

ORIGINAL ARTICLE

Review of atypical cytology of thyroid nodule according to the Bethesda system and its beneficial effect in the surgical treatment of papillary carcinoma

Yoo Seung Chung, Changyoung Yoo¹, Ji Han Jung¹, Hyun Joo Choi¹, Young-Jin Suh²

Department of Surgery, Gachon University Gil Hospital, Gachon University of Medicine and Science, Incheon, Departments of ¹Hospital Pathology, ²Surgery, St. Vincent Hospital, The Catholic University of Korea School of Medicine, Suwon, Korea

Purpose: For the atypical cases of fine needle aspiration (FNA) cytology of thyroid nodules, ultrasonographic findings are a primary guideline for the surgical treatment. However, they have the intrinsic risk of overtreatment, as well. In this study we examined whether the Bethesda system could provide a real effect on the diagnostic rate of atypical cytology, and thereby reduce the number of cases diagnosed as atypical from FNA cytology. **Methods:** We reviewed 166 cases diagnosed as atypical by FNA cytology at this institute between the years 2005 to 2010. We classified these cases on the basis of ultrasonographic and cytological findings and compared them with the histological results. **Results:** Ultrasonographically, findings suspicious for malignancy and indeterminate were associated with 83.7% and 47.2% of malignancy rates, respectively. Cytopathologically, the malignancy rates varied according to the main cytological features and the highest malignancy rate was 77.3%. Based on the Bethesda system, 39.2% of the cases diagnosed as atypical could be grouped into the category of suspicious for malignancy and yielded a malignancy rate of 76.9%. **Conclusion:** Although ultrasonography provides an excellent guideline for the surgical treatment of atypical cases, it also showed considerable risk of overtreatment. The Bethesda system did not offer definitive effects on the rate of atypical cytology, but this system seemed to provide stricter boundaries for the atypical cytology and to aid in reducing the rates thereof. This in turn may permit that more limited cases are allotted to ultrasonographic decision making.

Key Words: Thyroid nodule, Cytology, Atypical, The Bethesda system, Ultrasonography

INTRODUCTION

Fine needle aspiration (FNA) cytology is one of the most important and reliable diagnostic methods in the evaluation of thyroid nodules [1,2]. Although FNA cytology is also an important diagnostic method for the identification of

follicular lesions based on which follicular carcinoma could be selected for surgical treatment [3-5], the screening for papillary carcinoma is generally considered to be the most important area. Therefore, it may be correctly stated that the most important role of FNA cytology of the thyroid nodule is the selection of cases of papillary

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Correspondence to: Changyoung Yoo
Department of Hospital Pathology, St. Vincent Hospital, The Catholic University of Korea School of Medicine, 93-6 Ji-dong, Paldal-gu, Suwon 442-723, Korea
Tel: +82-31-249-7646, Fax: +82-31-244-6786, E-mail: ppgg2@catholic.ac.kr

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carcinoma.

When planning the surgical treatment for the thyroid nodule, the clinical information including ultrasonographic findings such as configuration and size of the lesions become the primary guideline. FNA cytology is carried out under the guidance of ultrasound. When the cytologic results are either benign or malignant, or at least suspicious for malignancy, the treatment will be decided based on these results. But when the cytological diagnosis is reported as atypical only, clinicians could be confronted with some difficulties in the management of patients. There have been many instances in which inevitably a diagnosis of atypical cytology was made, but when we reviewed these cases which had been previously diagnosed as atypical, the maximum number of cases showed the characteristic cytological features of papillary carcinoma but displayed low cellularity. Although the diagnosis of atypical cytology reflects the difficulties in cytological interpretation, it is also evident that when the diagnosis rate of atypical cytology will be as low as possible, the treatment plan will be more easily established.

The diagnosis rates of atypical cytology vary among different institutions. At our institute, from the year 2005 to 2010 the diagnosis rate of atypical cytology was approximately 13%. Recently, the Bethesda system defined the diagnostic categories and provided the diagnostic criteria for each category [6,7]. It is likely that this system raised an alert on the random allocation of many cytological cases into the atypical category.

In the clinical aspect, when the cytological results were atypical, surgical treatments of the thyroid nodules are determined on the basis of ultrasonographic findings. But the ultrasonographic guideline also contains the risk of overtreatment. If the diagnostic rate of atypical cytology is reduced as possible, more cases may have definite cytological basis for the surgical treatment, and more limited cases will be allotted to the ultrasonographic decision. In this study we aimed to know whether the Bethesda system could provide real effect on the diagnostic rate of atypical, and thereby it could make influential effect on the overall histological outcome including atypical cases in which decision making for the surgical treatment is done according to the ultrasonographic findings. Therefore, this study

was planned on two aspects. First, we estimate the intrinsic risk of ultrasonogram on the basis of malignancy rate for the cases of atypical cytology. Second, we reviewed the cases of atypical cytology on the basis of the Bethesda system to know whether the diagnosis rate of atypical cytology could be reduced when the diagnostic criteria which this system provides were applied in the interpretation of FNA cytology.

METHODS

Materials

Among 3,962 cases of FNA cytology of the thyroid nodules which performed in this institute from 2005 to 2010, 515 cases (13%) were diagnosed as atypical. From them, 166 cases were selected for this study. The eligibility criteria were as follows: 1) The case was diagnosed as atypical; 2) There were no comments such as suspicious for malignancy or the possibility of malignancy cannot be ruled out etc; 3) The histological diagnosis was made after surgical treatment; 4) On slide reviews if there was a sufficient cellular yield based on which the diagnosis of papillary carcinoma or nodular hyperplasia could be made, then such cases were excluded. This study was approved by the Clinical Study Medical Ethics Committee (VC10TISI0138).

Methods

In this study, we made an analysis of the cases on two aspects. Firstly, on the clinical aspect we arranged the guideline for the surgical treatments of patients with thyroid nodules and compared their histological results after surgery. Then on the pathological aspect we made an analysis of the atypical cases on the basis of main cytological features and their histological results, and then we made an analysis of these cytological features according to the Bethesda system.

Guideline for the surgical treatment of thyroid nodules

At our institute in the department of surgery, the decisions for the surgical treatment of thyroid nodules were primarily based on the results of FNA cytology and ultra-

sonographic findings. When a diagnosis of papillary carcinoma or other malignancies such as medullary carcinoma was made on FNA cytology, surgery was performed regardless of the ultrasonographic findings. When the cytological findings were suggestive of benign lesions such as nodular hyperplasia, the modalities of treatment were decided on the basis of size of the lesions estimated by ultrasonography and the present symptomatology. When follicular neoplasm was suspected and the tumor size exceeded 2.0 cm on ultrasonography, surgery was recommended. When the cytological diagnoses were atypical, ultrasonographic findings were the primary guideline. In ultrasonogram, category of suspicious for malignancy was made when one of the following findings are noted: speculated border, taller than wide configuration, marked hypoechogenic texture or calcification. When purely cystic lesion or colloidal nodules were noted, the interpretation was made as benign. Other cases were interpreted as indeterminate [8]. The surgical treatment was performed in all atypical cases with ultrasonographic findings of suspicious for malignancy and indeterminate. In cases of suspicious for malignancy, total thyroidectomy was performed if the nodular size was more than 1.0 cm, but lobectomy was performed if the nodular size was less

than 1.0 cm. In some exceptional cases with the nodular size same as earlier, lobectomy was performed when the patient requested for it and when there was no evidence of lesions in the other lobe. Even in case when the nodular size was less than 1.0 cm total thyroidectomy was performed, when surgical treatment was required for lesions in the contralateral lobe, when metastatic lymphadenopathy was suspected in the neck, or when the patient requested for total thyroidectomy. In cases with indeterminate findings, lobectomy was performed regardless of the nodular size. When an indeterminate nodule or a symptomatic benign nodule was found in the contralateral lobe, total thyroidectomy was performed. When the ultrasonographic finding was reported as benign, surgery was performed only if the patient requested for it (Fig. 1).

Classification of the cytological findings of atypical cases and matching these findings with the histological results

At this institute, cytological interpretations were done in the following categories: unsatisfactory, benign, atypical, malignancy and others. The benign category included nodular hyperplasia, Hashimoto’s thyroiditis and so on. When there were various cellular features including nu-

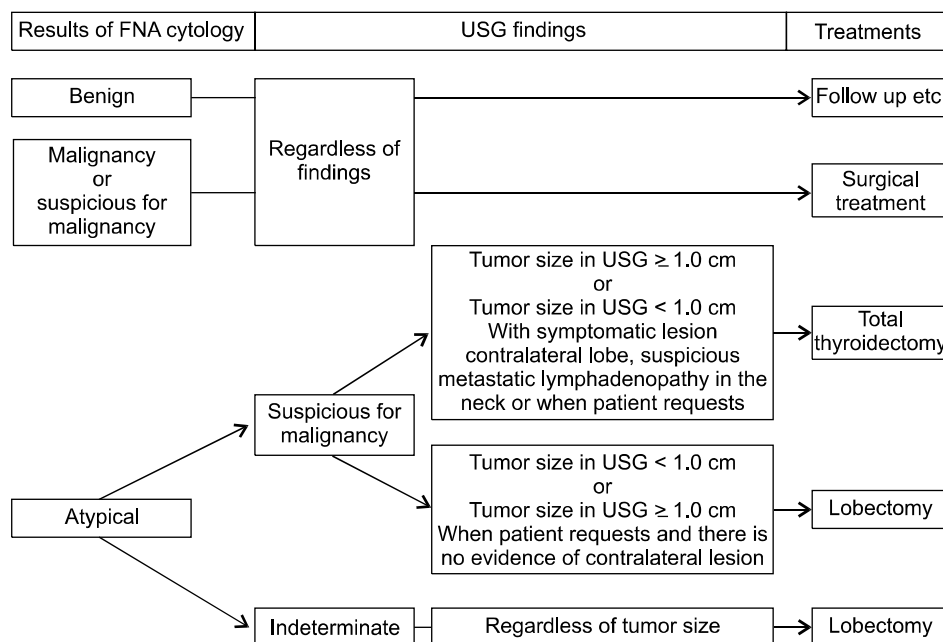


Fig. 1. Schematic presentation of guidelines for treatment of thyroid nodules. FNA, fine needle aspiration; USG, ultrasonographic.

Table 1. Comparison of diagnostic schemes

Our institute's system	The Bethesda system
I. Adequacy of specimen	I. Nondiagnostic or unsatisfactory
1. Satisfactory for evaluation	II. Benign
2. Unsatisfactory for evaluation	III. Atypia of undetermined significance or follicular lesion of undetermined significance
II. Cytologic diagnosis	IV. Follicular neoplasm or suspicious for follicular neoplasm
1. Negative for malignancy	V. Suspicious for malignancy
2. Atypical cells	VI. Malignancy
3. Malignancy	
4. Others	

clear features suggestive of papillary carcinoma, but they were inadequate for making the diagnosis of malignancy, the atypical category was applied. The malignancy category was applied when overt malignant features were found in the specimen. The category of others included various conditions including follicular neoplasms (Table 1). Among these categories, we reviewed the slides and cytological reports of the 166 atypical cases and classified them according to the representative cytological features. After that we again classified these features according to the Bethesda system, and these findings were then matched with the histological results. The slide review was done by a single pathologist. Cytological slides were made by the conventional method.

The Bethesda system for reporting thyroid cytopathology

Generally, when the diagnosis is atypical, one may bear in mind the likelihood of papillary carcinoma. So, it may be the ideal method when cases suspicious for malignancy can be selected from these atypical cases with more stringent criteria. The diagnostic scheme of the Bethesda system is depicted in Table 1. In the Bethesda system some specific criteria are applied to each diagnostic category. In this study, we focused on the criteria for the categories of atypical cells of undetermined significance (AUS) and suspicious for malignancy [6,7,9].

Diagnostic criteria for the category of AUS

In the Bethesda system, diagnosis of AUS is recommended when the following cytological findings are noted: population of microfollicles that does not fulfill the criteria for follicular neoplasm, predominance of Hurthle

cells in the low cellular smear or in the benign-appearing sample, several artifacts, focal features suggestive of papillary carcinoma in an otherwise predominantly benign-appearing sample, cyst-lining cells, minor population of nuclear abnormalities, and atypical lymphoid infiltrates.

Diagnostic criteria for the category of suspicious for papillary carcinoma

In the Bethesda system this category is divided into four groups. Pattern A (patchy nuclear changes pattern) consists of predominantly benign follicular cells with foci of atypical cells having nuclear enlargement, nuclear groove and so on. Intranuclear pseudoinclusion is infrequent. Pattern B (incomplete nuclear changes pattern) is characterized by mild to moderate nuclear enlargement with nuclear groove in the majority of cells and with varied cellularity. Similar to pattern A, intranuclear pseudoinclusion is infrequent in pattern B. Pattern C (sparsely cellular specimen pattern) is characterized by nuclear features of papillary carcinoma but with very low cellularity. Pattern D (cystic degeneration pattern) is characterized by evidence of cystic change with various nuclear abnormalities. Psammoma bodies are also found in this pattern.

In this study, the representative cytological features were reclassified according to the features included in the categories of AUS and suspicious for papillary carcinoma of the Bethesda system.

RESULTS

General characteristics

Among the 166 atypical cases, 16 were men (9.7%) and

150 were women (90.3%). With histological examination, the most frequently diagnosed were papillary carcinomas (65.7%), and nodular hyperplasia was diagnosed in 24.1% of the cases. Other diagnoses included follicular neoplasms, Hashimoto's thyroiditis and granulomatous thyroiditis (Table 2).

Ultrasonographic findings and surgical results

Among 166 cases, 92 cases were diagnosed as suspi-

cious for malignancy and 72 cases were diagnosed as indeterminate ultrasonographically. The remaining 2 cases were diagnosed as benign, but after surgery one case was confirmed as Hurthle cell adenoma and the other as papillary carcinoma. In cases suspicious for malignancy, 83.69% (77/92) were papillary carcinoma histologically. In these cases, 85.48% (53/62) were diagnosed as papillary carcinoma when the nodular size was less than 1.0 cm, and 80.0% (24/30) were diagnosed as papillary carcinoma when the

Table 2. General characteristics and histological results of current atypical cases

Gender	Histological results					Total
	Papillary carcinoma	Nodular hyperplasia	Follicular neoplasia ^{a)}	Hashimoto's thyroiditis	Granulomatous thyroiditis	
Female	100 (60.2)	36 (21.7)	7 (4.2)	6 (3.6)	1 (0.6)	150 (90.4)
Male	9 (5.4)	4 (2.4)	2 (1.2)	1 (0.6)	0 (0.0)	16 (9.6)
Total	109 (65.7)	40 (24.1)	9 (5.4)	7 (4.2)	1 (0.6)	166 (100.0)

Values are presented as number (%).

^{a)}Follicular neoplasia included follicular adenoma, Hurthle cell adenoma and follicular carcinoma.

Table 3. Ultrasonographic findings and surgical results of cases of atypical cytology

Findings on ultrasonogram (No.)	Tumor size on ultrasonogram (No.)	Operation type (No.)		Histology (No.)		Rate of malignancy (%)		
		L	TT	M	B			
SM	≤1.0 cm	62	L	47	M	41	85.48	
			TT	15	M	12		
			B	3	B	6		
	>1.0 cm	30	L	6	M	4		80.00
			TT	24	M	20		
			B	4	B	2		
I	≤1.0 cm	35	L	26	M	14	62.85	
			TT	9	M	8		
			B	1	B	1		
	>1.0 cm	37	L	17	M	6		32.43
			TT	20	M	6		
			B	14	B	11		
B	≤1.0 cm	1	L	1	M	0	0.00	
			TT	0	M	0		
			B	0	B	0		
	>1.0 cm	1	L	1	M	1		100.00
			TT	0	M	0		
			B	0	B	0		

SM, suspicious for malignancy; I, indeterminate; B, benign; L, lobectomy; TT, total thyroidectomy; M, malignancy; B, benign.

nodular size was more than 1.0 cm. The remaining 15 cases were diagnosed as benign lesions including nodular hyperplasia, follicular adenoma, Hurthle cell adenoma, Hashimoto's thyroiditis and granulomatous thyroiditis. In cases of the indeterminate group, 47.22% (34/72) were found to be histologically malignant including one case of follicular carcinoma and two cases of Hurthle cell carcinoma. The remaining majority of cases were of papillary carcinoma. Among these 34 cases, 62.85% (22/35) were diagnosed as malignant when the nodular size was less than 1.0 cm. 32.43% (12/37) were diagnosed as malignant when the nodular size was more than 1.0 cm. The remaining cases were diagnosed as benign lesions (Table 3).

Representative cytological features and their histological results

Among the cytological features found in the atypical cases, the most frequent finding was the infrequent nuclear grooves and intranuclear pseudoinclusions in scant cellularity (66/166; 39.8%), and these cases were histologically confirmed as papillary carcinoma in 77.3% (51/66) of the cases. The second most frequent finding was the suspicious nuclear groove (61/166; 36.7%), and 60.7% (37/61) of these cases were histologically confirmed as papillary carcinoma. Other findings included Hurthle cell change, papillary fronds, psammoma bodies and microfollicles, and these findings were associated with papillary carcinoma

in varying proportions (Table 4, Fig. 2).

Reclassification according to the Bethesda system and their histological results

Representative cytological findings of atypical cases were classified according to the criteria for AUS and suspicious for malignancy categories. Among the features presented in Table 4, features of nuclear grooves and intranuclear pseudoinclusions were allocated to pattern C of the suspicious for malignancy category. Other allocations are presented in Table 5. Since the cytological features of nuclear grooves and intranuclear pseudoinclusions are included in the category of suspicious for malignancy according to the Bethesda system, 65 (39.2%) of the 166 atypical cases were included into the category of suspicious for malignancy, and 50 (76.9%) of these 65 cases were histologically confirmed as papillary carcinoma. Seventy-three (44.0%) of the 166 atypical cases showed focal nuclear abnormalities and 44 (60.3%) of these 73 cases were histologically confirmed as papillary carcinoma.

DISCUSSION

Generally, thyroid nodules are found in 4 to 10% of the adults, and their incidence has been on a rise when ultrasonographic examination is carried out [4,10]. When thyroid

Table 4. Frequencies of cytological features in cases of atypical cytology

Cytological features	No. (%)	Surgical diagnosis, No. (%) ^{a)}					Rate of malignancy (%)
		PC	NH	FN	HT	GT	
Nuclear grooves with or without pseudoinclusions	66 (39.8)	51 (77.3)	12 (18.2)	1 (1.5)	2 (3.0)	0 (0.0)	77.3
Suspicious nuclear grooves	61 (36.7)	37 (60.7)	18 (29.5)	4 (6.6)	2 (3.3)	0 (0.0)	60.7
HCC with suspicious nuclear abnormalities such as nuclear grooves or enlarged nucleus	12 (7.2)	7 (58.3)	3 (25.0)	1 (8.3)	1 (8.3)	0 (0.0)	58.3
HCC without nuclear abnormalities	4 (2.4)	2 (50.0)	1 (25.0)	1 (25.0)	0 (0.0)	0 (0.0)	50.0
Other features such as enlarged nuclei, prominent nucleoli, psammoma bodies, papillary fronds, etc.	19 (11.4)	11 (57.9)	4 (21.1)	1 (5.3)	2 (10.5)	1 (5.3)	57.9
Microfollicles with mild nuclear atypism	4 (2.4)	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	0 (0.0)	25.0
Total	166 (100.0)	109 (65.7)	40 (24.1)	9 (5.4)	7 (4.2)	1 (0.6)	

PC, papillary carcinoma; NH, nodular hyperplasia; FN, follicular neoplasm; HT, Hashimoto's thyroiditis; GT, granulomatous thyroiditis.

^{a)}This indicates the percentage within a surgical diagnosis.

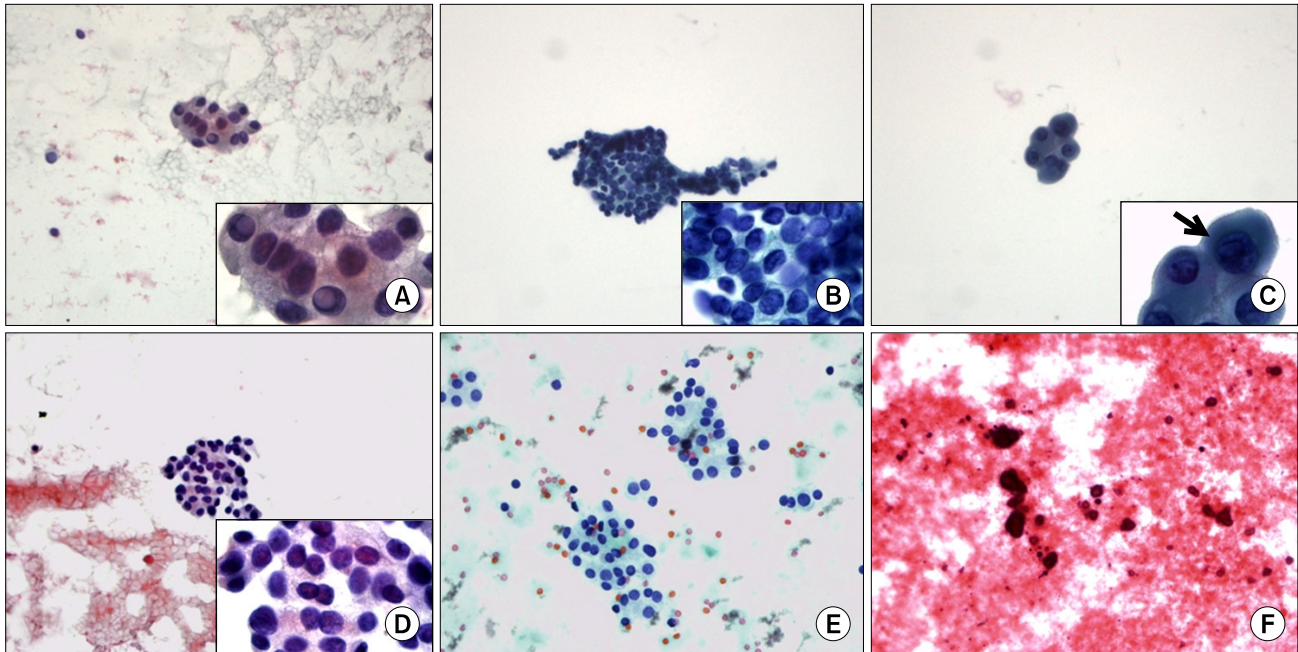


Fig. 2. (A) Nuclear grooves or pseudoinclusions are significant cytological features strongly suggestive of papillary carcinoma. In these cases, papillary carcinoma could be safely diagnosed in spite of low cellularity. (B) In this case, a suspicious nuclear groove is noted in a few follicular cells, but when most of the sample appears benign, it would be more appropriate to diagnose this as a benign lesion. The histological diagnosis was nodular hyperplasia. (C) In this case diagnosed as nodular hyperplasia after surgery, the cytological features show low cellularity, but also show suspicious nuclear pseudoinclusions (arrow) and irregularity, hence atypical cells of undetermined significance (AUS) is the proper diagnosis. (D) In this case, Hurthle cell changes in the follicular epithelial cells are noted, but suspicious nuclear grooves are also present and hence AUS is the proper diagnosis. The histological diagnosis was papillary carcinoma. (E) If Hurthle cell changes are accompanied with a microfollicular pattern, then the diagnosis of follicular neoplasm should be kept in mind. (F) Even though the typical nuclear features of papillary carcinoma are not distinctive, the presence of papillary fronds, enlarged nuclei or psammoma bodies could be associated with papillary carcinoma. So in these cases, a diagnosis of AUS should be made (Papanicolaou stain, $\times 400$; inset, $\times 1,000$).

Table 5. Reclassification of cytological features according to Bethesda system

Categories and diagnostic criteria	No. (%)	Surgical diagnosis, No. (%) ^{a)}					Rate of malignancy (%)
		PC	NH	FN	HT	GT	
Atypia of undetermined significance							
Microfollicles	4 (2.4)	2 (50.0)	1 (25.0)	1 (25.0)	0 (0.0)	0 (0.0)	50.0
Predominant Hurthle cells	4 (2.4)	2 (50.0)	1 (25.0)	1 (25.0)	0 (0.0)	0 (0.0)	50.0
Several artifacts	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Focal features suggestive of papillary carcinoma	73 (44.0)	44 (60.3)	21 (28.8)	5 (6.8)	3 (4.1)	0 (0.0)	60.3
Cyst-lining cells	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Other nuclear abnormalities such as nuclear enlargement, prominent nucleoli, etc.	19 (11.4)	11 (57.9)	4 (21.1)	1 (5.3)	2 (10.5)	1 (5.3)	57.9
Atypical lymphoid cells	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Suspicious for papillary carcinoma							
Pattern A	1 (0.6)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	100.0
Pattern B	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Pattern C	65 (39.2)	50 (76.9)	12 (18.5)	1 (1.5)	2 (3.1)	0 (0.0)	76.9
Pattern D	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-

PC, papillary carcinoma; NH, nodular hyperplasia; FN, follicular neoplasm; HT, Hashimoto's thyroiditis; GT, granulomatous thyroiditis.

^{a)}This indicates the percentage within a surgical diagnosis.

nodules are suspected, application of ultrasonographic examination and FNA cytology under the guidance of ultrasonography is the standard procedure [1,3]. In fact, ultrasonography is also important for the interpretation of FNA cytology because the configuration of thyroid nodules identified in ultrasonography provides useful information for the interpretation of atypical cells [11,12]. An ideal cytologic report can be made when the patient's clinical, laboratory and radiological information can be referred to before the cytological slides are examined [12]. When the cytologic report is reported as benign, follow-up is required, but in cases of malignancy or at least suspicious for malignancy, surgical treatment is required. In cases when follicular neoplasm is suspected or in the indeterminate cases, treatment modality can be decided according to the circumstances. Thus, FNA cytology provides an important guideline for the treatment of thyroid nodules by which on one hand the risk of unnecessary surgery is reduced and it also provides an appropriate opportunity for surgery of the malignant disease [12]. But, FNA cytology has some limitations. For example, its diagnosis rate is low in the case of follicular neoplasm [13].

Papillary carcinomas are the most frequent malignancies occurring in the thyroid gland and constitute approximately 70 to 80% of all thyroid malignancies [5]. Although FNA cytology is the important diagnostic tool in the evaluation of thyroid nodules [5,7], screening for papillary carcinoma is the most important. The diagnosis rate of papillary carcinoma by FNA cytology is high because the pathologists are relatively familiar to the cytological features of papillary carcinomas [5]. And ultrasonography is indispensable in the evaluation of thyroid nodules and contributes in increasing the diagnosis rate of papillary carcinoma [14]. Diagnostic categories vary among different institutes, but the categories of unsatisfactory specimen, benign, atypical or indeterminate, suspicious for malignancy, and malignancy are representative [15,16]. The Bethesda system which was introduced in 2007 provided six diagnostic categories for standardization of the diagnostic terms. This system grouped follicular neoplasms into an independent category, and since follicular carcinoma cannot be differentiated from follicular adenoma, the categories of suspicious for malignancy and malignancy in-

clude all malignancies of the thyroid gland except for follicular carcinoma. This system aimed to use identical diagnostic terms and ensure similarity in the interpretation of diagnostic results by the application of criteria for each diagnostic category [7,9,12,17,18]. Herein, the category of AUS includes diverse conditions, but these conditions can be roughly classified into two groups which are suggestive of papillary carcinoma on one hand and of follicular neoplasms on the other. According to the reports, the diagnosis rate of atypical cytology by FNA cytology of the thyroid nodule varies from 3% to 20% [7,19]. On histological studies of these atypical cases, papillary carcinoma was the most frequent diagnosis, and this finding is similar to the results of this study. The Bethesda system recommends that the diagnosis rate of atypical cytology should be less than 7% [6,7]. In this institute, diagnosis rate of atypical cytology was about 13.0% and this rate seems to be far exceed the limit which the Bethesda system recommends. But we selected 166 cases for this study according to the criteria as mentioned in the section of material and methods, and these cases occupy about 4.0% of total FNA cytology cases. This indicates excessive cases are allotted in the atypical category. Actually, even though the characteristic nuclear features of papillary carcinomas are evident while the cellularity is low, there is a tendency to make a diagnosis as atypical only. Besides, there may be many conditions which can give rise to indeterminate findings. Also, a considerable number of cytological smears from the cases of follicular neoplasm could be interpreted as simply benign lesions. Taken together, many cytological examinations remain ambiguous due to the lack of provision of precise guidelines for the clinicians.

From the results of this study, firstly we know that guidelines for the surgical treatment based on the ultrasonographic findings could provide a considerably precise discrimination power for diagnosing papillary carcinomas. But there were considerable risk of overtreatment also. Therefore it is certain that if atypical cases reduce, more limited cases will confront this risk. Second, among these atypical cases which were diagnosed according to the diagnostic scheme used at this institute, the cytopathological aspect revealed that 77% of these atypical cases were confirmed as papillary carcinoma on histological

examination. The Bethesda system systematized the pre-existing cytological knowledge, but the clarification of criteria for atypical cytology is worthy of special attention. According to this study, the nuclear features such as nuclear grooves with or without intranuclear pseudoinclusions were confirmed to be the important findings suggestive of papillary carcinoma. Hence, even when the cellularity is not sufficient for establishing a definite diagnosis, with these cytological features we think that the category of suspicious for malignancy is more appropriate than just the atypical category. In this study 39.2% of the cases of atypical cytology were included in the category of suspicious for malignancy and 76.9% of them were histologically confirmed as papillary carcinoma. Hurthle cell change can be found in the benign conditions such as Hashimoto's thyroiditis and nodular hyperplasia, so the presence of Hurthle cell alone cannot be a reliable indicator of papillary carcinoma. But when certain nuclear abnormalities accompany the Hurthle cell change, the category of AUS is more appropriate [20]. Papillary fronds, psammoma bodies or indetermined nuclear abnormalities can accompany papillary carcinoma, and so these findings can be the features of AUS. When mild nuclear atypism was found, microfollicles were sometimes diagnosed as atypical, but some cases were histologically diagnosed as nodular hyperplasia. When some cases were confirmed as follicular neoplasms, the category of AUS or suspicious for follicular neoplasms may be more appropriate. Conclusively, it seems probable that on the basis of the above results and the criteria provided in the Bethesda system, the diagnosis rate of atypical or AUS cases could be reduced and more standardized cytological reports can be obtained [13,21,22].

But on the other hand, it is uncertain as to how much these criteria can actually influence the cytological interpretation in a real situation. In this study, many cases of atypical cytology were allocated to the category of suspicious for malignancy logically, but it is doubtful whether in an actual situation the same proportion of cases will not be allocated to the atypical category. Even though the cytological features are evident for making a diagnosis of papillary carcinoma, the pathologists still hesitate when the cellular yield is not sufficient. Although a clarification on

whether the lesion is benign or malignant may be the most ideal, but still the diagnosis of atypical cytology is inevitable due to the various ambiguous situations. So, the most in-demand task is to reduce the diagnosis rate of atypical cytology to as low as possible. Ultrasonographic findings and atypical cytology showed a considerable discrimination power for malignant diseases, but there may be some cases in which unnecessary surgeries have been performed. If we consider the fact the main role of ultrasonography and cytological examinations was to screen the malignant lesion as precisely as possible and to reduce the possibility of unnecessary surgery, it is certain that the excessive allocation of cases to the atypical category may result in overtreatment in some of the patients. From this study it is difficult to confirm that the Bethesda system can make a remarkable difference in the diagnostic results. But when the cytological interpretation is made based on reference to these criteria provided by the Bethesda system and ultrasonographic findings, the diagnosis rate of atypical cytology can be reduced and more assertive guidelines can be provided for the clinicians.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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