

# The Accuracy of the Cytological Examination of Fine Needle Aspiration in Papillary Thyroid Carcinoma at General Hospital H. Adam Malik (HAM), Medan

Nelly Alamsyah<sup>a</sup>, Delyuzar<sup>a</sup>, T. Kemala Intan<sup>a</sup>, Nadjib Dahlan Lubis<sup>a</sup>,  
 Betty<sup>a</sup>, Joko S. Lukito<sup>a</sup>

<sup>a</sup>Department of Anatomical Pathology, Faculty of Medicine  
 Universitas Sumatera Utara Medan, Indonesia.

## Abstract

**Background:** Thyroid nodules are disorders of the thyroid gland, consisting of colloid nodules, cysts, and thyroiditis found in 80% of cases, while benign follicular neoplasms and thyroid carcinomas occur in 10%-15% and 5% of cases. The most common thyroid carcinoma is Papillary Thyroid Carcinoma (PTC), with an incidence rate of about 80% of all thyroid carcinomas. Distinguishing preoperative benign lesions is very important to prevent unnecessary surgery, therefore Fine Needle Aspiration Biopsy (FNAB) is needed, and easy to perform, this examination is the first line in evaluating preoperative thyroid lesions.

**Objective:** Assess the accuracy of FNAB examination compared to histopathological examination in diagnosing PTC.

**Methods:** This study is a diagnostic test. The population of this consisted of secondary data, patients with thyroid nodules diagnosed with PTC and non-PTC who underwent FNAB examination compared with Histopathological at the Anatomical Pathology Unit of General Hospital HAM, Medan.

**Results:** Based on age group, from 62 samples, there were 56.5% PTC aged 41-60 years, (21.0%) 21-40 years, (19.4) and (3.2%) <21 years. There are 80.6% of the samples are female. PTC has a sensitivity value of 28.57%, specificity of 100%, false positive of 100%, false negative of 73.21%, and accuracy of 85.48%.

**Conclusion:** This study can be used as a diagnostic tool for early diagnosis and a fairly accurate monitoring tool, however, a cytological diagnosis is not a substitute for a histopathological diagnosis which is still a definite diagnosis. Malignancy of PTC on cytological examination must be followed by Histopathological as the gold standard.

**Keywords:** PTC, FNAB, sensitivity, specificity, accuracy.

## 1. Introduction

Thyroid nodules are a common abnormality of the thyroid gland.[1-3] Palpable thyroid nodules account for about 4-7% of the population.[4] Benign thyroid tumors are a more frequent clinical finding than malignant thyroid tumors. These nodules consist of various diseases. Colloid nodules, cysts, and thyroiditis are found in about 80% of cases, while benign follicular neoplasms and thyroid carcinomas occur in about 10%-15% and 5% of cases. [2,5] Based on Globocan Burden Of Cancer (GLOBOCAN) data in 2020, the incidence of this disease is ranked 11th of all malignant diseases in the world, which is around 585,202 cases.[6] Reports based on the Surveillance, Epidemiology, and End Results (SEER) database in 2021 the incidence of thyroid cancer be 44,280 cases (2.3%) and the estimated death cases in 2021 are around 2,200 cases (0.4%), in the United States increased by an average of 3.6% per year during 1974-2013 (from 4.56 per 100,000 people/year in 1974-1977 to 14.42 per 100,000 people/year in 2010-2013), mainly related to the increase in PTC cases (annual percentage changes 4.4%).[7] Parura et al. studied thyroid cancer in the period July 2013-June 2016 at Prof. Hospital. Dr. R.D Kandou Manado. During those 3 years, the incidence of PTC increased (from 8.1% to 32.3%).[8]

The most common thyroid carcinoma is PTC, with an incidence rate of about 80% of all thyroid carcinomas and the best overall prognosis.[9-13] One of the main causes of PTC, is the presence of environmental factors such as exposure to ionizing radiation, especially when it occurs in childhood. There are also many other risk factors, such as reproductive factors, genetics, dietary iodine, and others, but the factors associated with the occurrence of PTC are not fully known.[10,14,19] This carcinoma may occur at any age. Typically, this PTC occurs three times higher in women than in men, and peaks earlier in women.[15-18] The main role of FNAB lies in distinguishing between malignant and benign thyroid nodules, this greatly influences treatment decisions.[20] From 2015-2020, the sensitivity values of FNAB in the thyroid are reported to range from 50% to 98.7% and specificity from 62.5% to 98%. The accuracy of FNAB examination in detecting malignancy in thyroid lesions ranges from 62.2% to 97%.[20-27] FNAB can categorize many benign and malignant lesions so that it can help with therapeutic protocols. This examination has been proven to be the safest and most accurate diagnostic tool for thyroid lesions.[28] When PTC was diagnosed by FNAB, 96-98.7% of cases proved to be PTC on histopathological examination.[29]

## 2. Materials and Methods

This study is a diagnostic test study. The population of this study consisted of secondary data, namely patients with thyroid nodules diagnosed with PTC and non-PTC who underwent FNAB compared with Histopathological at the Anatomical Pathology Unit of General Hospital. HAM, Medan. Histopathological and cytology specimens stained with Haemotoxylin Eosin and Giemsa stain.

## 3. Result

The number of samples in this study was 62 samples diagnosed by FNAB or histopathological as PTC and Non-PTC met the inclusion and exclusion criteria at the Anatomical Pathology Unit H. Adam Malik Hospital, Medan. This study aims to assess the accuracy of FNAB examination compared to histopathological examination in diagnosing PTC. The following are the results of the research obtained.

Table 1. Distribution of sample characteristics by age and sex.

Variable	F	%
Age (year old)		
• <21	2	3,2
• 21-40	13	21,0
• 41-60	35	56,5
• >60	12	19,4
Gender		
• Men	12	19,4
• Female	50	80,6
Total	62	100,0

Based on age group, from 62 samples, there are 35 samples (56.5%) PTC aged 41-60 years, 13 samples (21.0%) aged 21-40 years, 12 samples (19.4%) aged >60 years, and 2 samples (3.2%) aged <21 years. As for gender, from 62 samples, most of the samples were female, as many as 50 samples (80.6%), and 12 samples were male (19.4%).

Table 2. The results of the diagnostic test with FNAB examination were compared with histopathological examination.

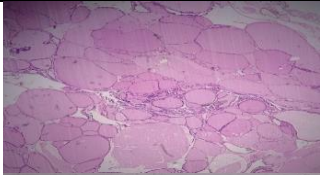

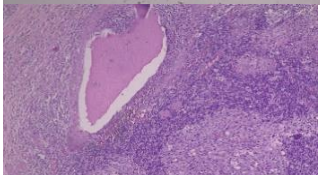
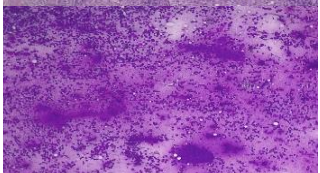
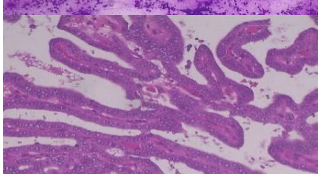
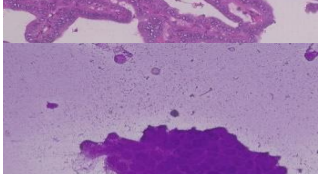
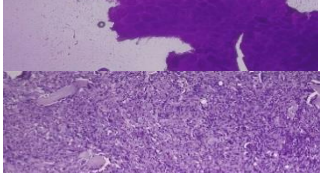
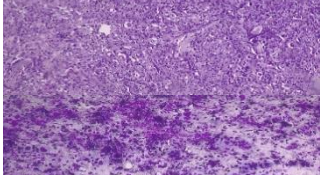
		Histopathological diagnosis		Total
		PTC	Non-PTC	
FNAB	PTC	6	0	6
	Non-PTC	15	41	56
	Total	21	41	62

Sensitivity	:	$a/(a+c) = 6/21 = 28,57\%$
Specificity	:	$d/(b+d) = 41/41 = 100\%$
Positive predictive value	:	$a/(a+b) = 6/6 = 100\%$
Negative predictive value	:	$d/(c+d) = 41/56 = 73,21\%$
Accuracy	:	$(a+d)/N = (6+41)/62 = 85,48\%$

\* **Table 2x2.**

Based on Table 4.2, it was found that the sensitivity value was 28.57%, specificity 100%, positive predictive value 100%, negative predictive value 73.21%, and the PTC accuracy was 85.48%.

**Fig: Cytology and histopathological in research**

No	Gender	Age (year old)	Behavior	Diagnostics	Picture
1			Histopathological	Colloid Goiter	
	Man	58	Cytology	Thy2 (The impression of a Benign follicular nodule)	
2			Histopathological	Tiroiditis Hasimoto	
	Man	54	Cytology	Thy2 (The impression of Tiroiditis Hashimoto)	
3			Histopathological	PTC	
	Female	52	Cytology	Thy6 (malignancy smear). The impression of a PTC	
4			Histopathological	ATC	
	Female	57	Cytology	Thy6 (malignancy smear) The impression of an ATC	

#### 4. Discussion

The number of cytology and/or histopathological slides diagnosed as PTC that met the inclusion and exclusion criteria in 2018-2021 was 62 samples. Ridho et al in their research found 61 cases of PTC between January-December 2016 at Dr. Mohammad Hoesin Hospital. Palembang.[30] The surgical oncology department at RSUD DR. H. Abdul Moeloek Lampung Province in 2017-2019 found there were 30 PTC patients.[31]

This study found the mean age and standard deviation of PTC samples were 49.37 years and 12.943 years, with the youngest age being 15 years and the oldest being 74 years. Based on age group, there are 35 samples (56.5%) aged 41-60 years, 13 samples (21.0%) aged 21-40 years, 12 samples (19.4%) aged >60 years, and 2 samples (3.2%) aged <21 years. In the journal Oktahermoniza et al said that the youngest age was 11 years of age, this patient underwent a total thyroidectomy, and the histopathological type was papillary. Possibly caused by well-differentiated thyroid cancer that mostly affects young people, with the incidence of PTC being more common in young adults.[32] The exact reasons for the increased incidence at a young age are still not fully understood, partly due to improved diagnostic methods (ultrasound, thyroid scan, FNAB) in increasing cancer recognition. Thyroid cancer is found at a young age. about 2% of cases of thyroid cancer are found in children and adolescents, and two out of three cases are found under the age of 55 years. This increase in the number of thyroid cancer cases is also due to the use of ultrasound equipment that can detect small thyroid nodules.[60] Wartofsky L in his research said under the age of 15 years, representing 1.5-3% of all childhood cancers, most of these tumors are PTC. Exposure to ionizing radiation increases the sensitivity of the thyroid gland in children so that younger children experience faster cell growth and proliferation, this was the case in the thyroid cancer epidemic in children exposed to radiation in Belarus in 1986.[34]

This study also found that women (80.6%) suffered from PTC more than men (19.4%). The results of this study are in line with Siswandi et al and Ridho et al. [30,31] Female dominance indicates that hormonal factors are involved.[35] Widhiasih explained that in women, the estrogen hormone receptor is also expressed by thyroid follicular epithelial cells so that women are more susceptible to infection. PTC. This hormone can affect the proliferation and invasion of thyroid cancer cells by affecting hormone receptors that are expressed on these cells, such as ER $\alpha$  and ER. In addition, estrogen can also increase the level of thyroid binding globulin which acts as a transporter of T4 and T3 in the blood it occurs decreased levels of free T4 and free T3. This will stimulate TSH levels which will cause hyperplasia of the thyroid gland as a compensatory mechanism to form more thyroid hormone so that serum T4 and T3 levels can return to normal. Increased TSH production can support thyroid growth, while estrogen increases TSH levels. [36,37]

In this study, from 62 samples, 21 samples were found that were proven to be PTC based on histopathological examination. Of these 21 samples, not all of them were diagnosed as PTC on the FNAB examination. In this examination, the results varied greatly, ranging from Thy 1 to Thy 6 On histopathological examination, 15 samples were diagnosed as PTC but were not cytologically diagnosed, and 6 samples were indeed diagnosed as PTC either by histopathological examination or diagnosed. cytologically. In the results of this study, it was found that the sensitivity value of PTC was 28.57%. When compared with several previous studies, the sensitivity value of this study is low. Therefore, it can be stated that the sensitivity of FNAB in this study is not good in diagnosing PTC, so other investigations are needed, while the histopathological examination is used as the gold standard to be able to establish a diagnosis. PTC accurately.[21]

Widarsoet al (2015), and Rahmadani, et al (2017), also suggested that the FNAB examination found a low sensitivity value, and was not good at diagnosing PTC, so other supporting examinations were needed such as radiological examination, and ultrasound, while the histopathological examination was used as a standard. the gold standard to be able to make an accurate diagnosis of PTC. FNAB can be used as an accurate preoperative diagnostic tool for thyroid tumors, but not as a substitute for histopathological diagnosis which is still the definitive diagnosis for thyroid tumors.[21]

The specificity value indicates the ability of a test to be negative for people who are not sick. The higher the specificity of a test, the more negative test results in people who are not sick or the fewer the number of false positives. PTC specificity value is 100%. Has a high value. Therefore, it can be concluded that FNAB can be used to determine the negative in people who are not sick. [38]

The positive predictive value is the proportion of sick people among the positive test results. Thus, this value indicates a high probability of getting sick in people with positive test results.[80] The positive predictive value of PTC is 100% and also has a high value. Therefore, FNAB can be used to see how likely it is that people with positive test results are sick. Widarso et al also said that the cause of a false positive diagnosis (false positive) in FNAB was a misinterpretation, namely benign cells were interpreted as malignant cells, this could be due to the absence of supporting radiological data or insufficient clinical data.[21]

The negative predictive value is the proportion of people who are not sick among negative test results. This value indicates the probability of not experiencing illness in people with negative test results.[38] The negative predictive value of PTC is 73.21%. This is in line with the research conducted by Ramadhani et al at the Laboratory of Anatomical Pathology, Central General Hospital, DR. M. Djamil Padang said that the rate of false negative diagnoses was quite high. A false negative diagnosis is usually associated with a cystic neoplasm. More than 40% of cystic neoplasms may not be detected by FNAB. A false negative diagnosis may be due to inadequate sampling,

incorrect location, concomitant abnormalities (e.g. a dominant non-neoplastic nodule may mask a smaller neoplasm and grow more diffuse), and misinterpretation.[22]

While the accuracy value is the proportion of true test results (true value) among all those examined. PTC accuracy value is 85.48%, this value is quite high. In line with the research, Widarso et al said that from the results of measurements of the level of accuracy which is a value that indicates the accuracy of the results of the FNAB examination in diagnosing patients with thyroid tumors, an accuracy of 92.24% is obtained, so it can be said that this study has a fairly high level of diagnostic accuracy. Therefore, it can be concluded that FNAB can be used as a means of supporting a fairly accurate thyroid tumor diagnostic examination.[21] The accuracy of cytological diagnosis is strongly influenced by the adequacy of the specimens obtained and the reading and interpretation of the samples. Adequate specimens are determined by the ability, experience, and skill of the operator making the smear, thus affecting the quality of the specimen. The reading and interpretation of the sample are greatly influenced by the accuracy and precision of the Anatomical Pathologists who perform the interpretation.[28]

## **5. Conclusion**

This study has a low sensitivity value, a high specificity value, and a fairly high accuracy result, therefore it is recommended to carry out a histopathological examination as the standard to avoid misdiagnosis.

## **Thank you note**

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