt investigation in evaluating thyroid nodule as it has resulted in 25-50% decrease in the need for surgery in patients with thyroid disease, while increase in the number of malignant results in the operated group of patients.<sup>9</sup> Currently, in the early stage of evaluating

thyroid nodule FNAC is the preferred modality of investigation.<sup>10</sup> In our study, the sensitivity and specificity of FNAC is 77.7% and 98.7% respectively which correlates with the published series which ranges between 65-98% for sensitivity and 73-100% for specificity.<sup>10-14</sup> Disagreement in the categorisation of follicular neoplasm and suspicious for malignancy is the most common reason for such wide range of sensitivity and specificity. In addition, natural difficulties in differentiating benign and malignant follicular lesions, inadequacy in sample, and inadequate experience of cytologists are the other factors that reduce the efficiency of FNAC. Moreover, some literatures have classified follicular lesions as benign, whereas others classify these as malignant.<sup>10,11,15</sup> In our study, we have considered follicular lesions in the benign category. In the various literature, false-negative and false-positive were reported between 1%-7% and 1%-11.6%.<sup>10,11,12,16</sup> In our series, the rate of false-negative and false-positive is found to be 2.2% and 1.1% respectively. False positive can cause over diagnosis which may lead to excessive treatment, specifically unnecessary thyroidectomy. In one of the study cases, preoperative cytology reported as suspicious for malignancy, post thyroidectomy it turned out to be a follicular adenoma. False negative can lead to underdiagnoses and hence under treatment. We report 2 cases reported benign preoperatively, and post-surgery both results came as follicular carcinoma category.

In our study, non diagnostic FNAC result is 7.77% which is within the reported range in the literature i.e., 1.6-20%.<sup>10,11,17</sup> Cystic degeneration, calcification and sclerotic nodule are the common cause for non-diagnostic sample. This error can be reduced by using Ultrasound.<sup>17,18</sup> The overall incidence of malignancy in solitary thyroid nodules varies from 4.7%-18.3% according to various studies.<sup>1</sup> In our study, the overall incidence of malignancy in solitary nodule was 10%. The limitations of the study includes; limited number of cases studied, ultrasound guided sampling could have yielded better sampling.

## Conclusion

FNAC is an invaluable tool for pre-operative assessment of thyroid lesions, but malignancy can still come as a surprise on postoperative histopathological examination. Ultrasound guided sampling, on-spot cytological examination during ultrasound guided sampling, fulfilling the criteria for adequacy etc, can decrease the false negative rates.

## References

1. Krukowski ZH. Bailey and Love, short practice of surgery. 26th edition. Boca Raton, Tylor and Francis, 2013, pp.741- 777.
2. Popovenic G, Jonklass J. Thyroid nodule. *Med Clin North Am.* 2012;96(2):329-349.
3. Lingegowda JB, Muddegowda PH, Rajesh KN, et al. Application of pattern analysis in fine needle aspiration of solitary nodule of thyroid. *J Cytol.* 2010;27(1):1-7.
4. Tarrar AM, Wahla MS et al. Solitary thyroid nodule; Frequency of malignancy at combined military hospital Rawalpindi. *Professional Med J.* 2010;17(4):598-602.
5. Werga P, Wallin G, Skoog L, Hamberger B. Expanding role of fine needle aspiration cytology in thyroid diagnosis and management. *World J Surg.* 2000;24(8):907-912.
6. Amrikachi M, Ramzy I, Rubenfeld S, Wheeler TM. Accuracy of fine-needle aspiration of thyroid. *Arch Pathol Lab Med.* 2001;125(4):484-488.
7. Del Rio P, Minelli R, Cataldo S, et al. Can misdiagnosis in pre-operative FNAC of thyroid nodule influence surgical treatment?. *J Endocrinol Invest.* 2011;34(5):345-348.
8. Roman SA. Endocrine tumors: Evaluation of the thyroid nodule. *Curr Opin Oncol.* 2003;15(1):66-70.
9. Yassa L, Cibas ES, Benson CB, et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. *Cancer.* 2007;111(6):508-516.
10. Bagga PK, Mahajan NC. Fine needle aspiration cytology of thyroid swellings: How useful and accurate is it?. *Indian J Cancer.* 2010;47(4):437-442.
11. Pandey P, Dixit A, Mahajan NC. Fine-needle aspiration of the thyroid: A cytohistologic correlation with critical evaluation of discordant cases. *Thyroid Res Pract.* 2012;9(2):32-39.
12. Haberal AN, Toru S, Ozen O, et al. Diagnostic pitfalls in the evaluation of fine needle aspiration cytology of the thyroid: Correlation with histopathology in 260 cases. *Cytopathology.* 2009;20(2):103-108.
13. Amrikachi M, Ramzy I, Rubenfeld S, Wheeler TM. Accuracy of fine-needle aspiration of thyroid. *Arch Pathol Lab Med.* 2001;125(4):484-488.
14. Gharib H, Goellner JR. Fine-needle aspiration biopsy of the thyroid: an appraisal. *Ann Intern Med.* 1993;118(4):282-289.
15. Wang CC, Friedman L, Kennedy GC, et al. A large multicenter correlation study of thyroid nodule cytopathology and histopathology. *Thyroid.* 2011;21(3):243-251.
16. Layfield LJ, Reichman A, Bottles K, Giuliano A. Clinical determinants for the management of thyroid nodules by fine-needle aspiration cytology. *Arch Otolaryngol Head Neck Surg.* 1992;118(7):717-721.
17. Ali SZ. Thyroid cytopathology: Bethesda and beyond. *Acta Cytol.* 2011;55(1):4-12.
18. Borget I, Vielh P, Leboulleux S, et al. Assessment of the cost of fine-needle aspiration cytology as a diagnostic tool in patients with thyroid nodules. *Am J Clin Pathol.* 2008;129(5):763-771.