ASTR

ORIGINAL ARTICLE
pISSN 2288-6575 • eISSN 2288-6796
http://dx.doi.org/10.4174/astr.2016.90.6.297
Annals of Surgical Treatment and Research

An online questionnaire survey on preferred timing for the diagnosis and management of thyroid carcinoma in general population in Korea

Jin-Woo Park[1,2], Jae-Soo Yoo[3], Jin-Kyung Yun[3], Byoung-Hoon Kim[3], Yeon-Woo Noh[3], Dong-Ju Kim[2]

[1]Department of Surgery, College of Medicine Chungbuk National University, Cheongju, [2]Department of Surgery, Chungbuk National University Hospital, Cheongju, [3]Department of Information & Communication Engineering, College of Electrical and Computer Engineering, Chungbuk National University, Cheongju, Korea

Purpose: An optimal timing for diagnosis and management of papillary thyroid microcarcinoma (PTMC) has become the subject for much controversy. The aim of the present study is to analyze people's preference in Korea for timing of diagnosis and management of PTMC using an online questionnaire.
Methods: The questionnaire consists of 3 questions about preference for the diagnosis and management of PTMC and 3 additional questions about respondents' personal information. An online survey was conducted from March 3 to June 3 in 2015 using Google Survey (http://goo.gl/forms/b81yEjqNUA).
Results: A total 2,308 persons (1,246 males, 1,053 females) answered the questionnaire. Respondents' ages varied widely from teenagers to 70-year-olds. If there was a suspicious thyroid nodule from PTMC measuring less than 1 cm in diameter, 95.7% of respondents want to know a cytological diagnosis for it. If a thyroid nodule turned out to be a PTMC, 59.5% of respondents wanted it removed immediately. For surgical management of PTMC, 53.0% of respondents were worried more about recurrences than complications. In subgroup analyses, respondents younger than 40 years old more often want immediate surgery than others: 66.7% *vs*. 32.7% ($P < 0.05$). Respondents who underwent thyroid cancer surgery (n = 91) were worried more about recurrences than others: 69.2% *vs*. 52.4% ($P < 0.05$).
Conclusion: Almost all respondents in the present study wanted diagnosis of suspicious thyroid nodules immediately. However, there were opposing opinions about the preferred timing for surgical treatment and surgical extents. A patient's right to know their disease status and decision on treatments should be emphasized all the more.
[Ann Surg Treat Res 2016;90(6):297-302]

Key Words: Papillary thyroid microcarcinoma, Surveys and questionnaires, Thyroid nodule, Diagnosis, Surgery

INTRODUCTION

Early diagnosis and treatment have been emphasized as a key to control cancer for a long time. Although true, some investigators recently have been concerned about overdiagnosis and overtreatment. The incidence of papillary thyroid carcinoma (PTC), especially microcarcinoma (PTMC) has rapidly increased during the past 15 years worldwide including Korea. An optimal timing for diagnosis and management of PTMC has become the subject of much controversy because of its high incidence and excellent prognosis. In this context, several management guidelines for patients with thyroid nodules and differentiated thyroid cancer (DTC) were revised recently [1-4]. However, there are different recommendations in different guidelines.

Received February 24, 2016, **Reviewed** March 9, 2016, **Accepted** March 12, 2016

Corresponding Author: Jin-Woo Park
Department of Surgery, College of Medicine Chungbuk National University, 776 1(il)sunhwan-ro, Heungdeok-gu, Cheongju 28644, Korea
Tel: +82-43-269-6033, **Fax:** +82-43-266-6037
E-mail: webjwpark@chungbuk.ac.kr

Lately, the American Thyroid Association (ATA) revised their guidelines in 2015, which contains several significant changes in recommendations for diagnosis and management of PTMC [1]. New ATA guidelines recommend fine needle aspiration (FNA), the procedure of choice in the evaluation of thyroid nodules, only when nodules >1 cm in greatest dimension even with high-suspicion sonographic patterns. They also adopt the Japanese suggestion of active surveillance for PTMCs as a reasonable alternative option to immediate surgery. New ATA guideline recommendations are slightly different from our current medical practice in Korea. Although they tried to avoid overtreatment of clinically insignificant PTMCs, there is a small but real risk of clinically significant disease progression, and unfortunately no clinical features can reliably predict it [1,5]. The authors believe that personalized decision making is important. The aim of the present study is to analyze people's preferences in Korea for timing of diagnosis and management of PTMC using an online questionnaire.

METHODS

The questionnaire consists of 3 questions about preferred timing for the diagnosis and management of PTMC and 3 additional questions about respondents' personal information. (Table 1). An online questionnaire survey was conducted from March 3 to June 3 in 2015 using Google Survey (http://goo.gl/forms/b81yEjqNUA). The response data was collected mainly by web and social network service (Fig. 1). The response data for the survey were analyzed with Hadoop, which is a distributed processing system for big data. We collected 2,308 answers. The collected data were transformed to enable processing in Hadoop and saving it in the Hadoop Distributed File System. We produced the results with Hadoop Map-Reduce framework, which is a distributed processing framework. In the Map phase, we made a correlation analysis between the response data grouping into related personal information questions. In the Reduce phase, we did a correlation analysis with data grouping into single personal information using the results processed in previous phase. Additionally, we turned the results into probability analyses for each of the questions. In a subgroup analysis, chi-square test was used with a $P < 0.05$ as a significant difference.

RESULTS

Characteristics of respondents

A total of 2,308 persons answered the questionnaire. A few respondents answered part of the questionnaire only. Ages of

Table 1. A questionnaire about thyroid cancer management (English translation version)

Thank you for participation.
As you know, an optimal timing for diagnosis and management of papillary thyroid carcinoma has become the subjects for much controversy in Korea.
This questionnaire is consists of 3 questions asking your decision to the management of thyroid nodules and carcinomas. We believe that your answers may make significant changes in upcoming revised version of Korean management guidelines for patients with thyroid nodules and carcinomas.
Q1: If you have a thyroid nodule less than 1 cm in maximal diameter, which turns out to be a papillary thyroid carcinoma, what would you do?
1. having an operation immediately
2. observing and having an operation only if significant changes occur
(References) Patients who have papillary thyroid carcinoma less than 1 cm in maximal diameter are generally expected to have less than 1% risk of cancer-specific mortality and 2%–6% risk of recurrence. Active surveillance without immediate operation performed in Japan showed that 5 years after initial diagnosis, 5% of patients experienced tumor growth and 2% of patients experienced lymph node enlargement. The longer observation period, the more patients experienced these changes. These changes might affect extent of surgery.
Q2: If you have a thyroid nodule less than 1 cm in maximal diameter, which has suspicious characteristics of a papillary thyroid carcinoma in cervical ultrasound examination, what would you do?
1. having a cytologic confirmation immediately
2. observing and having a cytologic confirmation only if significant changes occur
Q3: If you decide to have an operation for papillary thyroid carcinoma, which has generally a low risk of recurrence and mortality, which operation would you prefer to have?
1. an operation with a low risk of complication, accepting a little increased risk of recurrence
2. an operation with a low risk of recurrence, accepting a little increased risk of complication
(References) In general, 80%–90% of patients with papillary thyroid carcinomas have a low risk of recurrences and mortality. The risk of cancer death of these patients is less than 1% 10 years after initial treatment. However 10%–20% of patients have a high risk and a 10-year mortality is 20%–30%. Current risk stratification is excellent for selecting high risk patients preoperatively, but is not perfect. (Some of low risk patients may turn to be high risk afterwards.)
Generally, extent of surgery correlates with risk of complications. However experts can perform thyroid surgery with less than 5% of major complications regardless of surgical extent.

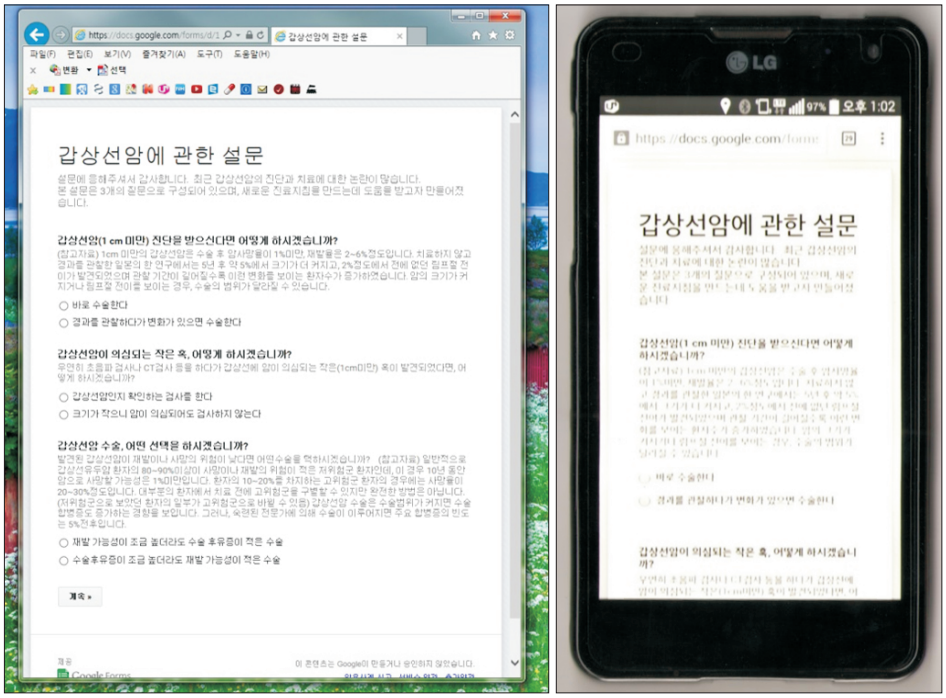

Fig. 1. An online questionnaire displayed on a computer and a smartphone screen.

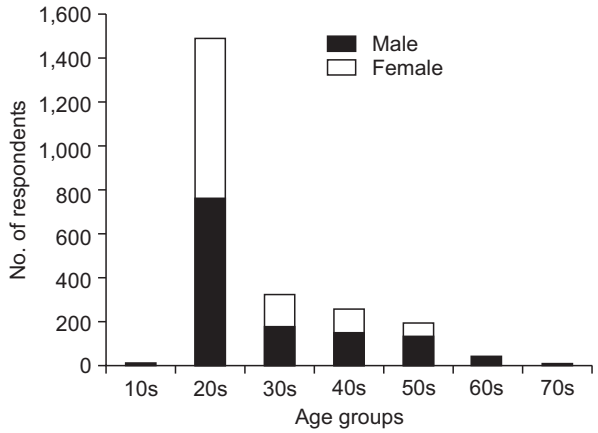

Fig. 2. Age distribution of respondents.

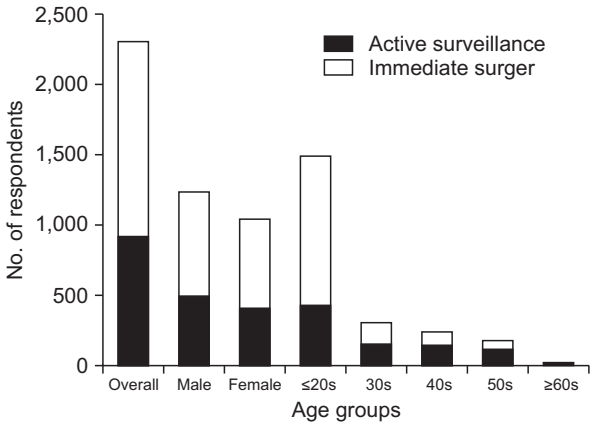

Fig. 3. Decision making for management of papillary thyroid microcarcinoma (questionnaire Q1) according to age groups.

the respondents varied widely from late teens to 70-year-olds. Respondents in their 20s were most common, consisting of 64.4% of all respondents. The overall male to female ratio was 1.2:1 (Fig. 2). Ninety-one respondents had operations for thyroid carcinomas.

Preferred timing of operations for PTMC

One thousand three hundred seventy-three (1,373) respondents (59.5%) preferred to have operations for PTMCs immediately after diagnosis. As the age groups become older, a lower proportion of respondents wanted immediate operations (Fig. 3). While 66.8% (1,209 of 1,811) of respondents who were younger than 40 years old wanted to have immediate operation, 32.7% (157 of 480) of respondents who were 40 years old or older preferred to observe PTMCs as long as it did not change significantly ($P < 0.001$).

Preferred timing of cytologic diagnoses for small suspicious thyroid nodules

Almost all respondents (95.7%) wanted to know whether the suspicious thyroid nodule(s) was malignant or not even though it was very small (Fig. 4). This pattern is consistent regardless of age and sex except for respondents who were in the thirties. In the thirties group, 35.5% of respondents wanted to delay cytologic confirmation as long as the nodule did not change significantly.

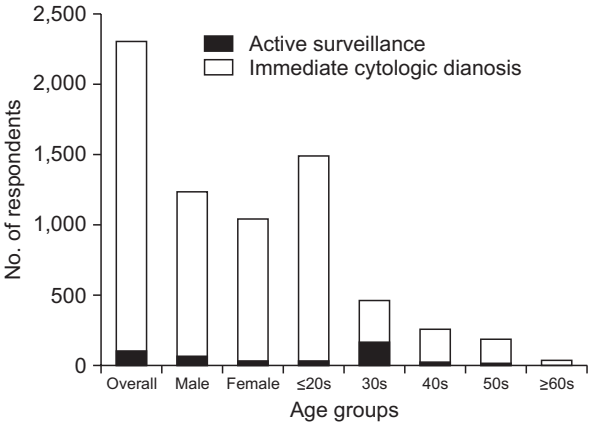

Fig. 4. Decision making for suspicious thyroid nodule(s) (questionnaire Q2).

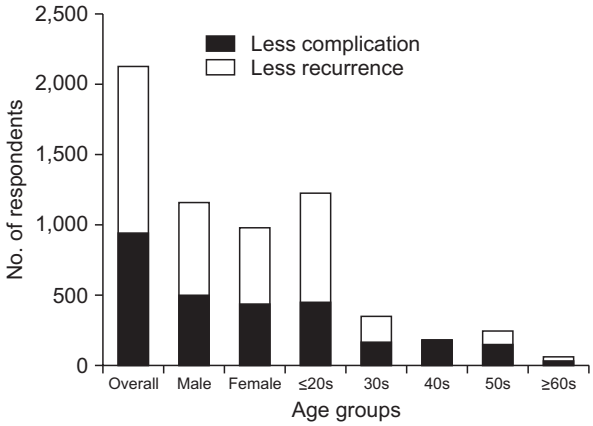

Fig. 5. Decision making for operative extent for papillary thyroid carcinoma (questionnaire Q3).

Preferred extent of thyroid surgery for PTCs

Nine hundred thirty-three respondents (933, 43.3%) preferred to have operations with a low risk of complications, accepting a little increased risk of recurrences (Fig. 5). The rest of the respondents (56.7%) seem to be more anxious about recurrences. The preferred extent of thyroid surgery for PTCs varied with different age groups. Most respondents (94.2%) in their forties wanted to have operations with a low risk of complication, while 70.7% (123 of 174) of elderly respondents whose ages were not less than 50 years preferred to have operations with a low risk of recurrences despite the potentially increased risk of complications. Respondents who had operation(s) for thyroid cancer worried more about disease recurrences than complications compared to respondents who did not.(69.2% *vs.* 52.4%, $P < 0.002$) (Table 2).

Table 2. Decision making for operative extent for papillary thyroid carcinoma (questionnaire Q3) according to past medical history related to thyroid cancer surgery

Operative extent	History of thyroid cancer surgery, n (%)	
	(+)	(–)
An operation with a low risk of complication, accepting a little increased risk of recurrence	28 (30.8%)	1,054 (47.6%)
An operation with a low risk of recurrence, accepting a little increased risk of complication	63 (69.2%)	1,158 (52.4%)

DISCUSSION

Optimal timing for diagnosis and management of PTMCs has been controversial because of its high incidence and excellent prognosis. Regarding this issue, a scarcity of high quality evidence supported by prospective randomized studies makes it difficult to reach consensus. In fact, there are different recommendations in different guidelines reflecting differences in appraising existing evidences, clinical practice patterns, and socioeconomic environments.

Recently, several groups revised their management guidelines for patients with thyroid nodules and DTC [1-4]. Significant changes were made in diagnosis and management of PTMC. Most investigators agree that PTMCs in general have an indolent disease course [6-9]. New ATA guidelines published in 2015 recommend FNA for nodules >1 cm in greatest dimension even with high-suspicion sonographic patterns to avoid overtreatment of clinically insignificant PTMCs [1]. New National Comprehensive Cancer Network (NCCN) guidelines published in 2015 follow the same policy as ATA's [2].

However, a lot of evidences suggest that size is not specific in differentiating benign from malignant thyroid nodules [10,11].

Nowadays, neck sonographic examination has becomes a common clinical practice. Without cytologic confirmation, some sonographic patterns can lead to a diagnosis of PTMC with an accuracy of approximate 70%–90% [1]. In some patients, detecting PTMC can be the best chance to stop disease progression without significant treatment-related morbidity. The British Thyroid Association (BTA) guidelines published in 2014 recommend selective performing of FNA for suspicious nodules <1 cm in greatest dimension when they are associated with extrathyroidal extension and/or metastatic lymphadenopathy [3]. Otherwise, responsible clinicians need to make an appropriate decision for FNA on the basis of the clinical picture and high-risk clinical history.

On the other hand, the German Association of Endocrine Surgeons (GAES) guidelines [4] published in 2013, American Association of Clinical Endocrinologists (AACE), Associazione Medici Endocrinologi (AME), and European Thyroid Association (ETA) guidelines [12] published in 2010 recommend FNA for all

suspicious thyroid nodules without size criteria.

In the present study, almost all respondents (95.7%) want to diagnose suspicious thyroid nodules immediately even if it is very small. This pattern is consistent regardless of age and sex except respondents in their thirties. The reason why they choose delayed diagnosis is unknown, but might be assumed that it is related with their unstable socioeconomic status at this age group in Korea.

One of the remarkable changes made in the new ATA guidelines is to adopt active surveillance as a reasonable alternative option to immediate surgery for PTMC [1]. While the latest BTA guidelines leave place for active surveillance decided by the responsible clinician in the absence of other risk factors, the latest GAES, AACE, AME, and ETA guidelines did not adopt active surveillance [3,4,12]. The concept of active surveillance for PTMC came from observation studies conducted in Japan [13,14]. Although the studies showed that careful observation might be a safe and effective alternative to immediate surgical resection, they did not include all PTMCs. Excluded were patients with the presence of regional lymph-node metastasis or distant metastasis, signs or symptoms of invasion to the recurrent laryngeal nerve or trachea, FNA cytologic findings suggesting high-grade malignancy, and tumors located adjacent to the recurrent laryngeal nerve or trachea in their studies. Patient age was significantly related to the progression of PTMC during observation [14]. Clinically significant disease progression, which means tumor growth and/or novel appearance of regional lymph node metastasis, was more frequent in young patients under 40 years old.

However, prognosis of PTC cannot be reliably predicted by size only. The cumulative risks of extrathyroidal growth, lymph node metastasis, and distant metastasis of PTCs increased linearly with increasing tumor diameter [15]. As a matter of fact, there are reports in the literature of patients with PTMCs presenting with clinically significant regional or distant metastases who very rarely died of the disease [6-9]. Even Ito et al. [16,17], who advocated active surveillance for PTMCs, admit necessity of exclusion criteria for nonoperative management of low-risk differentiated thyroid carcinoma. They also admit that patients who chose active surveillance may need more aggressive management due to delayed treatment if PTMCs progress clinically [16]. In addition, recent investigation using the National Cancer Institute's Surveillance, Epidemiology, and End Results Registries database cast doubt on active surveillance for all PTMCs [18]. Nilubol and Kebebew [18] analyzed the estimated impact of small PTCs on thyroid cancer-related mortality and suggested that an active surveillance policy should be used with caution. Because there are rare but serious conditions related with PTMCs, patients should be actively involved in decision-making for diagnosis and management of PTMCs.

In the present study, there are opposing opinions about the timing for surgical treatment for PTMCs. Roughly half of respondents prefer to have operations immediately after diagnoses and the remaining prefer active surveillance for PTMCs. Respondents younger than 40 years old wants to have immediate operation more frequently than older ones. As the Japanese observation trial results showed, young people might worry more about disease progression during their entire lives.

Optimal surgical extent for differentiated thyroid carcinoma has long been controversial. Historically, the recommended surgical extent for DTC has been reduced in ATA guidelines [1,19,20]. Total thyroidectomy was strongly recommended for almost all DTCs at the beginning. The Second version of the guidelines leave place for lobectomy in low-risk PTMCs. Finally, lobectomy is strongly recommended for low-risk PTMCs and has become an equivalent option to total thyroidectomy for PTCs larger than 1 cm but smaller than 4 cm in greatest dimension without extrathyroidal extension and clinical lymph node metastasis [1]. Reduction of surgical extent for DTCs largely depends on excellent prognosis of PTCs and treatment-related changes in quality of life. In America, over 80% of thyroid surgeries have been done by low- or intermediate-volume surgeons who have performed less than 100 cases in a year. Lack of experience is correlated with complication rates after total thyroidectomy [21]. The latest NCCN, BTA, GAES guidelines recommend the similar surgical extent for DTCs [2-4].

In the present study, slightly more respondents (56.7%) preferred to have operations with a low risk of recurrences accepting a little increased risk of complications. Elderly respondents (123 of 174, 70.7%) whose ages were not less than 50 years and respondents who had operation(s) for thyroid cancer (63 of 92, 68.5%) worried more about disease recurrences.

The aim of the present study is to get Korean people's opinions about diagnosis and management of PTMC including active surveillance. We designed an online questionnaire survey using Google Survey and 2,308 people answered. There are inborn limitations accompanying an online questionnaire survey. Because only people who can go online can respond, young people responded dominantly. For simplicity, the questionnaire contained very brief questions and information about the diagnosis and management of PTMC. Although respondents can get appropriate information to make decisions in each situation, it may not be enough to understand the complete features of PTMCs, and it does not consider potential confounding variables that may influence decision making. Nonetheless, answers from 2,308 respondents of various age and sex can be a little, but useful, clue to estimate Korean people's opinions about diagnosis and management of PTMC including active surveillance. Most respondents in the present study wanted to diagnose suspicious thyroid nodules immediately. However, there were opposing opinions

about the preferred timing for surgical treatment and surgical extents. New ATA guidelines recommendations are different from our current medical practice and results of the present study in Korea. At present there is increasing demand to revise the Korean guidelines for management of PTMC based on new evidences. In the revised guidelines, a patient's right to know their disease status and decide on treatments should be emphasized all the more.

CONFLICTS OF INTEREST

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

REFERENCES

1. Haugen BR, Alexander EK, Bible KC, Doherty GM, Mandel SJ, Nikiforov YE, et al. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid 2016;26:1-133.
2. National Comprehensive Cancer Network. NCCN clinical practice guidelines in oncology (NCCN Guidelines): Thyroid carcinoma ver. 2 [Internet]. Fort Wathington (PA): National Comprehensive Cancer Network; c2015 [cited 2016 Jan 19]. Available from: http://www.nccn.org/professionals/physician_gls/f_guidelines.asp.
3. Perros P, Boelaert K, Colley S, Evans C, Evans RM, Gerrard Ba G, et al. Guidelines for the management of thyroid cancer. Clin Endocrinol (Oxf) 2014;81 Suppl 1:1-122.
4. Dralle H, Musholt TJ, Schabram J, Steinmüller T, Frilling A, Simon D, et al. German Association of Endocrine Surgeons practice guideline for the surgical management of malignant thyroid tumors. Langenbecks Arch Surg 2013;398:347-75.
5. Brito JP, Morris JC, Montori VM. Thyroid cancer: zealous imaging has increased detection and treatment of low risk tumours. BMJ 2013;347:f4706.
6. Yu XM, Wan Y, Sippel RS, Chen H. Should all papillary thyroid microcarcinomas be aggressively treated? An analysis of 18,445 cases. Ann Surg 2011;254:653-60.
7. Wang TS, Goffredo P, Sosa JA, Roman SA. Papillary thyroid microcarcinoma: an over-treated malignancy? World J Surg 2014;38:2297-303.
8. Hay ID, Hutchinson ME, Gonzalez-Losada T, McIver B, Reinalda ME, Grant CS, et al. Papillary thyroid microcarcinoma: a study of 900 cases observed in a 60-year period. Surgery 2008;144:980-7.
9. Noguchi S, Yamashita H, Uchino S, Watanabe S. Papillary microcarcinoma. World J Surg 2008;32:747-53.
10. Shrestha M, Crothers BA, Burch HB. The impact of thyroid nodule size on the risk of malignancy and accuracy of fine-needle aspiration: a 10-year study from a single institution. Thyroid 2012;22:1251-6.
11. McHenry CR, Huh ES, Machekano RN. Is nodule size an independent predictor of thyroid malignancy? Surgery 2008;144:1062-8.
12. Gharib H, Papini E, Paschke R, Duick DS, Valcavi R, Hegedus L, et al. American Association of Clinical Endocrinologists, Associazione Medici Endocrinologi, and EuropeanThyroid Association Medical Guidelines for Clinical Practice for the Diagnosis and Management of Thyroid Nodules. Endocr Pract 2010;16 Suppl 1:1-43.
13. Ito Y, Miyauchi A, Inoue H, Fukushima M, Kihara M, Higashiyama T, et al. An observational trial for papillary thyroid microcarcinoma in Japanese patients. World J Surg 2010;34:28-35.
14. Ito Y, Miyauchi A, Kihara M, Higashiyama T, Kobayashi K, Miya A. Patient age is significantly related to the progression of papillary microcarcinoma of the thyroid under observation. Thyroid 2014;24:27-34.
15. Machens A, Holzhausen HJ, Dralle H. The prognostic value of primary tumor size in papillary and follicular thyroid carcinoma. Cancer 2005;103:2269-73.
16. Ito Y, Miyauchi A. Nonoperative management of low-risk differentiated thyroid carcinoma. Curr Opin Oncol 2015;27:15-20.
17. Ito Y, Oda H, Miyauchi A. Insights and clinical questions about the active surveillance of low-risk papillary thyroid microcarcinomas. Endocr J 2016;63:323-8.
18. Nilubol N, Kebebew E. Should small papillary thyroid cancer be observed? A population-based study. Cancer 2015;121:1017-24.
19. Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, Mandel SJ, et al. Management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2006;16:109-42.
20. American Thyroid Association (ATA) Guidelines Taskforce on Thyroid Nodules and Differentiated Thyroid Cancer, Cooper DS, Doherty GM, Haugen BR, Kloos RT, Lee SL, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19:1167-214.
21. Kandil E, Noureldine SI, Abbas A, Tufano RP. The impact of surgical volume on patient outcomes following thyroid surgery. Surgery 2013;154:1346-52.