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FNAB and Anatomic Pathology Biopsy Accuracy in Thyroid Nodule Diagnosis

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Abstract

Background: Thyroid cancer was ranked 9th out of 10 most cancers (4.43 percent) in Indonesia in 2014, according to the registration of the Indonesian Patho-logy Specialist Doctors Association. Thyroid cancer was ranked fifth at Dr. Cipto Mangunkusumo Jakarta. The problem examined is the accuracy of the FNAB examination compared to the gold standard histopathology.

Objective: To determine the value of sensitivity, specificity, positive and negative predictive values , and the accuracy of the FNAB

Method: This study uses a retrospective method. The population was patients with thyroid nodules in Pare Regional Hospital, Kediri, in 2015-2019. The sampling technique is Simple Random Sampling Probability. The sample was the patients who had been diagnosed with thyroid nodules and underwent FNAB examination followed by histopathology biopsy. The instrument used was secondary data collection inpatient medical record data. The data can be processed through diagnostic tests.

Results: FNAB sensitivity value of 66.6%, a specificity value of 97%, a positive predictive value of 90.9%, and a negative predictive value of 86.8%, and an accuracy rate of 87.7%

Conclusion: FNAB can be used as a first-line examination in diagnosing thyroid nodules but cannot replace histopathological examination as a gold standard.

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INTRODUCTION

In 2015 in the United States, there were 62,450 cases of thyroid cancer, with 3 out of 4 cases occurring in women. Based on data from the Cancer Registration Agency of the Indonesian Cancer Foundation in 2005, thyroid cancer ranks 9th out of 10 most malignant tumors and is the most common type of endocrine gland malignancy in Indonesia.[1,2]

The mortality rate due to thyroid nodules ranges from 0.6 per 100,000 population in men and 1.2 per 100,000 population in women, from all thyroid cancer. Thyroid cancer usually occurs at the age of 20-50 years, and women are the most dominant, but this cancer can occur at any age.[3,4] In Indonesia, in 2014 reported from the registration of the Indonesian Pathology Specialist Doctors Association, it was found that thyroid cancer ranked 9th out of 10 most cancers (4.43%), at Dr. Cipto Mangunkusumo Jakarta ranks fifth.[5]

According to Riskesdas data in 2013, East Java ranks 15th with an estimated population aged 15 years diagnosed with thyroid nodules totaling 173,135 people out of a total population of 28,855,895 people with a percentage of 0.5% in 2013. Aceh, North Sumatra, and West Sumatra with a percentage of 0.3% each.[5]

Most thyroid carcinomas originate from the follicular epithelium, except for medullary carcinomas derived from parafollicular cells or C cells. Several genetic and environmental factors are thought to play a role in the pathogenesis of thyroid cancer.[5, 6] Genetics, radiation, history of thyroid disease are known to be risk factors for thyroid nodules.[7] Symptoms of thyroid cancer usually occur after the tumor grows, including a lump or nodule in the front of the neck, hoarseness or difficulty speaking in a normal voice, swollen lymph nodes (KGB), especially in the neck, difficulty swallowing or breathing, or pain in the throat or neck.[8] In general, the prognosis is much worse in the elderly and patients with invasion of tissues outside the thyroid or distant metastases.[9]

Most cases of the thyroid do not cause severe symptoms, except for the type of anaplastic malignancy that enlarges very quickly, even in a matter of weeks.[10] Fine Needle Aspiration Biopsy (FNAB) examination of the thyroid gland is the first step in diagnosing thyroid nodules. Fine Needle Aspiration Biopsy (FNAB) examination is considered an effective method for diagnosing thyroid nodules with an accuracy rate of 62.2% for FNAB examination, with a specificity of 62.5%, a sensitivity of 61.2%, and a positive predictive value of 75%, and a negative predictive value.[11] by 47.6%. At the same time, the definitive diagnosis of a thyroid nodule is by examining anatomical, pathological biopsy on the surgical sample. This examination takes a long time, namely three to seven days. The sampling method is quite invasive and requires the use of anesthesia. While for the FNAB examination, the cost is cheaper, the time required is not too long, it does not require local anesthesia, and it is relatively safe.[12]

Fine Needle Aspiration Biopsy (FNAB) is a sensitive and specific test for the diagnosis of thyroid tumors, and there have been many publications confirming the superiority of this FNAB.[12, 13] However, although it is an accurate test and often without complications.[12,13], FNAB also has limitations, namely inability of FNAB to provide a differential diagnosis of

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nodules in hypercellular goiter and benign and malignant follicular neoplasms.[14]

A histopathological examination is also the Gold Standard examination in determining the type of thyroid nodule by taking part of the tissue after the nodule is removed and then confirmed using a microscope examination by a cytology expert. The advantage of histopathological examination when compared with FNAB examination is that it can determine the type of thyroid nodule with a high degree of accuracy to obtain sensitive and specific results. [15,16]

Based on the description above, it can be concluded that the level of accuracy of the FNAB is still relatively low and cannot replace the golden diagnosis of thyroid nodules, namely histopathology. However, FNAB itself has advantages in cost and efficiency in examination time. Moreover, for Pare Hospital itself, there has been no research on the accuracy of FNAB on the diagnosis of Thyroid Nodules. The researchers are interested in examining the accuracy value of FNAB compared to Anatomical Pathology Biopsy in establishing the diagnosis of Thyroid Nodules in Pare Hospital.

METHODS

This research is descriptive-analytical research with a retrospective approach. This study will be carried out from January to February 2020. The samples used were all patients with thyroid nodules who underwent FNAB examination followed by gold standard histopathology at Pare District Hospital. Kediri. The sampling technique uses Probability Sampling Simple Random Sampling using the Simple Random Generator application by entering the total population and required samples. The application will then randomize the sample and display the findings in a random order, ensuring that it is representative of the population.

Data collection uses secondary data regarding age, gender, and results of FNAB and Histopathology examinations with 49 respondents. Descriptive and analytical data analysis. Descriptively the data presented include descriptive analysis, and diagnostic tests.

RESULTS

During the research, the results obtained 141 samples, and there were only 58 samples that met the requirements, which were then selected randomly using the Random Simple Generator application to retrieve data according to the number of samples needed, namely 49 samples.

Adenomatous had the highest number with 31 samples (63.3%), Follicular Carcinoma in second place with 11 samples (22.4%), follo-wed by Papillary Carcinoma with four samples (8.2%), in fourth place there was Follicular Adenoma with two samples (4.1%), and Huthle Cell Adenoma with the least number of samples is 1 sample (2%).

According to the information gathered, 15 samples were found to be malignant, and 34 samples were benign after histopathological investigation (Gold Standard). There are two types of neoplasms, namely Follicular Carcinoma and Papillary Carcinoma. There are also four types of non-neoplasm, namely Adenomatous Goiter and Huthle Cell Adenoma and Follicular Adenoma. Adenomatous had the

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highest number with 31 samples (63.3%), Follicular Carcinoma in second place with 11 samples (22.4%), followed by Papillary Carcinoma with four samples (8.2%), in fourth place there was Follicular Adenoma with two samples (4.1%), and Huthle Cell Adenoma with the least number of samples is 1 sample (2%).

As listed in table 1, most respondents with thyroid nodules are female, as many as 37 respondents (75.5%). Based on table 2, most respondents with thyroid nodules at Pare Kediri Hospital are in the 46-55 years age group, as many as 17 respondents (34.6%). Moreover, the smallest age group >65 is one respondent (2%).

From table 3, it is found that there are ten samples classified as positive, 1 sample false positive, five false-negative samples, and 33 negative samples. The sample was then calculated using a diagnostic test formula and obtained an FNAB sensitivity value of 66.6%, a specificity value of 97%, a positive predictive value of 90.9%, and a negative predictive value of 86.8%, and an accuracy rate of 87.7%.

Table 1. Characteristics of Respondents by Gender

Gender Frequency		
Gender		**Presentation**
Men	**12**	**24.5%**
Women	**37**	**75.5%**
Total	**49**	**100%**

Table 2. Characteristics of Respondents by Age

Age	Frequency	%
12-15	**2**	**4%**
16-25	**2**	**4%**
26-35	**7**	**14.1%**
36-45	**15**	**30,9%**
46-55	**17**	**34,6%**
56-65	**5**	**10.4%**
>65	**1**	**2%**
Total	**49**	**100%**

Table 3. Diagnostic Test

		Histopathology		Total
		Malignant	Benign	
FNAB	**Malignant**	**10**	**1**	**11**
	Benign	**5**	**33**	**38**
Total		**15**	**34**	**49**

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DISCUSSION

Based on gender characteristics, women are more at risk of developing thyroid nodules than men. Based on the study results, women are three times more at risk than men. This finding is in line with the theory that gender is a risk factor for thyroid nodules, where estrogen in women significantly affects thyroid function, which can cause thyroid nodules, especially during early puberty and menopause. [17]

The age group above 65 years has the least sample with a sample of 1 person than the age group 12-15 and the age group 16-25 years both have a total sample of 2 people each, then followed by the age group 56-65 years with a total sample of 5 people, the age group of 26-35 years with a sample of 7 people, the age group 36-45 with a sample of 15 people, and the most found in the age group 46-55 with a total sample of 17 people. The age distribution can be explained using the notion that age is a risk factor for thyroid nodules; due to the aging process, people aged 45 and under are more likely to develop thyroid nodules than those aged 60 and up; this is impacted by hormones, particularly in women.[18]

The diagnostic test results showed that the FNAB sensitivity was 66.6%. Specificity of 97%. The positive predictive value is 90.9%. The negative predictive value is 86.8%. And the accuracy of 87.7%. According to research, the FNAB examination's sensitivity ranges from 65 to 98 percent, specificity from 55 to 100 percent, and accuracy ranges from 70 to 88 percent. Sensitivity, specificity, and accuracy are all dependent on the pathologist's ability to conduct examinations in both sampling and evaluating cytological preparations.[19]

Compared with previous research conducted at RSUP Dr. M. Djamil Padang (2018)[8]. The results of the FNAB sensitivity are 62.1%, specificity is 65.5%, the positive predictive value is 75%, the negative predictive value is 47.6%, and accuracy is 62.2%. The sensitivity value carried out from 2015-2019 varies each year where the lowest value of FNAB sensitivity is 50%, the highest is 99%, the lowest value is 50% FNAB specificity, and the highest is 100%. Moreover, Widarso's research showed the results of the FNAB sensitivity of 50%, specificity 97.12%, positive predictive value 66.5%, and negative predictive value 93.5%. And accuracy of 92.24%.[12]

Following the theory, which states that there is a difference in accuracy in the FNAB examination with Gold Standart histopathology [19] as well as in previous studies that carried out FNAB diagnostic enforcement against benign or malignant thyroid nodules carried out at Dr. Hasan Sadikin Bandung[20]. Diagnostic errors in the FNAB examination may occur due to several factors such as the small size of the tumor cells, causing the tumor not to aspirate, the examiner not recognizing the tumor, the experience, and foresight of the pathologist.

CONCLUSION

The incidence of thyroid nodules in RSUD Pare Kediri is more common in 46-55 years, and women are more at risk of developing thyroid nodules. The results of the diagnostic test for the FNAB examination are known to have a sensitivity of 66.6%, a specificity of 97%, a positive predictive value of 90.9%, a negative predictive value of 86.8%, and an accuracy of 87.7%.

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