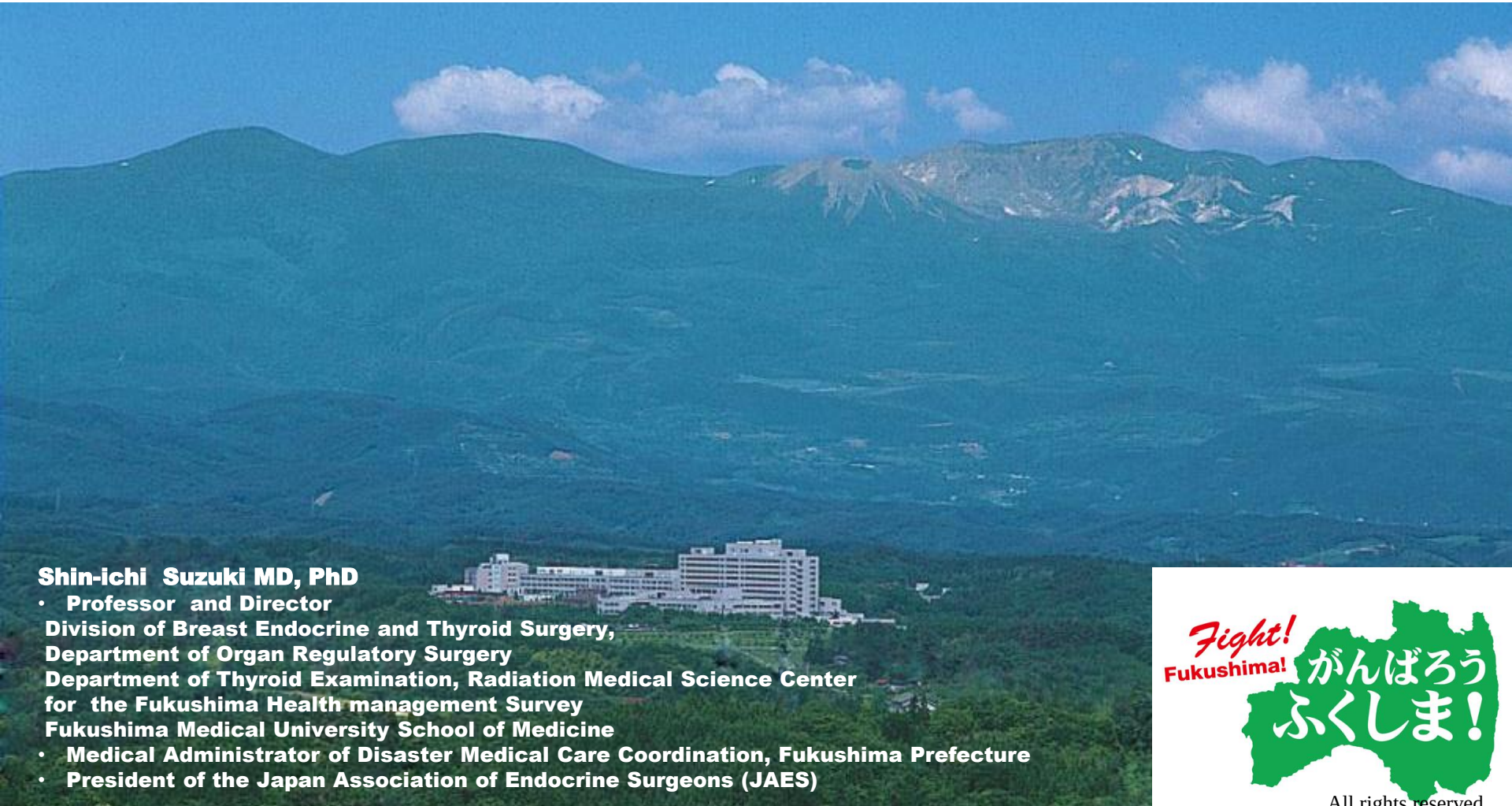
Highly Sophisticated Thyroid Ultrasound Examination used in the Fukushima Health Management Survey

February 25, 2013



Shin-ichi Suzuki MD, PhD

- Professor and Director

Division of Breast Endocrine and Thyroid Surgery,
Department of Organ Regulatory Surgery
Department of Thyroid Examination, Radiation Medical Science Center
for the Fukushima Health management Survey
Fukushima Medical University School of Medicine

- Medical Administrator of Disaster Medical Care Coordination, Fukushima Prefecture
- President of the Japan Association of Endocrine Surgeons (JAES)

Introduction1

- **Thyroid cancer is well known to have a good prognosis within all solid neoplasms.**
- **External (X-ray, γ-) radiation and internal exposure to radioiodine impose increased thyroid cancer risk.**
- **Risk has a strong inverse correlation with age at exposure; the highest risk is in younger children.**
- **Thyroid cancer in children is usually rare.**

Introduction 2

- **After the Chernobyl nuclear accident in 1986, childhood thyroid carcinoma increased significantly in Belarus and Ukraine, as a consequence of the exposure to iodine radioactive fallout.**
- **The accident of the Fukushima Daiichi Nuclear Power Plant is similar to the Chernobyl nuclear accident in terms of severity of its nuclear crisis, which was rated as level 7. However, the environmental radiation dose in Fukushima is one seventh to one tenth of Chernobyl.**

Introduction 3

- **The increase in thyroid cancer was reported to start 4 or 5 years after the Chernobyl accident. In Fukushima, however, the assessment of the current thyroid status, which is not apparently related to this nuclear plant accident, will be completed within 3 years.**

- **Therefore, we decided to perform thyroid ultrasound examinations on all children in Fukushima prefecture as one of the detailed surveys of Fukushima Health Management Survey.**

Fukushima Health Management Survey Outline

Basic survey

Subjects: 2.02 million people living in Fukushima
Method: self-administered Questionnaire

Ascertain health conditions

Detailed survey

Thyroid ultrasound examination

Subjects: 360,000 children aged 18 years or younger as of March 11, 2011

Comprehensive medical checkups

Subjects: Residents residing in evacuation areas, etc
Details: General medical checkup items as well as differential white blood count, etc.

Subjects: Residents not residing in evacuation areas
Details: General medical checkup items

Having workplace medical checkups, municipal medical checkups and/or cancer screening helps ensure early detection and early treatment of diseases.

Conducting of medical checkups for Fukushima prefecture

Mental health and lifestyle survey

Survey on pregnant women and nursing mothers

Health management file

(provisional name)

☆Results of health surveys and examinations recorded and retained by individuals
☆Increase awareness of radiation

Creation of a database

◆ Utilized for long-term healthcare and medical treatment of Fukushima prefecture residents
◆ Knowledge acquired in providing healthcare will be used for future generations

• Whole-body counter
• Individual dosimeter

Consultation and support | Follow-up | Treatment

Outline of Thyroid Ultrasound Examination

Subjects: 360,000 children aged 18 years or younger as of March 11, 2011

Methods: Ultrasonography of thyroid gland

Details:

First Screening: Screening Ultrasonography

Second Screening: Followed by detailed examination at Fukushima Medical University when necessary

Implementation:

Preliminary survey: from October 9, 2011 to end of March 2014

Full scale survey: start from April, 2014 to end of March 2016

Repetition: every 2 years until age 20, and every 5 years after that for life

Flow Chart of Thyroid Ultrasound Examination

First screening (primary examination)

No ← **Nodule** → **Yes**

Next Exam. 2014

Portable US machine

LOGIQ *e* Expert

Secondary screening (Confirmatory examination)
Precise US examination, Blood and Urinary analyses

HIVISION Ascendus

Follow-up ← **Criteria** → **FNAC**

Informed consent, Further examination

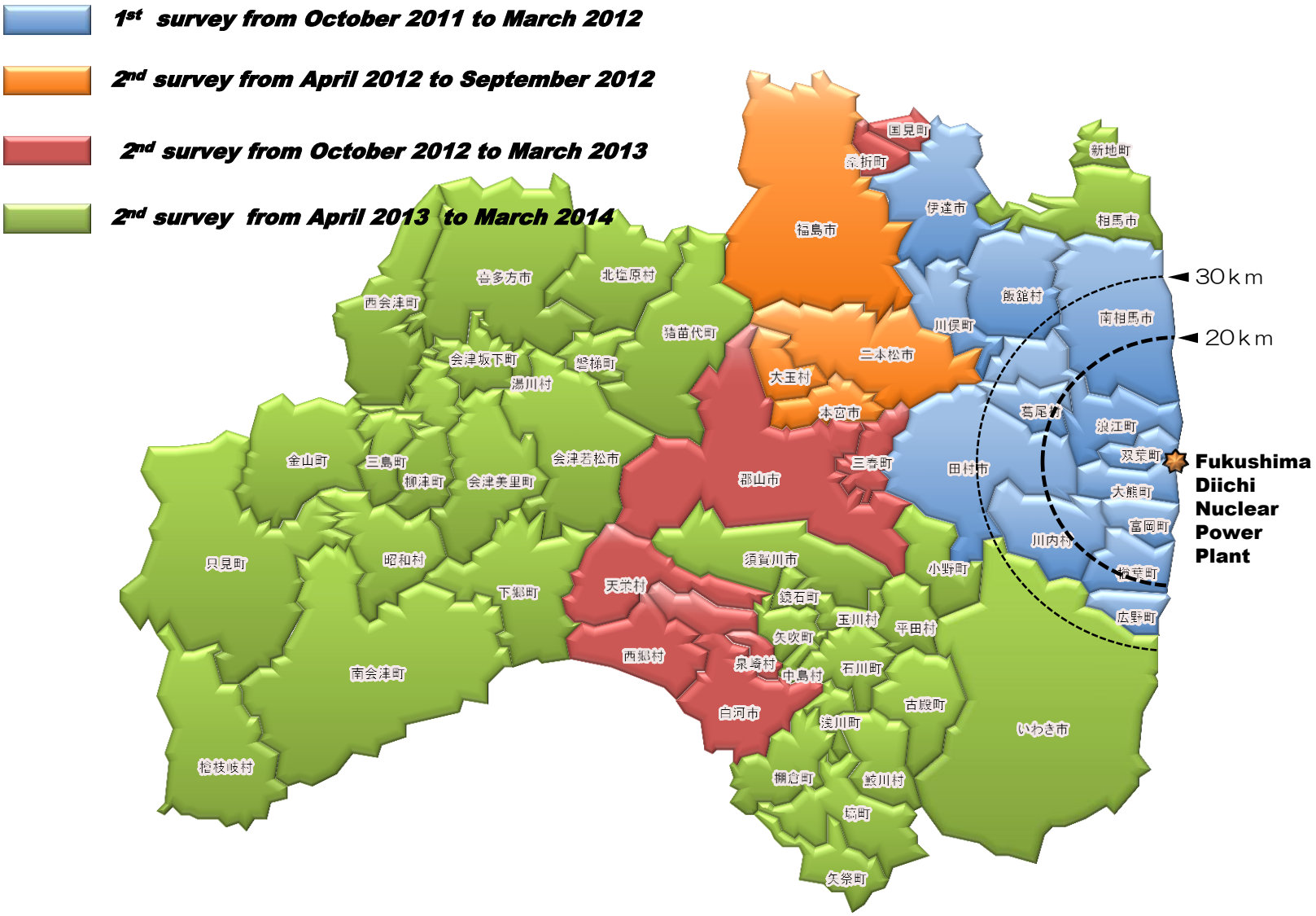
Benign ← **Malignant** → **Surgical Treatment, etc.**

Schedule of Thyroid Ultrasound Examination

- **Preliminary survey: 360,000 from October 2011 to March 2014**
  - **1st survey: from October 2011 to March 2012**
  - **2nd survey: from April 2012 to March 2014**
- **Full scale survey: 360,000 from April, 2014 to end of March 2016**
  - ***Repetition: every 2 years until age 20, and every 5 years after that for life***

The thyroid ultrasound examination was performed one after another at the time of the Nuclear accident on the residents from areas with high atmospheric dose of radioactivity.

Schedule of Preliminary Survey for Thyroid Ultrasound Examination



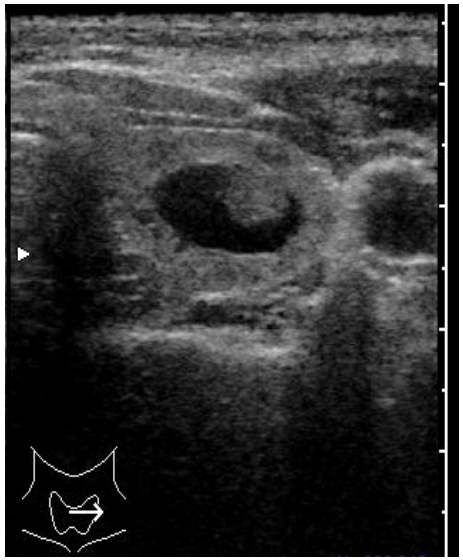
Primary Examination of Thyroid Ultrasound Examination from Oct 9, 2011 at the Fukushima Medical University Hospital

Diagnostic Criteria

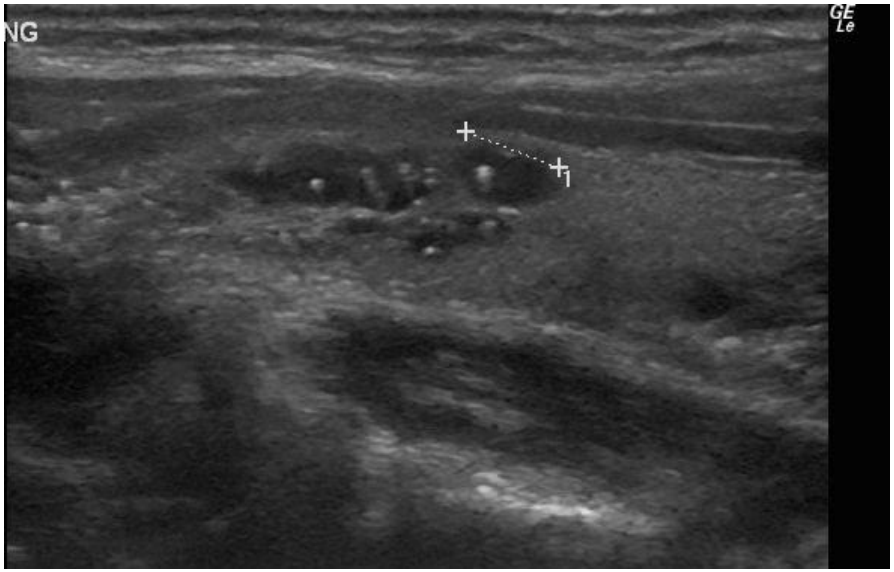
Judgment	Interpretation	recommendation
A	Within normal limits	
(A1)	No nodule and/or Cyst*	next primary examination
(A2)	Nodule with ≤5.0mm** or/and Cyst with ≤20.0mm	next primary examination
B	Nodule with ≥5.1mm or/and Cyst with ≥20.1mm	confirmatory examination
C	Requires immediate examination	urgent confirmatory examination

*Mixed cystic-solid nodule is included in the category of “nodule”.
**Some test results of A2 may be classified as B when clinically indicated.

Criteria of Cyst



Mixed cystic-solid nodule is included in the category of “nodule” in this survey.



Multiple Cysts with colloid clot (Colloid cysts)
This is rare in children aged 5 and under.

In this survey, “cyst” is a simple cyst or colloid cyst referring to normal.

Results of First Screening of Preliminary Survey (1st Survey) from October 9, 2011 to the End of March 2012

Judgment		Interpretation	N	(%)
A subtotal			37,928	99.5%
A	(A1)	No nodule and/or Cyst	24,468	64.2%
	(A2)	Nodule with ≤5.0mm and/or Cyst with ≤20.0mm	13,460	35.3%
B		Nodule with ≥5.1mm and/or Cyst with ≥20.1mm	186	0.5%
C		Requires immediate examination	0	0%
Total			38,114*	

(Data available at http://wwwcms.pref.fukushima.jp/)

** Participation rate :80%*

Results of First Screening of Preliminary Survey from April 2012 to January 2013

Judgment		Interpretation	N	(%)
A subtotal				99.4%
A	(A1)	No nodule and/or Cyst	53,028	55.8%
	(A2)	Nodule with ≤5.0mm and/or Cyst with ≤20.0mm	41,398	43.6%
B		Nodule with ≥5.1mm and/or Cyst with ≥20.1mm	548	0.6%
C		Requires immediate examination	1	0.001 %
Total			94,975*	

(Data available at http://wwwcms.pref.fukushima.jp/)

** Participation rate :85%*

Result of Cysts and Nodules

Test results		October 2011-March 2012		
		Number	Proportion (%)	Total (%)
Nodules	5.1 mm =<	184	0.48	385 (1.01)
	=< 5.0 mm	201	0.53	
Cysts	20.1 mm =<	1	0.003	13,383 (35.11)
	=<20.0 mm	13,382	35.11	

Judgment B

First Screening of Preliminary 1st Survey
from October 9, 2011 to the End of March 2012

Results of Cysts

First Screening of Preliminary 1st Survey
from October 9, 2011 to the End of March 2012

	Total	Male	Female	Class	%
None	24,731	12,891	11,840	A1 (64.9%)	83.3%
< 3.0 mm	7,036	3,552	3,484	A2 (35.1%)	16.7%
3.1-5.0 mm	5,377	2,404	2,973		
5.1-10.0 mm	949	341	608		
10.1-15.0 mm	18	4	14		
15.1-20.0 mm	2	0	2		
20.1-25.0 mm	1	0	1	B (0.003%)	0.003%
25.1 mm <	0	0	0		
Total	38,114	19,192	18,922		

High incidence?

Classification based solely on size of cysts.
Test results C are not included in the table since no single case has been observed to date.
Cysts < 3.0 mm are included in 'None' according to generally accepted classification.

Cysts below 3.0 mm, which are treated as negligible, were found in 7,036 children (18.4 %).

Children with no cysts or cysts below 3.0 mm, when combined, counted 31,767, sharing 83.3% of the total number screened.

Outline of Confirmatory Examination (Second Screening)

1 Procedure
- Confirmatory examination (advanced ultrasound examination, blood test, urine test, and fine needle aspiration biopsy cytology) is performed at Fukushima Medical University (FMU) Hospital
- Those with test results A2 but classified as B as clinically indicated are advised to undergo the confirmatory examination.
- FMU Radiation Medical Science Center contacts residents who require further examination and the confirmatory examination is conducted at an agreed venue on an agreed date.

2 Items
- Detailed ultrasound
- Blood test (TSH, FT-3, FT-4, Tg, Tg-Ab, TPO-Ab)
- Urine test (urinary iodine)
- Fine Needle Aspiration Biopsy and Cytology (FNAC) (in nodules of the thyroid gland suspected to be malignant by detailed ultrasound)

3 Test results
- Results of the confirmatory examination will be informed directly to the patient with detailed explanation

Flow Chart of Thyroid Ultrasound Examination

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LOGIQ e ***Expert***

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Follow-up ← **Criteria** → **FNAC**

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Benign

Malignant → **Surgical Treatment, etc.**

Fine Needle Aspiration Biopsy and Cytology (FNAC)

Secondary Examination (Confirmatory Examination)

started from March 2012

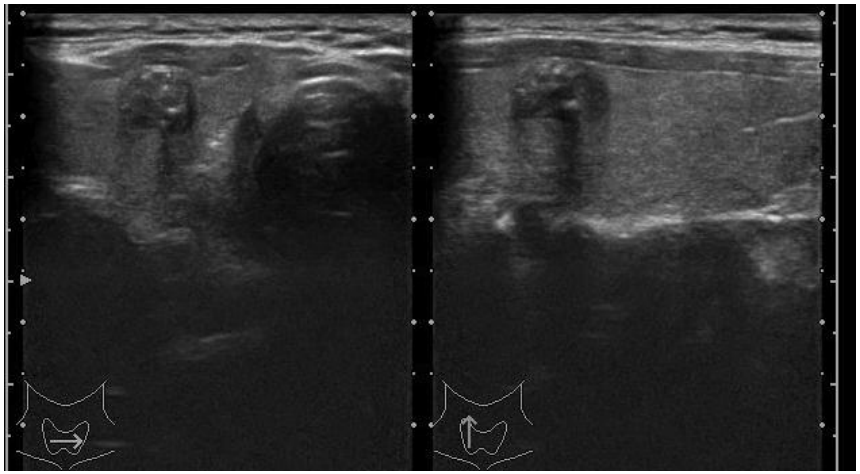
	No. of persons scheduled Secondary Examination (a)	No. of persons Performed Secondary Examination (b)	Implement-ation rate of Secondary Examination (%) (b/a)	No. of Re-examination	No. of Secondary Examination result decision					Total No. of Second Examination
						Down staging ※1		Follow up for usual medical examination※2		
						A1	A2	total	FNAC done	US alone
1st Preliminary Survey	186	162	87.1	11	151	11	22	118	76	42	390
2nd Preliminary Survey	549	56	10.2	20	36	0	12	24	9	15	102
Total	735	218	29.7	31	187	11	34	142	85	57	492

※1 The cases recommended a next full scale survey starting April 2014 as they were re-judged by A1 and A2 to be without abnormal findings.

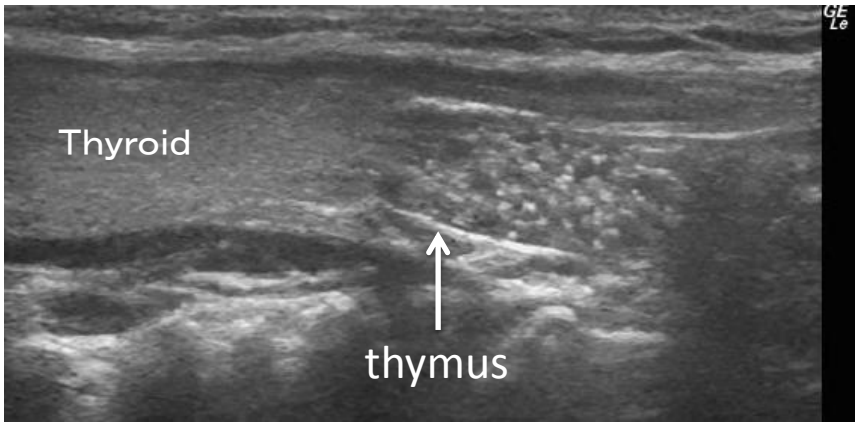
※2 The cases are going to shift to the usual medical examination and be re-consulted in six months or one year.

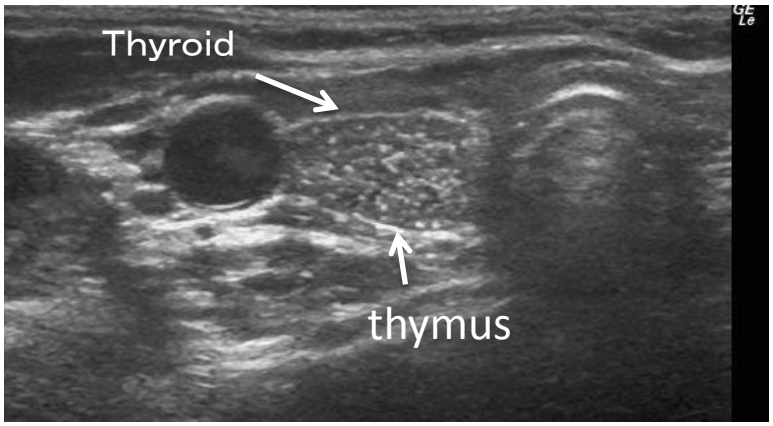
Of the 76 cases in which FNAC was performed in 1st Preliminary Survey, 10 cases were diagnosed as malignant or suspected for malignancy, and thyroid cancer was already confirmed in 3 of the 10 cases after thyroid surgery.

Thyroid cancer and Thymus



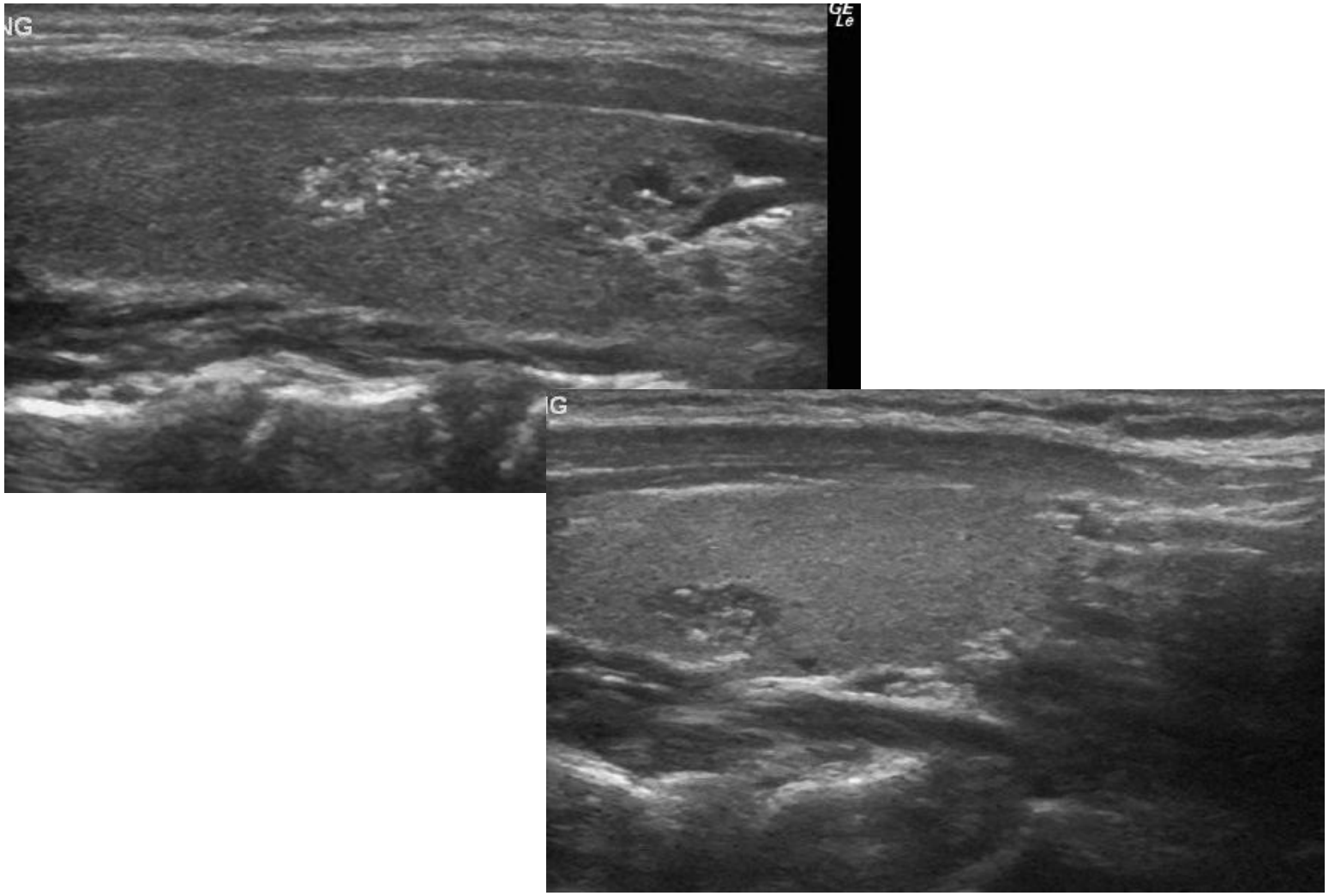
Papillary thyroid carcinoma (adult case)
T1 N0 M0 Stage I



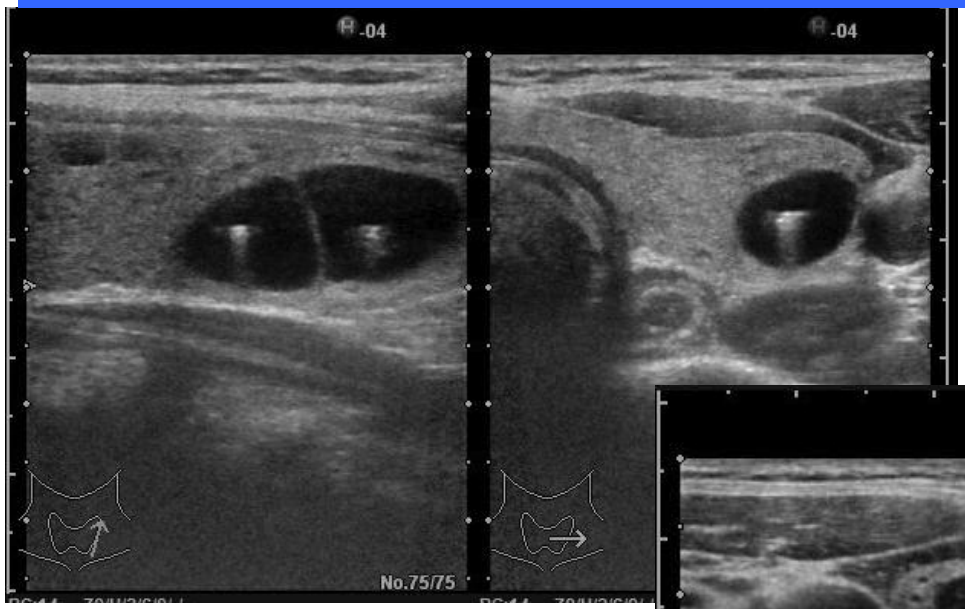


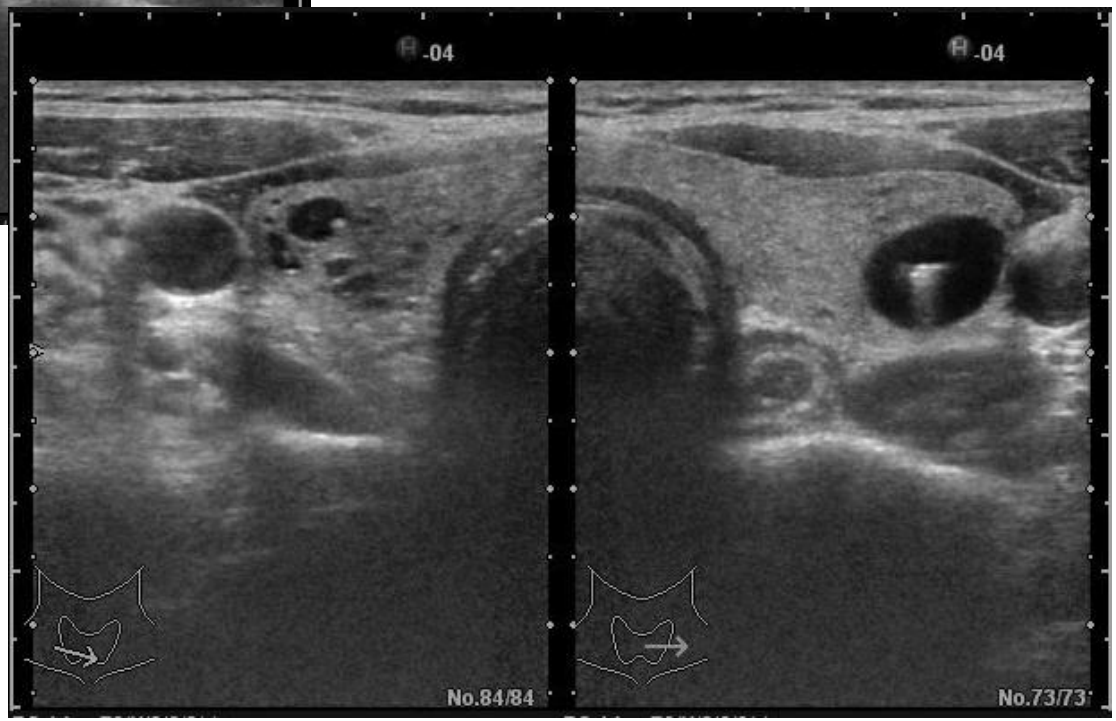
Thymus closed to normal thyroid gland

Ectopic intrathyroidal thymus



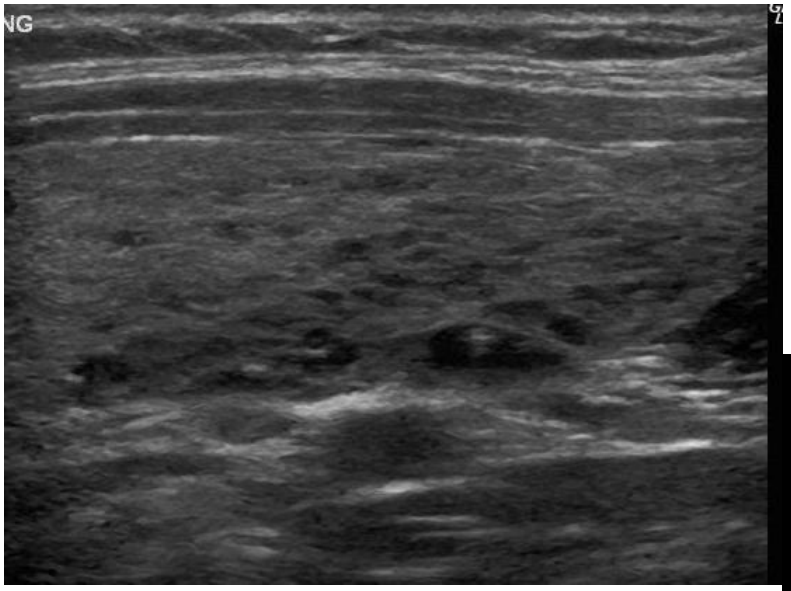
Colloid Cyst
(Cyst with Colloid Clot)

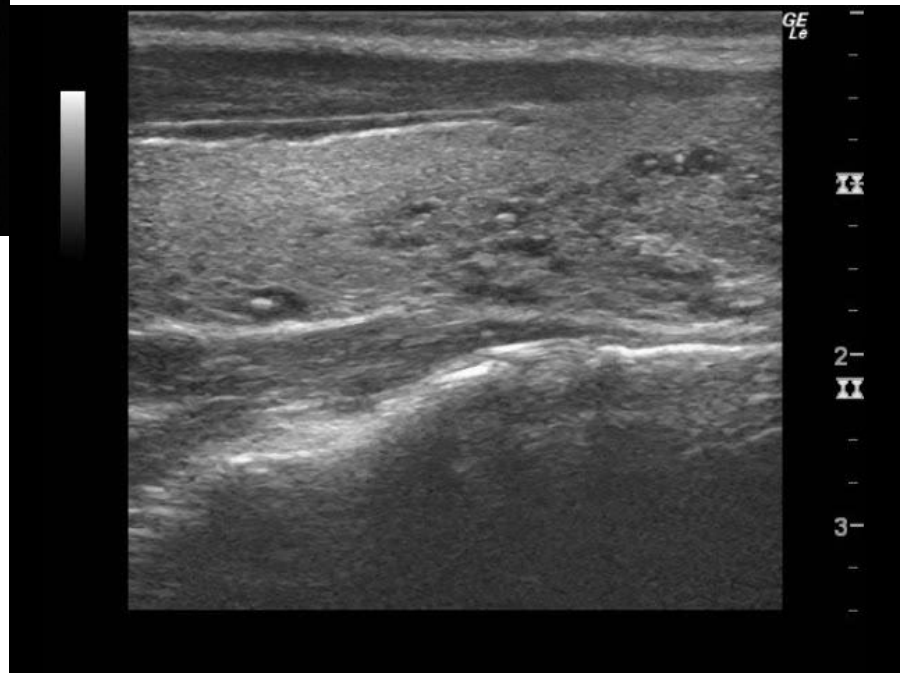




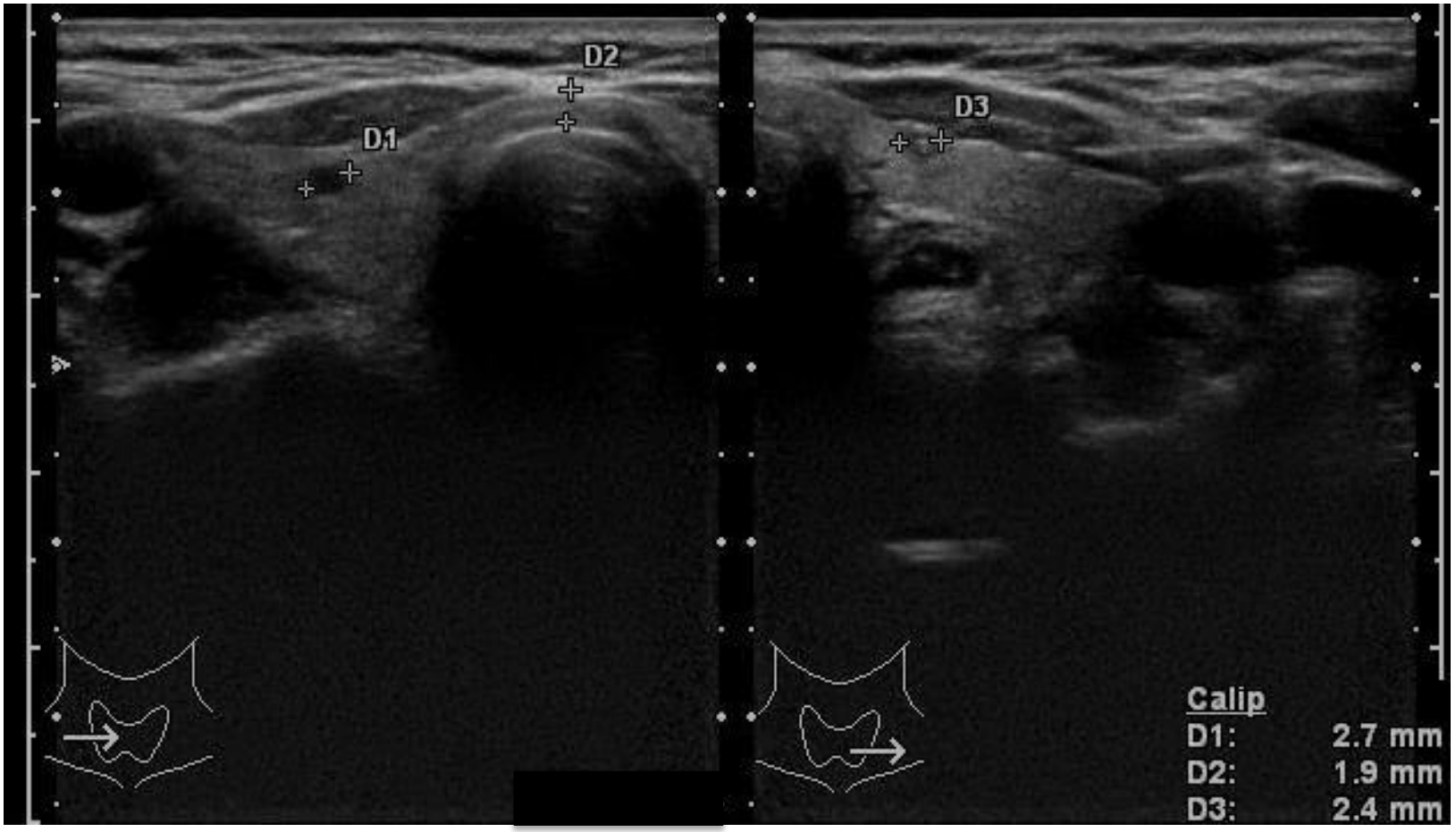
Comet Tail Sign

Colloid Cyst
(Cyst with Colloid Clot)





Case of 3years old girl



A2

Thyroid Ultrasound Examination in the Health Center

Our representative explains to the parents and children about the thyroid ultrasound examination.

Children and their mothers are waiting for the examination.

Thyroid Ultrasound Examination in an elementary schools and a junior high schools

elementary school

Students are listening to the explanation, while waiting for thyroid ultrasound examination.

junior high school

The arrangement of apparatus, and preparation of halls and booths for examinations.

Our staff sets up the hall in a short time themselves just before the examination starts every day with the aid of workers of a transport company .

Transportation of the fixtures for the examination

Conclusion

ふくしまから
はじめよう。
Future From Fukushima.

- ***This long-term large scale thyroid ultrasound examination has begun.***
- ***Thyroid ultrasound examination has been performed on over 150,000 children to date.***
- ***Three of the 38,224 children, who mostly completed the confirmatory examination, were diagnosed with thyroid cancer after surgical treatment, and seven were suspected of malignancy after FNAC.***
- ***This examination is highly sophisticated due to a detection ability of less than 1mm.***
- ***From November 2012, at least one institute was designated as an examination center in each of the 46 prefectures except Fukushima, to serve the approximately 20,000 evacuees living in other prefectures.***