

# Diagnostic Importance of Fine Needle Non-aspiration and Fine Needle Aspiration Cytology in Thyroid Lesions

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## Abstract

**Introduction:** Fine needle aspiration cytology (FNAC) is the routine, minimal invasive technique, and well-established baseline investigation used to diagnose the nodular thyroid lesion. The main disadvantages were an inadequate specimen or the specimen obtained was blood. To avoid these problems, a new method called as fine needle non-aspiration cytology is performed nowadays instead of FNAC.

**Aim:** To find the diagnostic importance of fine needle non-aspiration and FNAC in thyroid lesions.

**Materials and Methods:** This was a diagnostic study done at Melmaruvathur Adhiparashakthi Medical College and Hospital in the Department of Surgery from March 2013 to January 2015. About 55 patients who presented with a thyroid swelling were subjected to fine-needle aspiration (FNA) and fine needle cytology (FNC) technique and underwent thyroidectomy. The slides were assessed according to Mair *et al.* scoring system and compared with the histopathology reports. Finally, sensitivity, specificity, positive predictive value, and negative predictive value were calculated.

**Results:** In this study, the majority of the patients were 30-39 years (36.36%) of age. Females comprised about 54.55% of the study group. The diagnostic performance of FNC and FNA technique indicated that FNC yielded more diagnostically superior case than FNA. However, diagnostically adequate cases were more with FNA. On the whole, the sensitivity for the FNC and FNA were 87.04% and 90.74%. The negative predictive value for both FNC and FNA was 12.5% and 16.67%.

**Conclusion:** Both the techniques have similar results, hence, can be used in tandem. However, both the techniques should be used in different places. In high cellular lesions, FNC should be the first choice and in less cellular lesions FNAC should be preferred. But on the whole, FNAC was found to be diagnostically adequate and superior than FNC.

**Key words:** Fine needle aspiration cytology, Fine needle cytology, Thyroid lesion

## INTRODUCTION

The most common clinical problem encountered by the surgeon in their outpatient department is thyroid nodules. About 1-10% of the thyroid nodules are malignant.<sup>1</sup> The incidence of thyroid cancer tripled from 1975 to 2009 due

to the increased incidence of papillary thyroid carcinoma. Hence, a prompt diagnosis and treatment in time are necessary in curing the thyroid carcinoma.<sup>2</sup> A widely accepted method for diagnosing thyroid lesions is fine needle aspiration cytology (FNAC).

FNAC was first developed by Martin and Ellis in 1930.<sup>3</sup> It is the routine and well-established baseline investigation used to diagnose the nodular thyroid lesion. It was a minimal invasive technique which can be easily done with increased sensitivity, specificity and accuracy.<sup>4</sup> The main disadvantages were inadequate specimen or the specimen obtained was bloody due to negative pressure which may lead to unsatisfactory smear and improper interpretation.<sup>5-7</sup>

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To avoid these problems a new method called as fine needle non-aspiration cytology (FNNAC) fine needle cytology (FNC) was developed by Briffod *et al.* in France in 1982.<sup>8</sup> It was first described in diagnosing thyroid nodules by Santos and Leiman in 1988.<sup>7</sup> The main mechanism for FNNAC was it avoids active aspiration. It relies only on capillary tension to suck the tissues. By this way, it decreases the traumatic episodes and reduces the bleeding in thyroid tissue.<sup>9,10</sup> There are many studies regarding the superiority of FNAC to FNNAC and vice versa. However, the studies were inconclusive. Hence, we evaluated the diagnostic accuracy of FNAC and FNNAC in thyroid nodule.

## MATERIALS AND METHODS

This was a diagnostic study done at Melmaruvathur Adhiparashakthi Medical College and Hospital in the Department of Surgery from March 2013 to January 2015. About 55 patients who presented with a thyroid swelling and attended the cytology clinic were included in the study. All the patients were subjected to fine-needle aspiration (FNA) and FNNA technique. Both the techniques were done by 23 gauge needle and 20 ml disposable plastic syringe. The dry smears were stained by Giemsa stain, and the wet smear was stained with Papanicolaou stain.

This study was a single-blind study, and all the slides were assessed without knowing the knowledge about the technique by which the slide was prepared. The slides were assessed according to Mair *et al.* scoring system (Table 1). The main criteria were the presence of blood/clot, amount of cellular material, degree of cellular trauma, and retention of appropriate architecture. According to this, they are grouped into three categories like smear

unsuitable, smear adequate for cytological diagnosis and diagnostically superior smear. All the patients were subjected to thyroidectomy either partial or complete, and the histopathology reports were compared to the smear results. Finally, sensitivity, specificity, positive predictive value and negative predictive value for both FNA and FNNA technique were extracted.

## RESULTS

In this study, the majority of the patient belongs to the age group of 30-39 years (36.36%) followed by 40-49 years (32.73%) (Table 2). Females comprised about 54.55% of the study group, while male comprised 45.45%. All the patients were subjected to the thyroid function test, and all the reports were found to be within normal limit except for three patients who had elevated T-3 and T-4 values.

Clinically, out of 55 cases 45 (81.82%) were multinodular goiter, 5 (9.01%) were suspicious of malignancy, 4 (7.27%) were solitary nodule and 1 (1.82%) was toxic nodular goiter. The histopathology report came as nodular goiter in 42 (76.36%) cases, Hashimoto's thyroiditis in 6 (10.91%) cases, adenomatous nodule in 5 (9.1%) cases, toxic nodular goiter in 1 (1.82%) case, and multinodular goiter with micropapillary carcinoma in 1 (1.82%) case. The FNAC and FNC report were compared in Tables 3-5.

The diagnostic performance of FNC and FNA technique indicated that FNC yielded more diagnostically superior case than FNA. However, diagnostically adequate cases were more with FNA. On the whole, the sensitivity for the FNC and FNA were 87.04% and 90.74%, but the specificity and positive predictive value for both the procedures were 100%. The negative predictive value for both FNC and FNA were 12.5% and 16.67% (Table 6).

**Table 1: The Mair *et al.* scoring system**

Criteria	Quantitative description	Point score
Background blood/clot	Large amount, great compromise of diagnosis	0
	Moderate amount, diagnosis possible	1
	Minimal amount, diagnosis	2
Amount of cellular material	Minimal to absent, diagnosis not possible	0
	Sufficient for cytodiagnosis	1
	Abundant, diagnosis possible	2
Degree of cellular degeneration	Marked, diagnosis impossible	0
	Moderate, diagnosis possible	1
	Minimal, diagnosis easy	2
Degree of cellular trauma	Marked, diagnosis impossible	0
	Moderate, diagnosis possible	1
	Minimal, diagnosis obvious	2
Retention of appropriate architecture	Minimal to absent non diagnostic	0
	Moderate, some preservation of, for example, follicle, papillae, and acini	1
	Excellent architectural display closely reflecting histology, diagnosis obvious	2

**Table 2: Age distribution**

Age	Frequency (%)
20-29	9 (16.36)
30-39	20 (36.36)
40-49	18 (32.73)
50-59	8 (14.55)

**Table 3: Comparison between the FNC and FNAC diagnosis**

Diagnosis	FNC (%)	FNAC (%)
Single nodular goiter	28 (50.91)	28 (50.91)
Multi nodular goiter	18 (32.73)	18 (32.73)
Hashimoto's thyroiditis	3 (5.46)	4 (7.27)
Adenomatous nodule	1 (1.82)	3 (5.46)
Adenomatous nodule hyperplasia	3 (5.46)	1 (1.82)
Toxic nodular goiter	2 (3.64)	1 (1.82)

FNAC: Fine needle aspiration cytology, FNC: Fine needle aspiration

**Table 4: Comparison of FNC and FNAC diagnosis with histopathology report**

Diagnosis	FNC (%)	FNAC (%)	HPE (%)
Single/multi nodular goiter	46 (83.64)	46 (83.64)	42 (76.36)
Hashimoto's thyroiditis	3 (5.46)	4 (7.27)	6 (10.91)
Adenomatous nodule	1 (1.82)	3 (5.46)	5 (9.1)
Adenomatous nodule hyperplasia	3 (5.46)	1 (1.82)	0 (0)
Toxic nodular goiter	2 (3.64)	1 (1.82)	1 (1.82)
Multi nodular goiter with microscopic papillary carcinoma	0 (0)	0 (0)	1 (1.82)

FNAC: Fine needle aspiration cytology, FNC: Fine needle aspiration, HPE: Histopathological examination

**Table 5: Diagnostic performance**

Category	FNC (%)	FNA (%)
Diagnostically superior	16 (29.1)	13 (23.64)
Diagnostically adequate	34 (61.82)	38 (69.1)
Diagnostically unsuitable	5 (9.1)	4 (7.27)

FNA: Fine needle aspiration, FNC: Fine needle aspiration

**Table 6: Diagnostic accuracy of FNC and FNAC**

Diagnostic value	FNC (%)	FNA (%)
Sensitivity	87.04	90.74
Specificity	100	100
Positive predictive value	100	100
Negative predictive value	12.5	16.67

FNAC: Fine needle aspiration cytology, FNA: Fine needle aspiration, FNC: Fine needle aspiration

## DISCUSSION

Worldwide it has been already documented very clearly that FNAC is a gold standard method in diagnosing both palpable and nonpalpable masses. FNAC is also considered as the gold standard method in diagnosing thyroid swelling. It is a safe, simple and a cost effective method with a very

low complication rate. But still, another method which is simpler with less complications than FNAC should be found because of its limitation like inadequate specimens which require repeated aspirations.<sup>11</sup> The Thyroid gland is highly vascular. Samples taken from this may contain high quantities of blood and the cellular material may be inadequate for proper cytological interpretation. Hence, the diagnostic accuracy may decrease.

The maximum incidence of thyroid disorder was between 30 and 39 years followed by 40-49 years. The same observations have been stated by other authors. In this study, the majority were females (54.55%) followed by male patients (45.56%). All the patients showed a benign disease pattern except in one patient who had a multinodular goiter with micropapillary carcinoma in histopathology report. When both the techniques were compared with the parameters of blood clots, the FNC was found to be superior than FNAC. FNC gives a clear cytological report with least hemorrhage in the slide. The presence of blood was totally prevented by capillary action (i.e.,) while doing the procedure high pressure was not applied for aspirating the material. The vice versa occurs in FNAC. This was similar to other studies.<sup>7,10,12</sup>

In the high cellular lesion, the FNC was more likely to diagnose than FNAC. But in less cellular lesions FNAC was found to be diagnostically superior than FNC. The majority of the authors found that both were having similar reports.<sup>13-15</sup> Only very few studies had the results similar to the present study.<sup>7,16</sup> The degeneration and the cellular trauma were same for both techniques. FNAC had more cellular material if some sheets of cells were destroyed it does not obscure the field of diagnosis. This was contrast to the study done by Ghosh *et al.* and Raghuvver *et al.* In their study, they reported that FNC had a better score in cellular trauma and degeneration than FNAC.<sup>13,17</sup>

In our study, micropapillary carcinoma was detected in only one patient by histopathology. It was not diagnosed by FNAC or FNC. In a previous study, it was reported that there was a slight difficulty in diagnosing the carcinoma by FNC slide.<sup>7</sup> However, in our study, both methods failed to diagnose. On the diagnostic performance, FNC was producing diagnostically superior specimen ( $n = 16$  [29.1%]) than FNAC ( $n = 13$  [23.64%]). But diagnostically adequate specimen was yielded by FNAC ( $n = 38$  [69.1%]) than FNC ( $n = 38$  [69.1%]). This was contrast to the study done by others were FNC has diagnostically superior and diagnostically adequate slide than FNAC.<sup>7,10</sup>

In this study, FNC appears to be a better technique than FNAC in only one way (least hemorrhage). Both the techniques have its own advantages and disadvantages.

Sajeev and Siddaraju also done a similar study of comparison in lymph node lesion and concluded that FNC was superior in diagnosing cellular lymph node lesions.<sup>18</sup> The sensitivity, sensitivity, positive predictive value and the negative predictive value of FNC were 87.04%, 100%, 100%, 12.5%. The sensitivity, sensitivity, positive predictive value and the negative predictive value of FNAC were 90.74%, 100%, 100%, 16.67%, respectively. These results were compared with the other studies, and similar results were found.<sup>19,20</sup>

## CONCLUSION

Both the techniques have similar results, hence, can be used in tandem. However, both the techniques should be used in different places. In high cellular lesions, FNC should be the first choice and in less cellular lesions FNAC should be preferred. But on the whole, FNAC was found to be diagnostically adequate and superior than FNC.

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