

Clinical THYROIDOLOGY FOR THE PUBLIC



AMERICAN
THYROID
ASSOCIATION
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Peckham S, Lowery D, Spencer S. Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water. *J Epidemiol Community Health*. February 24, 2015 [Epub ahead of print].

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Yu X et al. Iron deficiency, an independent risk factor for isolated hypothyroxinemia in pregnant and nonpregnant women of childbearing age in China. *J Clin Endocrinol Metab*. January 19, 2015 [Epub ahead of print].

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Levothyroxine is the main medication used to treat hypothyroidism. Adequate thyroid hormone replacement in patients taking multiple medications is challenging, as several medications can interfere with levothyroxine. The goal of this study was to determine the extent of drug interactions in patients on long-term levothyroxine therapy.

Irving SA, Vadiveloo T, Leese GP. Drugs that interact with levothyroxine: an observational study from the thyroid

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Kaneshige T et al. Changes in serum iodine concentration, urinary iodine excretion and thyroid function after hysterosalpingography using an oil-soluble iodinated contrast medium (lipiodol). *J Clin Endocrinol Metab*. December 29, 2014 [Epub ahead of print].

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CT scans use ionizing radiation which, in high doses, increases the risk of thyroid cancer. This study used mathematical calculations to see how much radiation is absorbed by the thyroid during a neck CT scan. The calculations were then used to estimate the risk of developing thyroid cancer.

Tipnis SV et al. Thyroid Doses and Risks to Adult Patients Undergoing Neck CT Examinations. *Am J Roentgenol* 2015 May;204(5):1064-8.

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Nell S et al. Qualitative elastography can replace thyroid nodule fine-needle aspiration in patients with soft thyroid nodules. A systematic review and meta-analysis. *Eur J Radiol* 2015;84:652-61. Epub January 16, 2015

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Clinical Thyroidology for the Public

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CLINICAL THYROIDOLOGY FOR THE PUBLIC

A publication of the American Thyroid Association

VOLUME 8 • ISSUE 6 • JUNE 2015

EDITOR'S COMMENTS

Welcome to another issue of *Clinical Thyroidology for the Public*. In this journal, we will bring to you the most up-to-date, cutting edge thyroid research. We will be providing summaries of research studies that were discussed in a recent issue of *Clinical Thyroidology*, a publication of the American Thyroid Association for physicians. These summaries are presented in lay language to allow the rapid dissemination of thyroid research to the widest possible audience. This means that you are getting the latest information on thyroid research and treatment almost as soon as your physicians. As always, we are happy to entertain any suggestions to improve *Clinical Thyroidology for the Public* so let us know what you want to see.

We also provide even faster updates of late-breaking thyroid news through **Twitter** at [@thyroidfriends](https://twitter.com/thyroidfriends) and on **Facebook**. Our goal is to provide patients with the tools to be the most informed thyroid patient in the waiting room.

Also check out our friends in the **Alliance for Thyroid Patient Education**. The Alliance member groups consist of: the *American Thyroid Association*, *Bite Me Cancer*, the *Graves' Disease and Thyroid Foundation*, the *Light of Life Foundation*, *ThyCa: Thyroid Cancer Survivors Association*, *Thyroid Cancer Canada* and *Thyroid Federation International*.

June is Differentiated Thyroid Cancer Month.

In this issue, the studies ask the following questions:

1. Is fluoridated drinking water associated with a higher prevalence of hypothyroidism?
2. Does iron deficiency cause low T₄ levels during pregnancy?
3. What medications interfere with the effectiveness of levothyroxine?
4. Is there a risk of thyroid cancer as a result of exposure to CT scans?
5. Does iodinated contrast given with xrays affect thyroid function?
6. Can a new ultrasound technique replace the need for biopsy in certain thyroid nodules?

We welcome your feedback and suggestions. Let us know what you want to see in this publication. I hope you find these summaries interesting and informative.

— Alan P. Farwell, MD



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HYPOTHYROIDISM

Is fluoridated drinking water associated with a higher prevalence of hypothyroidism?

BACKGROUND

Fluoride is an element that has anti-tooth decay properties. Fluoridation of the water supply is an important public health intervention that has been shown to reduce the rate of tooth decay and dental carries. Drinking water fluoridation at a level between 0.7-1.2 mg/L is widely practiced in the United States and 10% of the population in the United Kingdom is exposed to water fluoridated at about 1 mg/L. Despite the dental benefits, water fluoridation has been a controversial subject over the years. Prominent in the arguments against fluoridation are the effects of fluoride on the thyroid due to some shared properties with iodine. High fluoride exposure (markedly greater than in the water supply) has been associated with hypothyroidism, especially in the setting of iodine deficiency. The aim of this study was to examine whether the prevalence of hypothyroidism differs between fluoridated and non-fluoridated geographical regions in the United Kingdom.

THE FULL ARTICLE TITLE

Peckham S, Lowery D, Spencer S. Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water. *J Epidemiol Community Health*. February 24, 2015 [Epub ahead of print].

SUMMARY OF THE STUDY

The authors studied data from 7935 general practices across the United Kingdom between 2012-2013. They were easily able to identify patients with hypothyroidism within each practice because in the U.K. annual testing of thyroid function is required for those with hypothyroidism by primary care physicians. Patient data was collected

within each practice and included TSH levels and average and maximum water fluoride concentrations. They then used the water fluoride concentrations to try to predict the risk of hypothyroidism within the practice.

The prevalence of hypothyroidism for all practices was ~3%. The odds of a high level of hypothyroidism within a practice was 1.37 times higher in areas with drinking-water fluoride levels of 0.3 to 0.7 mg/L than in those with fluoride levels less than 0.3 mg/L. In addition, the odds of having a high prevalence of hypothyroidism was nearly twice as high in the West Midlands (which as fluoridated drinking water) compared to Greater Manchester (which does not have fluoridated drinking water).

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

These data suggest that people residing in regions with drinking-water fluoridation have a higher risk of developing hypothyroidism than those living in regions without drinking-water fluoridation. The authors feel that these results raise concerns about the safety of community drinking-water fluoridation. However, others are skeptical of this conclusion and highlight significant limitations in the methodology used in this study, as well as the fact that these results are not consistent with previously published literature. Thus, more study is needed to determine if low levels of fluoride in drinking water can affect thyroid function.

— Philip Segal, MD

ATA THYROID BROCHURE LINKS

Hypothyroidism: <http://www.thyroid.org/what-is-hypothyroidism>

ABBREVIATIONS & DEFINITIONS

Hypothyroidism: a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

Fluoride: an element with powerful anti-tooth decay properties. Fluoride also shares some similar properties to iodine.



THYROID AND PREGNANCY

Could isolated hypothyroxinemia in pregnancy be caused by iron deficiency?

BACKGROUND

Isolated hypothyroxinemia is a condition in pregnancy where the T_4 levels in the mother are low but the TSH levels are normal. This does not lead to hypothyroidism in the mother and eventually resolves. The cause of isolated hypothyroxinemia is unknown. However, isolated hypothyroxinemia occurring during early pregnancy may irreversibly damage the brain development of the baby. There is an association between iron deficiency and isolated hypothyroxinemia but it is not clear if this is a cause and effect or if both low T_4 and iron levels are due to another similar cause. The goal of this study was to investigate the association of iron deficiency with thyroid function in women early in their pregnancy and in nonpregnant women.

THE FULL ARTICLE TITLE

Yu X et al. Iron deficiency, an independent risk factor for isolated hypothyroxinemia in pregnant and nonpregnant women of childbearing age in China. *J Clin Endocrinol Metab.* January 19, 2015 [Epub ahead of print].

SUMMARY OF THE STUDY

The study was done in northeast China, a region with adequate iodine intake. The study included 7953 pregnant women at 4 to 12 weeks' of their pregnancy and 2000 women of child-bearing age who were not pregnant. Of these, a subpopulation including 3340 pregnant women and 1052 nonpregnant women with sufficient iodine intake and no evidence of thyroid problems were studied. Hypothyroxinemia were defined as FT_4 levels below the 10th percentile (mild) and the 5th percentile (severe) with a normal TSH. Total body

iron, serum ferritin, and serum transferrin receptor were used as indicators for iron nutrition.

Serum FT_4 levels were significantly lower in both pregnant and nonpregnant women with iron deficiency, as compared with women without iron deficiency. The prevalence of mild and severe hypothyroxinemia was markedly higher in both pregnant and nonpregnant women with iron deficiency than in those without it.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This study suggests an association between iron deficiency and isolated hypothyroxinemia in both pregnant and nonpregnant women of child-bearing age, independently of the effects of iodine and underlying thyroid problems. The authors suggest that iron deficiency may be a cause of the hypothyroxinemia. More studies are needed to examine this association further. Until then, all pregnant women should be taking a prenatal vitamin containing iron. It is unclear whether this recommendation should be expanded to all women of child-bearing age.

— Alan P. Farwell, MD

ATA THYROID BROCHURE LINKS

Thyroid and Pregnancy: <http://www.thyroid.org/thyroid-disease-and-pregnancy>

Thyroid Function Tests: <http://www.thyroid.org/blood-test-for-thyroid>

Hypothyroidism: <http://www.thyroid.org/what-is-hypothyroidism>

ABBREVIATIONS & DEFINITIONS

Hypothyroidism: a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

Thyroxine (T_4): the major hormone produced by the thyroid gland. T_4 gets converted to the active hormone T_3 in various tissues in the body.

TSH: thyroid stimulating hormone — produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.



HYPOTHYROIDISM

TSH needs to be monitored in patients treated with levothyroxine plus multiple other drugs

BACKGROUND

Hypothyroidism is a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment is aimed toward replacing the main hormone of the thyroid, thyroxine. Levothyroxine is the main medication used to treat hypothyroidism. The levels of levothyroxine must be consistent for patients to experience benefits of treatment. Adequate thyroid hormone replacement in patients taking multiple medications is challenging, as several medications can interfere with levothyroxine. For example, some medications may decrease the absorption of levothyroxine from the gut and others slow down its metabolism. The goal of this study was to determine the extent of drug interactions in patients on long-term levothyroxine therapy.

THE FULL ARTICLE TITLE

Irving SA, Vadiveloo T, Leese GP. Drugs that interact with levothyroxine: an observational study from the thyroid epidemiology, audit and research study (TEARS). *Clin Endocrinol (Oxf)* 2015;82:136-141.

SUMMARY OF THE STUDY

In this study, the records of 10,999 patients 18 years old and over from Tayside, Scotland and were prescribed levothyroxine were reviewed before and after starting a medication reported to interfere with levothyroxine. A total 6,482 patients were included in the study. Drugs known to interfere with levothyroxine included iron, calcium, estrogen, proton pump inhibitors and H2 receptor antagonists (reflux medications), statins (cholesterol medications), anti-rheumatic drugs and gluco-

corticoids (steroid medications). Trends in the serum TSH a year before and 6 months following initiation of the interfering drug were recorded.

In patients treated with iron, proton pump inhibitors, calcium, and estrogens, an increase in serum TSH was observed; in some patients the TSH increase exceeded 5 mIU/L. Statins induced a significant decrease in serum TSH levels. Glucocorticoids, H2-receptor antagonists, or anti-rheumatic drugs had no effect on serum TSH.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This large study demonstrates the significant interaction between levothyroxine and iron, calcium, proton pump inhibitors, statins and estrogens. However, as millions of adults are treated with multiple medications including levothyroxine, it is important for endocrinologists to be aware of potential drug interactions that can affect the effectiveness of levothyroxine. Even though some changes in serum TSH may be small, it is essential for the treating physicians to closely monitor patients on multiple medications, as re-adjustments to the levothyroxine dose may be necessary.

— Maria Papaleontiou, MD

ATA THYROID BROCHURE LINKS

Thyroid Hormone Treatment: <http://www.thyroid.org/thyroid-hormone-treatment>

Hypothyroidism: <http://www.thyroid.org/what-is-hypothyroidism>

DEFINITIONS AND ABBREVIATIONS

Levothyroxine (T₄): The major hormone produced by the thyroid gland and available in pill form as Synthroid™, Levoxyl™, Tirosint™ and generic preparations.

Hypothyroidism: A condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

TSH: Thyroid stimulating hormone — produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.

Estrogen: The main female hormone. Estrogen levels are increased during pregnancy.



HYPOTHYROIDISM, continued

Steroids/Glucocorticoids: General anti-inflammatory and immunosuppressive drugs that are commonly used for the treatment of many autoimmune diseases associated with inflammation.

Proton pump inhibitors: A group of drugs whose main action is a pronounced and long-lasting reduction of gastric (stomach) acid production.

H2 receptor antagonists: A class of drugs used to block the action of histamine in the stomach, decreasing the production of acid.

Statins: A class of drugs used to lower cholesterol levels.

Anti-rheumatic drugs: A variety of medications used to treat several forms of inflammatory arthritis.

Differentiated Thyroid Cancer

AWARENESS MONTH
JUNE



THE AMERICAN THYROID ASSOCIATION



IODINE AND THE THYROID

Women who undergo xrays that include iodinated contrast agents should be followed for thyroid dysfunction

BACKGROUND

Iodine is essential for the thyroid gland to produce its hormones. We get iodine from food and iodized salt, but there are many other sources of iodine that may not be so obvious. One of them is the contrast materials used in xray imaging in which a large amount of iodine is given. Whenever an excessive amount of iodine is given to a person, the thyroid gland temporarily decreases thyroid hormone formation. This is a protective mechanism to avoid an increased production in thyroid hormones as a result of the large iodine load given. Typically, after a few days, the thyroid resumes its normal production of thyroid hormone. There is a large amount of evidence that some thyroids may not be able to resume normal functioning after such an exposure, especially in people who have underlying thyroid problems. In these cases, a patient could develop abnormally low levels of thyroid hormone (hypothyroidism).

Hysterosalpingography (HSG) is an xray study of the uterus and is frequently done as an infertility test. A HSG involves the administration of Lipiodol which is an iodine-rich contrast material. The current study was performed in order to understand the changes in iodine and thyroid levels that happen after an HSG, and to evaluate whether Lipiodol may affect thyroid function in women who undergo this test.

THE FULL ARTICLE TITLE

Kaneshige T et al, Changes in serum iodine concentration, urinary iodine excretion and thyroid function after hysterosalpingography using an oil-soluble iodinated contrast medium (lipiodol). *J Clin Endocrinol Metab.* December 29, 2014 [Epub ahead of print].

SUMMARY OF THE STUDY

This study was done in Japan. It enrolled 22 women who had infertility and had a HSG done as part of their evaluation. They did not have any history of thyroid disease.

Other sources of iodine were not found. They had measurements of thyroid hormones, urine and serum iodine at 4, 8, 12 and 24 weeks after the HSG. In addition, 6 women were also evaluated at 9-12 months after.

Of the 22 women, none developed severe hypothyroidism or received thyroid hormone. However, at 4 weeks, 72% of the women had thyroid hormone levels that are not at goal according to current standards for pregnancy, and at 8 weeks, 52% of women still were not back at baseline. Three women (13.6%) had a TSH hormone higher than 5 as early as 4 weeks. (Current guidelines advise a TSH level less than 2.5 for women attempting a pregnancy). The urine and serum iodine also peaked at week 4, but remained significantly elevated up to 24 weeks after the HSG. The T₃ and T₄ hormones did not change significantly.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

This study shows that thyroid hormone levels can be affected by the administration of Lipiodol, an iodine-rich contrast material. Since Lipiodol is administered during a HSG during a fertility evaluation, this may put women at risk of developing mild hypothyroidism at a time when they are trying for a pregnancy. This study suggests that women getting this procedure should have thyroid function monitored closely for at least 24 weeks after the procedure.

— Jessie Block-Galarza, MD

ATA THYROID BROCHURE LINKS

Hypothyroidism: <http://www.thyroid.org/what-is-hypothyroidism>

Iodine Deficiency: <http://www.thyroid.org/iodine-deficiency>

Thyroid Function Tests: <http://www.thyroid.org/blood-test-for-thyroid>



IODINE AND THE THYROID, continued

ABBREVIATIONS & DEFINITIONS

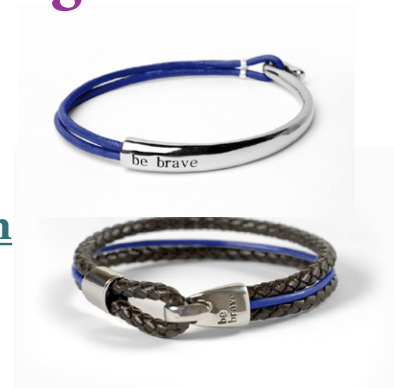
Hypothyroidism: a condition where the thyroid gland is underactive and doesn't produce enough thyroid hormone. Treatment requires taking thyroid hormone pills.

TSH: thyroid stimulating hormone — produced by the pituitary gland that regulates thyroid function; also the best screening test to determine if the thyroid is functioning normally.

Hysterosalpingography (HSG): an xray study of the uterus that is frequently done as an infertility test. A HSG involves the administration of Lipiodol which is an iodine-rich contrast material.

Thyroid Awareness Monthly Campaigns

The ATA will be highlighting a distinct thyroid disorder each month and a portion of the sales for Bravelets™ will be donated to the ATA. The month of June is **Differentiated Thyroid Cancer Month** and a bracelet is available through the [ATA Marketplace](#) to support thyroid cancer awareness and education related to thyroid disease.





THYROID CANCER

Risks of thyroid cancer associated with neck CT scans

BACKGROUND

Over the past few decades, the use of radiologic imaging studies has become increasingly popular. In particular, CT scans are commonly used in the diagnosis of a variety of medical problems. CT scans use ionizing radiation which, in high doses, increases the risk of cancers, specifically thyroid cancer; this has been studied extensively among survivors of atomic bombs, which also emit ionizing radiation, but at much higher energies. Thus, CT scans of the neck may predispose patients to developing thyroid cancer due to the direct exposure of the neck area during the procedure. This study used mathematical calculations to see how much radiation is absorbed by the thyroid during a neck CT scan. The calculations were then used to estimate the risk of developing thyroid cancer based on the patient's age and sex at the time of the neck CT scan.

THE FULL ARTICLE TITLE

Tipnis SV et al. Thyroid Doses and Risks to Adult Patients Undergoing Neck CT Examinations. *Am J Roentgenol* 2015 May;204(5):1064-8.

SUMMARY OF THE STUDY

This study was done at a single medical center of 68 adult patients who received a single neck CT scan. The researchers calculated the size of the patients' necks, thyroid glands, and how much radiation was absorbed by the thyroid gland as a result of the procedure. The main findings were that the dose of radiation corresponded to

the age and sex of the patient, with higher risks of thyroid cancer among patients who were younger and female. For example, a 20-year old woman had about 6 times the risk of developing thyroid cancer (0.2%) as a 20-year old man. These risks were lower in both men and women if they were older at the time of the neck CT scan.

WHAT ARE THE IMPLICATIONS OF THIS STUDY?

The results of this study suggest that neck CT scans contribute some small, but increased, risks toward the development of thyroid cancer, especially in patients who are younger and female. The findings confirm what is already well-understood from studies of childhood survivors of atomic bombs, such as those which occurred at Chernobyl, Hiroshima, and Nagasaki. Patients who are concerned about the radiation risks of CT scans should discuss with their physician the risks and benefits of having the study done.

— Angela M. Leung, MD, MSc

ATA THYROID BROCHURE LINKS

Thyroid cancer: <http://www.thyroid.org/cancer-of-the-thyroid-gland>

Childhood Head and Neck Irradiation: <http://www.thyroid.org/pediatric-endocrinology>

ABBREVIATIONS & DEFINITIONS

Ionizing radiation: radiation that can damage cells, causing cell death or mutation. It can originate from radioactive materials, x-ray tubes or specialized machines. It is invisible and not directly detectable by human senses.

Computerized tomography (CT) scans: radiology xray study that operates by using ionizing radiation to get a picture of tissues of the body. CT scan are often done using contrast material that contains high amounts of iodine.



THYROID NODULES

Qualitative ultrasound elastography holds promise for avoiding biopsy in some thyroid nodules

BACKGROUND

Thyroid nodules are exceedingly common, found in up to 50% of the population on ultrasound. Ultrasound evaluation is a mainstay in the evaluation of thyroid nodules. However, ultrasound appearance alone is not yet good enough to make a diagnosis. Most nodules still require a biopsy in ruling out thyroid cancer. Even thyroid biopsy has some limitations which require further testing or surgery. Quantitative elastography is an ultrasound technique to measure the stiffness or softness of a nodule. Cancerous nodules are stiffer than benign nodules. The goal of the study is to determine how accurate elastography is in determining if the nodule is benign or cancerous.

THE FULL ARTICLE TITLE

Nell S et al Qualitative elastography can replace thyroid nodule fine-needle aspiration in patients with soft thyroid nodules. A systematic review and meta-analysis. Eur J Radiol 2015;84:652-61. Epub January 16, 2015

SUMMARY OF THE STUDY

This is a meta-review of 20 previously reported studies including 3908 thyroid nodules referred for biopsy, qualitative elastography, and a reference test such as histology or cytology. All nodules in the study were classified in the Asteria elastography (ES) classification as

follows: ES 1 nodules are soft in their entirety, ES 4 are hard nodules and ES 2 and ES 3 have varying levels of hardness. ES 1 and ES 2 nodules were considered to show benign characteristics while ES 3 and ES 4 nodules were considered to show cancerous characteristics. Approximately 62% of the nodules were ES 1 or ES 2 and nodules classified as ES 1 were 99% benign. The ES 3 and 4 nodules were suggestive to be cancerous but not with the certainty that would avoid a biopsy and allow proceeding directly to surgery.

IMPLICATIONS OF THE STUDY

This study suggests that soft thyroid nodules (ES 1 classification) are 99% benign and would, thus, eliminate the need for biopsy in approximately 14% of thyroid nodules. Nodules classified as ES2 were suggestive but not as conclusive of a benign nodule. Overall, this study suggests that quantitative elastography can be an important tool in the evaluation of thyroid nodules and may allow some patients to avoid a thyroid biopsy.

— Julie Hallanger Johnson, MD

ATA BROCHURE LINKS

Thyroid Nodules: <http://www.thyroid.org/what-are-thyroid-nodules>

ABBREVIATIONS & DEFINITIONS

Thyroid nodule: an abnormal growth of thyroid cells that forms a lump within the thyroid. While most thyroid nodules are non-cancerous (Benign), ~5% are cancerous.

Thyroid Ultrasound: a common imaging test used to evaluate the structure of the thyroid gland. Ultrasound uses soundwaves to create a picture of the structure of the thyroid gland and accurately identify and characterize nodules within the thyroid. Ultrasound is also frequently used to guide the needle into a nodule during a thyroid nodule biopsy.

Elastography: an ultrasound technique used to measure the stiffness of a thyroid nodule. Cancerous nodules are stiffer than benign nodules.

Thyroid fine needle aspiration biopsy (FNAB): a simple procedure that is done in the doctor's office to determine if a thyroid nodule is benign (non-cancerous) or cancer. The doctor uses a very thin needle to withdraw cells from the thyroid nodule. Patients usually return home or to work after the biopsy without any ill effects.

Meta-review: a study that combines and analyzes the data from several other studies addressing the same research hypothesis.



ATA Alliance for Thyroid Patient Education

GOAL

The goal of our organizations is to provide accurate and reliable information for patients about the diagnosis, evaluation and treatment of thyroid diseases.

We look forward to future collaborations and continuing to work together towards the improvement of thyroid education and resources for patients.

WHO WE ARE (in alphabetical order)

- **American Thyroid Association**
- **Bite Me Cancer**
- **Graves' Disease and Thyroid Foundation**
- **Light of Life Foundation**
- **ThyCa: Thyroid Cancer Survivors' Association, Inc.**
- **Thyroid Cancer Canada**
- **Thyroid Federation International**

AMERICAN THYROID ASSOCIATION

www.thyroid.org

ATA Patient Resources: <http://www.thyroid.org/patients/>

Find a Thyroid Specialist: www.thyroid.org

Phone (toll-free): 1-800-THYROID

e-mail: thyroid@thyroid.org

ATA Mission: The ATA leads in promoting thyroid health and understanding thyroid biology.

ATA Vision: The ATA is the leading organization focused on thyroid biology and the prevention and treatment of thyroid disorders through excellence and innovation in research, clinical care, education, and public health.

ATA Values: The ATA values scientific inquiry, clinical excellence, public service, education, collaboration, and collegiality.

To further our mission, vision and values the ATA sponsors "Friends of the ATA" online to advance the information provided to patients and the public such as this publication, *Clinical Thyroidology for the Public*. We welcome your support.

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ThyCa: Thyroid Cancer
Survivors' Association, Inc.SM
www.thyca.org





ATA Alliance for Thyroid Patient Education

Continued...

BITE ME CANCER

<http://www.bitemecancer.org>

Bite Me Cancer was formed as a nonprofit foundation in September, 2010, by Nikki Ferraro, who was 17-years old at the time. Nikki was diagnosed with a rare form of thyroid cancer in April 2010 when she was a junior at Chantilly HS in Virginia. Nikki was determined to lead a Relay for Life team just two weeks after her diagnosis. She named the team Bite Me Cancer and experienced immediate success. When Nikki decided to create a foundation a few months later, she wanted to continue the legacy of her team name and thus her foundation became the Bite Me Cancer Foundation.

e-mail: info@bitemecancer.org

GRAVES' DISEASE AND THYROID FOUNDATION

www.gdatf.org

Phone (toll-free): 1-877-NGDF-123 or 643-3123

e-mail: Gravesdiseasefd@gmail.com

Founded in 1990, the Graves' Disease Foundation offers support and resources to Graves' disease patients, their families, and health care professionals. Their mission is to find the cause of and the cure for Graves' thyroid disease through research, to improve the quality of life for persons with Graves' disease and their caregivers and to educate persons with Graves' disease, their caregivers, healthcare professionals, and the general public about Graves' disease and its treatment. The web site features a monitored bulletin board.

LIGHT OF LIFE FOUNDATION

www.checkyourneck.com

email: info@checkyourneck.com

The Light of Life Foundation, founded in 1997, is a nonprofit organization that strives to improve the quality of life for thyroid cancer patients, educate the public and professionals about thyroid cancer, and promote research and development to improve thyroid cancer care.

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ThyCa: Thyroid Cancer
Survivors' Association, Inc.SM
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ATA Alliance for Thyroid Patient Education

Continued...

THYCA: THYROID CANCER SURVIVORS' ASSOCIATION, INC.

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ThyCa: Thyroid Cancer Survivors' Association, Inc., founded in 1995, is an international nonprofit organization, guided by a medical advisory council of renowned thyroid cancer specialists, offering support and information to thyroid cancer survivors, families, and health care professionals worldwide.

THYROID CANCER CANADA

www.thyroidcancercanada.org

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Thyroid Cancer Canada is a non-profit organization founded in 2000. The organization works towards creating an environment in which people who are dealing with thyroid cancer, especially the newly diagnosed, are met with support and information. Their goals & objectives include facilitating communication among thyroid cancer patients, providing credible information about the disease, providing emotional support, and assisting thyroid cancer patients with voicing their needs to health care professionals and those who are responsible for health care policy.

THYROID FEDERATION INTERNATIONAL

<http://www.thyroid-fed.org/>

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Thyroid Federation International (TFI) was established in Toronto in 1995. Thyroid Federation International aims to work for the benefit of those affected by thyroid disorders throughout the world by providing a network of patient support organizations.



AMERICAN
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ThyCa: Thyroid Cancer
Survivors' Association, Inc.SM
www.thyca.org



Thyroid Nodules

WHAT IS THE THYROID GLAND?

The thyroid gland is a butterfly-shaped endocrine gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid hormones, which are secreted into the blood and then carried to every tissue in the body. Thyroid hormone helps the body use energy, stay warm and keep the brain, heart, muscles, and other organs working as they should.

WHAT IS A THYROID NODULE?

The term thyroid nodule refers to an abnormal growth of thyroid cells that forms a lump within the thyroid gland. Although the vast majority of thyroid nodules are benign (noncancerous), a small proportion of thyroid nodules do contain thyroid cancer. In order to diagnose and treat thyroid cancer at the earliest stage, most thyroid nodules need some type of evaluation.

WHAT ARE THE SYMPTOMS OF A THYROID NODULE?

Most thyroid nodules do not cause symptoms. Often, thyroid nodules are discovered incidentally during a routine physical examination or on imaging tests like CT scans or neck ultrasound done for completely unrelated reasons. Occasionally, patients themselves find thyroid nodules by noticing a lump in their neck while looking in a mirror, buttoning their collar, or fastening a necklace. Abnormal thyroid function tests may occasionally be the reason a thyroid nodule is found. Thyroid nodules may produce excess amounts of thyroid hormone causing hyperthyroidism (see *Hyperthyroidism brochure*). However, most thyroid nodules, including those that cancerous, are actually non-functioning, meaning tests like TSH are normal. Rarely, patients with thyroid nodules may complain of pain in the neck, jaw, or ear. If a nodule is large enough to compress the windpipe or esophagus, it may cause difficulty with breathing, swallowing, or cause a "tickle in the throat". Even less commonly, hoarseness can be caused if the nodule invades the nerve that controls the vocal cords but this is usually related to thyroid cancer.

The important points to remember are the following:

- Thyroid nodules generally do not cause symptoms.
- Thyroid tests are most typically normal—even when cancer is present in a nodule.
- The best way to find a thyroid nodule is to make sure your doctor checks your neck!

WHAT CAUSES THYROID NODULES AND HOW COMMON ARE THEY?

We do not know what causes most thyroid nodules but they are extremely common. By age 60, about one-half of all people have a thyroid nodule that can be found either through examination or with imaging. Fortunately, over 90% of such nodules are benign. Hashimoto's thyroiditis, which is the most common cause of hypothyroidism (see *Hypothyroidism brochure*), is associated with an increased risk of thyroid nodules. Iodine deficiency, which is very uncommon in the United States, is also known to cause thyroid nodules.

HOW IS A THYROID NODULE EVALUATED AND DIAGNOSED?

Once the nodule is discovered, your doctor will try to determine whether the rest of your thyroid is healthy or whether the entire thyroid gland has been affected by a more general condition such as hyperthyroidism or hypothyroidism. Your physician will feel the thyroid to see whether the entire gland is enlarged and whether a single or multiple nodules are present. The initial laboratory tests may include measurement of thyroid hormone (thyroxine, or T4) and thyroid-stimulating hormone (TSH) in your blood to determine whether your thyroid is functioning normally.

Since it's usually not possible to determine whether a thyroid nodule is cancerous by physical examination and blood tests alone, the evaluation of the thyroid nodules often includes specialized tests such as thyroid ultrasonography and fine needle biopsy.

Thyroid Nodules

THYROID ULTRASOUND:

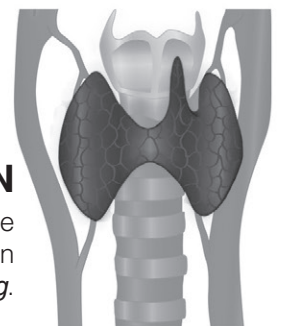
Thyroid ultrasound is a key tool for thyroid nodule evaluation. It uses high-frequency sound waves to obtain a picture of the thyroid. This very accurate test can easily determine if a nodule is solid or fluid filled (cystic), and it can determine the precise size of the nodule. Ultrasound can help identify suspicious nodules since some ultrasound characteristics of thyroid nodules are more frequent in thyroid cancer than in noncancerous nodules. Thyroid ultrasound can identify nodules that are too small to feel during a physical examination. Ultrasound can also be used to accurately guide a needle directly into a nodule when your doctor thinks a fine needle biopsy is needed. Once the initial evaluation is completed, thyroid ultrasound can be used to keep an eye on thyroid nodules that do not require surgery to determine if they are growing or shrinking over time. The ultrasound is a painless test which many doctors may be able to perform in their own office.

THYROID FINE NEEDLE ASPIRATION BIOPSY (FNA OR FNAB):

A fine needle biopsy of a thyroid nodule may sound frightening, but the needle used is very small and a local anesthetic may not even be necessary. This simple procedure is often done in the doctor's office. Sometimes, medications like blood thinners may need to be stopped for a few days before to the procedure. Otherwise, the biopsy does not usually require any other special preparation (no fasting). Patients typically return home or to work after the biopsy without even needing a bandaid! For a fine needle biopsy, your doctor will use a very thin needle to withdraw cells from the thyroid nodule. Ordinarily, several samples will be taken from different parts of the nodule to give your doctor the best chance of finding cancerous cells if they are present. The cells are then examined under a microscope by a pathologist.

The report of a thyroid fine needle biopsy will usually indicate one of the following findings:

1. The nodule is benign (noncancerous).
 - This result is obtained in up to 80% of biopsies. The risk of overlooking a cancer when the biopsy is benign is generally less than 3 in 100 tests or 3%. This is even lower when the biopsy is reviewed by an experienced pathologist at a major medical center. Generally, benign thyroid nodules do not need to be removed unless they are causing symptoms like choking or difficulty swallowing. Follow up ultrasound exams are important. Occasionally, another biopsy may be required in the future, especially if the nodule grows over time.
2. The nodule is malignant (cancerous) or suspicious for malignancy .
 - A malignant result is obtained in about 5% of biopsies and is most often due to papillary cancer, which is the most common type of thyroid cancer. A suspicious biopsy has a 50-75% risk of cancer in the nodule. These diagnoses require surgical removal of the thyroid after consultation with your endocrinologist and surgeon.
3. The nodule is indeterminate. This is actually a group of several diagnoses that may occur in up to 20% of cases. An Indeterminate finding means that even though an adequate number of cells was removed during the fine needle biopsy, examination with a microscope cannot reliably classify the result as benign or cancer.
 - The biopsy may be indeterminate because the nodule is described as a Follicular Lesion. These nodules are cancerous 20-30% of the time. However, the diagnosis can only be made by surgery. Since the odds that the nodule is not a cancer are much better here (70-80%), only the side of the thyroid with the nodule is usually removed. If a cancer is found, the remaining thyroid gland usually must be removed as well. If the surgery confirms that no cancer is present, no additional surgery to "complete" the thyroidectomy is necessary.
 - The biopsy may also be indeterminate because the cells from the nodule have features that cannot be placed in one of the other diagnostic categories. This diagnosis is called atypia, or a follicular lesion of undetermined significance. Diagnoses in this category will contain cancer rarely, so repeat evaluation with FNA or surgical biopsy to remove half of the thyroid containing the nodule is usually recommended.
4. The biopsy may also be nondiagnostic or inadequate. This result is obtained in less than 5% of cases when an ultrasound is used to guide the FNA. This result indicates that not enough cells were obtained to make a diagnosis but is a common result if the nodule is a cyst. These nodules may require reevaluation with second fine needle biopsy, or may need to be removed surgically depending on the clinical judgment of your doctor.



FURTHER INFORMATION

Further details on this and other thyroid-related topics are available in the patient information section on the American Thyroid Association® website at www.thyroid.org.

Thyroid Nodules

NUCLEAR THYROID SCANS:

Nuclear scanning of the thyroid was frequently done in the past to evaluate thyroid nodules. However, use of thyroid ultrasound and biopsy have proven so accurate and sensitive, nuclear scanning is no longer considered a first-line method of evaluation. Nuclear scanning still has an important role in the evaluation of rare nodules that cause hyperthyroidism. In this situation, the nuclear thyroid scan may suggest that no further evaluation or biopsy is needed. In most other situations, neck ultrasound and biopsy remain the best and most accurate way to evaluate all types of thyroid nodules.

MOLECULAR DIAGNOSTICS:

Can any other tests assist in evaluation of thyroid nodules?

Yes! While still mainly research tests and not widely available, new tests that examine genes in the DNA of thyroid nodules are being developed. These tests can provide helpful information about whether cancer may be present or absent. These tests are particularly helpful when the specimen evaluated by the pathologist is indeterminate. These specialized tests are done on samples obtained during the normal biopsy process. There are also specialized blood tests that can assist in the evaluation of thyroid nodules. These are currently available only at highly specialized medical centers, however, their availability is increasing rapidly. Ask your doctor if these tests are available and might be helpful for evaluating your thyroid nodule.

HOW ARE THYROID NODULES TREATED?

All thyroid nodules that are found to contain a thyroid cancer, or that are highly suspicious of containing a cancer, should be removed surgically by an experienced thyroid surgeon. Most thyroid cancers are curable and rarely cause life-threatening problems (see *Thyroid Cancer brochure*). Thyroid nodules that are benign by FNA or too small to biopsy should still be watched closely with ultrasound examination every 6 to 12 months and annual physical examination by your doctor. Surgery may still be recommended even for a nodule that is benign by FNA if it continues to grow, or develops worrisome features on ultrasound over the course of follow up.



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