

# Accuracy Of Fine Needle Aspiration Cytology In Diagnosis Of Thyroid Swellings

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## Citation

B Mundasad, I Mcallister, J Carson, P Pyper. *Accuracy Of Fine Needle Aspiration Cytology In Diagnosis Of Thyroid Swellings*. The Internet Journal of Endocrinology. 2005 Volume 2 Number 2.

## Abstract

**Introduction :** Fine needle aspiration cytology is regarded as the gold standard investigation in diagnosis of thyroid swellings. Published data suggest an overall accuracy rate of 75%<sup>1</sup> in the detection of thyroid malignancy. The aim of this study was to determine the accuracy of FNA cytology in detection of thyroid malignancy in our surgical unit.

**Methods :** Between 1989-2002, 144 patients who underwent thyroid resection by single consultant surgeon and who had preoperative FNA were enrolled in this retrospective study. The preoperative FNA results were compared with definitive histological diagnosis following thyroid resection.

Fine needle aspiration cytology was performed using aspirate and non-aspirate techniques on each thyroid swelling. The cytological sample was assessed by a single consultant pathologist and was classified as inadequate, non-neoplastic, neoplastic, suspicious or indeterminate. The histology were classified as non-neoplastic (benign), neoplastic (malignant).

**Results:** Fine needle aspiration cytology analysis revealed 94(13.88%) non-neoplastic, 6(65.27%) neoplastic and 20(4.16%) suspicious aspirates. Twenty (13.88%) samples were inadequate and 4(2.77%) samples were indeterminate. Histological analysis showed 118(81.94%) benign, 26(18.05%) malignant specimens. Fine needle aspiration cytology had a sensitivity, specificity and accuracy rate of 52.6%, 86.6%, and 79.1% respectively for diagnosing thyroid malignancy.

**Conclusion:** The results are comparable with the current published data and demonstrate that FNA cytology in our hands is accurate investigation for preoperative diagnosis for the detection of thyroid malignancy.

## INTRODUCTION

Fine needle aspiration and cytology (FNAC) is a well established out-patient procedure used in the primary diagnosis of palpable thyroid swellings<sup>1</sup>. FNAC gained acceptance in the UK and the USA in 1970s<sup>2</sup>. Currently this technique is practised world-wide and it is the investigation of choice in thyroid, breast, and lymph node swellings. The technique has been shown to be simple, safe and cost-effective<sup>3,4,5</sup>. The limitations include false negative results, false positive results and a proportion of FNA results that are not obviously benign or malignant and fall into the indeterminate or suspicious group<sup>6</sup>. Published data suggest FNA has an overall accuracy rate around 75% in the detection of thyroid malignancy<sup>7</sup>. The aim of this study was to determine the accuracy of FNAC in detection of thyroid malignancy in our surgical unit.

## MATERIAL AND METHODS

A retrospective audit of medical records was carried out to determine the diagnostic accuracy of FNAC for solitary thyroid swellings, in a single surgical unit, between 1989 and 2002. Patients were enrolled if they had a pre-operative FNAC performed and subsequently underwent a thyroid resection. The data was collected from computer database.

All FNACs were carried out by either a surgical registrar or consultant surgeon in the outpatient clinic. Two techniques were used to perform FNAC; (1) Aspiration technique when a 23-gauge needle was connected to a 10-ml syringe mounted on a syringe holder. Multiple needle passes were made within the lesion 3-4 times at varying angles and depths and with constant negative pressure (never emerging outside the skin). Before final withdrawal, the negative pressure was released prior to the needle emerging from the skin. The cytological material was transferred on to glass

slides. (2) Non-aspiration technique a similar 23-gauge needle was passed into the lesion 3-4 times in the same the same manner except that negative pressure was not used. After withdrawal, the needle was connected to a 10-ml syringe containing air and cytological material was transferred on to slides. All patients subsequently had a thyroid resection and a definitive diagnosis was reached. FNAC and histology specimens were analysed by a consultant pathologist.

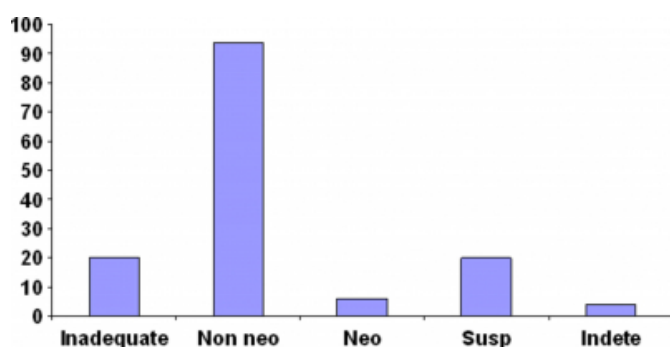
FNAC results were classified in to five groups: a) Inadequate (no diagnosis was made because of inadequate cellular material), b) Non neoplastic (including multinodular goitre, colloid goitre, thyroiditis), c) Neoplastic (papillary, anaplastic, lymphoma), d) Suspicious (suggestive / suspicious of neoplasm – follicular neoplasm), e) Indeterminate (no diagnosis made in spite of enough cellular material). Histology specimens were classified as non-neoplastic and neoplastic. Pre-operative FNAC results were then compared with the definitive histological diagnosis. The sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of FNAC in diagnosing thyroid malignancy was calculated. Statistical Analysis was done by using SPSS software.

## RESULTS

From 1989-2002 a total of 144 aspirates of thyroid swellings with subsequent thyroid resection were performed. A breakdown of cytological and histological results is shown graph 1 and table 2 for diagnosis of thyroid malignancy; FNAC had a sensitivity of 52.6%, specificity of 86.6%, NPV of 90.4%, PPV of 38.4% and accuracy of 79.1%.

**Figure 1**

Graph 1: Results of FNAC in 144 patients



**Figure 2**

Table 2 : Results of histology in 144 patients

Histology Results	FNAC Results		Total
	Neoplastic	Non-Neoplastic	
Neoplastic	10	09	19
Non-Neoplastic	16	85	101
Total	26	94	120

In Table 3 the FNAC results have been compared with the corresponding histological diagnosis after excluding the inadequate & indeterminate FNAC samples. Neoplastic and suspicious samples were combined.

**Figure 3**

Table 3 : Overall performance of cytology in diagnosis of thyroid malignancy

Histology Results	FNAC Results		Total
	Neoplastic	Non-Neoplastic	
Neoplastic	10	09	19
Non-Neoplastic	16	85	101
Total	26	94	120

**Figure 4**

Table 4 : Statistical analysis

Sensitivity	52.6 %
Specificity	86.6 %
NPV	90.4 %
PPV	38.4%
Accuracy	79.1 %

## DISCUSSION

Fine needle aspiration cytology is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings. The technique is safe simple and quick with a low complication rate. Several other tests, such as high resolution ultrasonography, radioisotope scanning and FNA biopsy have been used for evaluation of thyroid swellings before proceeding to thyroid surgery. Studies have demonstrated that among all these diagnostic modalities, FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swellings<sup>3,4,5</sup>. FNAC has been shown to have similar or higher sensitivity and accuracy levels than frozen section examination<sup>8,9,10</sup>. FNAC has higher sensitivity for detection of malignancy compared with ultrasonography and radioisotope scans<sup>11</sup>. False negative results are expected particularly with small tumours and when there is associated degenerative or inflammatory change in adjacent thyroid tissue. There is a group of lesions which overlap benign and malignant features. For instance, the distinction between a cellular colloid goitre and a follicular lesion may be impossible. Cytological diagnosis of follicular adenoma vs.

carcinoma is not possible on FNA and diagnosis is dependent on histological assessment for capsular/vascular invasion. Another limitation of thyroid FNAC is the large number of inadequate aspirates. Published data suggest inadequate sample ranges between 9-31%<sup>12,13,14</sup>. In our study the inadequate sample rate was 13%. The most important factors include experience of the aspirator and the criteria used to define a satisfactory sample.

In the published data, the sensitivity, specificity and accuracy of thyroid FNAC in detecting malignancy ranges from 84-86%, 52-86% and 65-79% respectively (Table 5).<sup>15,16</sup> The determinant factor for such a wide range of sensitivity, specificity and accuracy may be how the cytopathologists classify 'suspicious' as well as false positive and negative samples. Some authors include follicular lesion in malignant/neoplastic group, whereas others exclude them from the calculations. In our study sensitivity rate was low compared to others as three out of four (75%) 'indeterminate' FNAC results were later found to have malignancy on histological examination.. This was despite adequate number of cells (by definition) and suggests that the FNAC interpretation is operator dependent. Our positive and negative predictive values are comparable with published data (table 5)<sup>15,16</sup>.

## Figure 5

Table 5: Reported values of sensitivity, specificity, positive predictive value (PPV), negative predictive value and accuracy in previous series compared with our results.

	This study 2002	Cap et al (1999)	Holleman (1995)	Newcastle (2000)
FNA (n=)	144	2492	130	302
Surgery (n=)	144	536	53	239
Sensitivity	52%	86%	84%	86%
Specificity	86.6%	74%	52%	67%
PPV	38.4%	34%	53%	65%
NPV	90.4%	97%	83%	87%
Accuracy	79.1%	75%	65%	75%

## CONCLUSION

FNAC is a simple, safe and cost-effective diagnostic modality in the investigation of thyroid disease with high specificity and accuracy. The suspicious and indeterminate results prove to be an area of uncertainty often resolved by diagnostic surgical resection.

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