



## Original Article

# The use of fine needle aspiration and trends in incidence of thyroid cancer in Taiwan

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## Abstract

**Background:** Thyroid cancer is the most prevalent endocrine malignancy, and the incidence of thyroid cancer has increased worldwide. Fine needle aspiration (FNA) for cytology of thyroid tissue is used for differentiating thyroid cancers from benign thyroid nodules. Overuse of FNA may detect subclinical thyroid cancer and play a role in the increased incidence of thyroid cancer. The aim of this study was to evaluate trends in incidence of thyroid cancer and the use of palpation-guided FNA thyroid and ultrasound-guided FNA thyroid in Taiwan.

**Methods:** By retrospectively analyzing a cohort dataset of one million people randomly sample to represent as NHI beneficiaries of Taiwan National Health Insurance Research Database from 2004 to 2010, patients who received palpation-guided and ultrasound-guided thyroid FNA were identified. Individuals who were diagnosed as having thyroid cancer were determined. Age-standardized, yearly rates of palpation-guided thyroid FNA and ultrasound-guided FNA, and age-standardized, yearly incidence rates of thyroid cancer were calculated.

**Results:** In the study period, a total of 541 patients were newly diagnosed with thyroid cancer, 14,240 individuals received palpation-guided thyroid FNA, and 3823 individuals underwent ultrasound-guided thyroid FNA. There was a 94.8% increase in the age-standardized annual incidence rate of thyroid cancer. The age-standardized rates of palpation-guided thyroid FNA and ultrasound-guided thyroid FNA increased by 10.9% and 349.3%, respectively.

**Conclusion:** FNA for cytology of thyroid tissue, especially ultrasound-guided FNA, was conducted by physicians more frequently in Taiwan. Increased use of FNA, especially ultrasound-guided FNA for cytology of thyroid tissue, may attribute to the increased incidence of thyroid cancer in Taiwan.

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**Keywords:** Fine needle aspiration of the thyroid; Thyroid cancer; Ultrasound

## 1. Introduction

Thyroid cancer is the most common endocrine system malignancy, and the incidence of thyroid cancer has increased dramatically worldwide.<sup>1–3</sup> The rising incidence of thyroid cancer, especially papillary thyroid cancer, may represent an

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actual increase in the number of cases<sup>4–6</sup> or an increase in the detection of clinically occult thyroid “incidentalomas” with increased use of ultrasonography and fine needle aspiration (FNA).<sup>7–9</sup> Some experts argued that these incidentalomas would not have caused symptoms or death if left undetected,<sup>10–12</sup> and that the screening and diagnostic tools for thyroid cancer was overused, causing overdiagnosis of thyroid cancer and even “thyroid cancer epidemic”.<sup>2–4,7,13,14</sup>

FNA for cytology of thyroid tissue is recommended for clinically suspicious nodules because ultrasound features cannot differentiate malignant thyroid cancers from benign thyroid nodules accurately.<sup>15</sup> In an era with widespread use of medical ultrasound, ultrasound-guided FNA for cytological study of thyroid nodules has been conducted by physicians more and more frequently.<sup>2–4,13,14</sup> With the assistance of ultrasonography, physicians can aspirate thyroid nodules more accurately, even though the nodules are not palpable physically or measuring less than one cm in diameter, which may lead to the detection of a reservoir of occult disease.<sup>4,7</sup>

Data regarding the use and trend of FNA and the incidence of thyroid cancer is scarce in Asia. The single-payer National Health Insurance (NHI) program in Taiwan was launched in 1995 and covers more than 99.5% of the nation's inhabitants.<sup>16</sup> The data from Taiwan's National Health Insurance Research Database (NHIRD, <http://nhird.nhri.org.tw/>) have provided trustworthy information for population-based research for more than ten years.<sup>17</sup> Hence, it is worthwhile to evaluate the use of palpation-guided thyroid FNA, ultrasound-guided FNA and incidence of thyroid cancer by analyzing the NHIRD. We hypothesized there was a correlation between the increased use of thyroid FNA, ultrasound guided FNA and the increased incidence of thyroid cancer in Taiwan.

## 2. Methods

### 2.1. Databases

The NHI has provided comprehensive health insurance coverage in Taiwan since March 1995. From that time, the NHRI has released the NHIRD, comprised of health claim data of the NHI. In this study, we used a cohort dataset of one million people randomly sampled to represent NHI beneficiaries (Longitudinal Health Insurance Database 2005: LHID2005). Both hospitalization and ambulatory records, including encrypted personal identification number, date of birth, gender, diagnosis using the International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM)<sup>18</sup> and procedure coded in the fee schedule and reference list for medical services of NHI<sup>19</sup> were analyzed in this study. In addition, the registry of contracted medical facilities (HOSB) was used to know the category of hospitals. The registry for catastrophic illness patients (HV) was utilized in order to accurately identify patients who had the diagnosis of malignant thyroid cancer. The study was conducted in accordance with the Declaration of Helsinki and was approved by the institutional review board of Taipei Veterans General Hospital according to Republic of China law (VGHIRB No.: 2013-04-005E).

### 2.2. Study population

We obtained the medical records from 2004 to 2010 for the current study. Patients who received palpation-guided thyroid FNA were identified by having an NHI procedure code in their medical records with 29011C and without 19007B at the same time. Those who received ultrasound-guided thyroid FNA were identified by having an NHI procedure code in their medical records with both 29011C and 19007B at the same time. Individuals who were diagnosed as having malignant thyroid cancer were determined by using the ICD-9-CM code 193 in the HV dataset. Age-standardized yearly rates of palpation-guided thyroid FNA and ultrasound-guided FNA were calculated as the number of individuals who received these procedures per 100,000 individuals. In similar, age-standardized yearly incidence rate of thyroid cancer was calculated as the number of individuals who were newly diagnosed with thyroid cancer per 100,000 individuals. The age-standardized rate was adjusted based on the 2000 WHO world standard population.

Table 1  
Demographic characteristics of patients diagnosed with thyroid cancer documented in the registry for catastrophic illness patients: 2004 to 2010.

Characteristics	Number of patients	%
Age, years old		
<18	5	0.9
19–40	170	31.4
41–65	307	56.7
>65	59	10.9
Gender		
Male	118	21.8
Female	423	78.2

Table 2  
Demographic characteristics of patients who underwent thyroid fine needle aspiration and ultrasound guided thyroid fine needle aspiration: 2004 to 2010.

	Palpation-guided FNA, N = 14,240		Ultrasound Guided thyroid FNA, N = 3823	
	N	%	N	%
Age, years old				
<18	203	1.4	58	1.5
19–40	3772	26.5	948	24.8
41–65	8646	60.7	2363	61.8
>65	1619	11.4	454	11.9
Gender				
Male	2181	15.3	690	18.0
Female	12,059	84.7	3133	82.0
Hospital category				
Medical center	7969	56.0	1248	32.6
Regional hospital	4191	29.4	2387	62.4
District hospital	1559	10.9	188	4.9
Clinics	521	3.7		
Physician specialty				
Internist	12,092	84.9	2922	76.4
Surgeon	1151	8.1	483	12.6
Otorhinolaryngologist	599	4.2	293	7.7
Family physician	318	2.2	90	2.4
Neurologist	17	0.1	6	0.2
Radiologist	3	<0.1	12	0.3
Others	60	0.4	17	0.4

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