





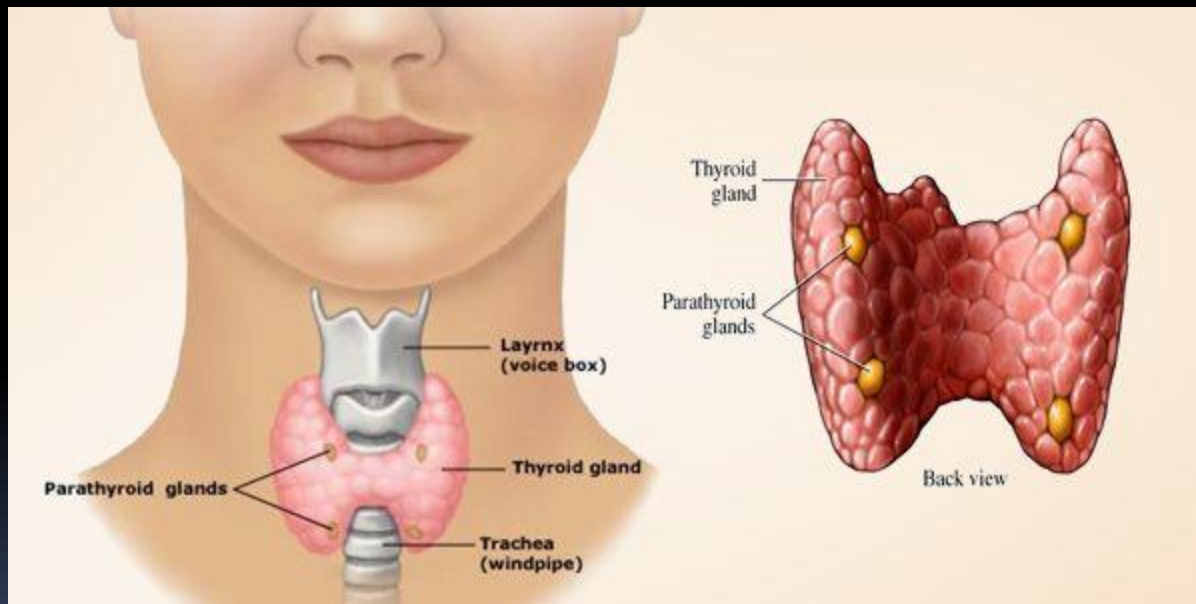
Thyroid gland cold nodule



Prof . Dr / Alaa El Suity

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- Introduction:
 - Cold nodule is a nodule in the thyroid gland that not take too much of the ionized cells in thyroid scan
 - Has a possibility 20% of being a malignant
 - Could be confirmed (either benign or malignant) by biopsy (either aspiration, fine needle or true cut)

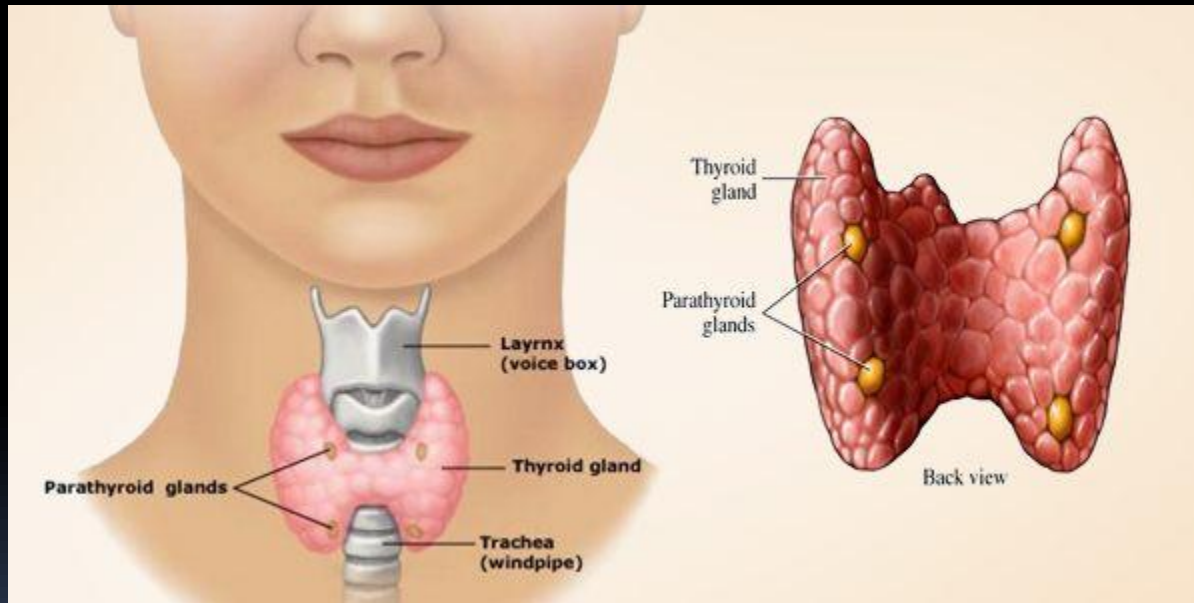
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- What will be discussed:
 - Anatomy and physiology of thyroid gland
 - Investigations for different thyroid diseases
 - Thyroid scan in detail
 - Results of thyroid scan
 - Management of thyroid nodule
 - References


- Anatomy and physiology of thyroid gland




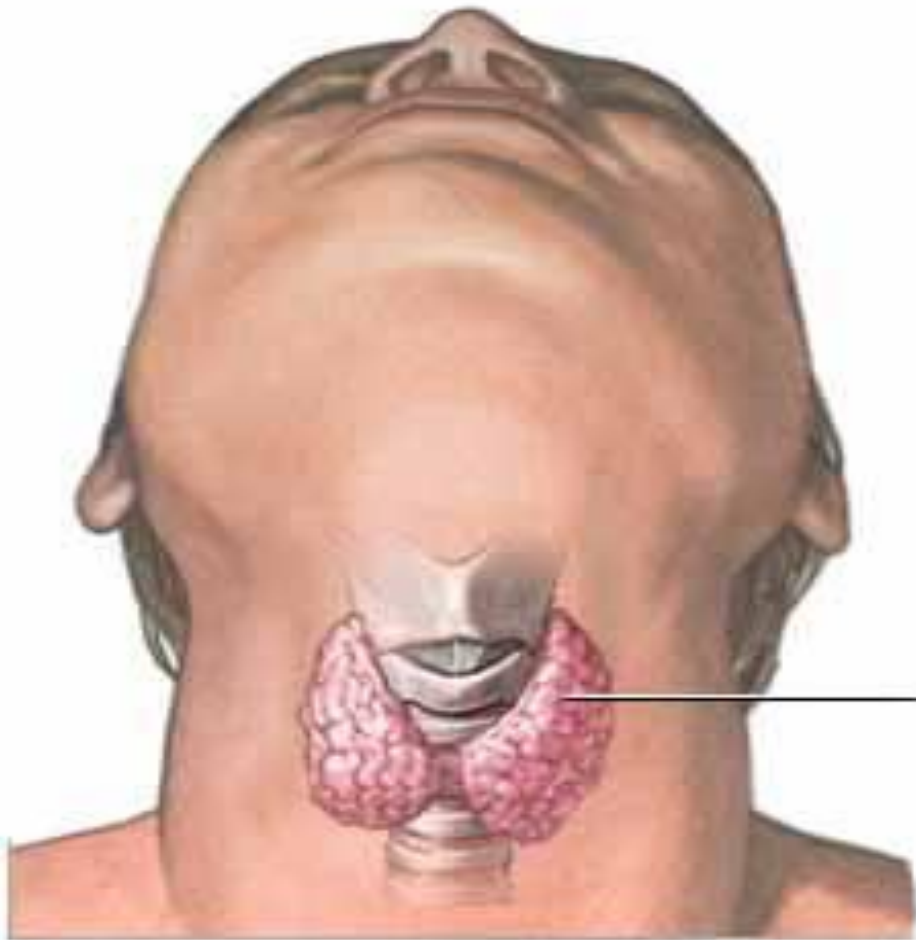


he thyroid gland is a butterfly-shaped organ located in the base of your neck. It releases hormones that control metabolism—the way your body uses energy. The thyroid's hormones regulate vital body functions, including:



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- Breathing
 - Heart rate
 - Central and peripheral nervous systems
 - Body weight
 - Muscle strength
 - Menstrual cycles
 - Body temperature
 - Cholesterol levels
 - Much more!

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- The thyroid gland is about 2-inches long and lies in front of your throat below the prominence of thyroid cartilage sometimes called the Adam's apple. The thyroid has two sides called lobes that lie on either side of your windpipe, and is usually connected by a strip of thyroid tissue known as an isthmus. Some people do not have an isthmus, and instead have two separate thyroid lobes.




Thyroid gland

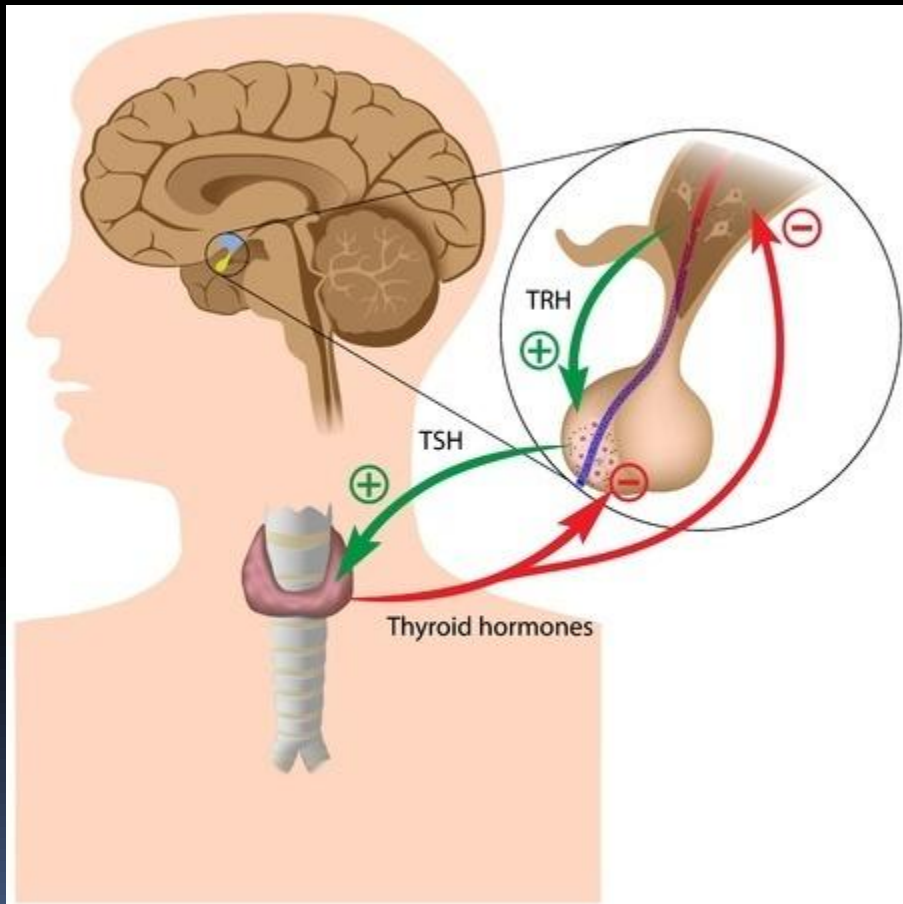


- **How the Thyroid Gland Works**

The thyroid is part of the endocrine system, which is made up of glands that produce, store, and release hormones into the bloodstream so the hormones can reach the body's cells. The thyroid gland uses iodine from the foods you eat to make two main hormones:

- Triiodothyronine (T₃)
- Thyroxine (T₄)

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- It is important that T_3 and T_4 levels are neither too high nor too low. Two glands in the brain—the hypothalamus and the pituitary communicate to maintain T_3 and T_4 balance.
 - The hypothalamus produces TRH (Thyrotropin Releasing Hormone) that signals the pituitary to tell the thyroid gland to produce more or less of T_3 and T_4 by either increasing or decreasing the release of a hormone called thyroid stimulating hormone (TSH).
 - When T_3 and T_4 levels are low in the blood, the pituitary gland releases more TSH to tell the thyroid gland to produce more thyroid hormones.
 - If T_3 and T_4 levels are high, the pituitary gland releases less TSH to the thyroid gland to slow production of these hormones.

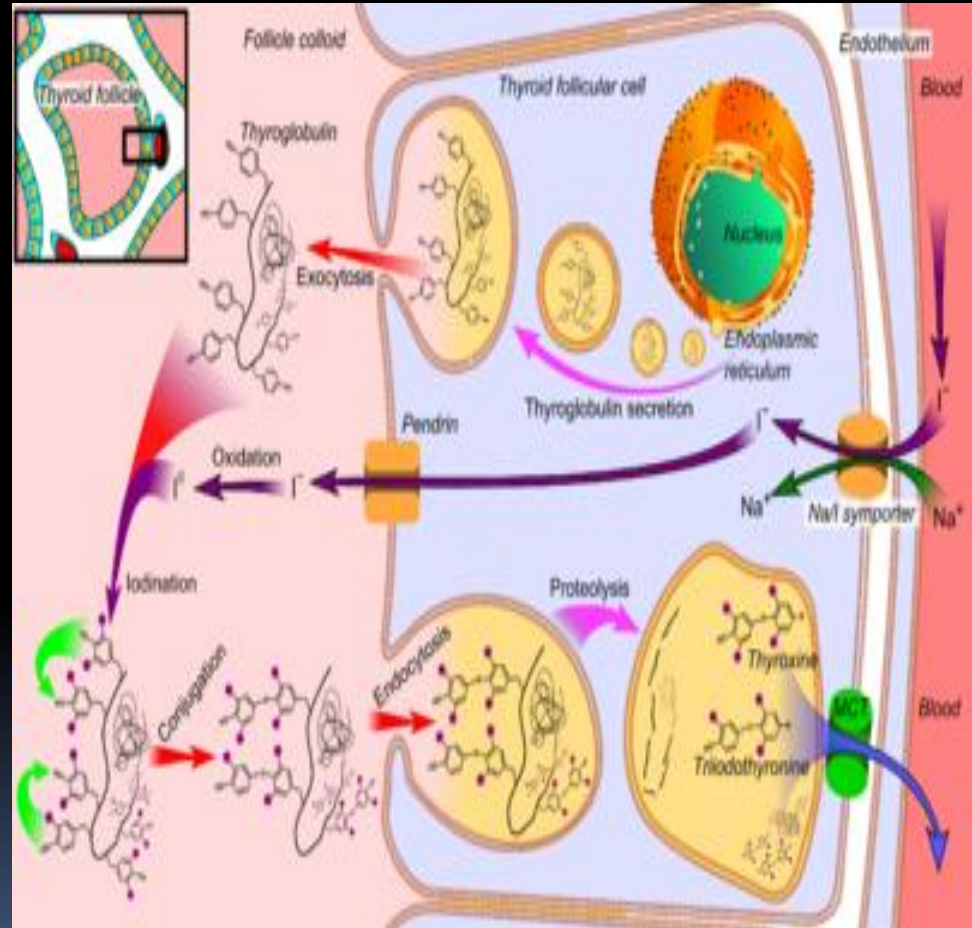
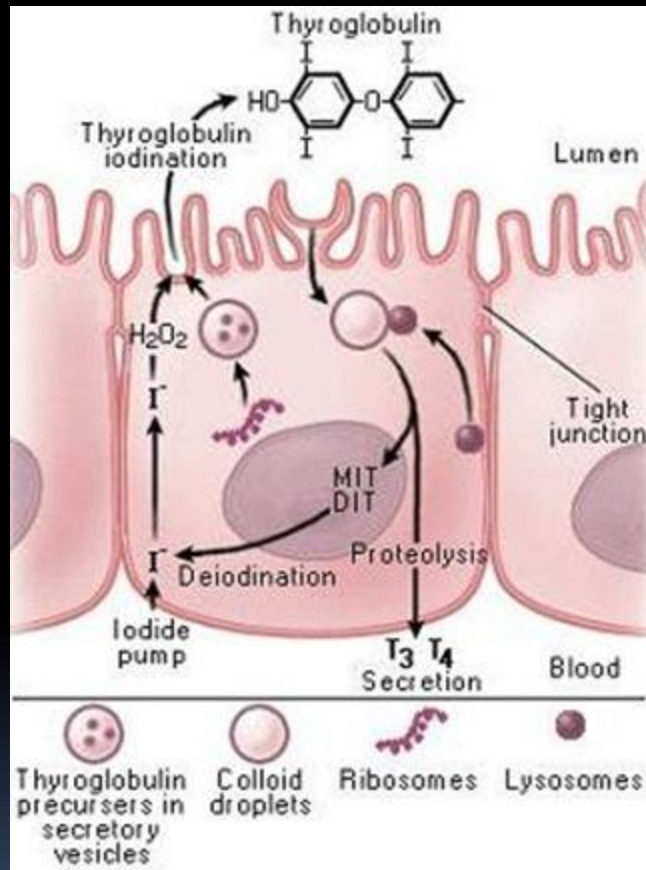






- **Why You Need a Thyroid Gland**


T₃ and T₄ travel in your bloodstream to reach almost every cell in the body. The hormones regulate the speed with which the cells/metabolism work. For example, T₃ and T₄ regulate your heart rate and how fast your intestines process food. So if T₃ and T₄ levels are low, your heart rate may be slower than normal, and you may have constipation/weight gain. If T₃ and T₄ levels are high, you may have a rapid heart rate and diarrhea/weight loss.

Thyroid hormone synthesis

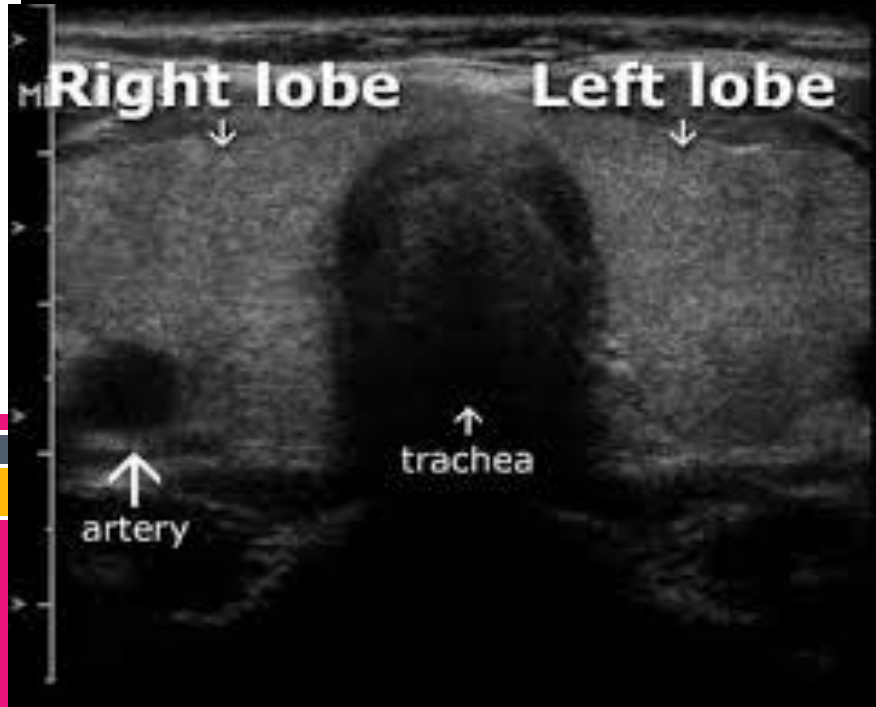


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- Listed below are other symptoms of *too much* T₃ and T₄ in your body (hyperthyroidism):
 - Anxiety
 - Irritability or moodiness
 - Nervousness, hyperactivity
 - Sweating or sensitivity to high temperatures
 - Hand trembling (shaking)
 - Hair loss
 - Missed or light menstrual periods

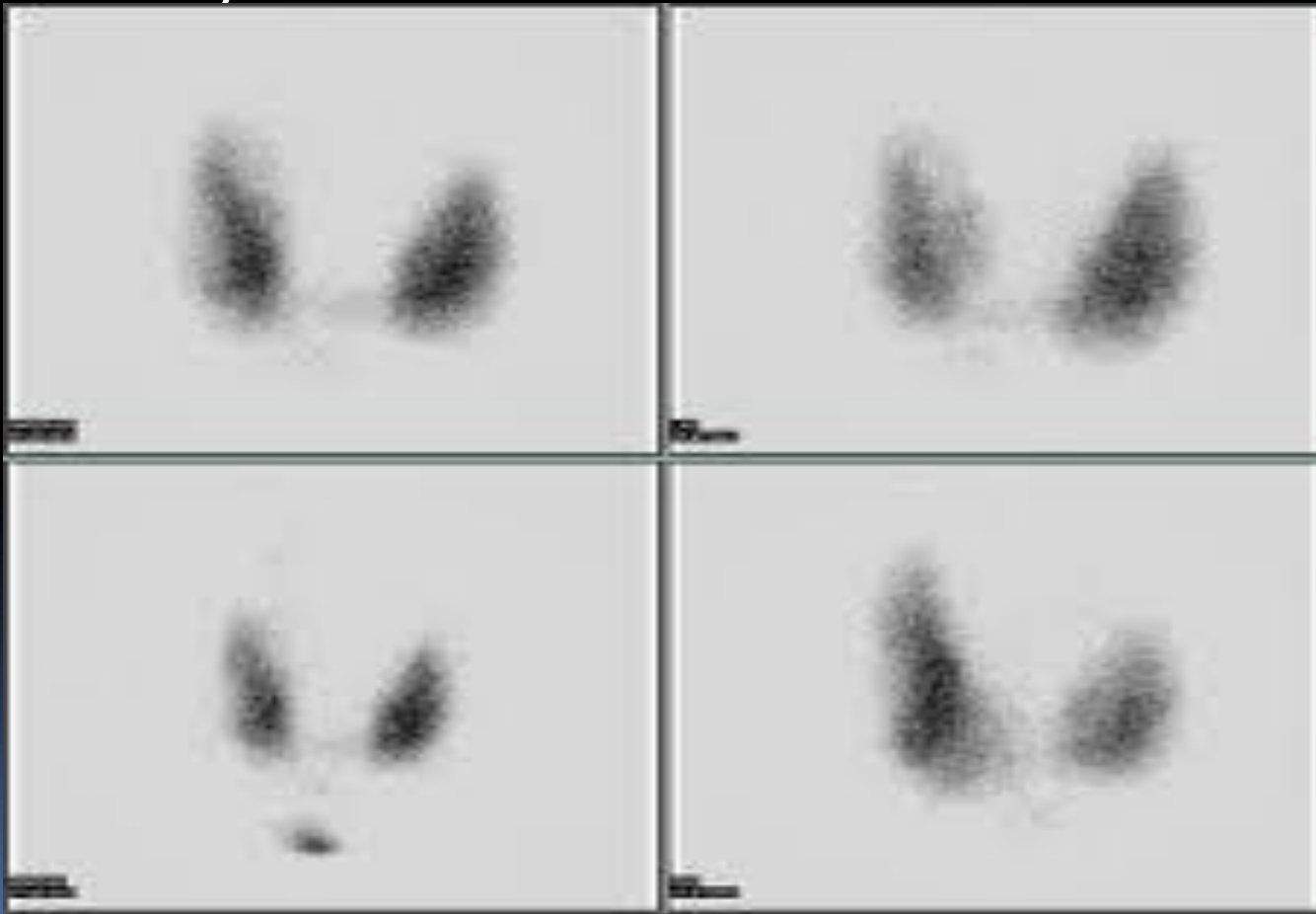
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- The following is other symptoms of *too little* T₃ and T₄ in your body (*hypothyroidism*):
 - Trouble sleeping
 - Tiredness and fatigue
 - Difficulty concentrating
 - Dry skin and hair
 - Depression
 - Sensitivity to cold temperature
 - Frequent, heavy periods
 - Joint and muscle pain

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- Investigations of thyroid gland
 - Thyroid function tests
 - T₃&t₄ level
 - TSH level
 - Thyroid antibodies
 - Thyroid US
 - Thyroid scan
 - Biopsy(fine needle or true cut)
 - CT&MRI

- Thyroid US



- Thyroid scan



Thyroid Scan in Thyrotoxicosis



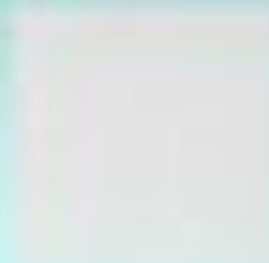
Graves' Disease



Follicular Adenoma



Multinodular Goiter



Subacute Thyroiditis

- fine needle aspiration



Thyroid scan

- Radioactive iodine uptake (RAIU) tests thyroid function. It measures how much radioactive iodine is taken up by your thyroid gland in a certain time period.
- A similar test is the thyroid scan. The 2 tests are commonly performed together, but they can be done separately.

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- The test could determine the thyroid nodule either hot(hyper active) or cold (hypoactive)

Or warm (normal)

The possibility of being a malignant nodule is:

Cold 20%

Warm 10%

Hot 4%

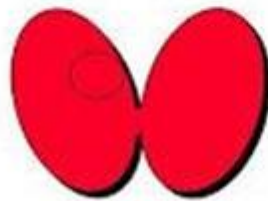
The role of thyroid scan for malignancy detection has greatly reduced after NEEDLE ASPIRATION

source: Health from Trusted Sources blog

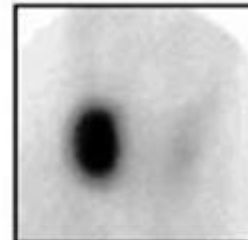
Thyroid Nodules on Radionuclide Scans



Cold



Warm



Hot



Causes of increased uptake include the following:

1-Hyperthyroidism

2-Iodine deficiency

3-Pregnancy

4-Recovery phase of subacute, silent, or postpartum thyroiditis


5-Rebound after suppression of thyrotropin

6-Rebound after withdrawal of antithyroid medication

7-Lithium carbonate therapy

8-Hashimoto thyroiditis

9-Congenital defects of thyroid homogenesis apart from trapping defect

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- Causes of decreased uptake include the following: ^[2]
 - Primary hypothyroidism
 - Destructive thyroiditis (subacute thyroiditis, silent thyroiditis, postpartum thyroiditis)
 - Post-thyroidectomy, ¹³¹I treatment, or external neck radiation
 - Central hypothyroidism
 - Thyroid hormone
 - Excess iodine
 - Dietary variations and supplements
 - Radiological contrast
 - Amiodarone
 - Topical iodine
 - Medications other than those containing iodine (eg, antithyroid drugs, perchlorate, thiocyanate, sulphonamides, sulphonylurea, high-dose glucocorticosteroids)



- **How the Test is Performed**

- The test is done in this way:
- You are given a pill that contains a tiny amount of radioactive iodine. After swallowing it, you wait as the iodine collects in the thyroid.
- The first scan is usually done 4 to 6 hours after you take the iodine pill. Another scan is usually done 24 hours later. During the scan, you lie on your back on a table. A device called a gamma probe is moved back and forth over the area of your neck where the thyroid gland is located.
- The probe detects the location and intensity of the rays given off by the radioactive material. A computer displays images of the thyroid gland.
- The test takes about 30 minutes.



- **How to Prepare for the Test**

- Follow instructions about not eating before the test. You may be told not to eat after midnight the night before your test.
- Your health care provider will tell you if you need to stop taking medicines before the test that may affect your test results. **DO NOT** stop taking any medicine without first talking to your provider.
- Tell your provider if you have:
 - Diarrhea (may decrease absorption of the radioactive iodine)
 - Had recent CT scans using intravenous or oral iodine-based contrast (within the past 2 weeks)
 - Too little or too much iodine in your diet



- **Why the Test is Performed**


- This test is done to check thyroid function. It is often done when blood tests of thyroid function show that you may have an overactive thyroid gland.







- **Normal Results**

- These are normal results at 6 and 24 hours after swallowing the radioactive iodine:
 - At 6 hours: 3% to 16%
 - At 24 hours: 8% to 25%
- Some testing centers only measure only 24 hours. Values may vary depending on the amount of iodine in your diet. Normal value ranges may vary slightly among different labs. Talk to your provider about the meaning of your specific test results.


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What is significant about whether a nodule is "hot" or "cold?"

- Functioning or "hot" nodules only rarely are from cancer. Nearly all thyroid cancers are nonfunctioning or "cold" nodules. However, even among "cold" nodules, cancer is infrequent (less than 5 percent of cases).

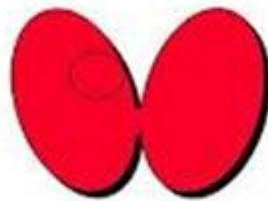
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- Most common causes of cold nodule:
 - Nodules of simple nodular goitre
 - Non functioning adenoma
 - cyst

source: Health from Trusted Sources blog

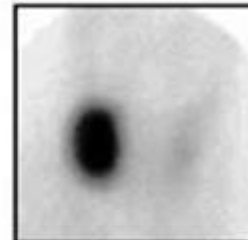
Thyroid Nodules on Radionuclide Scans



Cold



Warm



Hot

Thyroid Scan

Thyroid nodule: risk of malignancy 6.5%

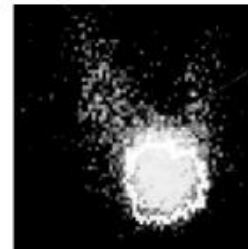
only 5-10% of nodules



Cold nodule
16-20% malignant

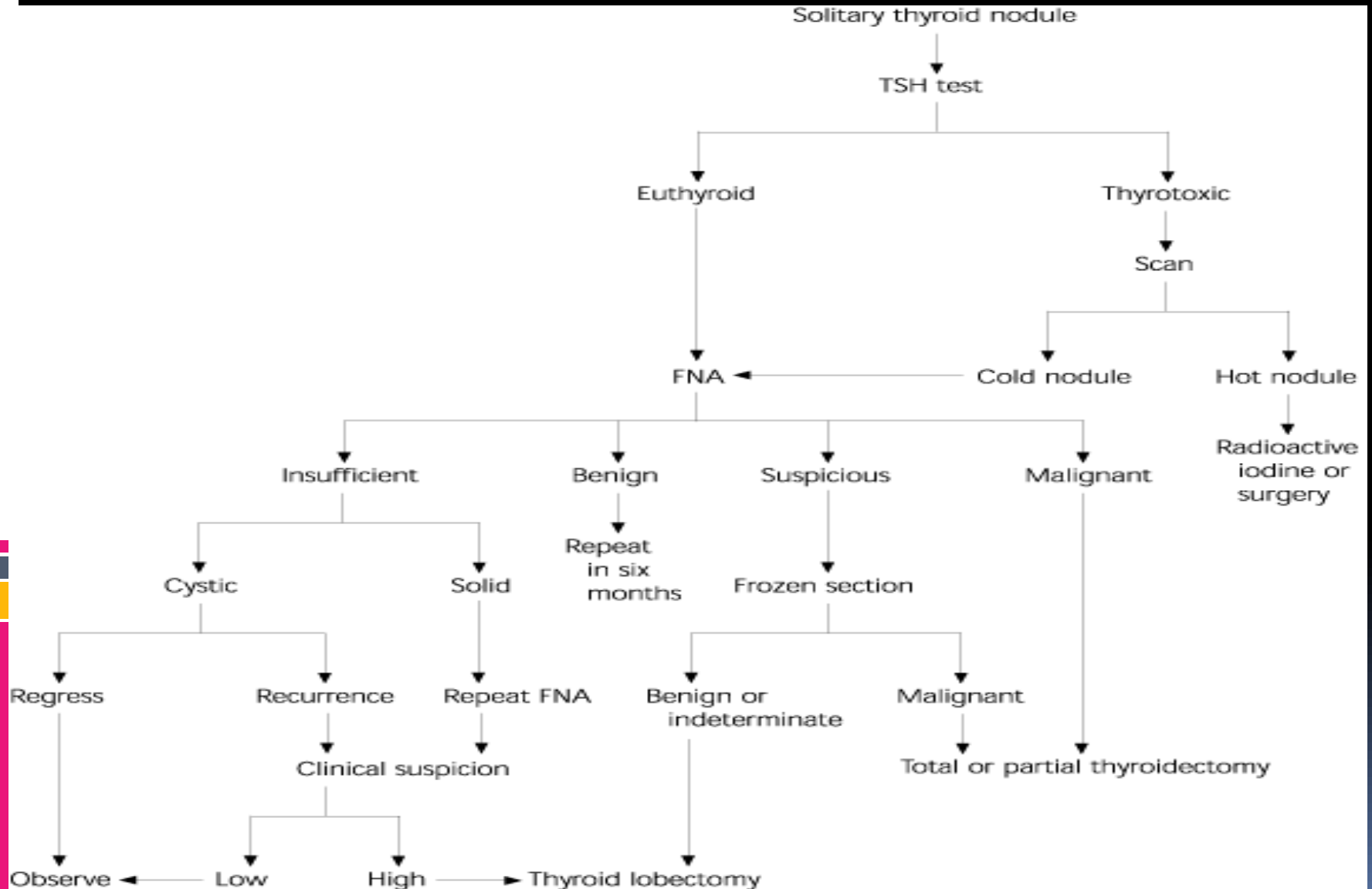


“Warm” Nodule
(indeterminant)
5% malignant



Hot Nodule
Tc-99m < 5% malignant
I¹²³ < 1% malignant

Management of thyroid nodule



References

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