

# Sensitivity and specificity test of fine needle aspiration biopsy in determining thyroid nodule diagnosis

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## ABSTRACT

Based on guideline of the American Association of Clinical Endocrinologist, fine needle aspiration (FNA) is believed as effective method to differentiate between benign and malignant thyroid nodule. At Dr. Sardjito Hospital, during 2004 – 2008 there were 12 cases of false negative from 14 cases of thyroid malignancy. The high false negative value raised question about the role of FNA in determining thyroid nodule diagnosis. The purpose of this study is to find out sensitivity and specificity of FNA in determining thyroid nodule diagnosis at Dr. Sardjito Hospital Yogyakarta. Patients underwent FNA and surgery for thyroid nodule were collected between January 2004 until December 2008. The result of FNA was compared to histopathological result then sensitivity and specificity test were performed respectively. The fine needle aspiration was conducted to 120 patients. It consist of 23 men and 97 women, mostly 41 – 50 years old. The results of FNA were four of malignancy, 74 of benign, and 42 of follicular neoplasm. Histopathological result showed malignant in 23 patients and benign in 97 patients. The FNA at Dr. Sardjito Hospital showed 14.29% of sensitivity, 96.86% of specificity, 50% of PPV, 83.78% of NPV, 4.55 of LR + 0.884 of LR-, 18.92% of prevalence, and 86.49% of accuracy. The thyroid FNA at Dr. Sardjito Hospital showed low value of sensitivity and high value of specificity. Futhermore, the thyroid FNA showed minimal role in determining thyroid nodule diagnosis.

**Keywords** : thyroid nodule-diagnosis-fine needle aspiration-sensitivity-specificity

## INTRODUCTION

Palpable thyroid nodule is one of the common reason for seeking medical advice all over the world. It occurs in 4-7% of the population.<sup>1</sup> In the United States, the lifetime risk for developing a palpable thyroid nodule is estimated to be 5-10%, and the condition affects women more than men.<sup>2</sup>

According to the guidelines of the American Association of Clinical Endocrinologists, Fine needle aspiration (FNA) is believed to be the most effective method, available for distinguishing between benign and malignant thyroid nodule, with a sensitivity and specificity approaching 96%<sup>1</sup>. Fine needle aspiration biopsy provides highly accurate cytologic information from which a definitive management plan can be arranged.<sup>3</sup> The utilization of FNA, along with clinical, laboratory and imaging data, has reduced the number of thyroidectomies performed by 21% to 75%.<sup>4</sup> The

success of a biopsy depends on the adequacy of the specimen and skill of the cytopathologist. The accuracy of cytological examination for papillary carcinoma, medullary carcinoma and anaplastic carcinoma is approaching 100%, but for follicular type depends on invasion of follicular cells to the capsule or vascular that only seen at histopathologic examination.<sup>5-7</sup>

There are two points of view on FNA precision. Some physicians believe that FNA is mostly specific and almost sensitive due to a number of published data, and as a consequence, thyroid FNA positive results effectively roles in the diagnosis.<sup>8</sup> The other view is that thyroid gland FNA is more sensitive and approximately specific, thus a negative result can effectively rule out the diagnosis of thyroid carcinoma.<sup>9</sup>

In PERABOI protocol 2003, it was mentioned that FNA at center education in Bandung showed

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7.2% of false negative value.<sup>7</sup> At Dr. Sardjito Hospital, during 2004 until 2008, there were 12 cases of false negative from 14 cases of thyroid malignancy. The high false negative value raised question about the role of FNA in determining thyroid nodule diagnosis.

## MATERIALS AND METHODS

In this retrospective study, diagnostic test was conducted to find out whether FNA would give positive result as histopathology as a gold standard. This study was conducted in Dr. Sardjito Hospital in Yogyakarta, Indonesia during January 2004 to December 2008. One hundred and twenty patients with thyroid nodule treated in Dr. Sardjito Hospital. The thyroid FNA was compared with histopathological result. Sensitivity and specificity test were performed with 2 x 2 table.

The study has been approved by The Health Research Ethics Committee of Faculty of Medicine, Gadjah Mada University, Yogyakarta.

## RESULTS

Data showed that 120 patients with thyroid nodule underwent FNA and thyroidectomy since January 2004 until December 2008 at DR. Sardjito Hospital. There were 23 men and 97 women. The comparison between men and women was 4.2 : 1. FIGURE 1 showed that the youngest patient was 12 years old and the oldest patient was 74 years old. Mostly patient was 41 – 50 years of age (30%).

From 120 patients, FNA results were divided to three category: malignant, benign, and follicular neoplasm. There were four malignancy cases, 74 benign cases, and 42 follicular neoplasm cases as shown in TABLE 1.

TABLE 1. Fine needle aspiration results from 120 patients

Interpretation	Total
Benign	74
Malignant	4
Follicular neoplasm	42

Fine needle aspiration result and histo-pathological result were inserted to 2 x 2 table for sensitivity and specificity test. TABLE 2 showed FNA and histopathological result. Comparison between FNA

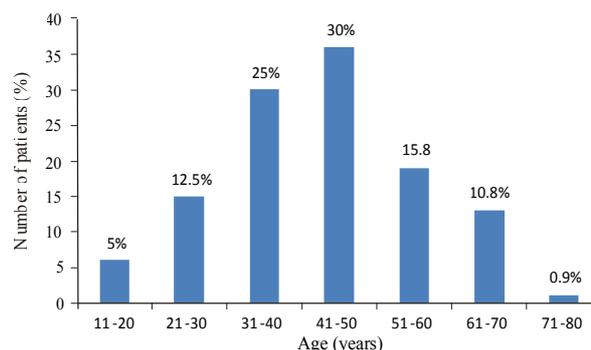


FIGURE 1. Distribution of age from 120 patients who treated as thyroid nodule

results and histopathological results were : positive in two cases, negative in 62 cases, false positive in two cases, and false negative in 12 cases.

From this test we found that FNA sensitivity was 14.29%, specificity was 96.86%, PPV was 50%, NPV was 83.78%, LR + was 4,55, LR – was 0.884, prevalency was 18.92% and accuracy was 86.49%.

TABLE 2. Comparison between FNA results and histopathology results

Variables	Histopathology		Total
	Malignant	Benign	
Fine needle aspiration	Malignant	2	4
	Benign	12	74
Total	14	64	78

## DISCUSSION

Most patients with FNA examination were 41 – 50 years of age. Wijayahadi also reported in his study that thyroid enlargement was more common in adult at 30 – 60 years old.<sup>10</sup> Proper diagnosis and treatment should be made because it can increase life expectancy. Early diagnosis through FNA will help to choose operative or non operative management.

The incidence of thyroid enlargement is more common in women than men. In this study, comparison between women and men was 4.2 : 1. In other study, Hanks<sup>5</sup> reported 2 : 1 and Khan<sup>11</sup> reported 2-4 : 1. The hypermetabolism that only happen in women such as pregnancy, menstruation and giving breast feeding was suspected as the cause of thyroid enlargement in women.<sup>12</sup>

The low value of sensitivity of FNA in this study (14.29%) raised uncertain result in detecting thyroid malignancy. When the result showed benign tumor, clinician should be aware and gave information to the patient that there still possibility of thyroid malignancy. The high value of specificity (96.86%) means FNA could be used in determining thyroid enlargement. Duek reported in his study that FNA has 55 – 90% of sensitivity and 90 – 100% of specificity.<sup>8</sup> Kessler also reported FNA sensitivity was 79% and specificity was 98.5%.<sup>4</sup>

The result of FNA is influenced by specimen adequacy and the ability of cytopathologist. The more cystic the lesion, the more likely the specimen is to be non-diagnostic. Larger thyroid nodule is often cystic, therefore the cytopathologist should be more careful when aspirate the mass.<sup>6</sup> Additional aspirations are recommended when there is a residual mass after a cyst has been drained, and more passes are recommended to guarantee the sample adequacy.<sup>13</sup> Kessler reported 4 – 8 passes were performed in his study.<sup>4</sup>

Most patients did not experience significant pain from FNA procedure. However, the procedure can cause some discomfort and anxiety, both of which may be minimized by using local anesthesia. For deep location or for procedure that may require more time, local anesthesia is recommended.<sup>13</sup>

Thyroid with diffuse enlargement or asymmetrical goiter without a discrete nodule on physical examination are sub optimal targets for palpation guided FNA. Ultrasound guidance is preferred to and appears to be more sensitive. For poorly palpable nodules, those that are predominately cystic or small nodule less than 1 cm, ultrasound guidance is also recommended.<sup>13</sup>

National Cancer Institute recommend to cytopathologist to follow some training to make interpretation the thyroid cytology. For clinician, specific identifying information should be provided. These information include : nodule location, size, any family history of thyroid cancer, history of hypothyroidism, autoimmune thyroiditis, a positive test for thyroid antibodies, Graves disease, and external radiation treatment especially at neck area.<sup>13</sup>

## CONCLUSION

It was concluded that thyroid FNA at Dr. Sardjito Hospital has low value of sensitivity and high value of specificity. Therefore, FNA has minimal role in determining thyroid nodule diagnosis.

## ACKNOWLEDGMENT

We would like to thank Medical Record Installation of Dr. Sardjito Hospital for helping to find the medical record of the patients whom used in this study. We would like to thank also Pathology Anatomy Installation of Dr. Sardjito Hospital for giving permission to take FNA and histopathology data of the patients.

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