

Study for the Availability of Ultrasonogram Guided Fine Needle Aspiration for Patients with Thyroid Gland Disease

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ABSTRACT

Since the diagnosis of malignancy and benign of thyroid gland diseases is difficult only by using ultrasonogram opinions, the combination of fine needle aspiration (FNA) has been generalized trend for precise pathological diagnosis. Therefore, the current study aimed to know about its availability. The study subjected 500 patients who received the FNA along with the ultrasonogram screening for thyroid gland from October, 2007 to April, 2008. As the equipments for the study, Philips HDI-3500 and Philips ULTRAMARKer-9 (UM-9) were used to conduct the comparative analysis of pathological results that were obtained through the inspection of ultrasonogram screening and through ultrasonogram guided FNA. Among the 464 patients who were found to be benign from the ultrasonogram screening inspection, 11 cases of the FNA diagnosis results judged to be malignancy, and 13 cases of the FNA diagnosis resulted to be benign among 36 patients who were diagnosed to be malignancy. The cases observed as solid from the opinions of ultrasonogram screening were often found to be malignancy, and most of the malignancy results were observed to show the hypoechoic pattern. Among the patients diagnosed with malignancy from the diagnosis of FNA, the 32 patients were found to have the papillary carcinoma, and the benign type was observed to be goiter and hyperplasia in 263 patients, which took up 52.6%. The ultrasonogram screening test that is performed for the purpose of diagnosing thyroid gland diseases, it is distinctively an useful inspection to diagnosis the presence, size and shape of nodules. However, the results of performing of FNA for those of nodules which were observed to be benign from the ultrasonogram were often came up with malignancy and there were cases that the nodules diagnosed with malignancy were diagnosed as benign from the FNA diagnosis.

Keywords: ultrasonogram, FNA, hypoechoic, thyroid gland

1. INTRODUCTION

Thyroid gland cancer is one of the cancer types which has been rapidly increased at the recent years. The health insurance review & assessment service reported that the thyroid cancer patients have been increased to 24,259 in the last year. Compared to the patient number in the year recorded in the year of 2005, the patient number recorded the increase of 5,934 by showing the 32.3% of increase rate[1]-[3]. Especially, it is the cancer type which recorded the highest frequency of development in women under 35 years old. From 2 years ago, it has been ranked as the first cancer type in women nationally.

Thyroid gland is a butterfly-shaped small organ that is located at the lower part of neck. It transforms digested iodine into hormone[4]. The hormone is very important since it plays the function to maintain the organs in human body. The thyroid gland cancer is largely divided into the following 4 cancer types of follicular adenocarcinoma, nipple cancer, medullary carcinoma, and undifferentiated cancer. More than 90% of the thyroid cancer is the thyroid gland nipple cancer type which shows slow progression of cancer cells[5]-[7]. If the cancer type is discovered in the early term, the rate of 10 year survival is more than 90%. Since the intake of marine products that are abundant with iodine is popular in our nation, the development frequency of follicular adenocarcinoma is low compared to the western countries. The medullary carcinoma could be developed related with hereditary diseases and the patients suffering with the Hashimoto's disease can have lymphoma.

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Although the development of undifferentiated cancer is very rare, it is the most horrible cancer that could be developed in a human body and it does not response to any treatments. It has been assumed that the frequently developed thyroid cancers in women will be affected by woman hormones, but it is not clear. As the most distinctive cause of the nipple cancer, the exposure to radiation could be listed[8], [9]. It is supported by the following facts that the atomic bombed regions of Hiroshima and Nagasaki, and the nearby regions after the accident in the Chernobyl atomic plant showed the sudden increase of the thyroid gland cancers. Various genetic abnormalities have been known to be related with thyroid gland cancers. The development of tuber is frequent in thyroid gland, and the frequency of development increases with the increase of age. When the ultrasonogram tests were conducted for the population group with more than 60 years old, the thyroid gland tuber could be discovered in 50% of the tests and 5% of the nodules is cancer[10], [11]. Since the malignant thyroid gland diseases could not be easily diagnosed from benign type, it is generalized trend to perform the test of ultrasonogram guided FNA for the precise pathological diagnosis, and the study was conducted to know its availability.

2. STUDY OBJECTS AND METHODS

2.1 Terms and Objects

Subject for this study came from 500 patients who visited the hospital between October 2007 and April 2008 due to thyroid gland problems and received a fine needle aspiration for at least one benign or malignancy lesion discovered during a thyroid ultrasound screening test.

2.2 Test equipments

Philips HDI-3500, Philips ULTRAMARKER-9(UM-9)

2.3 Test methods

The medical opinion for each patient’s ultrasound screening test was derived from dividing lesions into benign and malignancy followed by classifying them into the following segmentations: cyst, solid, solid/cyst, calcification, goiter, thyroiditis, and lymph node. The classification results of the medical opinions from the ultrasound were compared with the pathology results from the tissue biopsy for each patient. A comparative analysis was conducted to find the rate of mistaken diagnosis in the medical opinions of cyst, solid, solid/cyst, calcification, goiter, thyroiditis, and lymph node from the ultrasound test when the cases of the medical opinion from the ultrasound was benign and the pathology result as malignance or vice versa occurred.

2.4 Classification of the ultrasonogram tests

The R/O benign types are cyst, solid, solid/cyst, calcification, goiter, thyroiditis, and lymph node. The R/O malignancy types are solid, solid/cyst, calcification, lymph node, and metastatic mass(Fig. 1).

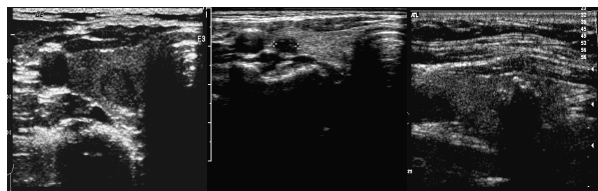


Fig. 1. Ultrasound Image by disease

2.5 Classification of pathological results

The comparative analysis was performed by dividing the types as papillary carcinoma, medullary carcinoma, follicular carcinoma, adenomatous goiter, and benign goiter, hyperplasia, cyst, and thyroiditis(Fig. 2).



Fig. 2. Ultrasound Guided Fine needle Aspiration Image

3. RESULTS

When analysis was done for the FNA results for 464 patients who were judged to have a benign type of thyroid cancer based on the findings of the ultrasonogram screening test, the test resulted to show 1 malignancy among 114 patients who were diagnosed to have benign cyst, 9 patients were diagnosed to have malignant type among 104 patients who were diagnosed to have benign solid, and 1 patient was diagnosed to have malignant type among 98 patients who were diagnosed to have benign solid/cyst. Out of 464 patients who were diagnosed to have benign mass based on the findings of ultrasonogram test, total 11 patients were turned out to have a malignant type of thyroid gland cancer according to the test results of FNA. So, the diagnosis error rate of the ultrasonogram findings was considered to be range approximately 3% (Table 1).

Table 1. Benign findings of ultrasonogram test and the FNA results

Findings	Patients	FNA(benign)	FNA(malignancy)
Cyst	114	113	1
Solid	104	95	9
Solid/Cyst	98	97	1
Calcification	13	13	0
Lymph node	9	9	0
Goiter	97	97	0
Thyroiditis	29	29	0
Total	464	453	11

When the malignant types of thyroid cancers that were found in 36 patients through the ultrasonogram screening tests were tested through the FNA tests, 9 patients were found to have benign type among 17 patients who were initially diagnosed to

have malignant solid, 1 patient was found to have benign type among 2 patients who were diagnosed to have malignant solid/cyst, 1 patient was found to have benign type among 4 patients who were diagnosed to have malignant lymph node, and 2 patients were found to have benign type among 11 patients who were diagnosed to have malignant metastatic mass. So, the FNA result provided that 13 patients were diagnosed to have benign type of thyroid cancer among the 36 patients who were judged to have benign type of thyroid cancer based on the findings of ultrasonogram screening tests by ranging approximately 36% of the error rate of the diagnosis (Table 2).

Table 2. Malignancy findings of ultrasonogram test and FNA results

Findings	Patients	FNA(benign)	FNA(malignancy)
Solid	17	9	8
Solid/cyst	2	1	1
Calcification	2	0	2
Lymph node	4	1	3
Metastatic mass	11	2	9
Total	36	13	23

When the FNA test results for total 500 patients were reviewed, Hyperplasia was the most frequently found benign type by showing it in 157 patients, which was followed by adenomatous goiter in 106 patients, Goiter in 97 patients, Cyst in 65 patients, and Thyroiditis in 42 patients.

As the malignant type, Papillary carcinoma was found in 32 patients, which was ranked as the most frequently found malignant type of thyroid cancer, and only 1 patient was found to have Follicular carcinoma (Table 3).

Table 3. Analysis of Fine Needle Aspiration test results

Classification	Papillary ca.	Medullary ca.	Follicular ca.	Adenomatous goiter	Goiter	Hyperplasia	Cyst	Thyroiditis
Population	32	0	1	106	97	157	65	42

Based on the findings collected from ultrasonogram screening tests, the mass that was viewed as in solid pattern often found to be malignant type, and most of the malignancies were showed as the hypoechoic pattern.

Based on the Fine Needle Aspiration (FNA) test results, papillary carcinoma was the most frequently found malignant type by showing it in 32 patients and Goiter and Hyperplasia recorded the most frequently found benign type by showing it in 263 patients by occupying 52.6% of total patients.

4. DISCUSSION

The studies regard on the epidemiological factors, biological characteristics, diagnosis and treatment methods for tubular

diseases of thyroid gland have been rapidly developed since 1970s. Especially, the Fine Needle Aspiration (FNA) test enabled to differentiate the thyroid gland diseases which require surgical treatments by waiving to perform unnecessary surgical operations[12]. Since after the thyroid gland cell inspection method was introduced by Martin & Ellis in 1930s, Soderstrom reported that it could be applied usefully in the diagnosis of thyroid gland diseases in 1950s. The Fine Needle Aspiration (FNA) is easy to perform and economical with less complications, and the direct information for the tissue diagnosis which was not previously available to acquire through palliative methods other than surgical operation could be acquired before performing a surgical operation. Therefore, it became the most usefully diagnosis method of the nodules of thyroid gland. Contrary to that, the previously used large needle biopsy method is not nearly used due to the doubts on its stability and the risk of distributing cancer cells[13]. Especially the thyroid disease is cancer, precise arrangement of preoperative diagnosis of the disease could provide full explanation for the treatment method, hospitalization period, and for postoperative plans for patient and guardians, which easily enables to recommend a surgical operation and the difficulties of having freezing tissue test during the operation could be avoided. It is also efficient in the administration of hospital and operating rooms by providing information which surgical operations are planned[14], [15]. Although the cause of tubular invasion of thyroid gland has not been clearly verified, the deficiency of iodine has been known as the most common cause of the disease, and the goitrogen contained in foods and genetic factors could act as the cause of the disease. The frequency of its development approximately ranges 2~3% of total population, and 4% of adults suffer from the diseases and approximately less than 5% of such tubular diseases are malignant type, which resulted 10~35% of malignancy when the operation was performed after diagnosing the disease only by using simple clinical and palliative methods. Miller and Hanni et al., reported that the use of Fine Needle Aspiration (FNA) enabled to reveal the malignancy precisely in 50% of

the clinically malignant tumor suspected patients.

5. CONCLUSION

It is clear that the ultrasonogram screening test is the test which is done for the purpose of diagnosing thyroid gland diseases is useful test to verify the presence of nodules, shape, and size. However, the FNA tests that were conducted for the benign test results obtained from the ultrasonogram test revealed that many cases were found to be malignant type. Among the nodules diagnosed as malignant type, the FNA test results also included to have benign type.

Therefore, the current test established the method that the combination of Fine Needle Aspiration (FNA) test along with the ultrasonogram screening test could make more precise

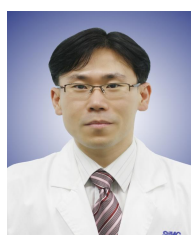
diagnosis whether the nodules are malignant or benign types. In addition, it is considered that the enhancement of the proficiency of FNA performance can not only reduce the patient pain, but also the cell acquisition rate can be increased, which will be helpful in performing more precise tests.

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