

The diagnostic value of fine needle aspiration biopsy and ultrasonography on thyroid nodule in Dr. Sardjito General Hospital, Yogyakarta

Wicaksono Probowoso^{1*}, Ishandono Dachlan²

¹PKU Muhammadiyah Hospital, Delanggu, Klaten, Central Java

²Department of Surgery, Dr. Sardjito General Hospital/Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia

ABSTRACT

As the prevalence of thyroid cancer increases, a diagnostic method that can identify malignancy that warrants further surgical treatment is needed. Fine needle aspiration biopsy (FNAB) and ultrasonography (USG) are preoperative test for diagnosing thyroid tumor. This research aimed to calculate the diagnostic value of FNAB and USG on thyroid nodule patients in Dr. Sardjito General Hospital, Yogyakarta. This was a diagnostic test study using a retrospective design using data from medical records of patients with thyroid nodules from January 2006 to December 2010. The diagnostic value of FNAB and USG including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated and compared with histopathological examination as the gold standard. Ninety medical records data of patients consisting of 71 females and 19 males who were diagnosed thyroid nodule with FNAB or USG before surgery were evaluated in this study. The results of FNAB of 90 patients were as follows: 54 (60.0%) benign, 6 (6.7%) malignant, and 30 (33.3%) follicular neoplasm. Meanwhile, the results USG of 90 patients were as follows: 38 (42.2%) benign, 15 (16.7%) malignant and 37 (41.1%) non determined. The diagnostic value of FNAB was described as follows: sensitivity of 50.0%, specificity of 100%, PPV of 100%, NPV of 50.0% and an accuracy of 60.0%, whereas the diagnostic value of USG was described as follows: sensitivity of 81.8%, specificity of 87.5%, PPV 60%, NPV 94.5% and accuracy of 50.0%. In conclusion, the diagnostic value of FNAB and USG in establishing diagnosis of thyroid nodule is still low. The FNAB has higher accuracy compared to USG for diagnosing thyroid nodules.

ABSTRAK

Akibat meningkatnya prevalensi kanker tiroid, adanya metode diagnosis dini untuk mengidentifikasi adanya keganasan sebelum tindakan bedah dilakukan sangat diperlukan. Aspirasi jarum halus (AJH) dan ultrasonografi (USG) merupakan pemeriksaan penunjang untuk menegakkan diagnosis tumor tiroid. Penelitian ini bertujuan untuk menentukan nilai diagnostik pemeriksaan AJH dan USG pada pasien dengan nodul tiroid di RSUP Dr. Sardjito, Yogyakarta. Penelitian ini merupakan penelitian uji diagnostik menggunakan rancangan retrospektif dari data rekam medik pasien nodul tiroid dari Januari 2006 sampai Desember 2010. Nilai diagnostik pemeriksaan AJH dan USG yang meliputi sensitivitas, spesifisitas, nilai duga positif, nilai duga negatif dan akurasi ditentukan dan dibandingkan dengan pemeriksaan histopatologi sebagai standar emas. Sembilan puluh data rekam medik pasien yang terdiri dari 71 wanita dan 19 laki-laki yang didiagnosis nodul tiroid dengan pemeriksaan AJH dan USG dievaluasi dalam penelitian ini. Hasil pemeriksaan AJH terhadap 90 pasien diperoleh tumor jinak 54 (60,0%), ganas 6 (6,7%), dan neoplasma folikuler 30 (33,3%). Hasil pemeriksaan USG diperoleh tumor jinak 38 (42,2%), ganas 15 (16,7%)

* corresponding author: wicaksonoprobowoso@yahoo.com

dan 37 (41,1%) tidak tertetapkan. Nilai diagnostik hasil pemeriksaan AJH diperoleh nilai sensitivitas 50,0%, spesifisitas 100%, nilai duga positif 100%, nilai duga negatif 50,0%, dan akurasi 60,0%. Sedangkan hasil pemeriksaan USG diperoleh nilai sensitivitas 81,8%, spesifisitas 85,7%, nilai duga positif 60,0%, nilai duga negatif 94,7% dan akurasi 50,0%. Dari hasil penelitian dapat disimpulkan nilai diagnostik pemeriksaan AJH dan USG untuk menegakkan diagnosis nodul tiroid masih relatif rendah. Akurasi hasil pemeriksaan AJH lebih tinggi dibandingkan USG untuk diagnosis nodul tiroid.

Keywords: diagnostic value - fine needle aspiration - ultrasonography - thyroid nodule - histopathological examination

INTRODUCTION

Thyroid nodules are extremely common, particularly among women. Epidemiological data show that 4 to 7% of all adults have thyroid nodules. Moreover, it was also reported that approximately 5 to 6.5% of nodules are malignant and require further surgical intervention.¹⁻³ As the prevalence of thyroid cancer increases, a diagnostic method that can identify malignancy that warrants further surgical treatment is needed.^{4,5}

After a nodule is found during a clinical examination, a referral to an endocrinologist may be conducted. To confirm the presence of a nodule and assess the status of whole gland preoperative examination, magnetic resonance imaging (MRI)⁶ or computerised tomography scan (CT scan)⁷ or ultrasonography (USG) or its combination should be performed before surgery.² In addition, laboratory examination by determinations of serum thyroid stimulating hormone (TSH) combined with serum thyroxine (T4) and/or free T4 will help to decide whether a functional thyroid disease exists.⁸ Cytologic examination using fine needle aspiration biopsy (FNAB) is used to confirm thyroid cancer.²

Although FNAB is the traditional diagnostic test for identifying malignant thyroid nodules recently, it still represents the gold standard preoperative test for diagnosing thyroid cancer.⁹ In addition, it helps the operating surgeon to decide the extent of surgical resection. The FNAB is safe, inexpensive and reliable. It also

has no serious complications and can be easily performed.^{1,10} However, the sensitivity of FNAB varies from 65 to 98%, and the specificity from 72 to 98%.¹¹ Therefore, FNAB should be conducted by a competent clinician and evaluated by an experienced pathologist to increase the efficacy of the method. If the size of the nodule is small, USG-guided FNAB should be performed.¹²

Although the use of USG in the diagnosis of thyroid nodules cancer has not been well-established, FNAB and USG play an important role in differentiating benign thyroid nodules from malignant nodules.¹³ Advance in the resolving power of USG apparatus have provided more information not only concerning the location of thyroid nodules, but also features that are associated with benign nodules and features associated with malignant nodules.^{14,15} The USG is a non invasive procedure without using ionizing ray and can be conducted repeatedly without pain to the patients, relatively quick and easy. In addition, it has a high accuracy with less contraindications.

The purpose of this study was to determine the diagnostic value of FNAB and USG on thyroid nodule before thyroidectomy in Dr. Sardjito General Hospital, Yogyakarta.

MATERIALS AND METHODS

This was a diagnostic test study using a retrospective design conducted in Dr. Sardjito General Hospital using data from medical

records of patients with thyroid nodules from January 2006 to December 2010. Medical records data from 90 patients who were diagnosed thyroid nodule with FNAB or USG before surgery in Dr. Sardjito General Hospital and fulfilled the inclusion and exclusion criteria were evaluated in this study.

The inclusion criteria were patients with nodule thyroids who underwent thyroidectomy in Dr. Sardjito General Hospital, underwent FNAB before surgery in Department of Anatomy Pathology and underwent USG before surgery in Department of Radiology, Dr. Sardjito General Hospital, Yogyakarta. The exclusion criteria were FNAB results not confirmed as benign, malignant, or follicular neoplasm and USG results demonstrating neither benign nor malignant.

Data of FNAB, USG and histopathological examination of surgical materials were collected and evaluated. The diagnostic value of FNAB and USG including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated and compared to histopathological examination as the gold standard. Statistical analyses were performed by using Chi square test with SPSS program. The protocol of the study had been approved by the Medical and Health Research Ethics Committee, Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta.

RESULTS

Ninety patients were enrolled in this study. The characteristics of the patients are presented in TABLE 1. There were differences in gender

and age of patients with thyroid nodules in this study. Female with thyroid nodules (78.9%) was more prevalent than male (21.1%) in this study. Moreover, thyroid nodules were more suffered by 41-45-year-old patients (34.4%). The youngest patient was 15 years old, while the oldest patient aged 70 years old, and the average age of patients was 45.02 years old. The results of FNAB of 90 patients were as follows: 54 (60.0%) benign, 6 (6.7%) malignant, and 30 (33.3%) follicular neoplasm, whereas, the results USG of 90 patients were as follows: 38 (42.2%) benign, 15 (16.7%) malignant and 37 (41.1%) non determined.

TABLE 1. Characteristics of subjects. Data are presented as frequency and percent.

Variables	Frequency (N)	Percent (%)
Gender		
• Male	19	21.1
• Female	71	78.9
Age (year)		
• 11-20	4	4.4
• 21-30	5	5.6
• 31-40	22	24.4
• 41-50	31	34.4
• 51-60	14	15.6
• 61-70	14	15.6
FNAB examination		
• Benign	54	60.0
• Malignant	6	6.7
• Follicular neoplasm	30	33.3
USG examination		
• Benign	38	42.2
• Malignant	15	16.7
• Non determined	37	41.1

The results of FNAB and histopathological examination surgical materials in thyroidectomized patients are presented in TABLE 2.

TABLE 2. Results of FNAB and histopathological examination in thyroidectomized patients

Fine needle aspiration biopsy	Histopatological examination		Total
	Benign	Malignant	
Benign	48 (88.9%)	6 (11.1%)	54
Malignant	0 (0.0%)	6 (11.1%)	6
Follicular neoplasm	24 (80.0%)	6 (20.0%)	30
Total	72	18	90

The histopathological examination of surgical material of 6 of 54 patients who had benign with FNAB revealed malignancy. In contrast, 6 (100%) of the 6 patients who underwent surgery because of suspicious FNAB results were diagnosed as malignant histopathologically. Validity of FNAB as compared to histopathological examination in detecting thyroid nodule could be counted, with a sensitivity of 50% and specificity of 100%, positive predictive value (PPV) of 100% and negative predictive value (NPV) of 50%, positive likelihood ratio (LR+) was infinite,

negative likelihood ratio (LR-) of 0.5, prevalence of 20% and accuracy of 60%. In 30 cases of follicular neoplasm yielded by FNAB and histopathological examination, 6 cases were diagnosed as malignant (20%) and 24 cases (80%) were diagnosed as benign. Finally, all samples recruited in this study demonstrated that 18 cases (20%) were described as malignant and 72 cases (80%) as benign tumors.

The results of USG and histopathological examination surgical materials in thyroidectomized patients are presented in TABLE 3.

TABLE 3. Results of USG and histopathological examination in thyroidectomized patients

Ultrasonography	Histopatological examination		Total
	Benign	Malignant	
Benign	36 (94.7%)	2 (5.3%)	38
Malignant	6 (40.0%)	9 (60.0%)	15
Total	42	11	53

The histopathological examination of surgical material of 2 of the 38 patients who had benign with USG revealed malignancy. Similarly, the histopathological examination of

9 of the patients 15 who had malignant with USG revealed malignancy, as well. The analysis of USG validity as compared to histopathological examination in detecting thyroid nodule

revealed that its sensitivity was 81.8%, specificity was 85.7%, PPV was 60%, NPV was 94.7%, LR+ was 5.72 and LR- was 0.212, prevalence was 20.7% and accuracy was 50%.

DISCUSSION

This study found that 31 (34.44%) subjects with thyroid nodules were observed in the age of 41-50 years old. This finding was similar to the previous study reporting that the most prevalent of thyroid nodule was observed in the age of 25-55 years old with the youngest patient was 15 years old and the oldest was 70 years old with the average age of 45.02 years old. Aryono¹⁶ also reported that most subjects with thyroid nodule (30%) were found in the age of 41-50 years, while Reksoprawiro¹⁷ reported that there was 40% of subjects found in that age.

Female with thyroid nodules (78.9%) was more prevalent than male (21.1%) in this study. This finding is in accordance with the previous study that reported that the prevalency of thyroid nodule in female was 85.53%. In addition, it was also reported that thyroid nodules are extremely common, particularly among women. The incidence in US is 4% among adults, and the female to male ratio equals 4:1.¹⁸⁻²⁰ It is thought that the higher prevalency of thyroid nodule in female is related with the hypermetabolism process in female.^{16,20}

The histopathological examination of surgical material of 6 of the 54 patients who had benign with FNAB revealed malignancy, whereas, 6 (100%) of the 6 patients who underwent surgery because of suspicious FNAB results were diagnosed as malignant histopathologically. The sensitivity of FNAB to detect a malignancy was 50%, whereas the specificity of FNAB was 100%. It was supported with the PPV of 100% and NPV of 0, with the accuracy of FNAB of 60%. These

results are different compared to the study conducted by Aryono¹⁶ in Dr. Sardjito General Hospital, Yogyakarta and Reksopawiro¹⁷ in Dr. Sutomo General Hospital, Surabaya. Aryono¹⁶ reported that the sensitivity of FNAB was 14.29%, the specificity was 98.86% with accuracy of 86.49%, whereas Reksopawiro¹⁷ found that the sensitivity of FNAB was 60% and the specificity was 97.70% with accuracy of 91.67%.

Among 30 patients who had follicular with FNAB, 24 patients (80.0%) had benign and 6 (20.0%) had malignant with histopathological examination. This finding was not similar with study conducted by Aryono¹⁶ which found that 21.43% had malignant and 78.57% had benign. The results of FNAB is considered a good if it provides false negative value of less than 5% and false positive value of nearly 1%.

In recent years, FNAB is the most important procedure for differentiating benign from malignant thyroid nodules. It is recommended and widely used as the first step in the diagnosis of thyroid nodules because it is safe, inexpensive, reliable, tolerable, and easily to perform. However, the results of FNAB can be affected by the clinician's competence, the pathologist's experience, and the nodule size.^{1,20}

The histopathological examination of surgical material of 2 of the 38 patients who had benign with USG revealed malignancy, as well as the histopathological examination of 9 of the patients 15 who had malignant with USG. The USG had sensitivity of 81,8%, specificity of 85,7%, PPV 60%, NPV 94,7% and accuracy of 50%. The finding of this study demonstrates a difference with the study conducted by Kountakis *et al.*²¹ which reported that USG had sensitivity of 100%, specificity of 14% and accuracy of 32%. Meanwhile, Razmpa *et al.*²⁰ demonstrated that USG has sensitivity, specificity, and accuracy of 82%, 78%, 80%, respectively.

Ultrasonography is one of the aids in diagnosing thyroid nodules. It is usually used to determine the location, size, texture, margin and the presence of calcification in a thyroid nodule. Ultrasonography is still used in the diagnosis of thyroid nodules because it is an inexpensive and noninvasive method, safe without applying radiations, and can be conducted repeatedly. However, the results of USG can be also affected by the clinician's competence, and the radiologist's experience.^{20,22}

CONCLUSION

In conclusion, the diagnostic value of FNAB and USG in establishing diagnosis of thyroid nodule is still low. The FNAB (60.0%) has higher accuracy compared to USG (50.0%) for diagnosing thyroid nodules. The FNAB has sensitivity of 50.0%, specificity of 100% with a PPV of 100% and NPV of 50.0%, whereas the USG has sensitivity of 81.8%, specificity of 85.7%, PPV of 60.0% and NPV of 94.7%.

ACKNOWLEDGEMENTS

Authors would like to thank the Head of Medical Records Installation of Dr. Sardjito General Hospital/Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta for the medical records of the patients involved in this study.

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