

Exploring the Diagnostic Efficacy of Fine-Needle Aspiration Cytology in Thyroid Nodules ≥ 4 cm: Results from a Tertiary Health Care Center in Jharkhand

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Abstract

Keywords

- ▶ fine-needle aspiration cytology
- ▶ thyroid nodules ≥ 4 cm
- ▶ histopathologic examination
- ▶ Jharkhand
- ▶ tertiary health care center

Background Any nodules of the thyroid, ≥ 4 cm, are generally associated with false-negative results for malignancy on fine-needle aspiration cytology (FNAC), which generally are confirmed cases of malignancy after histopathologic examinations.

Methods A retrospective hospital-based study was done in which data of patients having thyroid lesions ≥ 4 cm were reviewed. We checked the FNAC and histopathologic examination done on these lesions. Ultrasonography (USG)-guided aspiration records were also assessed. Sensitivity and specificity of FNAC for the detection of neoplastic or malignant lesions was determined.

Results A total of 192 patients (57 female) were included in study. Preoperative fine-needle aspiration (FNA) biopsies were categorized as negative for malignancy ($n = 183$, 63%), suspicious ($n = 6$, 4%), and malignant ($n = 4$, 2%). Final pathology of nodule was found to be benign in 157 (81.35%) patients, whereas in 36 (18.65%) patients, nodules were found to be malignant.

Conclusion In this study, we found the malignancy rate of thyroid nodules ≥ 4 cm to be similar to the accepted malignancy rate of smaller thyroid nodules. We missed 32 cases of malignancy on FNAC. Because of high incidence of thyroid malignancy, all nodules ≥ 4 cm must undergo histopathologic examination.

Introduction

Evidence suggests that thyroid nodular lesions are common in areas of iodine deficiency in India, and Jharkhand is among one of the iodine-deficient states.¹ Thyroid nodules are generally palpable swelling in the thyroid gland among which majority are asymptomatic, of these nodules, 5% are malignant, and the incidence as per recent evidence puts the percentage on the rise, with a slight variation toward the fairer sex.^{2,3} Of all the thyroid nodules, 5 to 15% of them are cancerous.⁴ A variety of tests have been used to separate benign from malignant thyroid nodules. Fine-needle aspiration cytology (FNAC) of thyroid nodules is the single most sensitive, specific, and cost-effective method of investigation.^{5–7} However, mounting evidence questions the

accuracy of FNAC in large nodules, with recommendations of thyroidectomy for nodules ≥ 4 cm even in the setting of benign FNAC, due to increased risk of malignancy and increased false-negative rates in large thyroid nodules.^{8–10} Histopathologic examination remains the gold standard for confirmatory diagnosis in all such lesions.^{9,10} FNACs often have been attributed to have facility-specific results in terms of accuracy and specificity.¹¹ Recent studies have claimed that excess in the incidence of the cancer is due to overdiagnosis by FNAC and other screening techniques.¹² These implications and situation regarding the diagnostic challenges mandate a study for the facility-specific FNAC.

Data regarding the sensitivity and specificity of the FNAC being conducted in various facilities in Jharkhand are not available. Rajendra Institute of Medical Sciences (RIMS)

is the premier medical institute of the state and caters to patients not only from state but also from adjoining states of West Bengal, Odisha, Chhattisgarh, and Bihar, thus by having sufficient number of FNAC records for generating the evidence. It was decided to undertake a record-based study for generating evidence that might act as an indicator about the sensitivity and specificity of the FNAC in RIMS and help future course of action.

This study was done with the following objectives: (1) to assess the reliability for FNAC in detecting malignancy for thyroid lesions > 4 cm; (2) to measure numbers of benign and malignant tumors finding on histopathologic examination and FNAC; and (3) to measure the sensitivity, specificity, accuracy, and the predictive value of positives and negatives of FNAC.

Methodology

This study was a hospital-based record evaluation study done in RIMS, Department of Pathology, Ranchi. Records from December 2016 to December 2017 were reviewed. Records of 92 patients with thyroid lesions > 4 cm were reviewed. After review of records, the data were collected using a predesigned and pretested format to capture the relevant details.

All lesions recorded with size ≥ 4 cm in the neck region confirmed to be on the thyroid were included for the analysis, whereas all lesions recorded with size < 4 cm in the neck region were excluded from this study evaluation.

Data were entered in MS Excel, and analysis was done. Standard statistical measures of central tendency such as mean, standard deviation (SD), etc. were used. We also used the accepted formula for sensitivity, specificity, etc. (►Table 1). A *p* value of < 0.05 was considered to be of statistical significance.

Table 1 Sensitivity and specificity of FNAC

Result of pathology examination	FNAC	
	Suspicious/Malignant/Positive	Indeterminate/Negative/Benign
Malignant	(TP) 8	(FP) 28
Benign	(FN) 10	(TN) 183

Abbreviations: FN, false negative; FNAC, fine-needle aspiration cytology; TN, true negative; TP, true positive.

Note: Sensitivity TP/TP + FN (8/36) 22.23%, Specificity TN/TN + FP (183/193) 94.82%, Accuracy TP + TN/TP + FP + FN + TN (8 + 183/193) 98.96%.

Results

We identified total 192 patients in whom 193 nodules were recorded. We analyzed all recorded 193 thyroid lesions that were ≥ 4 cm. We had 135 males having these nodules whereas the remaining were females (►Table 2). Preoperative biopsy records and histopathologic examination results were tracked.

We found on FNAC 6% nondiagnostic class 1, 66% as benign nodules class 2, and 22% of the results were indeterminate classes 3 and 4, whereas 3% were found to be suspicious for malignant class 5 and the rest 2% were malignant class 6 (►Table 2).

Out of these FNAC findings, we checked their results on the histopathologic examination results where we found 81% of the lesions to be benign whereas the rest were malignant. Of the malignant nodules, the most common was papillary thyroid cancer approximating to 70% (►Table 3).

Discussion

In our study, we had more males (70%) with thyroid nodules as per our records in comparison to females (30%) (►Table 2). This finding is opposed to the National Family Health Survey 4 (NFHS 4) data that suggest females to be having more incidence of thyroid problems than males.¹³ This can be explained by the societal and geographical constraints in Jharkhand. Also, the NFHS is not specific about large thyroid nodules. We also believe in our study that larger proportion of males is due the sociocultural norms prevalent in the

Table 2 Distribution of the sex and the types of nodules as per FNAC according to Bethesda class

Variable	n = 193
Bethesda class	
Class 1 Nondiagnostic (negative)	12 (6%)
Class 2 Benign	128 (66%)
Class 3 ASUS/FLUS (indeterminate)	19 (10%)
Class 4 Suspicious for follicular neoplasm (indeterminate)	24 (12%)
Class 5 Suspicious for malignant (malignant)	6 (3%)
Class 6 Malignant (malignant)	4 (2%)
Sex	n = 192
Male	135 (70%)
Female	57 (30%)

Abbreviations: ASUS, atypia of undetermined significance; FNAC, fine-needle aspiration cytology; FLUS, follicular lesion of undetermined significance.

Table 3 Fine-needle aspiration cytology versus surgical pathology

Pathology	Fine-needle aspiration cytology				Total
	Negative/Benign	Indeterminate	Suspicious for malignant	Malignant	
Malignant	20	8	5	3	36
Benign	120	35	1	1	157
Total	140	43	6	4	193

Table 4 Values of the various parameters of FNAC with a prevalence rate almost equal to the real prevalence of the thyroid disorders^{1,3}

	Values	95% Confidence interval
Positive predictive value	44.44% (^a)	25.31–65.38%
Negative predictive value	86.73% (^a)	84.55–88.64%
Disease prevalence	15.72% (^a)	11.26–21.09%

Abbreviation: FNAC, fine-needle aspiration cytology.

^ap-Value less than 0.05, not shown as Confidence Interval.

region, which often prevents the females from going out and getting themselves treated on their own. Also, as the institute caters to a population coming from far off regions, we understand that females might find it hard to come leaving their household chores, etc. In our study, we found FNAC to be having sensitivity on the lower side (22.23%) whereas the specificity for nodules > 4 cm was close to 95% (► **Table 1**). We also found FNAC to be having a negative predictive value of 86.73% (► **Table 4**), which was fairly good, but it brings caution regarding its reliability as the final test for deciding a nodule for its malignant nature, though with a good accuracy rate (98.6%) (► **Table 4**). Other studies too had similar findings.^{14,15}

The study by Shrestha et al,¹⁶ Bethesda, Maryland, found malignancy rate to be 18.6% with overall false-negative rate of 7%. They opined that FNAC accuracy increases with size. In our study, we found the disease prevalence to be 15% (► **Table 4**) that is almost similar to that reported in the recent study done in Stanford,¹⁷ in which they found the incidence to be 15%. Uchekukwu et al also found the sensitivity of FNAC to be 100% whereas the specificity to be 84%. Our specificity was found to be much better, but the sensitivity was only 22%, as stated in ► **Table 1**. As discussed, the values of FNAC sensitivity and specificity vary institution wise. We need more research to understand our quality. With FNAC, as studies have suggested, its accuracy depends on adequate sample and correct interpretation, which might explain the various differences with sensitivity and specificity of FNAC, and it is related to the local facility and prevalence rate.¹⁷ Limitation of the study was its retrospective nature. In addition, only those nodules were considered that were of size ≥ 4 cm.

Conclusion

It can be safely concluded with these results that FNAC for thyroid nodules > 4 cm is a fairly good investigation, but it would not give the true picture with high accuracy for such nodules. Histopathologic examination remains the test for confirmation, and a final decision to perform the thyroidectomy must be taken based on the histopathologic examination results.

Conflict of Interest

None.

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